

**A CULTURALLY RESPONSIVE STRATEGY FOR
TEACHING SEXUAL CONCEPTS IN RURAL XHOSA
SECONDARY SCHOOLS**

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**A CULTURALLY RESPONSIVE STRATEGY FOR TEACHING SEXUAL
CONCEPTS IN RURAL XHOSA SECONDARY SCHOOLS**

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Submitted in fulfilment of the requirements for the degree

PHILOSOPHIAE DOCTOR EDUCATIONIS

in the

FACULTY OF EDUCATION

at the

NELSON MANDELA UNIVERSITY

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December 2021

NELSON MANDELA UNIVERSITY

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TITLE OF DISSERTATION: A CULTURALLY RESPONSIVE STRATEGY FOR
TEACHING SEXUAL CONCEPTS IN RURAL XHOSA
SECONDARY SCHOOLS

DECLARATION:

In accordance with Rule G5.6.3, I hereby declare that the above-mentioned dissertation is my own work and that I have not previously been submitted to another university or for another qualification.

Signature:



Date: 16 November 2021

ACKNOWLEDGEMENTS

I would like to thank my two sons, Siyolisile and Masibulele Simayi, my nephews and nieces, Siyalizwa, Sisanda and Nqabomzi Xotyeni for making my days full of joy during my PhD journey. My late mother Ntombithini Nhinhi Vukuza, *Mamlambo*, would be dancing now but death stole her prematurely.

To my supervisor Prof Paul Webb, I do not have enough words to thank you. You chaperoned me, sacrificed your family time and space as you opened your home so that I could work during load shedding while in the middle of the covid-19 pandemic. You read, edited my work and responded timeously with precise instructions. Thank you for your expert guidance, your belief in my academic abilities and authorizing my CERM-ESA funding.

As a PhD scholarship recipient of the East and South African-German Centre of Excellence for Educational Research Methodologies and Management (CERM-ESA) (DAAD) for 2019-2021, I would like to thank CERM-ESA. The international coordinator Dr Malve von Möllendorff ensured that the monthly allowance, research, publication, and overseas funding was available. Thank you to the Research Capacity Development for funding the first year of my study.

To the teachers who participated in this study, I am nothing without you. I thank your resilience as you voluntarily continued even through the adjusted levels of the covid-19 pandemic. To Dr Benedict Khoboli, thank you for motivating me to initiate this PhD study. You identified my potential while I was still a teacher and you protected my student's interest and shielded me during challenges I faced when trying to join the university.

To the Executive Dean Dr Muki Moeng and members of the Faculty of Education, thank you for embracing me in the Faculty and for your continued support.

ABSTRACT

While research shows that the recognition and integration of indigenous knowledge (IK) is an important issue for developing culturally responsive strategies when teaching and learning science to, and by, indigenous people, little has been said about cultural taboos of a sexual nature and their effects on teaching and learning. This study investigated issues of taboo language use when teaching topics of a sexual nature during high school Biology classes. It also investigated the effects of a teacher development intervention based on Ogunniyi's Contiguity Argumentation Theory (CATPD) towards culturally responsive teaching strategies. Four phases in one cycle of a Critical Participatory Action Learning and Action Research (CPALAR) design were used in schools located in deep rural villages with a sample of Life Science Grade 12 teachers. Initially, 30 teachers answered a semi-structured questionnaire aimed at identifying cultural restrictions that could impede the teaching of sexual concepts (Stage 1). Stages 2-4 included seven participants of both gender. Data were generated from two sets of drawings with descriptions and audio recorded focus group discussions. The teaching of a collectively developed Indigenised Teaching Strategy lesson by a group-selected 'model-teacher' was video-recorded and analysed. Written participant evaluation is presented in a flow chart. Data analysis was done by manual thematic data analysis and by using Atlas ti. 8. The use of multiple data collection strategies contributed to the trustworthiness and credibility of the study. The few existing studies on cultural taboos report avoidance of using the vernacular for biological terminology and promote the exclusive use of standard, terms in English. In contrast, Xhosa IK-based sexual euphemisms derived from elderly, unlearned Xhosa women were successfully used for teaching sexual concepts. The teachers reported their findings through the cultural lens of Xhosa people. Cognitive change from the suppressed level in the CAT hierarchy to a more harmonious equipollent level of understanding was brought about using Bakhtin's theory of heteroglossia and the indigenist cognitive perspective of Contiguity

Argumentation Theory. This cognitive shift enabled verbalisation of the culturally avoided taboo sexual concepts. The transition in thinking symbolised transformation in terms of critical pedagogy. The claim is made that using Contiguity Argumentation Theory (CAT) and Bakhtin's explanations of heteroglossia provides an effective professional intervention in a deeply culturally determined Xhosa community. While not generalisable, the effect of this strategy should be of value when considering teacher development in indigenous communities and disciplines.

Key words: culturally responsive strategies, rural secondary school, Contiguity Argumentation Theory Professional Development, Xhosa Indigenised Teaching Strategy, culturally avoided sexual terms, CPALAR.

ABBREVIATIONS, TERMS AND KEYWORDS

CPALAR	Critical Participatory Action Learning and Action Research
CAT	Contiguity Argumentation Theory
CATPD	Professional Development on Contiguity Argumentation Theory
IK	Indigenous Knowledge
ITS	Indigenised Teaching Strategy
XIL	Xhosa Indigenised Lesson
PCCP	Primitive Cultural Counting Program

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CHAPTER 1

INTRODUCTION AND OVERVIEW

1.1 Introduction

Increasing calls have been made globally to widen the scope of science teaching by developing culturally responsive strategies across different cultures (Abrams et al., 2014; Gay, 2018; Ladson-Billings, 2009; Mhakure & Otulaja, 2017; Ogunniyi, 2013; Webb, 2013). Many of the calls for culturally responsive strategies have emphasised the pivotal role played by language in teaching science (Gay, 2010; Hodson, 2009; Probyn, 2015; Triandis, 2018; Yore & Treagust, 2006). Seah and Yore (2017) expand on this idea noting that there is a three-language problem consisting of an intersection of language from home, school, and discipline-specific languages to conceptualise science concepts. Considering that the language of indigenous people is encapsulated in the individual's cultural traditions and inherent worldviews (Hodson, 2009), encouraging the use of familiar language and cultural practices is important for understanding new science content, particularly sexual content that is viewed as sensitive by indigenous cultures. As this study is focussed on culturally responsive teaching strategies and language used in teaching sexual concepts to a homogeneous group of learners in rural schools, the issue of language is fundamental as a means of empowering teachers working in marginalised, rural and indigenous Xhosa communities.

In studies conducted among Xhosa speaking communities in South Africa, Webb (2017) presents a fourth language issue that arises when learners are taught in a language other than their home language. The issue of communicating in English as the language of learning and teaching (LoLT) is common in previously colonised areas of the world, including South Africa (Phakeng, 2018; Probyn, 2015; Setati, Chitera & Essien, 2009; Webb, 2017). Evidence

supporting the issue of language and culture suggests that science content of a sexual nature is considered taboo in certain indigenous cultures (Chilisa & Ntseane, 2010; Doidge & Lelliott, 2016). Furthermore, various research studies (Hodson, 2009; Ogunniyi, 2011; Probyn, 2015; Webb, 2017; Webb & Treagust, 2006) have reported on dichotomies displayed by the issue of language of teaching science at home and at school. Hodson (2009) emphasises that “a subject is its language” (p. 242) meaning that language is key in communicating the peculiar terms of a subject discipline.

In terms broader than subject discipline, Chomsky (2010), as cited in Makepeace (2010) as a film, notes that “a language is not just words. It is a culture, a tradition, a unification of a community, a whole history that creates what a community is. It's all embodied in a language”. This quote rings true for me when considering my personal experiences as a Xhosa woman brought up in a Xhosa cultural setting. Similarly, the positions of Yore and Treagust (2006) and Setati et al. (2009) resonate authentically with my many years of experience in teaching Life Sciences (Biology) to isiXhosa speaking learners in English in the Eastern Cape. From personal experience, I observed and assisted female learners of Xhosa culture who had accidental menstrual ‘slips’ in class. These young girls revealed a fear of telling their parents about the onset of menstruation as they feared being accused of being sexually active. In addition, they revealed that they could not share their menstruation mishaps with male teachers even if that teacher was a Biology teacher due to embarrassment. Instead, they found solace in female teachers, using colloquial terms in the vernacular such as *ndizimoshele*, meaning *I have dirtied myself*, expressed with shyness, and this special language required the cultural background of female teachers who were knowledgeable about such Xhosa terminology.

The subject content knowledge that learners are expected to know includes concepts such as the structure and functions of male reproductive systems such as testes, epididymis,

vas deferens, penis, urethra and female parts such as vagina, uterus, menstruation, sexual intercourse and fertilization (Department of Basic Education, 2017a). Such sexual content is mostly viewed as taboo most frequently in rural areas where traditional Xhosa culture persists most strongly (Deyi, 2016; Simayi & Webb, 2020). As such, the phenomenon of how cultural taboos might influence language use when teaching aspects of human sexual reproduction underpins this research study, particularly when teaching culturally sensitive issues in culturally homogenous classes. In this case, isiXhosa speaking children are taught what may be considered to be sensitive sexual content by isiXhosa first-language teachers in the English language in rural schools. Hence the study is premised on the supposition that there is a need for teachers to engage in culturally responsive teaching by implementing teaching strategies that link the Indigenous Knowledge (IK) (Msila & Gumbo, 2016) of relevant indigenous communities with Western Modern Science (WMS) (Abrams et al., 2014) relating to sexual concepts in order for learners to gain a deeper understanding of the content.

Culturally responsive teaching is viewed as a sum of pedagogical activities where IK is integrated into teaching and provides ‘a means for improving achievement by teaching diverse students *through* their own cultural filters’ (Gay, 2013, p. 50). The discourse on language and culturally responsive strategies suggests a need for the development of culturally responsive science teachers (Aikenhead et al., 2014) to effectively teach science to learners whose home language is not English (Phakeng, 2018; Rollnick, 2000). The study aims at contributing to this discourse from a perspective that investigates possible links between learning about sexual concepts (WMS) and the IK of Xhosa people, as well as the possible influence of culturally situated professional intervention for teaching sensitive science content in line with the IK of indigenous people (Desimone & Pak, 2017).

Drawing from the subject pass percentage levels in the Eastern Cape for Grade 12 Life Sciences (LFSC) examination over three years extending from 2015 to 2017, evidence from available data indicates that results were exceptionally poor (Department of Basic Education, 2017c, 2017d). Only 25% of the students in the province achieved a mark higher than 50% and nearly 40% of the candidates earned a mark of 30% or less (Department of Basic Education, 2017b, 2017c) in each year's final examinations. The section on sexual concepts (human reproduction) falls under LFSC Paper 1 content knowledge and this section has a significantly high weighting of 37% examinable content (Department of Basic Education, 2017a). In these LFSC Paper 1 examinations, sexual concepts constituted a varying mark distribution inclusive of topics such as male and female reproduction (31 marks), reproduction in vertebrates (6 marks) and human endocrine system (15 marks) (Department of Basic Education, 2017a). Poor performance in this section contributes significantly to the low achievement rate as the combined mark for human reproduction processes contributes 52 marks out of 150 (37%) for LFSC Paper 1 (Department of Basic Education, 2017a).

Although the study is not making direct inferences from the poor pass rate and LoLT, Nord (2018) reports that translation issues among indigenous languages are common. In this study this view is indicated by missing isiXhosa lexicon for sexual terms commensurate to how they are described in English. For example, isiXhosa translation of the 'uterus' as *isibeleko* (Deyi, 2016; Ideabuilder, 2011) is used generally in an ambiguous manner to refer to all the internal parts of the female reproduction system such as the fallopian tubes, ovaries, endometrium and uterus (Ideabuilder, 2011; Simayi & Khoboli, 2019). Also, there is the issue of avoiding naming sexual terms and that becomes apparent when one considers the isiXhosa word *asibizi*. The term *asibizi* translates as 'we do not talk about this' in Xhosa culture (Simayi & Webb, 2020). Not being allowed to talk about something is a cultural taboo, in this case, not

being able to use content language to explain the reproductive systems in isiXhosa or English. Such taboos are most frequent in rural areas where traditional Xhosa culture persists most strongly (Moletsane, 2012; Simayi & Webb, 2020). As such, the phenomenon of how cultural taboos might influence language use when teaching aspects of human sexual reproduction underpins this research study, particularly when teaching culturally sensitive issues in culturally homogenous classes. In this case, in classes where isiXhosa speaking children are taught what may be considered to be sensitive sexual content by isiXhosa first-language teachers in the English language in rural schools.

1.2 Problem statement

Teaching and talking about content of a sexual nature is a problem in many parts of the world (Buni, 2013; Chamany, Allen & Tanner, 2008; Doidge & Lelliott, 2016; Levinson, 2006). There are studies on culture and human reproduction in sub-Saharan Africa such as Doidge and Lelliott's (2016) research on metaphorical language and sexuality education. There is evidence that the language used when teaching sexual concepts in diverse South African indigenous communities is recognized as culturally taboo (Chilisa & Ntseane, 2010; Doidge & Lelliott, 2016). However, there is a gap because African research projects generally focus on HIV and sexuality (Helleve, Flisher, Onya, Mukoma & Klepp, 2009; Malambo, 2000; Mpondo, Ruiter, Schaafsma, Van Den Borne & Reddy, 2018), sexuality issues in Zimbabwe (Gudyanga, de Lange & Khau, 2019), sexuality issues in SePedi women (Phetla et al., 2008) and gender-based sexual abuse of girls (Chilisa & Ntseane, 2010). In turn, there is a paucity of research on the existence and influence of cultural taboos in African contexts (Masinire, Maringe & Nkambule, 2014), particularly cultural taboos that influence the teaching of sexual concepts to learners of the same culture in deep rural village schools.

There is anecdotal evidence that this is also the case in Xhosa rural communities and Simayi and Webb (2020) report on cultural taboos among Xhosa teachers that indicated evidence of general avoidance of naming sexual concepts in isiXhosa expressed in vernacular as *asibizi*. The study notes that these studies were reportedly preliminary (Simayi & Webb, 2020). Therefore, the research problem extends this study to establish clarity as to whether African teachers of Xhosa culture experience similar inhibitions when talking about sexual reproduction processes as there is little to no evidence of how they teach sexual concepts to learners residing in deep, rural schools and how they respond to language and culture challenges. We also do not know whether the teachers perceive these inhibitions and language issues as taboos when teaching in culturally homogenous settings where learners share the same Xhosa culture as the teachers. Hence, the problem posed by the study is whether the use of sexual language that is familiar to the teachers' and learners' (since they share the same culture) as everyday knowledge and IK could be used to clarify and deepen the connection between Xhosa indigenous culture and WMS.

The contradiction between mandatory school science curriculum (WMS) requiring naming of sexual processes such as copulation, fertilization and menstruation (Department of Basic Education, 2011a, 2017a) and Xhosa culture (IK), suggests a problem that requires culturally responsive science teachers who can explain such phenomena to learners using acceptable language linked to the IK of indigenous Xhosa people. Doidge and Lelliott (2016) state that there are cultural taboo problems with language used when naming genitalia and sexual language which may not be part of the normal, everyday language of that group of individuals. However, Doidge and Lelliott (2016) propagate the exclusive use of English biological terminology (WMS) instead of clarifying with IK-based terms. This approach of using sexual language that is not familiar with learners' everyday language may raise conflict

between teachers and learners (Chilisa & Ntseane, 2010), bringing to the fore a need to directly confront the connection between culture, ethnic grouping and learning between individuals and groups (Gay, 2002; Phetla et al., 2008).

Ogunniyi (2007) proposed Contiguity Argumentation Theory (CAT) as an indigenous knowledge (IK) - based argumentation framework for teaching WMS in African cultures. Ogunniyi (2007) and Ogunniyi and Hewson (2008) argue that cognitively, a dialogue between two competing thought systems such as WMS and IK can co-exist in a balanced cognitive state. In this instance, we do not know whether an understanding of Xhosa culture viewed within the structure of Contiguity Argumentation Theory (CAT) may influence the teachers' ability to design effective culturally based teaching strategies. Similarly, we do not know whether teachers would be able to successfully engage in Contiguity Argumentation Theory professional development (CATPD) and design their own Xhosa Indigenised Teaching Strategies (ITS) for teaching Xhosa Indigenised lessons (XIL) on sexual concepts.

1.3 Research questions

The main research question in this study is “can teachers of Xhosa culture use culturally responsive strategies for teaching sexual concepts to learners of the same culture in rural secondary schools of the Eastern Cape”?

1.3.1 Subsidiary research questions

- What are the perceptions of Grade 12 Life Sciences' teachers of Xhosa culture about taboos that may restrict or enhance teaching strategies used in teaching sexual concepts to a homogenous group of learners in Eastern Cape rural secondary schools?
- What are the experiences of Xhosa teachers about teaching strategies they use for teaching sexual concepts to Grade 12 learners?

- How do Xhosa teachers develop culturally responsive strategies to teach sexual concepts to learners in rural secondary schools?
- What are the perceptions of Xhosa teachers about the Contiguity Argumentation Theory professional development (CATPD)?
- How do Xhosa teachers perceive the use of Indigenised Teaching Strategies (ITS) in teaching sexual concepts to a homogenous group of learners in rural secondary schools after being introduced to CAT?

1.4 Research aim and objectives

The aim of the study is to explore how teachers of Xhosa culture use culturally responsive strategies for teaching sexual concepts to learners of the same culture in rural secondary schools of the Eastern Cape.

1.4.1 The study intends to address the following objectives

- To establish the perceptions of Grade 12 Life Sciences' teachers about Xhosa cultural taboos that may restrict or enhance teaching of human reproduction content in Eastern Cape rural secondary schools.
- To determine the experiences of Xhosa teachers about teaching strategies they use for teaching sexual concepts to Grade 12 learners.
- To find out how Xhosa teachers develop culturally responsive strategies to teach sexual concepts to learners in rural secondary schools.
- To explore the perceptions of Xhosa teachers about the Contiguity Argumentation Theory professional development (CATPD).

- To determine the perceptions of Xhosa teachers about the use of Indigenised Teaching Strategies (ITS) in teaching sexual concepts to a homogenous group of learners in rural secondary schools.

1.5 Research design and methodology

A recursive, one cycle design-based Participatory Action and Learning Action Research (PALAR) model consisting of four flexible steps (Wood & Zuber-Skerritt, 2013; Zuber-Skerritt, 2018) was used in this study. This design was chosen due to the flexible nature of PALAR, meaning that no step is fixed (Kearney, Wood & Zuber-Skerritt, 2013; Zuber-Skerritt, 2009; Zuber-Skerritt, 2002). Therefore, PALAR could be adapted based on how the study unfolds. Moreover, the multiplicity of data collection sessions of PALAR (Steps 1 – 4) allowed participants to communicate and reflect about issues between the steps (Wood, Louw & Zuber-Skerritt, 2017) which allowed for rich data collection and space to implement changes (Mertler, 2012; Onwuegbuzie, Leech & Collins, 2010).

1.5.1 Four steps of Participatory Action and Learning Action Research (PALAR)

The first step of PALAR sought to diagnose (Wood & Zuber-Skerritt, 2013) whether Xhosa teachers have experienced cultural nuances that restrict teaching of human reproduction in rural schools. Open – ended questionnaires were used to identify the problem of the existence of cultural taboos. The second PALAR step required action, where individual teachers and groups performed activities such as drawings and focus group interviews to give in-depth views and new ideas (Wood & Zuber-Skerritt, 2013; Zuber-Skerritt, 2015) about their perceptions in teaching sexual content and taboos. Professional Development (Desimone, 2011; Desimone & Pak, 2017) in the form of a power point was presented on the Contiguity Argumentation Theory (CATPD) and research studies during the second-action phase of PALAR (Fletcher & Zuber-

Skerritt, 2008). The purpose of the CATPD was to give opportunities to group members to design a Xhosa Indigenised lesson (XIL) plan and Indigenised Teaching Strategies (ITS) based on their own selected sexual concept topic drawn from the Grade 12 human reproduction curriculum (Department of Basic Education, 2011a, 2011b).

Presentation of the XIL using the ITS was done by the model teacher to group members serving as model-learners during the third, implementation stage of PALAR. Participants designed the Xhosa Indigenised Teaching Strategy through which the concepts of WMS and Xhosa IK were integrated into a Xhosa Indigenised Lesson. The implementation of the ITS used a Primitive Cultural Counting Program (PCCP) on the menstrual cycle with a counting time schedule that was roughly equivalent to the scientific menstrual cycle in CAPS. The fourth and final PALAR step was for the researcher to present her findings to both the participants and a wider audience. This action aimed at getting both participant confirmation and wider dissemination of the knowledge generated. In other words, that was to ensure that the voices of the teachers who participated in the study were heard and the researcher was reporting accurate and authentic information (Zuber-Skerritt, 2015). However, restructuring of phase four of PALAR to few numbers was necessitated by restrictions set by the covid-19 pandemic that restricted number of people that could be accommodated in a venue (World Health Organization , 2020).

1.5.2 Sample and setting

All 27 public rural secondary schools with 30 Life Sciences teachers in Chris Hani East Cluster (former Ngcobo-Cala district) were purposively sampled to take part in the study based on being located in deep, rural villages of the Eastern Cape. The setting was composed of widely spread rural villages with scattered schools, poorly maintained roads and schools that lacked running water and electricity (Simayi & Webb, 2020). Recruitment of participants was

done through the office of the Subject Education Specialist (SES) who was the manager of the subject in the district. As indicated earlier, 30 teachers participated in an initial data gathering exercise which explored the presence and influence of cultural taboos in teaching human reproduction in rural secondary schools. These public schools were all categorized under quintile one to three in terms of poverty levels (Masitena & Schmidt, 2016) as categorised in the Eastern Cape Provincial Gazette, and they were also ‘no-fee paying schools’ (Dass & Rinqest, 2017, p. 146).

This purposive sampling technique also enabled the geographical clustering of a sample comprised of a minimum of 6 and maximum of 12 participants (Fusch & Ness, 2015; Onwuegbuzie & Leech, 2019) with five or more years’ experience in the selected schools as an acceptable number for in-depth data collection (Etikan, Musa & Alkassim, 2016; Mason, 2010). From the second to the fourth cycle of PALAR, eight participants volunteered to take part in in depth data generation strategies where they drew pictures and mind maps about their experiences and told stories of how they felt when teaching sexual content to Grade 12 learners of the same culture. The sample consisted of three (3) males and five (5) females. All eight participants were part of the initial purposively selected pool of 30 volunteers that was selected earlier based the criteria set in the questionnaires and research questions of the study. There was no specific gender bias and gender distribution was merely for demographical distribution and gender inclusivity. All eight participants were sampled based on sharing Xhosa culture, teaching Life Sciences in grade 12 with five or more teaching experience, working in rural public secondary schools with learners of the same culture.

1.5.3 Professional Intervention

As noted above under the design section, a recursive, one cycle design-based Participatory Action and Learning Action Research (PALAR) model consisting of four flexible

steps was used in this study, see Figure 3 of PALAR. Research in support of professional intervention suggests that the focus should be on teaching strategies associated with specific curriculum content (Darling-Hammond, Hyster & Gardner, 2017). Also, the intended focus of the professional intervention was on the subject discipline (Stanley & Brickhouse, 2001) comprised of sexual concepts as prescribed in the curriculum, underpinned by the Contiguity Argumentation Theory as a supportive indigenous framework. Therefore, the CATPD was designed with the aim of developing teaching skills as research (Probyn, 2015) indicates that there is little training that guides English Additional language (EAL) teachers towards a coherent systematic approach to using both languages in classroom.

The CATPD covered curriculum content on sexual concepts, international strategies used in teaching sexual concepts and Contiguity Argumentation Theory (CAT), over a period of two days in Ngcobo district. The small group of eight participants discussed their views on the international strategies used in teaching sexual concepts and the Contiguity Argumentation Theory presentations linked with their Xhosa IK. The group selected the menstrual cycle as content focus of their Xhosa Indigenised Lesson (XIL) and this topic was in line with the requirements set the Curriculum and Assessment Policy Statement (CAPS) for Life Sciences in Grade 12 (Department of Basic Education, 2011a, 2011b).

As reported earlier in section 5.1 of this chapter, a Primitive Cultural Counting Program (PCCP) on the menstrual cycle was presented by the model teacher who was selected on consensus by group members. The Indigenised Teaching Strategy (ITS) that was used was a form of culturally appropriate teaching strategy developed by the teachers in the CATPD to teach the PCCP. The design of the ITS and XIL was the collective effort of the group members. The model teacher used the ITS to draw parallels between Xhosa-*IK* based language and

sensitive WMS sexual concepts such as sexual intercourse and menstruation and presented the topic in a jovial, relaxed atmosphere which was interspersed with isiXhosa concepts.

1.5.4 Data generation and analysis

Semi-structured questionnaires (Fusch, Fusch & Ness, 2018) with pen and paper were issued as preliminary questionnaires (Appendix 9) to 30 participants with the intention of exploring the presence and influence of cultural taboos in teaching sexual concepts and processes in rural secondary schools. The semi-structured questionnaires were distributed and collected by the researcher on the same day of issue. The questionnaires consisted of demographical questions that sought to establish relevant sampling based on cultural grouping, subject taught and rural location of the schools during the first data generating session. As this study is qualitative, thematic data analysis (Braun & Clarke, 2019; Clarke & Braun, 2014) of generated data was conducted based on similarities gleaned from colour-coded themes and key terms. After translation and transcription, data was analysed by organizing data into patterns and themes by manually coding the data using sorting, writing and labelling (Creswell & Piano-Clark, 2007; Denzin, 2012).

A sample of eight participants engaged in two cycles of drawings and focus group discussions (Appendices 12, 13, 14, 15), before and after CATPD and teaching with ITS (Appendix 16). In both cases, drawings (De Andrade, Freire & Baptista, 2021; MacEntee, 2020; Mitchell, De Lange & Moletsane, 2017) were done to allow participants to draw mind maps (Jewitt, Kress, Ogborn & Tsatsarelis, 2001; Mannay, 2016) about their experiences and tell stories of how they felt when teaching sexual content. The aim of this phase was to find out their experiences and perceptions on teaching this sensitive content area to learners of the same culture as themselves. Focus group interviews (Fusch et al., 2018; Kvale, 2008; Mason, 2010) were conducted by means of audio recordings to determine the participants' current teaching

strategies and culturally responsive teaching strategies used in teaching sexual content. Two forms of thematical data analysis were done namely, manual (Fereday & Muir-Cochrane, 2006; Fusch et al., 2018; Mason, 2010) and electronic data analysis using Atlas ti. 8 software (Friese, Soratto & Pires, 2018; Paulus, Woods, Atkins & Macklin, 2014; Saldaña, 2021; Woods, Paulus, Atkins & Macklin, 2016).

Data generation before the CATPD was initially aimed at determining culturally responsive strategies used by the teachers and use those strategies as a basis for argumentation with CAT as a framework for IK-based science teaching (Ogunniyi, 2013). However, participants indicated that they did not know nor use culturally appropriate strategies. Therefore, a change to the initial plan was implemented as discussed in chapter four of this study. The XIL was presented using the ITS designed by the group. The presentation was video recorded (Creswell & Poth, 2016), see Appendix 16. Video – recorded data was analysed by means of Atlas ti. 8 for capturing gestures and video time stamps for accurate, evidence based reporting (Friese et al., 2018; Saldaña, 2021). After using the XIL plan and teaching with ITS, participants were asked to reflect critically on their experience and share their experiences of using the ITS and the CATPD during the second cycle of drawings and focus group interviews. The reason for second cycle of drawings was to evaluate the whole research process based on the views of individual participants and address the research questions posed earlier in the study.

The new Xhosa Indigenised lesson (XIL), the influence of Contiguity Argumentation Professional in the professional development session (CATPD) and the use of the Xhosa Indigenised Teaching Strategy (ITS) in the lesson design were evaluated by means of a group-designed flow chart (Appendix 19). The original plan was to have a celebration and invite other Life Science teachers and department officials from the same district to share the newly

developed Xhosa Indigenised lesson plan and Indigenised Teaching Strategy developed by the teachers. However, due to the world-wide covid-19 lockdown restrictions (Department of Health, 2020) that restricted movement between cities and emphasised social distance and reduced numbers, holding a seminar in line with PALAR requirements became impossible. Therefore, amendments were made to continue with the study using the widely used and cheaper mode of communication WhatsApp (Ngaleka & Uys, 2013) to secure a date on which a visit to the research group could be acceptable. More sophisticated online video-conferencing facilities could have been used however, there was a problem due to the challenge of internet that was reported by participants. Wi-Fi reception in the mountainous, rural areas where the study was conducted and unavailability of internet connectivity and online software was a problem. The participants communicated and recorded their views on a flowchart (Appendix 19) which was drawn by their model teacher as confirmation of the findings, representing the last phase of PALAR. More details on the research design and methodology used in this study can be found in the design and methods chapter of this report (Chapter 3).

1.6 Philosophical underpinnings

Epistemological perspectives are concerned with the way knowledge is acquired while ontology focuses on the nature of reality (Creswell & Poth, 2016). Epistemology is the theory of knowledge and focuses on what constitutes valid knowledge (De Vos, Delpont, Fouché & Strydom, 2011). My epistemology, in the context of this study, is that truth can only be known by those who experience it through a process of self-conscious action of reflection (Charmaz, 2015; Mertens, 2007). Therefore, the driving force of the study is the epistemology of the knowledge of South African teachers of Xhosa culture about how they believe and experience the influence of their culture on teaching sensitive sexual content knowledge. As the study explores issues of social justice issues (Denzin, 2017; Freire, 2005; Kemmis, McTaggart &

Nixon, 2015) of rural and marginalised rural school teachers, including issues of power, dialogue and reflection, it falls within the critical paradigm (Carr & Kemmis, 2005; Denzin, 2017; Freire, 2005; Kemmis, McTaggart & Nixon, 2014). Defining my study within the critical paradigm is based on my ontological, epistemological and methodological assumptions mentioned earlier.

My axiological assumptions reside in respect for the language, beliefs, values and traditions of the Xhosa participants who live and work in poor, under resourced rural environments and that the world has multiple realities that are critical in this study. The narrative nature of the study embraces this approach as I, as the researcher; needs to listen to the subjective voices of the teachers as participants (De Vos et al., 2011; Denzin & Lincoln, 2005). The study is framed within the linguistic conceptual framework of Bakhtin's metalanguage (Bakhtin, 1994, 2010) when communicating Western Modern Science sexual terminology in a context where there are competing cultural limitations. The indigenous perspective of this study is founded on the theoretical framework of Contiguity Argumentation Theory (Ogunniyi, 2013; Ogunniyi & Hewson, 2008).

This study falls within the paradigmatic notion of critical theory. I make this statement because of the radical transformations that the participants and I experienced during the intervention. The participants became extremely attentive to the topic of sexual content and Xhosa culture and shared their reflections much more than I expected. I was shocked as I saw great change (Appendix 11) in their social circumstances as they became able to talk more and more freely to each other about sexual concepts. They shared and exchanged views in collaborative settings and made radical social changes within the group by openly sharing their weaknesses and insecurities about the topic under investigation.

1.7 Outline of the study

The research process report consists of six chapters.

Chapter 1: Introduction and overview

Chapter 1 gives an overview and introduction to the study, provides the problem statement, rationale and establishing the research gap. The research questions, objectives and aim which guide how the research will unfold and strive to address the identified problem are discussed. Issues of cultural taboo and language used in teaching sensitive, human reproduction concepts are considered under the umbrella of professional intervention and IK-based culturally appropriate teaching strategies.

Chapter 2: Literature Review

A review of literature pertaining to language of science, Indigenous Knowledge and the influence of Bakhtin's metalanguage is presented. Ways of teaching sexual science content in rural schools is considered from a cultural perspective using Ogunniyi's Contiguity Argumentation Theory as a theoretical framework.

Chapter 3: Research Design and Methodology

In this chapter, issues around research design and the methods used are presented and discussed within a critical indigenist perspective, CAT, modalities of socio-cultural development and philosophical assumptions guiding the PALAR.

Chapter 4: Results

In this chapter, the findings are reported and interpreted.

Chapter 5: Discussion of Results

The findings are interrogated in this chapter using notions of Critical Participatory Action and Learning and Action Research, dialogic argumentation provided by Contiguity Argumentation Theory strategy, and analysis of language differences within Bakhtin's heteroglossia theory. The limitations and implications of the study are also considered.

Chapter 6: Conclusion

The main conclusions based on the study are presented in Chapter 6 and recommendations are made for further research.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter provides a literature review on indigenous knowledge with a focus on the effects of culture and language on teaching science concepts. The review focuses on the phenomenon of linguistic cultural restrictions when teaching particular science content in an attempt to provide an understanding of how possible effects of worldview and language use may contribute positively when teaching science. It then follows research findings that lead to language restrictions within a particular indigenous culture, in this case to that of Xhosa people in South Africa.

The Xhosa indigenous population comprises 83% of the total population of the Eastern Cape province (Makiwane, 2011, p. 40). Xhosa people who adhere strongly to traditional values are called 'Red' Xhosas, and the areas where the majority of this grouping live are considered to be deep rural (Mda, 2007, p. 92). In this culture, issues of menstruation and teachings of the transition from girlhood to womanhood are very important (Mtuzze, 1990). Despite the importance this topic, the scarcity of studies on the issue highlights the gap in our knowledge about teaching of sexual concepts in secondary schools that are based in rural Xhosa indigenous group settings, where teachers and learners share similar cultures. This topic underpins the teaching and learning of sexual reproduction by Xhosa teachers of the same ethnicity as their pupils. Note that in this study, teachers of Xhosa culture are summarily referred to as Xhosa teachers based on common culture shared and not on teaching isiXhosa as a subject or speaking the language.

The review then focuses on teacher professional intervention with the intention of framing a Xhosa Indigenised teaching strategy as a culturally responsive strategy (Gay, 2013; Lewthwaite, Owen, Doiron, Renaud & McMillan, 2014; Mhakure & Otulaja, 2017). Literature on Ogunniyi's Contiguity Argumentation Theory (Ogunniyi, 2007, 2013) is introduced as an indigenous knowledge-based theoretical framework. Contiguity Argumentation Theory (CAT) is a framework that mediates for the creation of a balanced cognitive state between Western Modern Science (WMS) and Indigenous Knowledge (IK). In addition, Aikenhead et al., (2014) reported on a professional development held in 2011-2012 with science teachers about enhancing their science teaching with Indigenous knowledge; many for the first time. The stories shared by the teachers demonstrated what it meant to 'become a culturally responsive science teacher' (Aikenhead et al., 2014, p. 3). In this study, professional intervention is used to frame and help understand possibilities for developing meaningful teaching and learning strategies for teaching culturally sensitive topics in an understandable and culturally integrated way to children who are brought up in a community that adheres strongly to traditional values.

2.2 Indigenous knowledge in context

Clarification of concepts becomes critical for an understanding of the themes under discussion. In the context of this study, I follow the definition of indigenous people as "long term inhabitants of a place with traditional knowledge of the place" (Abrams et al., 2014, p. 671). While positioning the study within an IK-based framework, IK is clarified to avoid ambiguous and interchangeable use of terms. The study follows the definition of IK as knowledge that assists a way of living so that people can survive and live in harmony (Aikenhead, 2006), and this definition is relevant to the position of indigenous societies that adhere strongly to traditional values. Adding another dimension to the definition, (Odora Hoppers, 2002) describes IK as "local knowledge – knowledge that is unique to a given culture

or society” (p. 102). Various sub-Saharan scholars (Hewson, Javu & Holtman, 2009; Mertens, Cram & Chilisa, 2013; Odora Hoppers, 2002; Ogunniyi, 2013; Webb, 2016) emphasise the importance of culture as part of IK. In relation to the South African context, Ogunniyi (2013) presents Indigenous Knowledge System (IKS) as an over-arching system of thought that has been handed down from one generation to another, peculiar to a particular people living in a specific socio-cultural environment. Meanwhile, Odora Hoppers (2009) views IKS as an extensive effort by academic and national institutions to allow a discourse on cultural identity and participation in an unequal society. In trying to frame an argument for the cultural integration of IK into WMS, the study aligns the definition of IKS, IK and indigenous people on the cited studies.

Furthermore, Battiste (2005) captures the essence of cultural integration of Indigenous Knowledge into Eurocentric Knowledge noting:

The recognition and intellectual activation of Indigenous Knowledge today is an act of empowerment by indigenous people. The task for indigenous academics has been to affirm and activate the holistic paradigm of indigenous knowledge to reveal the wealth and richness of indigenous languages, worldviews, teachings, and experiences, all of which have been systematically excluded from contemporary educational institutions and from Eurocentric knowledge systems. (p.1)

Thus, a brief historical perspective to curricula that excluded the culture of indigenous people is presented as argument for equitable, cultural-inclusive pedagogy relevant to learners’ socio-cultural environment.

2.2.1 Historical perspective of IK inclusion

Empirical data bears evidence of historical exclusion of IK in science teaching and domination of indigenous groupings in First World Nations as in the case of the Maori of New Zealand (Aikenhead, 2001; Aikenhead et al., 2014; Lewthwaite & Wood, 2008; McKinley & Keegan, 2008), the Amis in Taiwan (Lee, Yen & Aikenhead, 2012) and ‘first-nation’ people in Canada (Aikenhead, 2001; Aikenhead et al., 2014; Ball & Bernhardt, 2008; Battiste, 2005). It is worth noting that Hodson (2009) uses the term ‘Eurocentric sciences’ (p. 124) to refer to school science, however, the study will consistently use Western Modern Science (WMS) (Abrams et al., 2014) when referring to school science. Mindful of competing views proposed by the universalist group which sees IK as inferior to WMS (Siegel, 2002) and as it is value-laden, therefore cannot be regarded as science (Harding, 1998), this study is underpinned by research that reveals successful implementation of IK-embedded science curricula in various indigenous communities.

Lessons have been learnt from the pioneer studies of the Maori and the largest ethnic group in Taiwan, the Amis (Lee et al., 2012), where language, cultural beliefs and generally the worldview of the people were successfully integrated into the Western curricula. In agreement, Battiste (2005) posits that IK ‘reconceptualizes the resilience and self-reliance of Indigenous peoples, and underscores the importance of their own philosophies, heritages, and educational processes’ (p. 2). Hodson (2014) emphasises the view that science conceptual development is complex and personal therefore, the location of the sociocultural context where learning occurs is important. Furthermore, Gay (2013) regards pedagogical activities where IK is integrated into teaching as culturally responsive strategies. The definition of culturally responsive teaching as ‘a means for improving achievement by teaching diverse students *through* their own cultural filters’ (Gay, 2013, p. 50) is relevant for this study. Therefore, the

successful integration of IK into the curriculum provides strong argument for such interventions to act as a bridge between IK and WMS (Stanley & Brickhouse, 2001) and this view underpins the current study.

Supporting arguments for IK inclusion in school curriculum are presented by Snively and Corsiglia (2001) who caution that a clash between learners' cultural identity and school science develops when IK is neglected. They suggest that science programmes and curricula have been developed with little understanding of imbedded cultural assumptions of indigenous communities (Snively, 2018; Snively & Corsiglia, 2001; Snively & Williams, 2005). Fundamental to the study, is the prioritisation of Indigenous people as embedded in indigenized science education, premised on a 'decolonising framework' (Snively, 2018, p. 261). Likewise, Aikenhead (2001) addresses the question of how to teach WMS to indigenous people recommending 'cultural border crossing' (p.11) as an alternative to the clash between the two. Grounded research on cultural identity (Chilisa, Major & Khudu-Petersen, 2017; McKinley & Keegan, 2008) and cross border crossing (Aikenhead, 2001, 2002; Aikenhead & Jegede, 1999; Hodson, 2009) are pivotal to this study due to shared similarities regarding indigeneity, traditional settings and a history of curricula set by colonisers. Furthermore, evidential support suggests that cultural border crossing allows learners to gain knowledge of WMS without using losing their cultural identity (Aikenhead, 2001).

A study on First Nations indigenous people of Saskatchewan, Canada, by Aikenhead (2001) suggests that in learning WMS, learners have to move from one culture (everyday language) to another (WMS) through cultural border crossing, therefore there are two contrasting cultures. Likewise, Ball and Bernhardt (2008) report on the role played by "cultural patterns of communication" (p. 573) in preserving the language of indigenous First nation people of Canada. One of the challenges for WMS teachers working in indigenous

communities is that WMS is itself a cultural body comprised of Eurocentric underpinnings which are different from the worldview of indigenous people (Aikenhead, 2001; Aikenhead & Jegede, 1999). While teaching WMS, teachers are faced with several fundamental cultural challenges such as language, ethnicity, geographical location, gender and social class which differ from the learners' familiar knowledge. In this context, a strategy is required to allow teachers to mediate between the two cultures (community knowledge and WMS knowledge). Cross-cultural teaching is proposed as a strategy that teachers can use to alleviate the tension between community identity and school identity (Brown, Reveles & Kelly, 2005; Hodson, 2009), creating an effortless transition between two cultures so that learners can develop into better citizens. Cross cultural teaching is suggested as a fundamental strategy requiring teachers to bridge the gap and act as culture brokers, responsible for identifying and mapping out cultural borders that have to be crossed by learners in their search for new WMS knowledge.

In trying to bridge the gap, Hodson (2009) proposes personalised science as a strategy to narrow the gap between community knowledge and school science knowledge. Personalised science is a strategy that requires teachers to use their pedagogical skills such as talking and writing activities to enhance learning "about science" (Hodson, 2009, p. 241), with emphasis on making science more meaningful and accessible to the learners. In addition, recognition of indigenous people's culture addresses forms of injustice related to representation and participation requiring "remedies of voice (or 'having a say')" (Christie, 2016, p. 441). Therefore, the use of indigenous people's culture is to innately restore and uplift the national heritage of that grouping while learning school language manifest in WMS.

Nieto (2004) cautions about the danger of elevating Western culture and sexual patterns to the detriment of the beliefs and behaviours of other cultures. Personalised science occurs when other cultures' teachings such as the practices and language are also promoted and

brought into the teaching of WMS. Thus, opportunities that allow individuals to personalise science by encouraging the use of indigenous language and beliefs for sexual reproduction concepts are fundamental as the current study is focussed on the use of indigenous language concepts in teaching WMS as part of Xhosa IK in sub-Saharan Africa. In this regard, the study notes the use of culturally responsive strategies as means of bridging education of indigenous people such that their indigenous knowledge is used in the teaching of WMS as part of Xhosa IK in sub-Saharan Africa.

Due to the IK-based nature of the research, the study considers the contribution of African scholars to IK-integrated science teaching as I believe that African scholars have direct experience of the philosophy of African people hence, their scholastic views pose supporting argument on how Africans construct knowledge. Several African scholars have studied the IK of various indigenous people particularly the influence of language to science education. For example, Ogunniyi (2013) provides a synopsis of African countries attempting to integrate IK into science. Rollnick (2000) reported on language and science teaching to English second language speakers. Dube and Lubben (2011) raised the role of traditional, cultural practices of Swazi teachers on promoting Education for Sustainable Development through science teaching, and Webb (2009); (Webb, 2013) reported on the IK of Xhosa people.

However, few scholars have studied the particular circumstances of Xhosa people in the South African science education context. Webb (2009) and (Webb, 2013) is one of the few African scholars who exposed what can be understood as Xhosa IK in terms of science classes with isiXhosa speaking teachers and learners. Webb (2009) suggests that there is a common practice where teachers code-switched from English (the language of learning and teaching) to isiXhosa while learners used isiXhosa exclusively. He suggests that a culturally homogenous group such as the Xhosa people of the Eastern Cape share a common understanding of their IK

and they see value in including their cultural values in the science curriculum (Webb, 2013). The IK of many Xhosa people consists of traditional medicine and supernatural beliefs such as thunderstorms, lightning, and witchcraft and ancestral beliefs shared in history (Webb, 2013). As Xhosa people are the participants in this study, a brief narrative is presented to explain their broad cultural beliefs and teachings in relation to other beings such as the White colonisers who came to occupy their land.

2.2.2 IK of indigenous Xhosa people in South Africa

From 1779 until 1878, a series of Cape Frontier wars were fought between European colonisers (both Dutch and English) and the Xhosa kingdom (Mda, 2007; Peires, 1982; Pires, 2013). In 1856, the Xhosa people experienced a disastrous pivotal event, called by some as the ‘Cattle Killing’ (Pires, 2013, p. 128) and by others as the National Suicide of the Xhosa people (Peires, 1982). At this time, a young prophetess named Nongqawuse sowed the foundations of division among the Xhosa kingdom. Nongqawuse prophesied that ancestors instructed her to tell the elders that each family must kill all their farm animals and destroy all of their crops and, in retribution, the ancestors would destroy the colonisers (Mtuzze, 2004; Saule, 1996). The division sowed in Xhosa society was between the believers, the traditionalists who followed Nongqawuse’s instruction and a more modern group, the non-believers, who did not follow the prophecy (Mda, 2007; Pires, 2013). In brief, the story tells the historical dispossession of Xhosa people, both believers and non-believers as they died of starvation and lost their political sovereignty to the European settlers due to Nongqawuse’s false prophecy. The belief in Nongqawuse’s prophecy is an example of strict adherence to cultural beliefs and instructions from elders when conveyed by a person with cultural authority (Mda, 2007; Saule, 1996). Xhosa people, who refuse to accept anything contrary to their cultural beliefs and fear of change, are called ‘amaqaba’, which translates as ‘red people’ (Mda, 2007).

As an aftermath of the wars, and subsequent to the Nongqawuse event, feuding occurred between the believers (red) and the non-believers (modern) as the 'red' group fought for what they believed was the unbelievers' intention to get "rid of their redness" (Mda, 2007, p. 92). Of relevance to the study is the distinction between the believer and non-believer status because it raises two things: the issue of the resilience and blind loyalty to cultural beliefs and alienation and resistance to the ideas of those who do not share the same views depicted by the believers. Mda (2007); Mtuze (2004); Saule (1996) draw a clear dichotomy between the 'red and modern' Xhosas. The historical dimension presented here provides context for understanding local culture when conducting this indigenous study. The aim of understanding local culture addresses the identity of Xhosa people (red versus modern) as the study seeks to enrich teaching of sensitive WMS topics by including an indigenous epistemology of sexual concepts, which may be rejected or accepted by local community members based on how they conform to their cultural identity.

2.2.3 Xhosa cultural practices of womanhood

In an effort to put forward authentic knowledge, context-specific and place-based understandings (Budge, 2006, 2010; Human Sciences Research Council - Education Policy Centre HSRC-EPC, 2005) of Xhosa cultural issues, there is a need to put Xhosa cultural practices in perspective. Xhosa people are generally known to perform a number of undocumented rituals and customs shared and known by group members during various traditional ceremonies as part of their cultural identity. One example is the custom signifying the rite of passage from girlhood to womanhood, specifically after the girl's first menstruation (Mtuze, 2004). In the olden days, teachings were conducted by adult Xhosa females to young girls, equipping them about what to expect in marriage and how to behave and handle themselves in public after graduation from the womanhood school (Mtuze, 1990, 2004). This

initiation of girls into “young womanhood at a certain age” (Mtuzze, 1990, p. 40) is guided by older women. Further, Saule (1996) points to the “traditional girls initiation school” (p. 90) as a fountain of knowledge for young women as older women prepared the girls for womanhood and marriage. Upon graduation, young women were expected to know about acceptable language that can be used in public and personal grooming as a future wife and responsible Xhosa community member. Considering that we are living in modern times where most of the traditional schools are diminishing and have been replaced by modern schooling, sharing of Xhosa cultural practices has not stopped as clan members continue to perform customs and share their common beliefs from generation to generation. Therefore, the question of cultural taboo language is explored to determine whether teachers sharing common language and culture with learners (with traditional cultural teachings) has an influence on rejecting the use of WMS and vernacular sexual language on concepts such as menstruation, copulation and fertilization. Hence, homogeneity is viewed to ascertain whether teachers sharing similar Xhosa language and culture with the learners experience cultural inhibitions and negative feelings when required to talk about sexual concepts in a science class.

2.2.4 Cultural differences among the amaXhosa

Issues mapped in this study are viewed against a backdrop of rural secondary schools situated in remote settings within homogenous cultural groupings, speaking the same language and practising similar cultural beliefs, The indigenous Xhosa people residing in this area are regarded as traditional ‘red’ Xhosas (Mda, 2007), translated into isiXhosa as ‘amaqaba’ or ‘babomvu’, and their teachers as modern amaXhosa. The setting is in a remote, rural and traditional region of Eastern Cape Province where most Xhosa community members share the same culture and language. This setting provides an opportunity to investigate whether the issue of red (community members with Xhosa IK) versus modern (teachers and WMS) Xhosas

has an influence in terms of language use and appropriate teaching strategies implemented while teaching sexual concepts. The question of acceptable language and cultural practice in this traditional setting is an important one as the study investigates sexual concepts, a topic that is largely regarded as sensitive across the globe (Chilisa & Ntseane, 2010; Gay, 2010; Simayi & Webb, 2020). As noted earlier, the issue of menstruation and teachings of the transition from girlhood to womanhood are both very sensitive and important (Chilisa & Ntseane, 2010; Mda, 2007). As such, it appears appropriate that this study investigates how modern-day teachers teach, and how sexual concepts such as menstruation to a homogeneous cultural group of Xhosa learners (boys and girls) residing in traditional, rural villages populated largely by red Xhosa population groupings (Mda, 2007), can be taught.

2.3 Broader IK contribution to knowledge

Although restricted to Xhosa IK-embedded sexual concepts and topics, the study should not be seen as only extending the ontological, epistemological and axiological perspectives of Xhosa people. Literature on global language taboos in different cultures warrants an investigation on how Xhosa teachers go about crossing restrictive cultural barriers and language taboos a springboard for developing IK-WMS integrated teaching strategies to enable better understanding of sensitive sexual terminology in indigenous communities. Also, sharing IK-embedded sexual concepts seeks to raise the reality, cultural knowledge, practices and values so that they can be understood and used as a teaching approach which can be understood by other ethnic groupings.

2.3.1 Cultural taboos and language use in indigenous groupings

Cultural taboos are words that are avoided and considered inappropriate to talk openly about such as bodily parts referring to sexual concepts and sexuality (Simayi & Webb, 2020).

Considering the interconnection between language and culture (Odora Hoppers, 2002), the study is aligned with a description of culture as being ‘linked to a language, at a particular time period, and a place’ (Triandis, 2018, p. 4). In one of his earlier work, Triandis (1996) describes indigenous culture as collective group needs, practices and values which are regarded as more important in non-Western communities. Similarly, an African scholar, Odora Hoppers (2009), defines culture as the collective property of a group and ‘a social legacy the individual acquires from his group, a way of thinking, feeling, and believing’ (p. 604). In addition, Chilisa (2012) points out that cultural beliefs of most communities are not written down and communities have individual and collective ways of thinking of a group. Thus, the collective attribute of culture on how culture influences selection of teaching strategies by teachers of a particular culture (Xhosa), sharing a common language with the learners, situated in a rural place at a particular time, might use particular teaching strategies to teach sexual content. (Gay, 2013) argue that when cultural taboos are left unattended, a conflict may arise among teachers, learners and parents. Hence, there is a need to directly confront the connection between culture, ethnic grouping and learning between individuals and indigenous groups so that culturally sensitive, WMS sexual concepts can be interfaced with acceptable indigenous language concepts (Gay, 2002, 2013).

2.3.2 Broader language issues

Research indicates that language is intricately intertwined to culture, hence there is a challenge of the language of science among many indigenous teachers and learners (Webb, 2009; Yore & Treagust, 2006). Yore and Treagust (2006) raise the issue of a three-language problem common to most science teachers as seen in the transition between home, school and specific subject language for English second language learners. Adding to the three-language

problem, the use of English as the language of learning and teaching becomes an additional, fourth language issue.

Preliminary findings on a pilot study on language of science used by Xhosa teachers when teaching human sexual concepts, revealed a common language taboo of *asibizi*, we do not talk about this” (Simayi & Webb, 2020, p. 36), suggest another layer of language issues in teaching and learning. The findings of the pilot study revealed that teachers largely identified avoidance of naming sexual terms to learners as a sign of respect to Xhosa culture. The issue of cultural taboos adds an extra dimension to the challenges of the home, school and subject language. Thus, Simayi and Webb (2020) suggest that the teachers’ responses of *asibizi* represent a fifth language issue, indicated by an avoidance of naming and talking about sexual concepts in science by teachers of Xhosa culture teaching learners of similar culture.

Culture, language and cultural taboos are viewed in a broader perspective by considering international perspectives so as to present a more grounded pedagogy argument for the study. For example, in New England in the United States of America, English First language parents, until recently, prevented teachers from teaching explicit sexual parts like ‘penis’ and ‘vagina’ (Buni, 2013, p. 2). Parents viewed communicating sexual concepts to their children as culturally taboo, exhibiting a prohibitive stance based on their English cultural values. Similarly, in Africa, several studies indicate the presence of cultural taboos where teachers and parents do not talk openly about sexual parts and people talking about sexual issues are seen as vulgar and disrespectful of cultural values (Bastien, Kajula & Muhwezi, 2011; Doidge & Lelliott, 2016; Helleve et al., 2009; Phetla et al., 2008; UNESCO., 2018). Likewise, Chamany, Allen and Tanner (2008) suggest that cultural beliefs prohibit teachers from talking about sexual organs directly and that colloquialism and euphemisms are drawn from informal home vocabulary as substitutes for biological terms in African cultures. In principle, several studies

on the international landscape (Levinson, 2006; Oulton, Dillon & Grace, 2004) as well as in Sub-Saharan Africa (Doidge & Lelliott, 2016), promote the use of standard, biological terminology for science terminology instead of euphemisms and colloquialisms. In Burkina Faso, the use of the learners' home language is reported as having improved achievement levels in various academic subjects (Bender, Dutcher, Klaus, Shore & Tesar, 2005). In essence, instruction in Mooré language (mother tongue) before beginning instruction in French yielded improved results in French and Mathematics compared to learners instructed only in French (Bender et al., 2005). Searching for the benefits of language use on teaching indigenous people, Harrison and Papa (2005) share the success of the Maori immersion language programme. A key point of the study is that the New Zealand education changed its mainstream curriculum by allowing Maori language and epistemology to be part of the national curriculum. In a South African context, Msimanga, Denley and Gumede (2017, p. 5) reported that teachers maintained a 'balance between developing proficiency in language and content in the classroom while maintaining a high level of engagement and without reducing the cognitive demand of the tasks'. Thus, the question of language used to clarify sexual conceptions remains important and interest is on whether teachers feel perturbed when required to explain prescribed WMS sexual concepts in the vernacular to the learners.

2.3.3 Research on human reproductive issues

Teaching of the human reproductive systems focus on the structure of the male and female reproductive system with underlying processes such as puberty, gametogenesis, fertilisation and development of zygote to blastocyst, implantation, hormonal control and the menstrual cycle (Department of Basic Education, 2011a, 2017a). While teachers are called on to include IK in their teaching, there is little to guide them as to how to do it when teaching about the human reproductive systems as prescribed in Grade 12 Life Sciences curriculum

(Doidge & Lelliott, 2016). Research has been done on cultural taboo problems linked to naming genitalia and sexual language which may not be part of the normal, everyday language of that group of individuals Doidge and Lelliott (2016) and Phetla et al. (2008) report on cultural taboos linked to HIV and sexuality education in Limpompo province, South Africa. The latter study was done with women of SePedi culture, an indigenous grouping in one of South African indigenous cultural groupings. Critical and relevant findings of the study purport that ‘discussion of sex and sexuality is generally considered vulgar and taboo’ (Phetla et al., 2008, p. 512). A key point raised in the study is that older participants were reported to be against talking openly about sexual parts and sexuality (Phetla et al., 2008). Thus, this study strives to obtain more knowledge of the lived experiences of Xhosa teachers on possible cultural limitations set by taboos and whether they use Xhosa substitute colloquial terms for sexual concepts to clarify problem areas.

2.4 Dialogical and argumentational theoretical framework

Several research studies point to a growth in focussed and structured classroom dialogic teaching and learning engagements (Resnick, Asterhan & Clarke, 2015, 2018). Many such studies highlight that dialogic forms of teaching and learning have improved learner performance and retention of knowledge in traditional tests in almost every school subject. Dialogic teaching and learning is given various names by different authors, for example, (Resnick et al., 2015) called it productive discussion. Other names include exploratory talk (Mercer, Wegerif & Dawes, 1999), collaborative reasoning (Reznitskaya et al., 2012); critical discussion (Keefer, Zeitz & Resnick, 2000); accountable talk (Michaels, O’Connor, Hall & Resnick, 2002); argumentation (Chin & Osborne, 2010) and argumentive discussion (Nussbaum & Asterhan, 2016).

The common nature raised in all these different terms is that dialogic argumentation is open-ended, enables collective reasoning and provides individual opportunities to listen and react to each other's ideas (in a group) through a process of constructive conflict (Baumtrog, 2018; Webb, 2019). The fact that using a dialogic argumentation approach is most common among individuals (Baumtrog, 2018) and embraces the aim of this study as teachers were able to raise their individual views in a group. Hence, one of the reasons that CAT was used in this study as it allowed Life Sciences' teachers of Xhosa culture to discuss how they currently teach this sensitive topic and engage in a structured format to resolve sensitive issues and conflicts.

In one of Bakhtin's (1994) seminal writings (as cited in Nesari, 2015), Bakhtin specified that in a dialogue 'a person participates wholly and throughout his life: with his eyes, lips, hands, soul, spirit, with his whole body' (p. 643). Thus, the study adopted an approach where teachers were involved wholly through various communication platforms such as drawings and verbal views within oneself and with others. For example, searching for individual beliefs and teaching strategies on sexual concepts in relation to the commonly shared Xhosa culture was an attempt at dialoguing within themselves. The notion of individual argumentation, termed 'solo argumentation' (Baumtrog, 2018) is a form of dialogic argumentation encompassing dialogue within oneself as the individual is given time to argue with her or himself. In addition, Ogunniyi (2013) suggests intra-argumentation as individual argumentation and inter-argumentation as group argumentation. Hence, the study included the use of personal, individual drawings that allowed the individual to argue with oneself about sensitive, sexual concepts that they teach while restricted by their Xhosa culture.

2.4.1 Argumentation in science education

Dialogic argumentation in science education is important as participants' agreements and disagreements are carried in such a manner that participants are given turns to

communicate their views verbally (Baumtrog, 2018). Given the sensitive nature of sexual concepts (menstruation, fertilization, penis, vagina, sperm cells, childbirth, circumcision) that Xhosa teachers are supposed to teach, disagreements about teaching strategies used and cultural conflicts are expected. Hence, dialogical argumentation is seen as a platform where Xhosa teachers can consciously and being fully aware of their conflicting views, be able to engage and listen to others' viewpoints and change their different attitudes and views where necessary. Dialogical approaches to teaching and learning have resulted in learners performing better on science tests, sometimes with better retention of knowledge over a period of two to three years. One example is Mercer, Dawes, Wegerif and Sams' (2004) study which revealed a statistically significant improvement in the Qualifications and Curriculum Authority in England and Wales' science test scores after exploratory talk was promoted in classrooms. Concurrently, remarkable improvement in many science education studies showed concomitant improvement in Mathematics and English scores (Trickey & Topping, 2004; Webb, 2010). The findings above suggest that major activities other than just learning science were taking place when engaging in dialogic thinking together in science classrooms.

Dialogical argumentation provides a structure where participants can change their initial attitudes adopted before the discussion. Hence, the purpose of reasoning which is acquisition of new knowledge is achieved through talking among multiple participants and reaching decisions. Developing better reasoning is rooted in dialogic thinking, hence practices that are underpinned by the use of language and argument which includes and respects the creative co-presence of other voices and ideas of other people are important for this study (Webb, 2019). As the roots of CAT are dialogic it was selected, in part, as it allows people to engage consciously and openly, listen to each other and reason by putting their thoughts clearly in words that are understood by others (Broome, 2013).

Contrary to dialogical argumentation, dialectical argument is characterised as a debate on points of disagreement and is aimed at persuasion rather than promoting free thinking (Broome, 2013). As the current study aims at a productive discussion which includes multiple voices with multiple and varied views to be expressed (Gee, 2015), dialectical argumentation was not chosen as part of the argumentation platform. However, dialectical argumentation cannot totally be forgotten as it remains to be seen whether the teachers (participants) will engage exclusively in dialogical argumentation or will be tempted to try to persuade rather use open, shared and respectful discussion. In fact, it was recognised in advance that extreme care must be undertaken to ensure respect of participants who verbalise their disagreement in topics viewed as sensitive. As such, using other opportunities of voicing their concerns, for example following other modes of reasoning such as writing, were adopted in an attempt to get reliable data.

Given the specific context of rural Eastern Cape where modernised Xhosa teachers (educated) are teaching in more traditional settings, argumentation about Xhosa cultural ties versus the expectations of formal school curriculum is an interesting area for exploration. In particular, cultural intricacies generally known to Xhosa people with some inhibitions bordering on gender, social standing, age and respect to authority need to be verbalised and subjected to dialogic analysis. Thus, a review of both linguistic and argumentation frameworks is presented to expose the interactions between familiar, everyday language versus formal science language in homogeneous indigenous groupings. Bakhtin's linguistic theory provides a general dialogic theoretical framework (Bakhtin, 2010) while Contiguity Argumentation Theory (CAT) is used as an indigenous dialogical theoretical framework for science education (Ogunniyi, 2007).

2.4.2 Bakhtin's notion of multiple voices

Bakhtin's theory of heteroglossia and dialogics are presented as a linguistics framework that may enable explanations of language issues raised in this study (Bakhtin, 1994, 2010). The term heteroglossia is used to illustrate that in every national language there is a problem of internal differences where individuals have subtle varieties of naming words or objects even though they share the same culture and speak the same language. Heteroglossia refers to language differences about particular words within a national grouping where members speak the same language and share the same culture (Bakhtin, 2010; Cooren & Sandler, 2014). Bakhtin's notion of heteroglossia accommodates diverse language discourses where subtle variations occur as meaning evolves within social contexts (Nesari, 2015; Rule, 2011). Bakhtin's notion of dialogics emphasises openness, debate, diversity of ideas and negotiation of different statements enabling a multiplicity of voices, generally referred to as a polyphony of voices (Bakhtin, 2010; Cooren & Sandler, 2014; Rule, 2011). Another term for multiple voices within a social grouping is polyphony, a double-voiced discourse (Bakhtin, 2010; Cooren & Sandler, 2014) described also as "multi-voicedness" (Nesari, 2015, p. 645).

Key to the heteroglossic perspective of words within a social group is the view that meaning could be negotiated (Nesari, 2015) in a dialogue. In dialoguing, differing opinions require acceptance hence heteroglossic negotiations between two or more different opinions on sexual concepts were entered into in this study. A professional intervention created a platform so that negotiations can occur on Xhosa terminology used to name sexual concepts such as the copulation and fertilisation prescribed in the Grade 12 curriculum. Furthermore, Bakhtin (2010) mentions that the different voices have already formed a cultural dialogue (Nesari, 2015) even before individuals such as Xhosa teachers (in this study) joined the conversation. Therefore, the study aimed at providing teachers with an opportunity to interact

and contribute to the existing Xhosa cultural dialogue through a professional intervention where they could design a Xhosa-based science lesson that could be shared worldwide. In an effort to counter the limitation for heteroglossia cited by Nesari (2015) as ‘how to find out the terms of one’s own speech and coordinate them with the unfamiliar terms of another speech’ (p. 644), the study accommodated the use of multiple data generation methods such as individual drawings, focus group interviews and Xhosa-Indigenised lesson design.

Avoiding uttering prescribed science sexual concepts poses a threat to quality teaching due to a contestation between the worldviews of indigenous people and the western world. Bakhtin’s theory of heteroglossia addresses taboos taking place in a Life Science classroom where WMS approaches and terminology may be in conflict with IK due to strong cultural influence provides a linguistic theoretical framework for language discourses (Cooren & Sandler, 2014;Nesari, 2015). In particular, heteroglossic relations between the elements of Xhosa language raise another important point, namely that there is a difference in the words that one uses is based on the region from which the individual comes (Bakhtin, 2010).

In the context of isiXhosa-speaking participants, the philosophical analysis of heteroglossia is inherent in the belief that individuals hear many words that have different meanings due to a mixture of everyday language with formal, school language (Cooren & Sandler, 2014), including different words for the same sexual part. In fact, there are often subtle varieties in naming sexual parts, inner reflections and beliefs associated with a given text. A polyphonic dialogic relation is found where many voices are recognised, identified, and acknowledged in a situation such as when a teacher creates opportunities for learners to engage in a discussion and negotiate solutions (Bakhtin, 2010; Nesari, 2015). This issue is central to the study in terms of whether teachers promote reasoning and questioning opportunities through heteroglossic dialogic practices in class when dealing with culturally sensitive terms.

2.4.3 Heteroglossia and Xhosa culture

The languages of the Xhosa and Zulu are people are closely related but there are variations in the stem Nguni language they share. Govender (2019) cites the use of ‘cake’ or ‘ikhekhe’ (in Zulu) when Zulu teachers feel internally threatened by naming a ‘vagina’ due to cultural taboos. General knowledge indicates that a cake is not a vagina (even in English). It appears, however, that Zulu teachers have chosen to use this colloquial Zulu word due to feelings of shame and fear (Govender, 2019; Ngeleka, 2014). Similarly, Xhosa teachers use a variety of substitute terms or euphemisms when developing teachings strategies. Determining Xhosa teachers’ strategies when teaching contentious sexual topics using IK-based language experiences and how they interface with WMS concepts when developing an IK-based professional intervention strategy. Also, analysing them through the lens of Ogunniyi (2007) argumentation theoretical framework should both help develop and explain a harmonised IK-WMS integrated teaching strategy.

2.4.4 Contiguity Argumentation Theory

Notions of IK amongst Xhosa groupings become linguistically diversity (Deyi, 2016; Gxekwa & Satyo, 2017) as people from different geographical and social groupings have different vernacular terms for the same sexual concepts. Hence, as noted earlier, this study uses the Contiguity Argumentation Theory (CAT) as an indigenous knowledge-based argumentation framework that can assist with understandings and mediation between IK and WMS when teaching science in African cultures Ogunniyi (2007); (Ogunniyi & Hewson, 2008). Contiguity Argumentation Theory (CAT) argues that, cognitively, a dialogue exists between two competing thought systems or worldviews such as IK and Western Modern Science (Diwu & Ogunniyi, 2012; Ogunniyi & Hewson, 2008). Further, CAT states that these two windows of worldviews create cognitive disharmony due to contiguity, a state of two

different perspectives (IK and WMS) that are in conflict with each other (Ogunniyi, 2013). According to Ogunniyi (2013), ‘the nature of the relationship between two distinct worldviews would depend on whether or not they share common elements or conceptual schemes which form the point of template or contiguity between the two’ (p. 17). Hence, the importance of different types of dialogical argumentation is brought to the fore. CAT suggests that intra-argumentation occurs when individuals are exposed to science concepts and each person engages in a private, internal argument (Ogunniyi, 2013). Another dialogical argumentation occurs in the form of bridging that occurs when two or more people in a group are involved in dialogical argumentation, termed inter-argumentation. The third type of argumentation extends across groups in search of consensus, termed trans-argumentation (Ogunniyi, 2007, 2013; Ogunniyi & Hewson, 2008).

In the case of this study, the dialogue is in the form of WMS sexual concepts and Xhosa cultural taboos. In CAT, two opposing ways of thinking can co-exist and dialogue helps create a balanced cognitive state. Ogunniyi (2007) describes five CAT cognitive states, namely: dominant, suppressed, assimilated, emergent and equipollent states. Ogunniyi (2007); Ogunniyi and Hewson (2008) regard the dominant position as occurring when a scientific claim is more convincing than a cultural belief, as in for example, the results of an experiment conducted in a laboratory over a belief. In brief, the suppressed context is a worldview that is controlled by a culturally dominant view while the assimilated is when cognitive thoughts are changed into a more adaptable mental state. The emergent conception is observed when an individual has no other previous knowledge of a given phenomenon especially with abstract science concepts such as atoms and molecules. Lastly, the equipollent conception is when two competing worldviews exert comparable, equal intellectual force on an individual’s thinking.

In other words, the equipollent conception state is the idea that both worlds (IK and WMS) can co-exist in the mind of the individual without necessarily resulting in a conflict.

While recognising that there has been criticism of Ogunniyi and Hewson (2008)'s claims because of issues of procedure and the presentation of different meaning and styles of argumentation in African culture (Easton (2011)). This study adopts CAT as a theoretical framework as it addresses the socio-cultural environment of the study and operates in specific indigenous communities. Contiguity Argumentation Theory provides an indigenous theoretical framework for dialogue about restrictive Xhosa cultural practices experienced by teachers. In other words, CAT should be of use when considering WMS and Xhosa cultural taboos as two opposing ways of thinking, and whether engaged cognitive dialogue can help move them towards a more balanced cognitive state.

Argumentation and dialogic teaching have become mainstream topics in the literature on successful science teaching (Resnick et al., 2018). However, while Contiguity Argumentation Theory is recognised as a relevant basis of science teaching argumentation where there is cultural conflict between IK and WMS, there is a paucity of documented evidence of planned Professional Development strategies other than general teacher workshops (Desimone, 2009; Desimone & Garet, 2015; Desimone & Pak, 2017). As noted earlier, while espoused in the South African school curricula (Department of Basic Education, 2011a), there is little to no direction on how to teach IK (Adedeji & Olaniyan, 2011). Teacher development based on authentic researched studies may be one way of providing such direction. As such, this study focuses on using a teacher development strategy based on IK issues of linguistic taboos when teaching a controversial topic in the context of a community steeped in traditional cultural values.

2.5 Teachers, taboos and learner achievement

Current debate in the South African public education system around cultural taboos associated with teaching sexual reproduction and poor teaching strategies was illustrated in the Sunday Time newspaper under the title “*More cakes, Less Pornography for Sex Education Teachers*” (Govender, 2019). Govender (2019) reports on a study done in KwaZulu Natal suggesting that teachers refrained from using biological terms such as vagina and used euphemisms such as the “cake or ikhekhe” (p. 10). Teachers were reported to have felt uncomfortable in using prescribed sexual terms and regarded them as culturally inappropriate. Avoiding talk that is viewed as offensive is a sign of collective respect for their culture and elders (Taylor & Cranton, 2012). As the debate around cultural taboos and language frames the main question of the study, it seeks to find whether Xhosa teachers know the different Xhosa taboo words used when teaching sexual concepts and how they integrate them in their teaching WMS concepts.

Annually, there is a standard tradition where the Minister of Basic Education in South Africa, Angie Motshekga, (Department of Basic Education, 2018b) announces National Senior Certificate results in all forms of media, applauding schools that have performed well, based on the overall NSC percentages. Noting that the Eastern Cape is mainly rural, poor performance shows that public education is in crisis as the 50 worst performing schools (Ainscow & Miles, 2008) are found in rural-based schools (Department of Basic Education, 2018a). A gradual decline in learner enrolment in Life Sciences is seen from the year 2015 with 49672 learners to 2017 with 44368 learners (see Table 1).

Diminishing numbers of registered learners pose a problem for underprivileged communities because Life Sciences is one of the gateway subjects offering opportunities for

scarce careers in nursing, medicine and other health related skills. Table 1 shows a high failure rate in Life Sciences as Grade 12 learners fail to achieve the minimum national benchmark of 30%-39%, referred to as meritorious Level Two (L2) in the National Curriculum Statement (Department of Basic Education, 2011a) policy document and in the national promotion requirements document (Department of Basic Education, 2011b). Poor Level Two (L2) pass rates are evident in pass percentages ranging from 24% in 2015, 25% in 2016 and finally, 22% in 2017 (see Table 1). Thus, Table 1 presents a situation where the majority of registered Life Sciences learners fail to pass the subject as they cannot achieve the basic, elementary L2 in their final examinations.

Table 1

Eastern Cape Grade 12 pass percentage in Life Sciences from 2015-2017. Extracted from National policy pertaining to the programme and promotion requirements of the National Curriculum Statement Grades 10-12, 2011

Year	Number of learners	Not achieved (0-29%)	Elementary (30-39%)	Moderate (40-49%)	Above 50+
2015	49672	40%	24%	14%	22%
2016	50142	38%	25%	16%	21%
2017	44368	32%	22%	18%	28%

As indicated in Table 1, a high percentage of Grade 12 Life Sciences learners have failed over three consecutive years (2015-2017), as 40%, 38% and 32% attained Level One (L1) consecutively (see Table 1). Therefore, a question into the teaching strategies used by Life Sciences teachers is brought to the fore. What brings up the question of teaching strategies is a troubling feature portrayed by a decline in the National Senior Certificate (NSC) Grade 12

external results in the Eastern Cape (Department of Basic Education, 2018b). The need to find out more about teaching strategies implemented in rural schools is also fuelled by a report tabled by Human Sciences Research Council-Education Policy Centre HSRC-EPC (2005) identifying a lack of knowledge about a variety of teaching strategies that can be used to teach science in rural schools. Teachers have been found lacking in how to teach science using their IK (Hodson, 2009; Kress, 2001; Ladson-Billings, 2002; Ogunniyi & Hewson, 2008). Teachers may be using teacher centred strategies such as talk and chalk and textbook method (Probyn, 2006) because they do not know of how to develop cultural-responsive strategies (Gay, 2010; Jewitt, 2008; Ladson-Billings, 2009; Liu & O'Halloran, 2009) and incorporate the learners' cultural background. This suggests that teachers have to be assisted to extend the concepts in biological framework or curriculum (Chamany et al., 2008) to include "issues of social relevance" (p. 267). Such issues of 'social relevance' may be the language and cultural practices of Xhosa people relevant to the Life Sciences (Biology) curriculum framework on human sexual concepts. If so, this becomes an area for appropriate professional development.

Studies on professional intervention where IK is integrated in biological sciences (Chamany et al., 2008; Gay, 2002; Kress, 2001) support a view that workshops provide an opportunity to create space for teachers to freely to voice their concerns (Ball & Bernhardt, 2008; Einfeld & Collins, 2008). Furthermore, IK-integrated professional intervention affords teachers with opportunities to reflect upon emerging conversations from other group members and actively partake in developing their own teaching strategies that will change their current teaching strategies (Lewthwaite et al., 2014; Morgan, 2004; Msimanga et al., 2017; Msimanga & Lelliott, 2014; Passmore, Gouvea & Giere, 2014). A study by the National Science Foundation (2007) in South Dakota at Oglala Lakota College, indicated an increased percentage pass on Biology majors of 44% due to designing biological curricula which fitted with the culture and language of the people (Chamany et al., 2008; Einfeld & Collins, 2008;

Schwab & Kral, 2012)). Thus, opportunities where teachers are exposed to strategies that infuse social context into their specific disciplines (Diwu & Ogunniyi, 2012; Martínez, 2011; Otulaja, 2010) are accommodated in this study. These findings suggest that language nuances linked to feelings of cultural inappropriateness should be explored further to find out whether there are linguistic and cultural theoretical frameworks that may explain such manifestations, for example Bakhtin's theory of heteroglossia (Bakhtin, 2010).

Addressing the issue of teachers' lack of IK-embedded teaching, Hewson et al. (2009) report on a study on traditional health practitioners (THP) conducted on Xhosa teachers in Cape Town. The report suggests that Xhosa teachers did not know about different types of IK that are particularly relevant to their learners' culture and that an ideal is to prioritise IK-embedded teaching so that learners can learn within the richness of their context and learn to respect science as something worth learning in their culture. In agreement, Cobern and Loving (2001) argue that cultural-inclusive teaching strategies are beneficial when teaching WMS to learners coming from indigenous groups, as do Stanley and Brickhouse (2001) who recommend the use of cultural-inclusive strategies for learners whose worldviews differ notably from those of WMS. Mindful of Hargreaves (2003)'s warning against teaching approaches that takes the form of 'standardised curriculum scripts' (p. 2), this study adopts a more generalised Xhosa IK-integrated teaching dialogic/dialectic approach.

The aim of this study is not to emulate existing generic cultural strategies, but to investigate the possibilities of designing particular, Xhosa IK-based strategies that can be used in situations where WMS is in conflict with the worldview of local people (Abrams et al., 2014; Snively & Corsiglia, 2001; Stanley & Brickhouse, 2001).

Teacher development in culturally homogenous rural areas

Rural-based teachers are often left behind and miss out on mainstream in-service programmes (Adedeji & Olaniyan, 2011). Professional intervention sessions should be designed to offer indigenous teachers an opportunity to engage with appropriately researched material that aims at changing and developing their teaching practice (Desimone, 2009; Simayi, 2014). Oulton, Day, Dillon and Grace (2004) suggest that teaching strategies should be developed to deal “effectively with controversial issues” (565). Professional intervention has the potential to create formal and informal learning communities among teachers that can act as powerful mechanisms for teacher growth (Fletcher & Zuber-Skerritt, 2008; Southwood & Ngcoza, 2009). As such, a professional intervention strategy designed for Xhosa teachers teaching in a traditional rural area that focused on the contentious issues of sexual reproduction and female anatomy provides was developed for this study. As Xhosa teachers, by virtue of understanding the particular nuances of Xhosa language and beliefs, are probably best positioned to understand the influences of IK when learning WMS. As such, the name given to the teaching strategy planned for development in this study is ‘Indigenised Teaching strategy’ (ITS). This name clarifies both the context and clearly delimits it as a strategy developed for Xhosa teachers teaching science embedded in Xhosa IK in rural Xhosa communities.

Figure 1 presents a conceptual framework for developing an ITS for science teachers as a product of the professional intervention. The professional intervention programme is informed by the Curriculum and Assessment Policy Statement (CAPS) Grades 10-12 curriculum requirements (Department of Basic Education, 2011a, 2017a) so that the final product (ITS) meets the aims and lesson objectives set in the National Curriculum Statement (NCS) lesson plan designs. For example, the aims of a lesson on human reproductive structures

on the NCS Life Sciences lesson plan requires learners to draw, label, identify and give functions of the reproductive structures.

The first phase of the professional intervention strategy used in this study consists of a voluntary identification of a WMS topic under human reproduction systems (marked as selection of human reproduction concepts, Xhosa IK and WMS in Figure 1) which is regarded as culturally sensitive by the teachers.

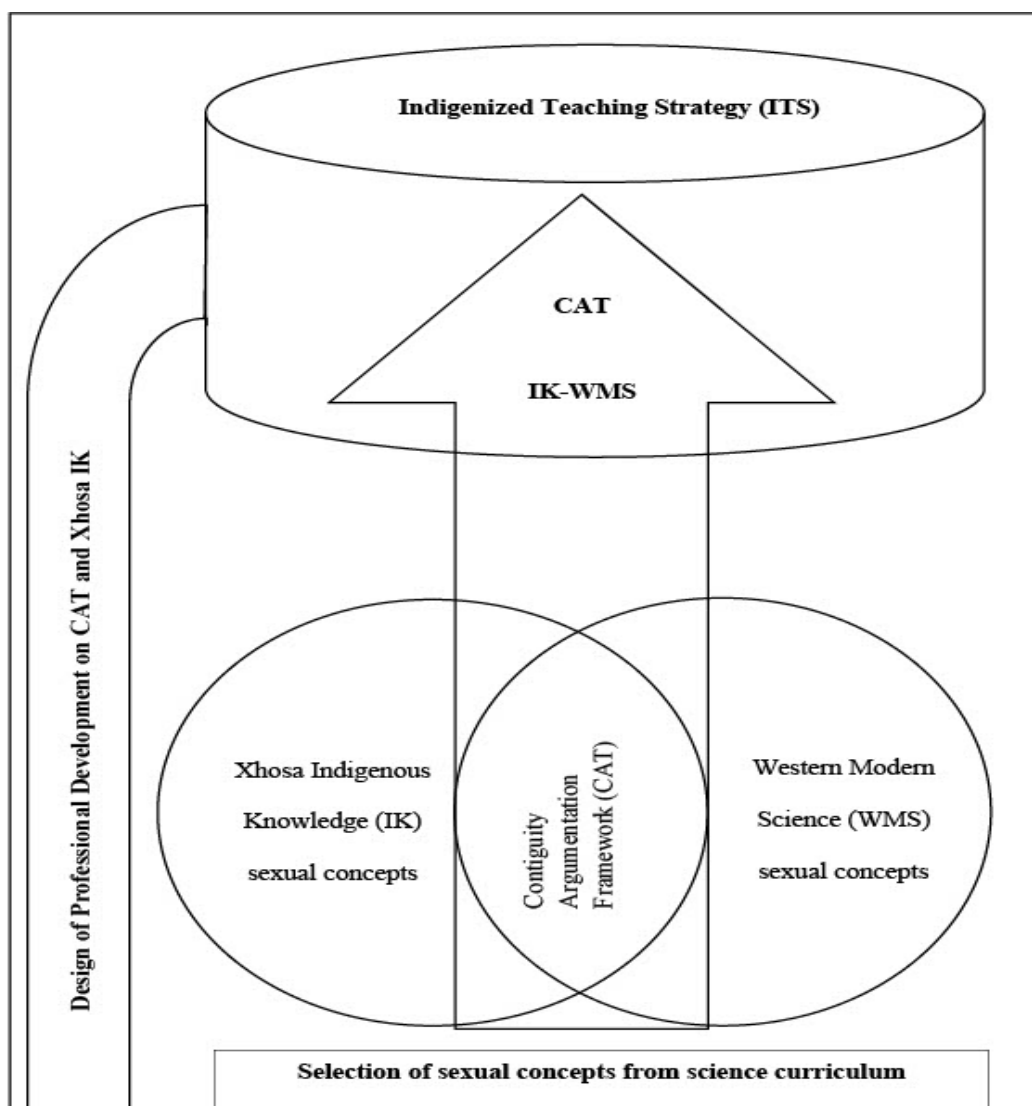


Figure 1: Design of Indigenised Teaching Strategy based on Contiguity Argumentation Theory (CAT) and Xhosa Indigenous Knowledge (IK) for teaching sexual concepts

Xhosa equivalent terms (IK) for the taboo sexual are shared and teachers engage in argumentation with the aim of arriving at a consensual decision. The idea was to create a dialogue and get the views of the teachers about Xhosa IK sexual concepts used when naming and explaining sexual concepts (see area marked CAT, Xhosa IK and WMS in Figure 1). In other words, the idea was to investigate whether the familiar, vernacular terms for taboo terms can be used as a bridge that teachers can use to cross over to WMS when teaching.

Next, research findings on CAT (Ogunniyi, 2007) were presented with the aim of providing CAT as an IK-based science theoretical framework that can be used to cross over cultural boundaries and integrate IK into WMS (see Figure 1). Then, teachers were engaged in argumentation through exploratory and accountable talk as they explained, reasoned, and shifted their views to accommodate Xhosa dialects about taboo sexual concepts and decided which term to adopt for the lesson. Teachers were given opportunities to link any of the domains of CAT with WMS concepts to produce a new IK-WMS embedded teaching strategy (final stage in Figure 1). The idea was to allow the teachers to enter into sophisticated argumentation, stretch their intellectual capabilities as they link their Xhosa IK with research findings and WMS classroom lessons to develop a Xhosa Indigenised teaching strategy using border crossing from IK to WMS knowledge construction. This approach is represented graphically in Figure 1.

2.6 Chapter summary

This chapter introduced a review of literature regarding culture and language embedded in the teaching of human reproduction concepts to indigenous people with a view of establishing an indigenous epistemology that can be linked to the national science curriculum. The phenomenon of cultural taboos was raised as argument for inclusion of indigenous knowledge as part of western modern science, with reference to the historical role played by

culturally responsible strategies globally on teaching science content to indigenous people. The chapter progressed to the Eastern Cape Xhosa indigenous people, raising a question of teacher empowerment due to literature citing lack of specific teacher development programmes, low pass rate for Grade 12 in rural schools and cultural intricacies embedded in teaching sexual concepts.

A professional intervention based on argumentation was designed with the intention of developing an Indigenised Teaching strategy (ITS) as a culturally responsive strategy. Ogunniyi's Contiguity Argumentation Theory was introduced as an IK-based theoretical framework that mediates for the creation of a harmonious cognitive state in contrasting WMS and IK cognitive states.

CHAPTER THREE

RESEARCH DESIGN AND METHODOLOGY

3.1 Introduction

The chapter provides a description and justification for undertaking a qualitative, flexible and Critical Participatory Action and Learning Action Research (CPALAR) design viewed through an indigenous knowledge-based theoretical lens (Kearney et al., 2013; Zuber-Skerritt, 2015, 2018) to explore issues of cultural taboos influencing teaching of sexual concepts in rural secondary schools. The rationale for using multiple data generation methods and instruments including the recruitment strategy, sampling technique and data analysis techniques is provided. Justification for the use of a professional intervention workshop using IK-based Contiguity Argumentation Theory (Ogunniyi, 2007, 2013) and Bakhtin's linguistic theoretical frameworks (Bakhtin, 2010) towards a data-driven Xhosa culturally appropriate teaching strategy is made. Issues of credibility, trustworthiness and ethical considerations adhered to during fieldwork are explained. Finally, the chapter closes with an exposition of the methodological limitations of the study.

3.2 Philosophical assumptions

In this section, a brief rationale for selecting underlying philosophical stances is outlined before describing the paradigmatic framing of the study as philosophical assumptions define each paradigm (Creswell & Poth, 2016; Denzin & Lincoln, 2009; Lincoln, Lynham & Guba, 2011; Taylor & Medina, 2011). As such, this section starts by unpacking the philosophical underpinnings before delineating the paradigmatic stance. (Lincoln et al., 2011) refer to ontological, epistemological, axiological and methodological origins of research. Without

engaging in the historical debate about definitions and classification of research paradigms (Cameron, 2009; Creswell & Creswell, 2017), and because this study is underpinned by an overarching recognition of the role played by everyday cultural, social, and linguistic beliefs that give meaning to human reality (Denzin, 2017), the ontological, epistemological, axiological and methodological positions framing this study are presented to provide an understanding of the design choice.

3.2.1 Ontological positioning of the study

The first point to consider is Denzin (2012, p. 85) *bricoleur* ontological position of a qualitative researcher. Using the *bricoleur* analogical position, the researcher is viewed as a quilt maker who meticulously fits the ragged pieces of a complex situation together to produce a well-stitched quilt. The question is, when playing an insider *bricoleur* role, is the researcher fitting the quilt pieces together doing so without getting involved in the process, or is the researcher intricately involved and therefore part of the process? If the latter, which is the case in this study, it can be argued that the ontological position of an insider researcher, bound in the context of the people, is legitimately aligned and can be of value in describing the phenomenon under study through reasoning collaboratively with the participants (Reznitskaya et al., 2012). As this study is focused on language and Xhosa cultural taboos in relation to teaching sexual concepts to learners of the same culture, my insider ontological stance becomes central to authentically investigating culturally sensitive concepts. The shared ontological philosophical cultural assumptions provide a set of shared logic that guides action and focuses on views about reality (Creswell & Poth, 2016; Taylor & Medina, 2011).

3.2.2 Epistemological perspectives

Epistemological perspectives are focused on the way in which knowledge is acquired (Creswell & Poth, 2016). In this study, knowledge is viewed as being subjective as it is

embedded in culture (Taylor & Medina, 2011). In this instance, knowledge is embedded in the language and context of the Xhosa teachers and community members residing in remote rural villages in the Transkei. In essence, the epistemological perspective of the study is that there are multiple truths (Denzin, 2017; Guba & Lincoln, 2005) that are influenced by the participants' culture, language and beliefs, and which need to be able to be made explicit. In an attempt to create a climate of trust, I administered the data generation instruments and became part of the study. I asked focus group questions on "how do you teach the structure and functions of the male and female reproductive system to your Grade 12 learners?" I observed that the teachers mostly conversed in isiXhosa and struggled to phrase responses in English, then I also responded in isiXhosa and translated into English.

This particular action elicited positive responses where teachers openly shared that they felt more comfortable when talking to a person of their own culture who have some experience of how they feel. They said it was good that "the Professor" (my supervisor, whom they assumed would not be Xhosa speaking) did not come as they would not have been that open and probably would not have shared on record issues such as "I stick to English only", "I don't teach it as the kids know sex", "I give them as homework", "I strictly use English and avoid explaining in Xhosa because it's rude". Their openness allowed for the expression of a multiplicity of knowledge that enriched the data generation phase and shed more light to my research question.

3.2.3 Axiological assumptions

Axiological assumptions entail issues of respect, value and social justice and indigenous knowledge studies should focus on these criteria (Chilisa, 2012, 2019; Lincoln et al., 2011). With this in mind, the study links the sensitive and taboo nature of sexual talk to the question of respect of Xhosa values, dignity and language restrictions. In fact, the study regards

axiological assumptions highly because it is obvious that the participants should not feel degraded while sharing their closely-held cultural beliefs and inhibitions. Instead, they should be enabled to see the value of undertaking a study with a sexual connotation as a way of potentially freeing themselves and others from any cultural restrictions that they themselves may feel impede their way of teaching and learning as compared with Western ways of teaching and learning. Specifically, Xhosa teachers revealed during the focus group discussions that they know and believe that there are positive attributes and reasons on why certain sexual terms are not referred to or spoken about in isiXhosa. For example, they raised the positive aspect of Xhosa pride and ‘ukuhlonipha’ (respect) and a nation known for avoiding vulgarity and disrespect. This axiological assumption provided an underpinning understanding of why such a study was being undertaken

3.2.4 Methodological underpinnings

Lastly, methodological underpinnings pertain to the unfolding of the research design which consists of methods and techniques that the researcher plans to use to respond to answer the study’s research questions, supported by a variety of qualitative instruments under a relevant paradigm (Denzin, 2017; Fusch et al., 2018). In simpler terms, the type of knowledge or data that is required to answer the research question is inherent in the nature of the research question and, in turn, determines the researcher’s methodological philosophical underpinnings (Creswell & Creswell, 2017; Fusch & Ness, 2015).

Quantitative approaches insist on large samples and single truths obtained from randomised controlled trials to give clear evidence about ‘what works’ (Hammersley, 2005, p. 89). The fixed, objective, pre-determined and experimental nature of quantitative research which excludes researchers’ direct involvement in a study is not what was envisaged for this study. Instead, a guiding belief system that directs one’s thinking and action plan towards

achieving planned outcomes appeared to be a more fruitful approach towards generating a multiplicity of subjective views (Denzin, 2012; Denzin & Lincoln, 2009, Fusch et al., 2018) provided by small numbers using data generation methods that allow immeasurable expressions of data (Creswell & Creswell, 2017; Onwuegbuzie & Leech, 2019). This methodological assumption determined why personal, in-depth methods of data collection, small samples, rural setting and qualitative analysis of data, were the methods used (Beeson & Strange, 2003; Nkambule, Balfour, Pillay & Moletsane, 2011). Similarly, this assumption supported the use of individual, descriptive methods that catered for more personal, confidential and open sharing of views on sensitive topics dealing with sexual concepts (Chilisa & Ntseane, 2010; Mannay, 2016).

3.3 Research paradigm

A paradigm is defined by Denzin and Lincoln (2009) as a philosophical framework that guides one's approach about the world and nature of knowledge. Of importance to the study is the definition presented by Creswell and Poth (2016) where paradigms are viewed as "a researchers' own worldview, or sets of beliefs to the research project, and these inform the conduct and writing of the qualitative study" (p. 15). This definition accommodates the design of the study, namely that of research being conducted by a female of Xhosa culture who grew up in a rural setting continuously observing the written and oral reflections of Xhosa high school teachers who teach Xhosa children in rural high schools.

Mertens (2007) suggests that paradigms function by "establishing a relationship between or among constructs that describe or explain a phenomenon by going beyond the local event and trying to connect it with similar events" (p. 2). Current dominant paradigms in the literature range across positivism, post-positivism, interpretivism, critical, post modernism, pragmatic

and multi-paradigmatic approaches (Lincoln et al., 2011; Samuel, 2019; Taylor & Medina, 2011). As mentioned earlier, the positivist epistemological stance looks to objectivity where knowledge is viewed as absolute with no personal explanations (Creswell & Creswell, 2017; Denzin, 2010). Hence, the relationship between the researcher and the participant is free of subjectivity as no values and cultural interpretations are catered for and attention is deflected away from the deeper issues of value and purpose (Denzin, 2010). Therefore, the axiological position of a positivist is that of a value-free relation (see Figure 2). Methods of data generation and analysis are precise, experimental with controlled variables, factual, measurable and focussing on proving or disproving hypotheses (Lincoln et al., 2011). Thus, positivist underpinnings are aligned with a quantitative approach (Figure 2). In contrast, my research addresses sensitive phenomena around sexual concepts, culture and gender within cultural (ethnic) groupings. Such an approach requires the sharing of personal experiences, which cannot be quantified by the participants, and an appreciative, empathic and respectful insider research approach is far more appropriate.

Post-positivism shares various similarities with positivism except in the view that suggests participants beliefs' and hypotheses are neither true nor false (Creswell, 2009). A postmodern paradigm is used mainly by researchers with an artistic frame of reality, focusing on how our different thoughts are represented in different modes of communication such as language and dance (Creswell & Poth, 2016). With interpretivism, reality is relative to changes in the individual's surroundings as the individual's knowledge has cultural and historical roots. Including issues of social justice, power, dialogue and reflection, as is sought in this study, brings the research within the critical paradigm (Freire, 2005; Taylor, 2007). Defining my study within the critical paradigm is based on my ontological, epistemological, axiological and methodological assumptions mentioned earlier. A brief comparison in Figure 2, where the

assumptions of positivism and critical theory are juxtaposed, provides a starting point for my rationale for framing my study within the critical theory paradigm.

Nature of beliefs	Positivist position	Critical position
<ul style="list-style-type: none"> • Ontological • Epistemological • Axiological • Methodological 	<ul style="list-style-type: none"> • Realism, reality exists independently of the researcher. • Knowledge is objective. • Value-free • Measurable, experimental, manipulative 	<ul style="list-style-type: none"> • Reality is shaped by social, cultural, ethnic and gender aspects over time. • Knowledge is subjective, multiple truths, value-laden. • Value-laden, social justice and power issues of marginalised groups • Dialogic, participatory, reflective

Figure 2: Philosophical assumptions of a critical researcher versus a positivist researcher, adapted from (Lincoln & Guba, 2011)

The critical paradigm was not my initial choice (see Chapter 1), and this study did not follow the textbook process where a paradigm is chosen to give an indication of what one wants to achieve and motivation for what is expected at the end of the project (Denzin, 2010; Denzin & Lincoln, 2009). My initial belief that I was working within an interpretivist paradigm shifted gradually towards an understanding that I was actually working within a critical paradigm. This realisation came about as I saw events unfolding and the data emerge during the intervention and the fieldwork.

In order to fully understand how the critical paradigm emerged, one has to look at how the dialogue and active participation of the teachers disrupted my plan and introduced the change. I encountered surprising moments of disbelief at how willingly teachers openly shared in a dialogue about how embarrassed and how uneasy they felt when teaching of sensitive sexual concepts in their rural schools. The teachers entered into a dialogue about how isiXhosa language use and cultural beliefs restricted them while simultaneously they were expected to earn respect and maintain authority in the school and community at large. There was a troubling dichotomy in the dialogue consisting of isiXhosa language and culture serving as barriers to expressions of WMS sexual concepts. Such barriers caused feelings of loss of power and respect when talking about sexual matters to learners.

The issues raised by the teachers induced a shift into a more transformative paradigm (Merriam, 2011; Mertens, 2007; Mezirow, 2003; Taylor & Cranton, 2013; Warrell & Kawalilak, 2011) than originally planned, a paradigm that accommodates exploration of power issues, culture and gender issues as teachers participate in their own transformation (Christie, 2016; Ntseane, 2012; Taylor & Cranton, 2013). Hence, the critical paradigm (Denzin, 2017; Kemmis et al., 2014) emerged as the qualitative research field of my study, as it is dialogic and ‘locates the observer in the world’ (Denzin, Lincoln & Smith, 2008, p. 4) and strives for emancipation (Freire, 2005; Kemmis, 2008).

The teachers used drawings accompanied by written descriptions (MacEntee, 2020; Mannay, 2016; Mitchell et al., 2017) to reflect on how they used to teach sexual concepts and how they had felt embarrassed, helpless, disrespected and in conflict with local community expectations of maintaining known Xhosa culture beliefs of avoiding speaking about sexual concepts in public. Reflections from the focus group discussions indicated that they needed to disrupt their current teaching strategies in favour of the newly-presented research knowledge

presented in the workshop. They shared their perceptions of their own strengths and weaknesses in terms of their own teaching strategies and engaged with their peers on how they taught the section on sexual concepts. At the same time, they pinpointed sections where they felt that transformation had occurred in terms of their teaching. They brain-stormed about planning IK-based lessons and reached consensus on the topic to be taught, whether the lesson meets the criteria set on CAPS, and decided who amongst them would present the lesson. As such, the critical paradigm found me - the research participants led me to it.

The ontological position of historical realism Lincoln et al., (2011, p. 169) is central to a critical perspective as it gives space for power issues such as language, culture, ethnic nuances and gender to be explored (Freire, 2005; Kemmis, 2008). The spotlight on social justice indicates that the end product of the research should go beyond interpretivism and provide opportunities for freedom. Thus, in this study an opportunity for change in pedagogical praxis (Denzin & Lincoln, 2011; Hammersley, 2005) became a major goal. With this in mind, it was envisaged that the Xhosa teachers who were actively engaged in voicing their ideas during the development of an IK-based teaching strategy should feel empowered to teach sexual concepts without the restrictions of cultural taboos. This engagement positioned the study within the critical paradigm because it seeks to integrate critical research traditions (Denzin, 2017; Lincoln et al., 2011) with culture, thereby facilitating an emancipatory praxis where teachers can own the change and transform their professional life (Denzin, 2010; Denzin et al., 2008). This view created a positive atmosphere for the development of culturally-structured professional intervention, with the participants taking action on how to derive strategies based on Xhosa culture to teach sensitive, sexual concepts.

Change is important as researching in the critical paradigm does not seek to merely understand and interpret reality (Carr & Kemmis, 2005; Kemmis et al., 2014; Kemmis et al.,

2015), but to change the status quo that existed prior to the professional interactions with the aim of redressing injustices found in the field site (Chilisa, 2019; Taylor & Medina, 2011). In this case, it was envisaged that teachers engaged in the professional intervention aspect of the study should be able to see change in their teaching strategies compared to before the intervention. I believe that the change was marked by the turning point which I observed onsite during professional development on human reproduction themes (Figure 4) and Contiguity Argumentation Theory (Figure 5). I also believe that the keenness of the teachers to change from avoiding talk of sexuality to an open engagement using Xhosa IK terminology, indicated a turning point symbolising change; a change that represents transformation in terms of critical pedagogy (Freire, 2005; Shor, 2002). In fact, as shown in the following chapter, there was evidence of a radical change from their initial teaching strategies through the use of more democratic and culturally appropriate teaching and learning activities.

As the critical paradigm is culturally driven and situated in the history of the people, knowledge is loaded with value as it is determined by the social and positional power of the individuals (Denzin, 2010, 2017; Fusch et al., 2018; Kemmis et al., 2015). In order to fully participate in a critical teaching and learning situation, “critical theory must be localised and grounded in specific meaning, traditions, customs and community relations that operate in each indigenous setting” (Denzin, 2010, p. 298). Therefore, context comes to the fore with all the underlying axiological underpinnings based on Xhosa morals, on what is stipulated as taboo, the respect accorded to adults and acceptable language being important. In this instance, the question on cultural taboos should be linked directly to whether I believe that reality (the problem) is in the traditional nature of Xhosa culture (IK) or the manner in which the curriculum on sexual concepts (WMS) has been structured.

I believe that issues of Xhosa values and culture bring an important view of how quality teaching and learning should occur in more traditionally-steeped indigenous communities. This belief resonates with the definition of critical pedagogies adopted by this study, a view that considers inclusion and use of Xhosa culture as part of the social transformation agenda in rural schools (Masinire et al., 2014; Nkambule et al., 2011). The advantages implicit in the use of a critical pedagogy are expounded by (Mertens, 2007), who explains that knowledge acquisition is through active participation in the natural setting where people work and live, in this case in the familiar rural setting where the participating teachers work (Mertens et al., 2013; Nkambule et al., 2011).

Furthermore, seminal writings on critical pedagogy by Giroux, Freire and McLaren (1988), emphasise the issue of rural school and community education in rendering quality teaching and learning. Guidelines for assessing pedagogies of practice falling within a critical pedagogy framework are marked by action-oriented activities (Kemmis et al., 2014, 2015) that bring forth the language and cultural nuances of indigenous groupings (Chilisa, 2012, 2019; Mertens et al., 2013). The above all provided the impetus for locating the study in the critical paradigm as it accommodates the possibility of creating pedagogies suitable for a defined community in rural school classrooms with the hope that such work will promote a spirit of self-determination and empowerment that brings the indigenous perspective to the fore (Beeson & Strange, 2003; Budge, 2010; HSRC-EPC, 2005; Khumalo & Mji, 2014).

In doing so, my axiological assumption of respecting the values, culture and beliefs of Xhosa people is accommodated. My view is that the researcher's paradigm provides a lens through which to consider how and why certain activities have been conducted and interpreted in a certain manner. In other words, my axiological, epistemological and methodological

assumptions underpinned my research questions and determined the paradigm guiding the study.

3.4 Research design

In this section, the design of the Participatory Action Learning and Action Research (PALAR) process using Ogunniyi (2007) dialogic Contiguity Argumentation Theory and Bakhtin (2010) ‘heteroglossia’ (p. 67) are considered and their relevance to the study explained. The description includes the sample, setting, data generation tools, methods and analysis.

3.4.1 Participatory Action Learning and Action Research (PALAR)

Zuber-Skerritt (2018) states that Participatory Action and Learning Action Research (PALAR) is one of the derivatives of action research Mertler (2012), with more emphasis on how values influence people’s worldviews to determining their actions and bind them to their culture (Torre, Fine, Stoudt & Fox, 2012; Zuber-Skerritt, 2009; Zuber-Skerritt, 2002). PALAR evolved from Participatory Action Research (PAR) (Wood & Zuber-Skerritt, 2013; Zuber-Skerritt & Passfield, 2016), therefore it consists of an action-oriented approach which incorporates teacher collaboration and critical reflection (Wood et al., 2017; Wood & McAteer, 2017; Zuber-Skerritt, 2018). PALAR is a recursive, flexible, dialogic model that has been used to bring change in teacher practice (Kearney et al., 2013; Wood et al., 2017; Wood & Zuber-Skerritt, 2013).

A distinguishing feature of PALAR is based on the 7C’s and 3R’s principles that serve as ‘criteria for evaluating participants’ actions, interactions, and learning outcomes in PALAR projects in South Africa’ (Zuber-Skerritt, 2018, p. 520). The seven features of democratic participation and emancipatory values commonly known as the 7C’s (Zuber-Skerritt, 2018) namely “communication, collaboration, commitment, coaching, critical reflection, competence

and character building” (p. 519). Overall, the 7C’s played an important role in the study as participants were always free to communicate their views, share their anxieties and make suggestions about their competencies as the study progressed (Kearney et al., 2013). This was the case and the participants were encouraged to express points where they differed in teaching strategies used to teach sexual concepts and give reasons.

Taking into consideration the potential complex social setting of a cultural study focusing on sensitive sexual concepts, the role of the researcher in a participatory study requires clarification. McIntyre (2007) suggests a fundamental point about a participatory researcher, namely that a good participatory researcher has faith in people and have a belief that people can create and change things. This fundamental point was exercised in the current study. For example, during the focus group discussion some teachers indicated that they do not teach this section because ‘learners ask ‘silly questions’ because they know it’. Others objected. A female teacher indicated that that she teaches this section strictly in English with an angry facial expression so as to avoid being asked naughty questions and learners changing the lesson into a sexual topic. Teachers were able to communicate their conflicting views while collaborating with each other and attempted to find consensus on how to move forward and gain more competence on how to handle these sensitive concepts.

Although I had prior research questions, these questions were not fixed as critical reflections took place after each phase and each had an influence on how the next phase was going to proceed. The principles of relationships, reflections and recognition embedded in the 3R’s (Wood et al., 2017; Zuber-Skerritt, 2018), guided how I conducted the study as I was able to adapt my initial research questions in recognition of the participants’ views, showing that I trusted them and was willing to cooperate. As suggested by Kearney et al. (2013), a good relationship, regular reflection and recognition of progress or challenges served as a form of

validation for the continuation of the study. Increased competence was observed from the critical reflections shared by the participants after the action stage of Phase Two in Figure 3.

One of the advantages of PALAR is prolonged engagement, persistent observation, and triangulation (Denzin, 2012; Flick, 2013) achievable through repeated data collection steps (Kearney et al., 2013; Wood & Zuber-Skerritt, 2013; Zuber-Skerritt, 2015). Thus, prolonged engagement and persistent observation involved the investment of a sufficient amount of time to build trust with respondents, learn the culture, and test for misinformation introduced by both myself as the researcher and participant. Multiple data collection methods and triangulation were used in the different stages of the study to add depth to the collected data (Creswell & Creswell, 2017; Denzin, 2012, 2017) to ensure trustworthiness (Shenton, 2004; Tracy, 2010). As no phase was fixed, the model was adaptable based on how the study unfolded (Zuber-Skerritt, 2015) and changes were made based on the outcomes of each step (see steps in Figure 3).

One of the shortcomings of a participatory study is that it takes a long time to finish data generation due to the cycles and the reflective action (Zuber-Skerritt, 2002). However, that feature is an advantage as the study consist of one cycle of CPALAR made by four flexible steps as follows (i) problem identification phase, (ii) action stage, (iii) implementation stage and (iv), participant confirmation and extension of knowledge to others (see Figure 3). Noting that the PALAR design used in this study is underpinned by a critical paradigm (Denzin, 2017; Kemmis et al., 2014, 2015; Torre et al., 2012), the term Critical Participatory Action Learning and Action Research (CPALAR) design is used consistently throughout the study.

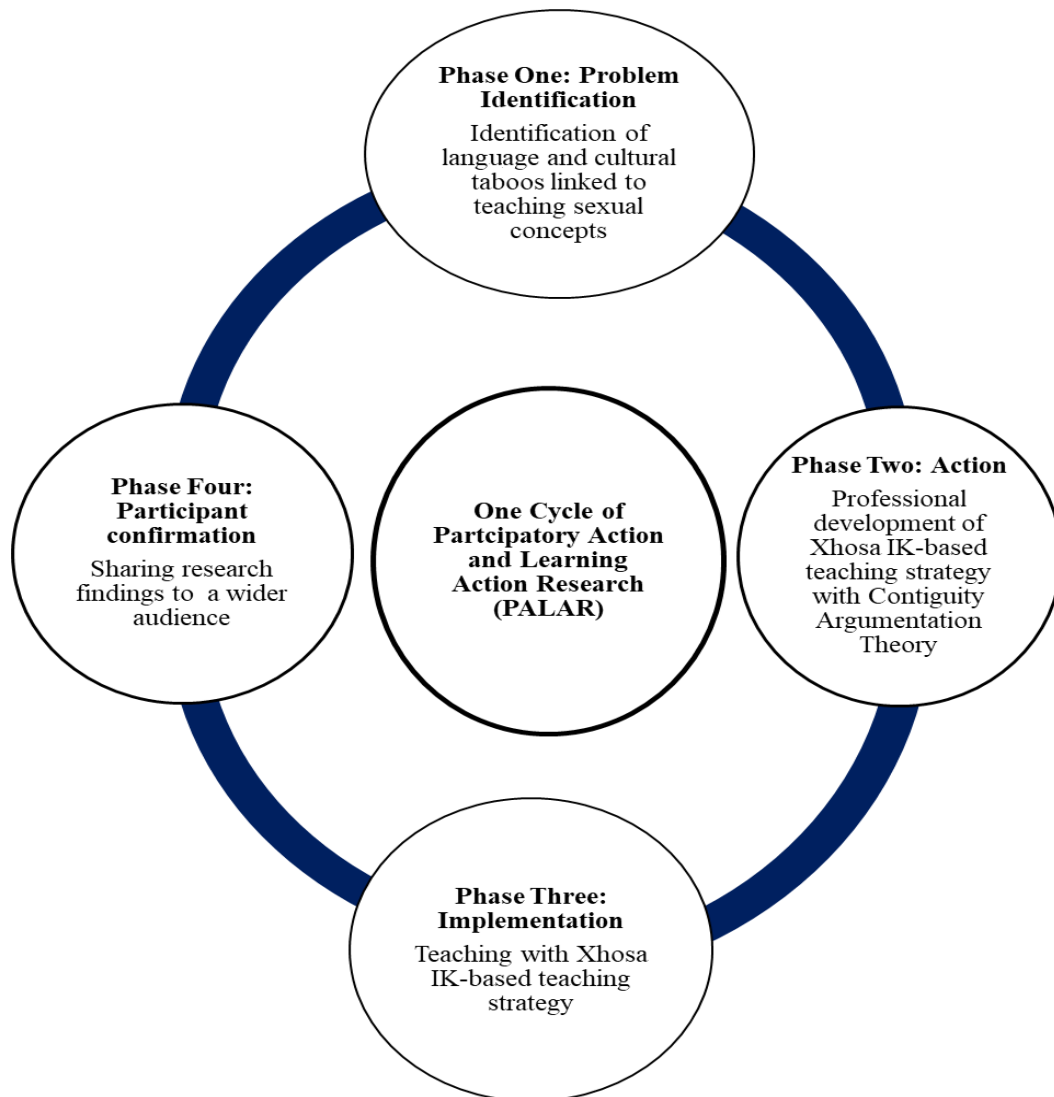


Figure 3: Cycle of Participatory Action Learning and Action Research (PALAR) consisting of four steps, adapted from Zuber-Skerritt (2018)

3.4.2 Design outline

The first stage of the design identified the problem of cultural restrictions that could impede teaching of sexual concepts by Xhosa teachers to a homogenous group of Xhosa learners in a rural setting. After problem confirmation, participants' reflections paved the way for data generation in each successive step (Zuber-Skerritt, 2018) of CPALAR design. The second stage was professional development where a Xhosa-*IK*-based culturally appropriate teaching strategy was developed using Contiguity Argumentation Theory (Ogunniyi, 2007).

The third stage was the implementation phase marked by teaching of the Xhosa Indigenised lesson by a model teacher. The last phase was participant confirmation aimed at validating and sharing of the findings and served as a “presentation and celebration day” (Zuber-Skerritt, 2015, p. 15).

3.5 Methodology

Creswell and Poth (2016) define methodology as procedures of qualitative research that are “characterized as inductive, emerging, and shaped by the researcher's experience in collecting and analysing the data” (p. 19). In this section the issues of recruitment, setting and sampling are explained, the intervention and data generating instruments are described, and the analysis and teacher confirmation processes are illustrated.

3.5.1 Setting

The study was conducted among teachers practising in rural secondary schools of the Eastern Cape, South Africa. The Ngcobo district is largely rural and schools are sparsely scattered. These schools are located in deeply rural Xhosa villages with “traditional herdsmen often seen on horseback, while women dressed in Xhosa traditional attire are ubiquitous, carrying water buckets on their heads” (Simayi & Webb, 2020, p. 38).

3.5.2 Sample

Purposively sampling (Etikan et al., 2016; Maxwell, 2012) was used to ensure that the particular setting, culture of the teachers and the subject were deliberately selected to provide information necessary to address the research questions of the study (Etikan et al., 2016; Maxwell, 2012). Secondary schools located in Ngcobo district and offering Grade 12 Life Sciences as a subject and were identified using electronic data available from the Department of Education website (Department of Basic Education, 2016, 2017c, 2018b). After receiving

permission to access schools from the principals, I arranged a meeting to make a “rapport” (Creswell & Poth, 2016, p. 118) with the participants so that I could get credible data from relevant participants who fit the criteria set for the study, namely experience in teaching Life Sciences in Grade 12 and a minimum teaching experience of five years.

Sample size for Phase One (completion of questionnaires) consisted all the 27 rural secondary schools in the Ngcobo district with twenty-nine (29) Life Sciences teachers and one (1) Subject Education Specialist (n=30). There were no differences in the schools’ pass performance or gender, hence all consenting participants were issued with open-ended questionnaires. Mason (2010) suggests that studies using more than one method require fewer participants, as do studies that use in-depth interviews with the same participants. In addition, a small group allows all the members to talk and share their thoughts while being large enough to give diverse views (Denzin, 2012; Fusch et al., 2018; Fusch & Ness, 2015). As I intended using a variety of in-depth data generation methods, including drawings and focus group discussions (Fusch et al., 2018; Theron, Mitchell, Smith & Stuart, 2011), the sample size was reduced from thirty (30) to eight (8). The sample consisted of three (3) males and five (5) females. However, due to transport challenges after rainy weather conditions affecting the poor road infrastructure of the villages, one female participant could not attend. Therefore, I was left with 7 participants. Data saturation (Fusch & Ness, 2015; Leech & Onwuegbuzie, 2007) was attained when I determined that “there was enough information to replicate the study” (Fusch, Fusch & Ness, 2017, p. 1408) and no new appeared to be forthcoming.

Phase Four was a celebratory and study dissemination session (Wood & Zuber-Skerritt, 2013; Zuber-Skerritt, 2018) and so all the participants who took part in the first data generation cycle (questionnaires) were invited. However, because of Covid-19 lockdown restrictions, numbers in the booked venue had to be limited to 15 as the carrying capacity of the room was

30 (Department of Health, 2020; World Health Organization, 2020). Also, due to a shift from the original Grade 12 examination calendar due to Covid-19 restrictions, some of the teachers and Department officials could not attend as teachers were invigilating Grade 12 examinations and officials preparing examination material for all the grades. This meant that all who were invited and could attend, attended.

3.5.3 Professional Intervention

Darling-Hammond et al., (2017) describes one of the most important elements of teacher professional development as a shift from “traditional learning models that are generic and lecture based toward models that engage teachers directly in the practices they are learning and, preferably, are connected to teachers’ classrooms” (p. 2). This aspiration was kept in mind when structuring five intervention activities:

- Presentation on human reproduction content and Contiguity Argumentation Theory
- Evaluation of the professional development on sexual concepts and CAT (CATPD)
- Design of Xhosa Indigenised lesson (XIL) on menstruation
- Presentation of XIL using a Xhosa-Culture based Indigenised Teaching Strategy (ITS) by a model teacher-participant
- Evaluation of the Indigenised Teaching Strategy (ITS)

A power-point presentation on Grade 12 human reproduction content and Contiguity Argumentation Theory was made by the researcher. Secondly, focus group discussions followed immediately after the presentation to evaluate the presentation and align it to their current teaching strategies. Thirdly, identification of the menstrual cycle the most difficult and sensitive sexual concept to teach took place. Fourthly, the teachers were engaged in argumentation on how Xhosa IK could be used to design a lesson plan based on menstruation

as the selected sexual concept. Then, presentation of the newly developed Xhosa-Indigenised lesson was made by a teacher selected to do so for the group.

Lastly, evaluation of the ITS was done by the teachers. The participants made a comparison and drew parallels between the phases of the menstrual cycle as described in CAPS (Department of Basic Education, 2011) and the terminology denoting stages of the menstrual cycle in the XIL. As the study has an indigenous axiology based on cultural values of Xhosa teachers, the participants engaged in individual drawings followed by focus groups evaluating how teaching strategies aligned with Xhosa teachers' classroom contexts and cultural beliefs could be of benefit to indigenous people. The duration of the professional development was two days.

3.5.3.1 Human reproduction, language and culture

The presentation on human reproduction systems was initially prepared on the male system consisting of testis and penis, female system formed externally by the vagina and uterus with ovary as the internally, the menstrual cycle characterised by bleeding and lastly, fertilization as prescribed by the *Curriculum and Assessment Policy Statement (CAPS) for Life Sciences (2011)*. However, participants suggested that presentation should focus specifically only on the terminology and functioning of menstruation as presented in Figure 4 (Department of Basic Education, 2017a).

In response, the presentation was changed to focus only on the menstrual cycle starting with the definition of menstruation. That is the benefit of CPALAR as the plan is not fixed, changes are allowed depending on the views and decisions of the participants. The language of science used in describing menstruation was introduced based on CAPS requirements (see

Figure 4). Thus, menstruation was defined as the regular shedding of the uterine lining called the endometrium together with the remains of the unfertilised egg cells.

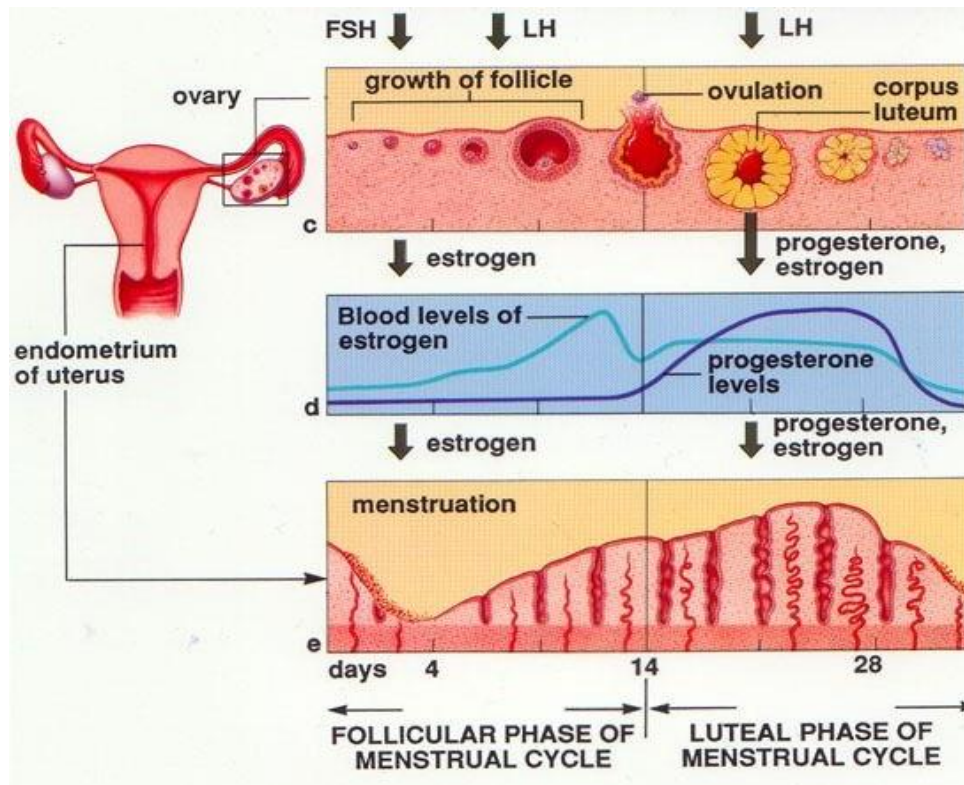


Figure 4: Diagram showing time periods in the menstrual cycle for Grade 12 Life Sciences (images retrieved from <http://biologywarakwarak.wordpress.com/2011/10/30/how-to-study-the-female-sexual-cycle-in-little-time/>)

The process takes place throughout a matured woman's reproductive life except when the female is pregnant (Department of Basic Education, 2011a). Emphasis was on menstruation as hormone-controlled cycle occurring naturally over a 28-day cycle (see Figures 4). The time period for the Graafian follicle formation was identified by visual images showing thickened endometrium as more blood vessels develop (Figure 4). The important function of the Graafian follicles in preparing in release mature egg cells during ovulation was noted. This was the fertile period where fertilization normally take place from approximately day 14 of the cycle and changes of Graafian follicle to the *corpus luteum* after release (see Figure 4).

In the absence of fertilization from approximately day 17 to 28, the uterine lining cleans itself as the *corpus luteum* and uterine lining disintegrate and appear as blood released through the vagina in a process referred to as menstruation flow. This is done to prepare a ‘clean’ uterine lining in preparation of the fertilized egg cell. This particular point elicited some unexpected responses as the participants’ sporadically murmured “yhaa”; “ewe” (yes in isiXhosa), “hmm” and nodded their head. My views on this response suggest that they affirmed the ‘cleansing effect’ of the uterine lining through the release of blood as an important factor.

The menstrual cycle includes ovarian and uterine cycles, namely the development of the Graafian follicle, ovulation and the formation of the *corpus luteum*, and changes that take place in the thickness of the endometrium (see Figure 4). The menstrual cycle (ovarian and uterine cycles) is under hormonal control of the action of follicle stimulating hormone (FSH), oestrogen, luteinizing Hormone (LH) and progesterone. The menstrual cycle teaching content is prescribed by the National Examination Guidelines for Life Sciences (Department of Basic Education, 2017a).

After this teaching and discussion intervention the participants raised the need to work together, engage in active learning structured in a professional intervention. They raised positive aspects of Xhosa culture being respectful yet maintaining authority and “doing the (teaching) job that we are paid for”. The participants engaged in a dialogue about their experiences of isiXhosa language that can be used to refer to sexual concepts. Thus, there was consensus on respectful language use that did not sound rude as Xhosa people take great consideration of respect. In that way, the participants took charge in changing their cultural and pedagogic situation (Desimone, 2011; Southwood & Ngcoza, 2009). I probed further and asked whether they have heard about and used culturally responsive strategies. The response was negative and I gave an explanation based on researched literature emphasising the importance

of recognising and linking indigenous people's language and culture with sexual concepts. The participants indicated that they always struggled on how to bring IK into the actual science lesson and collectively agreed that menstruation is a very sensitive content area that requires attention.

3.5.3.2 Xhosa-Indigenised Contiguity Argumentation Theory lesson design

In preparation for the development of an Indigenised Teaching Strategy on the menstrual cycle, I made a presentation on the Contiguity Argumentation Theory (Ogunniyi, 2013). The theory consists of five domains, namely the dominant, suppressed, assimilated, emergent and equipollent categories that serve as the basis for this type of argumentation (see Figure 5). Participants then engaged in a dialogue and argued about how they viewed the CAT cognitive domains in relation to their own cognitive status. Interestingly, teachers drew parallels, made comparative links and drew inferences between the phases of CAT and their own cognitions before and after the professional intervention.

Participants aligned the CAT categories with their own thinking using the cognitive domains illustrated in Figure 5. For example, an argument ensued about the Xhosa belief that adult married women who want to fall pregnant should have sex with their partners within 14 days after menstruation. An example was made by a female teacher that if "the period takes 7 days, then the next 14 days are fertilization days". There was open communication between male and females, between neighbouring participants (inter-argumentation) and the group at large including the reserved male who initially did not want to share his views. There was a change in attitude noticeable immediately after the presentation through inter argumentation between the individual members (Kwofie & Ogunniyi, 2011). Male participants indicated that they have never heard of this Xhosa practice of having sex after 14 days in order to fall

pregnant, while all the females agreed that they knew about it. The males believed that their Xhosa IK was suppressed (see B in Figure 5). The males became curious and asked for an explanation on how that worked and an argument arose out of its effectiveness.

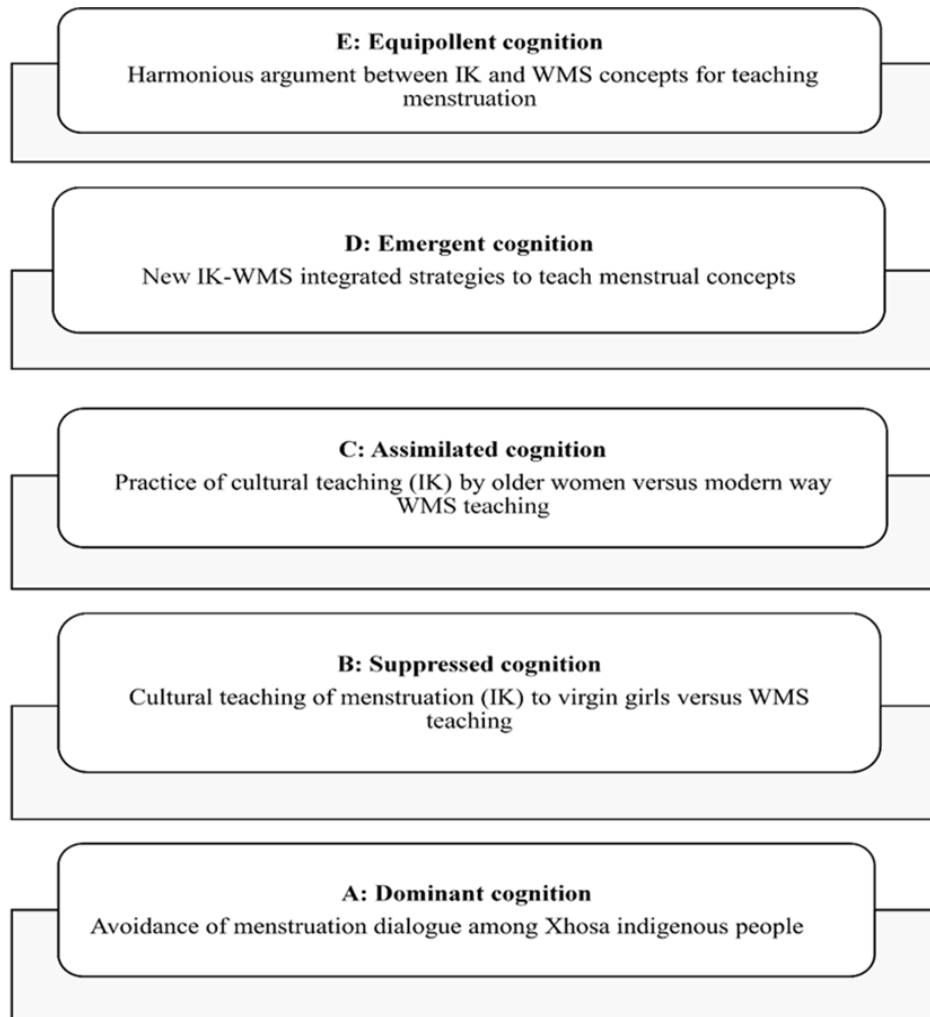


Figure 5: Framing the teacher focus group discussion within Contiguity Argumentation

The female teachers explained the simple traditional counting which they indicated was also used as a traditional pregnancy prevention method where women would abstain from sex in those 14 days after menstruation. Thereafter, collective agreement was made as males were reminded about the scientific ovulation cycle that they teach in Life Sciences Grade 12

curriculum. Female teachers collectively took the lead, linking the traditional Xhosa counting to Western science ovulation counting. At this point I took the opportunity to frame the discussion above within the Contiguity Argumentation Theory postulated by Ogunniyi (2013) that had already been discussed in abstract form (Figure 5).

There was consensus within the group that all of the aspects discussed above should be kept cognate when designing any IK underpinned lesson on human reproduction for rural isiXhosa children and their teachers. Detailed analysis of how the participants explained their cognitive shifts before and after CAT presentation is discussed in the results and data analysis sections. Multiple data generation techniques (Fusch et al., 2018) were used to generate descriptions of the participants' experiences, arguments and reflections. In Phase One, semi-structured questionnaires, blank papers and pens for writing were issued. The aim of these instruments was to generate data that can answer the question of teachers' cultural awareness about cultural inhibitions that impede teaching of sexual concepts to homogenous learner groupings.

3.5.4 Data generation tools

In Phase Two, blank papers with colourful markers and pens were issued to individual participants for the purposes of collecting drawings supported with statements. The drawings and written and oral explanations of the pictures concepts (Mannay, 2016; Mitchell et al., 2017; Theron et al., 2011) were used to determine the teachers' perceptions about their current teaching strategies and how they felt when teaching sexual. An audio recorder was used to record these discussions. Two laptops were used. The first laptop was used for presenting the power-point. The second laptop was a standby for any technical failure that could occur since the field site was very far from the university. In addition, a data projector, portable screen and electronic pointer were used to present a power-point. A video recorder (Creswell & Poth,

2016; Maxwell, 2012) was used to record the XIL presented by the teacher. Video recording was important as an additional tool that added gestures and body language that could not be picked up from the focus groups and drawings, complementing the observation schedule. Notebooks (Creswell & Creswell, 2017; Lincoln et al., 2011) were used to record participant observations by research assistants. Notebooks were also provided for participant reflections and I used a notebook for my reflections as a researcher.

The aim of designing the exploratory questionnaire was to collect demographic factors such as gender, rural placing of the school, subject taught by the teacher, Xhosa as home language, Eastern Cape as the province in which the school is situated and more than 5 years teaching experience in the subject at Grade 12. These demographics were essential so as to accumulate empirical evidence about contextual similarity (Atchoarena & Gasperini, 2003) based on the schools being rural and Xhosa ethnicity (Maringe & Moletsane, 2015; Masinire et al., 2014). The questionnaire was also used to provide qualitative data.

3.5.5 Data generation

Due to the reflective nature of CPALAR research design where reflection of a previous step determines how the next step is structured, both data generation and data analysis is discussed together. As noted earlier, a data set was generated on 30 May 2019 when thirty open-ended qualitative, colourful, semi-structured questionnaires were completed by participants (Phase One). The reason for using colour to make the questionnaires aesthetically appealing was based on a study by Simayi and Lombard (2019) which found out that Xhosa-speaking Natural Science learners engaged more actively when using a multi-coloured diagram than when using a plain one. The questionnaires were numbered to be able to locate them in case of errors or a loss. All 30 participants willingly participated (see section 3.7 of this chapter for ethical considerations) and took a maximum of one hour to respond to the questionnaire.

As noted above, demographic data relating to gender, ethnicity, province where the school was situated (to confirm that the school could be classified as rural and Xhosa in terms of culture and home language) were generated (Fusch et al., 2018). Open ended questions investigated whether culture has an influence on teaching sexual concepts within the sample group of teachers and how they felt when teaching sexual concepts to learners.

Phase Two generated five sets of data, namely individual drawings, focus group discussions before the CAT presentation, written observations, individual drawings and focus group discussions after the CAT presentation. These data were generated on the 14th of August, 2019. The participants were asked to produce individual drawings with descriptions of what the drawings represent. This was done to probe the innermost feelings of how Xhosa teachers experience teaching sexually related human reproduction concepts to Grade 12 learners (Mannay, 2016; Mitchell et al., 2017).

The participants were asked to choose any sexual concept prescribed in the Grade 12 curriculum and reflect about how they feel when teaching the topic. Specific prompts required participants to make drawings that show how they feel about the role played by Xhosa culture on the manner they teach sexual concepts. Also, participants were asked to explain in writing, using isiXhosa or English, how they felt about gender (their own and their pupils) when teaching these concepts. It was emphasised that it was not the artistic aspect of the drawing that mattered, but its meaning. The session lasted for one hour and each individual was allowed personal time and freedom to take part in the task or refrain from doing so. All members of the group complied.

A focus group discussion (Creswell & Poth, 2016) followed immediately after the drawing and writing task was completed by all. The focus group discussion was audio-recorded

(Denzin, 2017; Denzin & Lincoln, 2009) in order to generate data on the current strategies and language used to teach concepts of human reproduction. The participants were asked to reflect on the difficulty, embarrassment, and possible loss of respect they experienced when teaching concepts related to sexuality. As noted earlier, the importance of reflective practice (Wood & McAteer, 2017) cannot be underestimated as what needs to be done in the action steps is dependent on the discussions held in the previous step (Zuber-Skerritt, 2009, 2015). The participants' reflections reinforced the researcher's initial belief that the teachers would benefit from further professional intervention about teaching strategies and the Contiguity Argumentation Theory could mediate their discomfort. As such, the next step taken was that of further professional development.

The professional development strategy enabled the generation data from multiple sources, including observation and recording of audible responses and gestures exposing negative emotions due to cultural inhibitions regarding sexual talk (Darling-Hammond et al., 2017; Desimone & Garet, 2015; Fletcher & Zuber-Skerritt, 2008). For example, a male participant was notably always looking down throughout the presentation. The situation became worse when the diagrams were projected on the big screen and he was playing 'nervously' with his pen. This gesture was also observed by the two research assistants.

Out of concern for this participant's emotional status and well-being, I asked whether he was feeling comfortable with the presentation. He indicated that he always felt uncomfortable when teaching sexual concepts as Xhosa culture prohibits talking about sexual matters because community members have high expectations from the teachers, especially males as bearers of authority. His anxiety was reflected as he shared that "when teaching the male sexual organ, learners seem to be looking through my trousers and I feel embarrassed". His explanations were followed by a chorus of "hmm...hmm....yes" from group members. He declared that he

does not teach this section fully and mainly gives it to learners as homework. Revelations such as this one helped guide me in terms of shaping and tweaking the activities as we moved forwards together. For example, a female participant revealed that “it becomes difficult for me to call a vagina, instead I use substitute terms like ‘igusha’ (sheep) to avoid calling it”. The use of euphemism introduced a language issue where teachers avoided using actual sexual terms in fear of sounding vulgar. A male participant shared that “it’s not only male learners who have difficulties, female learners get embarrassed when I teach it and I don’t finish teaching it”. On the question of gender, there was a disagreement as female teachers expressed that boys were naughty as they laughed at girls when there was menstrual talk. Female teachers indicated that they believed that teaching human reproduction that could be linked to sexuality is biased against female learners. The notion of different terms used for sexual concepts and processes such as menstruation was argued and agreed upon. A Xhosa-IK based lesson plan with a teaching strategy was developed by the teachers and taught to the group by a peer teacher.

During the CAT presentation the participants unanimously agreed that Xhosa culture has very good cultural practices which have been suppressed (level B in Figure 5) in the minds of Xhosa people by modern science but noted that they identified with the dominant cognition (level A in Figure 5) where WMS dominated Xhosa IK, hence the suppression of IK. The participants could not find anything that they could link to the third level of cognition which is assimilation (labelled C in Figure 5), but easily linked the emergent conception (labelled D in Figure 5) to concepts such as endometrium, morula, blastocyst, aspects which are not known and have no vocabulary in Xhosa culture. Lastly, they could easily relate to the equipollent conception of the integration of two competing worldviews, such as IK and WMS conceptions on menstruation due to dialogic conversation on the teachers’ thinking (Diwu & Ogunniyi, 2012). All of the above information supported my initial contention that incorporating CAT

into the design of the research would probably be a meaningful and fruitful approach both in terms of the professional intervention and as an analytic tool.

3.5.6 Data analysis

Thematic data analysis was used to reduce its volume by developing a coding scheme and organizing data into patterns and themes manually (Braun & Clarke, 2019; Denzin, 2012), and also with Atlas ti. 8 computer software (Paulus et al., 2014; Paulus, Woods, Atkins & Macklin, 2017; Saldaña, 2021).

3.5.6.1 Manual thematic data analysis

Manual counting, sorting, writing and labelling common attributes into categories (Denzin, 2012, 2017; Fusch et al., 2018) was used firstly, in the closed section of questionnaires in Phase One of CPALAR. Manual thematic data analysis that was suitable for the research purpose of this study (Braun & Clarke, 2019; Flick, 2013) was also used in audio recorded focus group interviews in Phase Two and in the flow chart used in Phase Four of CPALAR. In all the identified sections, colour-coding was done by grouping similar evidence and labelling it to give a wider perspective. Similarities in terms of responses were grouped together and differences set in another category. For example, use of isiXhosa language, subject taught, gender and rural school positioning from closed section of questionnaires. Likewise, descriptive texts from drawings were coded by searching through data for groups of common words or phrases to form two main categories (Flick, 2013; Leech & Onwuegbuzie, 2008). For example, data was grouped into two categories (Creswell, 2009; Denzin et al., 2008), with green representing 'cultural taboos limit teaching' and red for 'cultural taboos do not limit teaching'. Responses to each question were re-read with specific attention paid to the themes arising from the first stage of data analysis. However, the amount of data was larger than

expected and I utilised Atlas ti.8 analysis for capturing data in a software program (Friese, 2019; Friese et al., 2018; Lewis, 2016; Paulus et al., 2014).

3.5.6.2 Computer-aided thematic data analysis using Atlas ti. 8 software

Atlas ti.8 was used as Computer-Assisted Qualitative Data Analysis Software (CAQDAS), (Friese et al., 2018; Saldaña, 2021; Woods et al., 2016) similarly known as Qualitative Data Analysis Software (QDAS) (Paulus et al., 2017; Woods et al., 2016). In order to enhance accuracy of generated data, secure storing, organising and electronic coding of data with password protection to prevent security risks, Atlas ti. 8 software was used to increase transparency. Below, are three areas where Atlas ti. 8 was used thematically to generate themes in CPALAR:

- Open-ended questionnaires in Phase One
- First cycle of descriptive drawings in Phase Two
- Video recorded teaching of Xhosa Indigenised lesson on menstrual cycle in Phase

The first step was translation, followed by transcription of the drawings, focus group interviews and video on the indigenised lesson (Fereday & Muir-Cochrane, 2006; Garrison, Cleveland-Innes, Koole & Kappelman, 2006). Interviews were translated and transcribed (Onwuegbuzie & Leech, 2019; Onwuegbuzie et al., 2010) from isiXhosa to English as most participants used their home language. This was a very time-consuming and expensive phase due to translation and transcription costs as the qualitative data had isiXhosa and English, therefore professional translation services were sought first before transcription. I scanned all drawings (before and after Xhosa Indigenised lesson) and uploaded them on Atlas ti.8 so that I could develop codes for data analysis. Thereafter, video data was uploaded to derive networks on Atlas ti.8 to authenticate the study and increase its trustworthiness.

In the first cycle of coding, I used two coding methods simultaneously, open coding and in vivo coding as these were the ‘beginning stages of data analysis that fracture or split the data into individually coded segments’ (Saldaña, 2021, p. 51). According to Friese (2019), it is possible to create ‘a quotation and a code at the same time’ (p. 10) using the uploaded documents. Hence, open coding was used to familiarise myself with the participants’ written and visual data to get a general view of raw data since translation and transcription was done by an independent person. The study notes the variation in the use of terminology as ‘initial coding was also referred to as open coding’ (Saldaña, 2021, p. 59) thus, the term ‘open coding’ has been used in this study (Friese, 2019).

Uploaded transcripts were used to select a quotation and create a code simultaneously by highlighting a quotation that I wanted to code, I selected open coding from the coding menu and used the same quotation as a code. Assigning codes to quotations is termed in vivo coding and quotations serving as codes were used and the maximum number of characters that could be used in a single quote was 40 (Friese, 2019; Saldaña, 2021). In vivo coding was also used because indigenous concepts such as language and practices of a particular culture (Xhosa in this case) were captured verbatim. Using direct quotations assisted in validating the study and provided a grounding for the study (Charmaz, 2015). For example, the development of the theme of *‘asibizi* was based on in vivo coding and the code was captured realistically as presented in the vernacular of the participants.

The transition from the first to second cycle of coding involved classification, interrogation, re-arranging and categorization of data, a type of coding referred to as ‘eclectic coding’ (Saldaña, 2021, p. 59). Thus, I refined codes generated in the first cycle as by using eclectic coding. For example, results showed data that exposed gender and power issues (female teachers versus male learners) when teaching sexual concepts, issues that were not

originally covered by the study. Eclectic coding allowed the use of colour to detect patterns, aiding in easy identification and classification of codes, categories and emergent themes (Saldaña, 2021). Hence, pattern coding (part of eclectic coding) was used to examine trends that were revealed by similarities and differences in the data so that data interpretation could occur (Charmaz, 2015). Data with shared similarities based on the researcher's defined attribute, were color-coded and codes were compared, grouped and categorised for theme development.

Data display was achieved by using Atlas ti. 8 networks (Saldaña, 2021; Woods et al., 2016), creating visual representations that explored how various color-coded codes and categories make up a theme and also how codes related to each other. Atlas ti.8 networks are software groupings that show converging points of agreement between various uploaded data (Friese, 2019; Saldaña, 2021), lending more credibility to the findings. Friese et al. (2018) emphasises that 'that this is not an automated process' (p.18) because the software does not create nor name links. Therefore, it was my duty as a researcher to pull codes that were related to each other. Furthermore, document mapping provided results that engaged analytical practice beyond the constraints of paper-based mechanisms (Woods et al., 2016). In this regard, data analysis was made transparent by linking document number with direct quotations, using data retrieved from descriptive drawings, focus groups and audio time frames in video analysis.

Video analysis provided results that captured emotional and cultural coding found in values, attitudes, beliefs, emotions and gestures using Atlas ti. 8 (Saldaña, 2021). As the study is culture-based, Atlas ti. 8 provided credible results where evidence of data analysis could be tracked on the time-stamped frame of the audio and video transcripts, showing exact times when particular data were shared by participants (see section 4.4.2 of Chapter 4 of this study). However, adhering to my research license and legislation prohibiting circulation and use of

participants' faces (Department of Justice South Africa, 2013), graphic data analysis with facial recognition has been excluded. The themes were then analysed theoretically using Contiguity Argumentation Theory and Bakhtin theory of heteroglossia.

3.6 Credibility and trustworthiness in qualitative research

Mindful of quantitative researchers' critique of qualitative research as being subjective and inherently unreliable and invalid, the study takes the view that validity and reliability of qualitative research be judged under criteria different from those used in quantitative studies (Creswell & Miller, 2000; Creswell & Poth, 2016; Fusch et al., 2017). Therefore, the study adopts the following terms to describe validity and reliability: credibility for internal validity, transferability for external validity, dependability for reliability and confirmability for objectivity (Creswell & Miller, 2000; Fusch et al., 2017; Maxwell, 2012).

Credibility of research findings was viewed on whether there was any congruence and links with reality (Creswell & Miller, 2000; Creswell & Creswell, 2017), using journal entries of the participants and researcher as sources for ensuring credibility of findings (Denzin, 2012; Denzin & Lincoln, 2009). Transferability was viewed against the backdrop of the characteristics and geographical area where field work took place (Onwuegbuzie et al, 2010). Transferability was based on whether field work has been carried on rural high schools with human reproduction content and teachers of the same culture as the learners. Therefore, findings were checked for a trail of documentary evidence where research was understood in the context of the place and content area done.

Since the epistemological position of the critical paradigm is subjectivism, this means that the language, beliefs, culture, gender and ethnic issues of the indigenous people under study are linked to the problem (Cohen, Manion & Morrison, 2007). Due to my epistemological

position that knowledge is not neutral, and Mertens (2007) view that knowledge can only be known by those who experience it through a process of self-conscious action of critical reflection, my own self-reflections became an important part of the study. Therefore, I recorded the trail of my thoughts as I interacted with the participants (Cohen et al., 2007; Denzin, 2017; Mertens et al., 2013). In recognising that no data are silent, every datum was recorded to lend credibility and trustworthiness to the study (Onwuegbuzie et al., 2010). All written material acquired from the participants was returned and only copies of drawings were kept, voice and video will be kept for a period of 5 years. As a researcher, I kept a journal where my personal beliefs and biases about the study were written to enable me to make a full declaration when writing this thesis.

Keeping within critical paradigm commitments (Carr & Kemmis, 2005; Denzin, 2017), it is important to note that knowledge centred on the indigenous knowledge of Xhosa people and substitute names used for sexual concepts and processes, creates an avenue for getting authentic data about how Xhosa people live. Listening carefully to the participants voices (Merriam, 2011; Shor, 2002) about aspects of Xhosa culture and language use, and showing a keen interest to know more is also important in terms of getting credible, dependable and confirmable knowledge.

3.7 Ethical considerations

Ethical conduct is very important when conducting a study that includes human beings (Basit, 2010), even more so when dealing with sensitive and embarrassing content such as sexual concepts. Also, individual justice was practiced by the researcher, ensuring that risks that may have arisen were made explicit and benefits that were given were clarified to all participants (Creswell & Poth, 2016). An annexure with names of schools and principals was

kept but pseudonyms were used to protect the identity of the schools and principals for confidentiality purposes (Department of Health, 2014; Dieltiens & Meny-Gibert, 2012). Dissemination of knowledge in a seminar or exhibition using copies of drawings was planned as a strategy compliant with CPALAR. The intention of this task is to extend group knowledge to a wider audience. However, Covid-19 lockdown restrictions prevented public gatherings as a national control against infection (Department of Health, 2020). Nonetheless, the researcher communicated with the Department of Education to agree on a date where a presentation would be made with some of the teachers. The presentation was a strategy of ensuring that the voices of the teachers who participated in the study are heard and the study validated. However, care was taken to guard privacy and confidentiality by using codes to refer to extracted text and drawings. In other words, the participants' identities were protected. Finally, consensus was reached that findings of the study were credible and represent the views of the participants and could be shared as new knowledge to a community of teachers and academics.

This education research is governed by a code of conduct enshrined in Condition 6 of the POPI Act (Department of Justice South Africa, 2013) which refers to openness. This principle requires transparency, maintenance of confidentiality and data protection of participants (Basit, 2010). Keeping with ethical conduct, permission was requested from the university *The National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research* and sent to the Department of Education at Head office and to the District Director at Chris Hani District (old Ngcobo). Ethical clearance number H19-EDU-ERE-002 was obtained from the Nelson Mandela University Human Ethics Committee (Appendix 1). To ensure ethical compliance, a consultative meeting was held with the participants before the start of data collection to clarify terms of reference for participation using attached protocols (Appendices 1, 2, 3A, 3B, 3C, 4, 5, 6, 7 and 8). Ethical clearance was obtained from Eastern

Cape Department of Basic Education (Appendix 2) and permission letters sent to District Director (Appendix 3A), Subject Education Specialist in charge of the subject (Appendix 3B) and principals of participating schools (Appendix 3C). Permission letters (Appendices 3A, 3B, 3C) authorising the study and the list of 27 schools expected from Ngcobo district issued by the Eastern Cape Department of Basic Education were shown to the participants.

Informed participant consent (Appendix 4) on how collection, use and storage of personal data that may seem more sensitive in nature, like the participant's racial or ethnic origin and feelings about teaching topics of a sexual nature would be kept was signed in this session (Creswell & Creswell, 2017). In addition to the stated protocols (Appendices 5, 6, 7, 8), confidentiality and consent to drawings recording of focus group interviews, research tool for drawings and audio recording of focus group interviews, video recording and its research tools respectively, were explained and signed before actual data collection. All acts of kindness such as transport compensation, accommodation and meals for workshop attendance were declared and monitored by the supervisor. Monitoring of monetary benefits is essential as a means of guarding against unethical conduct such as bribing or falsification of data collection by participants (Creswell, 2009; Denzin, 2012). Nonetheless, the welfare of the participants needed to be protected at all times in the study. The participants were accommodated in a single venue for the duration of the workshop and transport expenses compensated according to Department of Education's claim rate.

Critical to the study, was the issue of respect and value of cultural beliefs of ethnic Xhosa groups. The issue of confidentiality and voluntary participation was explained. Also, collected data was kept with great care in password protected computer software under the supervision of the appointed university supervisor (Mertler, 2012). Owing to the emancipatory nature of the study, the participants were given confidentiality forms to sign declaring that they would

protect the names of the participants and not reveal or disseminate the names of the participating schools. They also signed consent forms allowing the confidential data generated to be used for the thesis, conference proceedings and other academic publications (Denzin & Lincoln, 2009).

3.8 Chapter summary

The chapter described the critical and indigenous Participatory Action and Learning Action Research, termed CPALAR) used in this study. The philosophical underpinnings of qualitative research were described and rationale for following a critical indigenist perspective were discussed. Further, rationale was given for using dialogic argumentation grounded on Contiguity Argumentation Theory.

The first CPALAR stage of this study aimed at determining via questionnaires whether Xhosa cultural taboos exist that restrict or enhance the teaching of sexual concepts to grade 12 learners. The questionnaires were also aimed at establishing the teachers' views about the role of culture in the teaching of sensitive, sexual concepts. In addition, the questionnaire affirmed the correct demographical distribution of the study to ensure that the sample is relevant to the research title of investigating rural secondary schools with Life Sciences in Grade 12. The limitations of CPALAR were noted, namely that its success depends on participants' reflections in order to proceed to the next phase.

The second phase was the action phase. Participant drawings with explanatory texts were used to generate in-depth data to address the question of how the participants feel when teaching this section of the curriculum. These data were generated in a confidential and sympathetic way. Focus group discussions were done to get the teachers' views about the role of culture in relation to teaching sexual concepts. The focus groups were created to allow a

communicative space for teachers to collectively participate, share views and commit to accepting other people's views through dialogic argumentation. Observations of the participants' gestures during focus group discussions were recorded by a research assistant.

As part of the action stage, an indigenous knowledge-based CAT professional intervention was done to empower the teachers about current IK based research strategies that can be used to mediate the contradictions between Indigenous Knowledge (IK) and Western Modern Science concepts. The professional intervention provided a platform for the participants to critically reflect on their current teaching strategies while using the Cognitive Argumentation Theory as a foundation to think (internally) and openly reflect on how they might apply a CAT approach to develop Xhosa IK based lessons.

The third phase was the implementation stage which resulted in the development of a new Xhosa IK based lesson plan and teaching strategy, collaboratively developed by the participants in a two-day professional development workshop. Dialogic argumentation created opportunities for participants to agree or disagree while negotiating consensus, learning from each other and making decisions. Participants argued and then agreed that the menstrual cycle is the most difficult and sensitive sexual concept to teach, hence an indigenised lesson on menstrual cycle was developed.

Additional consideration was given to Contiguity Argumentation Theory's domains of cognition and language dynamics pertinent to homogenous groupings were grounded on Bakhtin's heteroglossia. Heteroglossia addresses language differences for homogenous groupings residing in different geographical settings. The notion of different terms used for sexual concepts and processes such as menstruation was argued and agreed upon. A Xhosa-IK based lesson plan with a teaching strategy was developed by the teachers and taught to the

group by a peer teacher. The last phase was the participant confirmation phase where district officials were invited to witness the sharing the study by the participants to other isiXhosa speaking teachers.

The ways that qualitative data were generated, namely via open-ended questionnaires, teacher focus group discussions, observation schedule, audio recording, video recording of Xhosa Indigenised lesson presentation and flow chart during the participant confirmation of findings' stage were explained. Data analysis was done through thematic data analysis. Atlas ti. 8 electronic software was used. The participants were provided with an opportunity express their thoughts on the study as an important step in terms of validating the study. Issues of credibility and trustworthiness, as well as ethical issues regarding the study, were discussed.

CHAPTER FOUR

RESULTS

4.1 Introduction

The first set of qualitative results presents empirical evidence from open-ended questionnaires generated during the problem-identification phase of the Critical Participatory Action Learning and Action Research (CPALAR) design (Kemmis et al., 2014, p. 59; Zuber-Skerritt & Passfield, 2017). The second set of results were derived from qualitative data obtained from three instruments; descriptive drawings, focus group discussions focussed on the Contiguity Argumentation Theory of Professional Development (CATPD) and the researcher's observation protocol. The third set of results were drawn from video-recorded data of the Xhosa Indigenised lesson (XIL) on the menstrual cycle, presented during the implementation phase of the design. The fourth and last set of results were drawn from data generated during the participant confirmation of the findings' stage and presented as a flow chart.

In all the four phases, data have been translated, transcribed and interpreted to make sense of the participants' experiences and appendices have been attached as evidence (see appendices 9 to 19). Results from the numbered open-ended questionnaires were thematically analysed to determine demographical distribution (Appendix 9) and cultural inhibitions that restrict teaching of sexual concepts (Appendix 10). The researcher's observation protocol (Appendix 11) data were transcribed for thematic analysis of participants' gestures and researcher's personal views throughout the study. Data from the descriptive drawings derived from the first cycle of drawings were transcribed (Appendix 12) and emerging themes were analysed using Atlas ti. 8 (Paulus et al., 2017; Saldaña, 2021) to determine teaching strategies used by the participants (Appendix 13). Transcript of audio recordings of focus group interviews before (Appendix 14) and during

the CATPD (Appendix 15) were analysed thematically to determine the participants' perceptions about language and argumentation levels. Transcript of video-recorded data were analysed with Atlas ti. 8 (Appendix 16) to determine the participant's reflections on the XIL on menstruation. An audio recording transcript presented data retrieved after the presentation of the IK-lesson, confirming the use of a Xhosa cultural counting system for the menstrual cycle (Appendix 17). The second cycle of drawings was analysed thematically after the presentation of the Indigenised lesson and CAPTD (Appendix 18). All direct extracts from the transcriptions are presented in italic font. Finally, a flow chart (Appendix 19) drawn by one participant representing collective findings of the group was analysed thematically.

4.2 Analysis of open-ended questionnaires

Phase one of CPALAR consisted of numbered, an open-ended questionnaire (see Appendix 9) presented to 30 participants with the intention of identifying Xhosa cultural taboos that restrict or enhance the teaching of sexual concepts to a homogenous cultural grouping of learners in rural secondary schools. Each of the 30 questionnaires consisted of two pages, numbered sequentially from 1 to 30 before being issued to provide a trail of evidence and keep track of the number of participants (see Appendix 9), with the abbreviation P for participant (P1 to P30). The first part of the questionnaires provided results responding to the demographical distribution of the participants, addressing questions of gender, subject taught, home language, type of school and province where the study was undertaken. The second open-ended part provided empirical evidence based on development of dominant patterns (Appendix 10). Xhosa texts were translated to English orally and transcribed by a professional Xhosa language teacher, and codes were developed. Dominant themes emerged after transcription and were analysed firstly by using manual thematic data analysis, followed by Atlas ti.8 data software for establishing network links between identified codes and quotations.

4.2.1 Gender distribution and culture distribution

The exploratory study consisted of 18 female and 12 male participants, making a total of 30 participants during the first phase of CPALAR. Due to the small sample size of 30, demographic data were sorted manually (Creswell & Creswell, 2017) by counting the number of ticks representing the required attribute such as gender and culture specification. Two coloured categories of data representing male or female gender and Xhosa culture were drawn, followed by counting. Coding of the attributes of the participants indicate that all 30 participants were of Xhosa culture and were isiXhosa home language speakers (as expected).

4.2.2 Subject taught and geographical distribution of the school

The participants were all teaching the subject currently known as Life Sciences (Department of Basic Education, 2011a), formerly known as Biology in the previous curriculum. Results of thematic data analysis indicate that all 30 participants were teaching Grade 12 in public secondary schools situated in the same district, located in the same province of the Eastern Cape. Results showed that all 30 participants were teaching in secondary schools situated in rural villages. These results confirmed that the purposive sampling arrangements had met their purpose.

4.2.3 Analysis of open-ended portion of questionnaire

Results of data analysis from open-ended questions revealed that participants avoided talking about sexual concepts in their Life Sciences' classes and in community settings due to Xhosa cultural restrictions. Counting of participants' responses indicate that all the 30 participants responded with 'no' to the question asking whether they think that human reproduction topics such as menstruation, ejaculation, fertilization, pregnancy and childbirth are part of the normal cultural conversation among young and old members of their culture. Out of

the 30 participants, 10 participants did not give explanations to the *no* response, (P15; P16, P17, P18, P19, P21, P24, P25, P26, P28 in Appendix 10).

Based on translation and coding of the transcripts using Atlas ti. 8 software, dominant patterns that emerged from the responses were:

- *Asibizi* sexual concepts, a Xhosa term meaning avoidance of talking about something.
- Cultural taboos restrict teaching of sexual concepts due to innate Xhosa cultural beliefs.

These two dominant themes, as described below, are supported with direct quotations from the transcription (Appendix 10) and Atlas ti.8 data analysis. As explained in Chapter Three of this study (see section 3.5.6.2), Atlas ti. 8 provided an analytic procedure that applied specific types of codes to data, starting from the general to more detailed coding. For example, *in vivo* and eclectic coding were used, allowing for the development of a theory that is rooted in the participants' original, spoken, and written data as discussed below.

4.2.3.1 Asibizi, we do not talk about sexual concepts

Results of data analysis indicated that 20 out of 30 participants responded with explanations indicating that they avoided explaining sexual topics in isiXhosa language as their culture prevented talk about sex matters such as vagina, penis and menstruation. Results on Atlas ti. 8 were based on documentary trail that followed three steps to develop the theme of *asibizi*. The report first captured snapshots of raw data from written responses on uploaded documents as shown in Figure 6 and 7. This was followed with an Atlas ti. 8 desktop snapshot (see Figure 8) of *in vivo* and eclectic coding using the uploaded transcripts (Appendix 10). Finally, visual Atlas ti. 8 networks (Figure 9) provided evidence of theme development, showing links between the raw and patterned codes leading to the emergence of *asibizi* theme.

Results from raw data captured from the participants' written responses indicated that they do not talk or name sexual concepts, using the isiXhosa language term *asibizi* (P29 in Figure 6).

Part of normal cultural conversation in my culture.
Not part of normal conversation in my culture.	<i>asibizi (not allowed in our culture).</i>

Figure 6: Raw data response of participant 29 (P29) stating *asibizi* and providing culture as the reason for the avoidance in open-ended questionnaires

Additional supporting statements to *asibizi* as being culturally based was provided by P29, describing the avoidance as being *not allowed in our culture* (Figure 6). Also, P9 (Figure 7) indicated that Xhosa culture regarded talking about sexual concepts *as a sign of disrespect and looking down at adults*:

Part of normal cultural conversation in my culture.
Not part of normal conversation in my culture. X	<i>According to our Culture it is seen as a sign of disrespect and looking down at adults.</i>

Figure 7: Participant 9 (P9) revealing culture as the reason of avoiding talking about sexual concepts

Further supporting comments were provided for the dominant theme *asibizi* directly from the uploaded transcripts (see Appendix 10) and were used verbatim, to generate in vivo codes displayed in Figure 8:

P29: Asibizi, not allowed in our culture.

P9: According to our culture, it is seen as a sign of disrespect and looking down at our culture.

P20: We don't say these things, siyahlonipha, asibizi.

Results of data analysis captured from the desktop snapshot of the Atlas ti. 8 project used for code management (Figure 8), indicated similar use of the Xhosa term *asibizi* from various participants although they were given individual, open-ended questionnaires with no room for a discussion or sharing of views. Surprisingly, the term '*asibizi*' permeated the data trail as various participants responded in vernacular while some explained in various ways (see Figure 6, 7 and 8) and (Appendix 10).

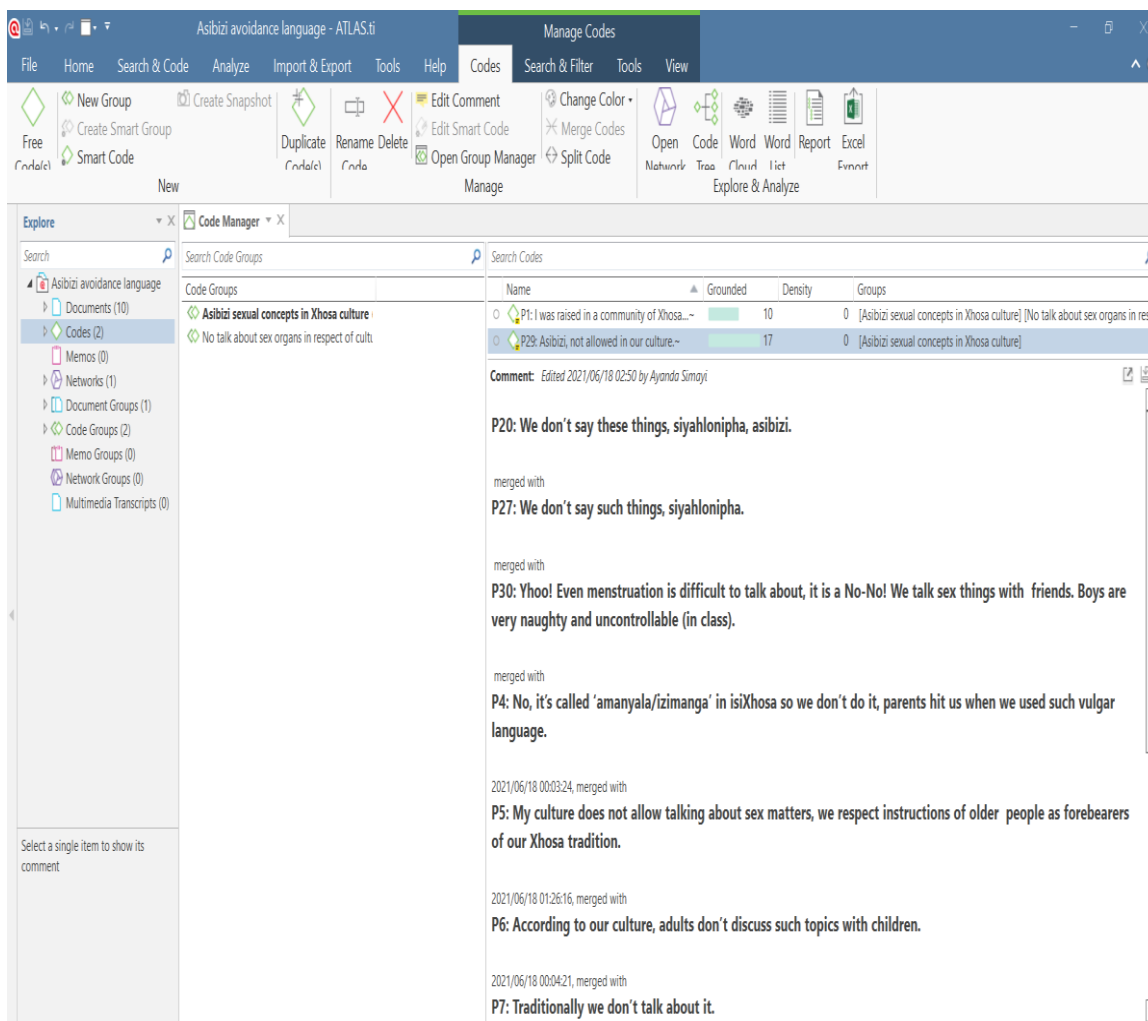


Figure 8: Development of asibizi using from in vivo and eclectic coding on Atlas ti.8 snapshot

Additional supporting comments from quotations of participants that were used as codes and provided the development of the dominant theme of asibizi:

P30: Yhoo! Even menstruation is difficult to talk about, it is a No-No! We talk sex things with friends. Boys are very naughty and uncontrollable in class.

P7: Traditionally we don't talk about it.

P23: Tradition dictates silence on sex language or talk.

Results of data analysis showed additional support for the development of *asibizi* were provided by the ‘groundedness’ (Friese, 2019, p. 14) of the code, showing the number of times that a particular written text was connected to a particular code. For example, results show in vivo coding that generated the code *asibizi, not allowed in our culture*, had a grounding of 17. This means that 17 text passages were connected to the code *asibizi, not allowed in our culture*. At this stage, I did not create any links or connectedness with other codes as shown by results with a density of zero (0).

Cultural value coding was supplemented with Atlas ti.8 networks to determine the general theme of ‘*asibizi*’ (Figure 6). Eclectic coding was used to sort and further categorise codes, using colours. For example, two colours were used with white representing codes that gave a general description of *asibizi* as in ‘*people respect (ukuhlonipha) sexual things*’ and ‘*gender and age respect sex*’. Pink represented specific and direct descriptions of *asibizi* as in ‘*menstrual talk is cultural taboo*’ ‘*penis talk is taboo in the presence of circumcised men*’ (see Figure 4).

Figure 9 shows results of Atlas ti.8 networks used to systematically analyse data by linking codes to the emerging theme of *asibizi* based on general and specific, more direct responses to the question of Xhosa culture and avoidance of naming sexual concepts. Supporting statements for the general description of the cultural aspect of *asibizi* in Figure 9 (with white colour code), was shown by shown by statements that did not disclose specifically what was being avoided in sexual talk. For example, participants gave general statements such as *gender and age restrict sex talk* and *people respect sex (ukuhlonipha) topics*.

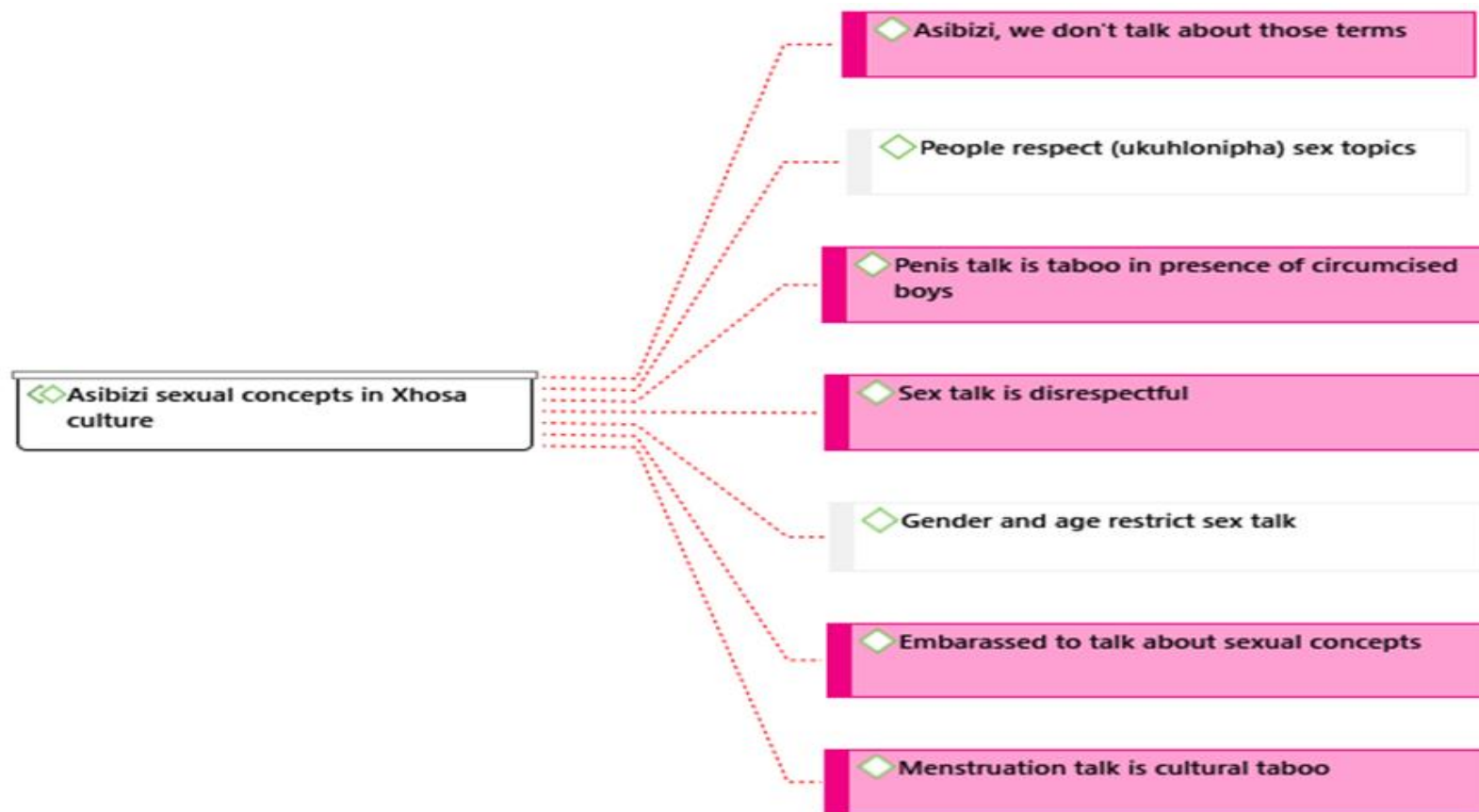


Figure 9: Language of avoidance asibizi used for avoiding teaching sexual concepts regarded as culturally taboo in Xhosa culture using Atlas ti.8 schematic representation

Although both general and specific statements contributed to the description and development of *asibizi*, the general, white-coded statements did not give specific sexual concepts that were being barred by Xhosa culture (see Figure 9). In contrast, the pink-coded statements gave direct statements that named the sexual concepts they avoided and how they felt about the avoidance:

Menstruation talk is culturally taboo.

Penis talk is taboo in presence of circumcised boys.

Embarrassed to talk about sexual concepts.

4.2.3.2 Cultural taboos restrict teaching of sexual concepts

In addition to the cultural restriction identified above, further systematic sorting and colour coding was used to group data into categories (Creswell, 2017; Denzin et al., 2008). The report indicated that cultural taboos restrict teaching of sexual concepts due to cultural beliefs. In appendix 10, the green colour represents ‘cultural taboos limit teaching’, grey colour for ‘cultural taboos do not limit teaching’ and yellow for no explanations given.

Supporting statements for cultural limitation on talking about sexual concepts was derived from the participants’ written responses (Appendix 10):

P1: *I was raised in a community of Xhosa people who respected private parts and never called them with their real names. Even now, we don’t talk about sexual parts and sexuality openly.*

P4: *No, it's called 'amanyala/izimanga'(vulgar) in isiXhosa so we don't talk about these sex things, parents used to hit us and said we are using vulgar language when we asked anything close to sex.*

P5: *My culture does not allow talking about sex matters, we respect instructions of older people as forbearers of our Xhosa tradition.*

Further data analysis indicated an expression of a common text in vernacular of 'siyahlonipha', meaning respect in English. Again, cultural value was coded as the centre of the avoidance of naming sexual concepts. A theme emerged indicating that there were common cultural taboos expressed as 'siyahlonipha', meaning that participants avoided naming sexual concepts out of respect of their culture value as indicated by the participants' comments:

P10: *Talking about sex, reproduction, parts or organs is not normal in our culture, siyahlonipha.*

P22: *My family values don't allow sex talk.*

The results of thematic data analysis both manually and using Atlas ti.8 from the open-ended questionnaires present a general thread that teachers of Xhosa culture are restricted by Xhosa culture from naming and clarifying sexual concepts when teaching learners of the same Xhosa culture. These findings were complemented by data in the form of direct quotations (Appendix 10) and Atlas ti.8 analysis (Figure 8).

4.3 Analysis before professional intervention

Seven participants took part from phase two to phase four of the study although initially, consent was obtained from eight participants. One participant had transport challenges due to

damaged roads after her village experienced heavy rain. Nevertheless, the limited numbers of respondents still resulted in data saturation (Fusch & Ness, 2015). In other words, I determined that there was sufficient data and that, probably, no new information would appear (Onwuegbuzie et al., 2010). There were two descriptive drawings' sessions, the first cycle was coded numerically as 1, with alphabetical letter A representing the first member (1A) up to the last participant, 1G representing seven participants. As most participants responded in their home language, a professional Xhosa translator translated raw written data from the drawings from isiXhosa text to English. Translation was followed by transcription of drawings and texts to get the meanings of what was expressed by the participants (Appendix 12). Using Atlas ti. 8 software, data analysis was performed to generate codes and common patterns in order to provide evidence of quotations linked to documents (Appendix 13) and results are based on this evidence.

4.3.1 Data analysis of drawings during before professional development

Drawings with descriptive text were conducted in two sessions. The first cycle was done before the professional development with Contiguity Argumentation Theory (CATPD). The drawings and texts were analysed to provide in depth understanding of participants' perceptions regarding the teaching strategies they were using (Appendix 13). The aim of the personal drawings with written explanations was to find out teaching strategies and language used by the teachers when clarifying sexual concepts to learners of the same culture.

4.3.1.1 An avoidance teaching strategy as a defensive mechanism due to cultural restriction

The data show that participants do not simplify sexual terminology and instead, they used meaningless, non - scientific terms such as '*that thing*' when teaching sexual processes such as fertilization (Figure 10). The Grade 12 Life Sciences curriculum requires that teachers must implement a teaching strategy that enables learners to differentiate between sexual concepts such

as ‘copulation and fertilisation, process of fertilisation’ (Department of Basic Education, 2017a). Figure 10 revealed a teaching strategy used by a participant that lacks use of essential key scientific terminology for explaining fertilization. The direct quote (Figure 10) shows a participant’s teaching strategy (1A in Appendix 12) where fertilization is explained as... ‘when that thing of a male enters that thing of a female and releases those things of a male’.

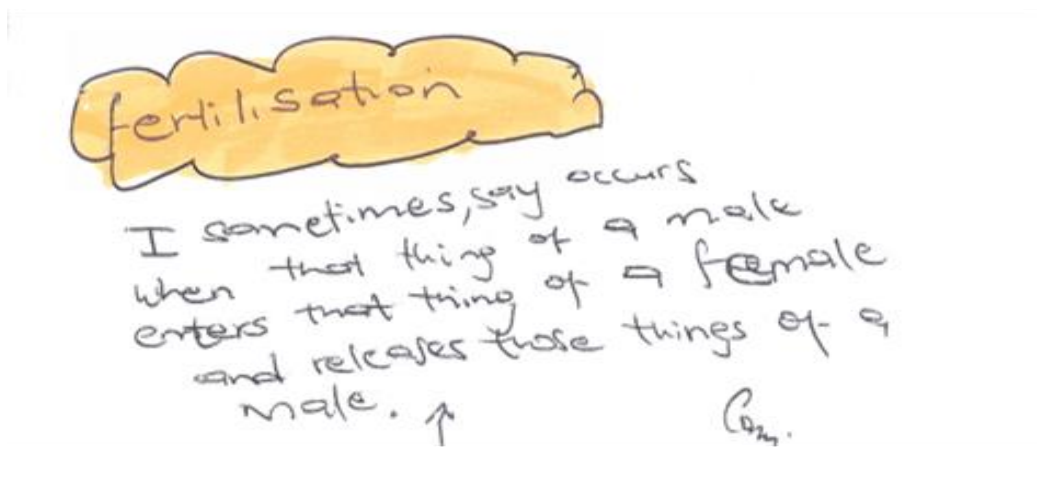


Figure 10: An avoidance teaching strategy showing lack of scientific terminology in teaching fertilization due to Xhosa culture

The extract in Figure 10 is derived from raw data showing an avoidance teaching strategy that lacks the use of scientific terminology in explaining the concept of fertilization. Looking at the participant’s verbatim quote (Figure 10), I juxtapose the *thing* explanation with the standard scientific explanation of fertilization as prescribed in the Grade 12 curriculum and indicate that the participant avoided naming any of the required key terms expected in the definition of fertilization. Distinct sexual concepts such as penis, vagina, sperm cells and process of fertilisation are required to be taught and clarified by Life Science teachers. Instead, sexual concepts and processes are all collectively referred to as ‘*that thing*’ (as shown in Figure 10 and in 1A of Appendix 12). Erroneously, the participant makes no differentiation between the

definition of the different sexual concepts and processes as required by the curriculum. This avoidance teaching strategy directly evades the use of basic scientific concepts as the participant used *that thing* to refer to all the prescribed, key scientific concepts required in teaching fertilization.

In contrast, other teaching strategies were covert, as they could not be read directly from the teachers' responses. Instead, language used in clarifying sexual concepts revealed their defensive teaching strategies when participants indicated that '*saying Xhosa term of 'ukulalana' or undergoing sexual intercourse is not easy*' (1C in Appendix 12) when differentiating between sexual intercourse or copulation and fertilization. The language of avoiding naming of sexual concepts surfaced again as teachers indicated that they avoided clarifying sexual concepts to learners in isiXhosa language (vernacular).

Various responses indicated that Xhosa language was not used to clarify sexual concepts, only English was used:

It is difficult for me to call vagina in isiXhosa, even in English. Instead, I use substitute terms...I end up using slang and call vagina 'usisi'. (1A).

Explaining and teaching fertilization in learners seems as if you say they must do sexual intercourse. (1B).

Learners disrespect me as if we are of the same age. (1C).

It is easy to say it in English but I don't feel comfortable to say it in my own language. (1F).

Results further showed an additional defensive technique, indicating that participants used threatening techniques as a mechanism of shielding themselves from clarifying sexual concepts. Evidence of raw data (1C in Appendix 12) provided the reasons for the threatening teaching technique as a better (preferred) teaching strategy shown in Figure 11.

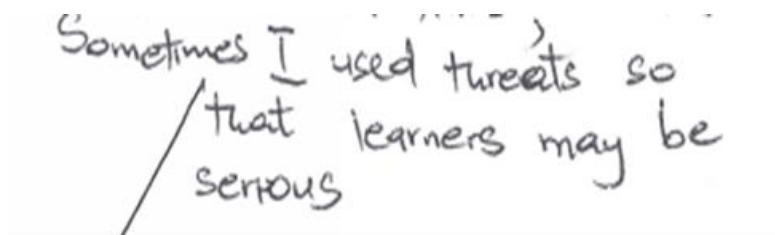


Figure 11: Threatening teaching strategy used by Xhosa teachers to cope with teaching sexual concepts as a form of maintaining a positive teaching and learning environment

The comment (Figure 11) supports findings indicating that teachers felt scared and uncomfortable when teaching sexual concepts such that they devised coping strategies. In order to continue with teaching and learning, the participant in Figure 11 shared that threats were used *so that learners may be serious* and teaching can continue in a positive, learning environment for all.

The teachers shared other defensive teaching strategies and explained that they used them to try to maintain a healthy learning and teaching environment when teaching sexual concepts. They gave specific details about how they conducted their defensive strategies (Figure 11 and Appendix 12), sharing that they devised coping mechanisms by changing their facial expression to look serious:

I have to have a serious face and avoid laughing at all costs. Otherwise, the lesson will take a long time because my learners ask difficult sexual questions. (1F)

Sometimes I use threats so that learners may be serious. (1C)

In order to finish the topic I must not laugh, otherwise it will take a long time to finish the topic because my learners will ask difficult sex questions. (1F).

4.3.1.2 Female teachers fear confrontation by male learners

An emotive side of teaching sexual concepts emerged where participants expressed their feelings of fear and embarrassment. Various reasons and patterns of expressing their fears emerged as some felt like '*wilted flowers*' (1G in Appendix 12) when having to teach about the penis (Figure 12). Figure 12 represents raw data from a female participant about her feelings of fear and embarrassment, indicated by feeling like a *wilted flower* when teaching the penis to male learners.

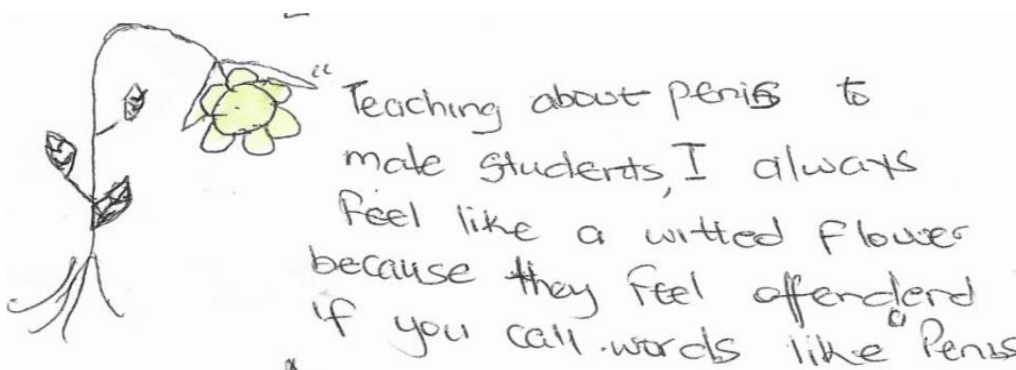


Figure 12: An example of a drawn response revealing a female teacher's feeling of fear and frustration when teaching about the penis to male learners of the same culture

Female teachers expressed fear and embarrassment of teaching the penis and testes to male learners due to Xhosa cultural restrictions, as shared in the following statements:

Sometimes you feel embarrassed when teaching copulation because they ask sensitive questions about sex. (1G).

Very uncomfortable when teaching about this organ called testis. I cannot use the Xhosa name in calling testes because it is taboo in my culture. (1B).

I am scared that as a female teacher, I have to explain fertilisation and talk about fusion of male sperm cell and female egg cell forming a zygote. (1D)

The participants reported that Xhosa culture prevent women from talking about male sexuality, indicating that *as a woman you have to respect men especially those who have reached 'manhood' (circumcised).*

Further supporting comments were given by participants explaining their fear of male learners who felt offended by female teachers teaching about male sexual concepts:

Teaching about penis to male students, I always feel like a wilted flower because they feel offended if you call words like penis and testes. (1G).

It is very difficult teaching the topic especially when teaching about circumcision and diseases. (1B).

There is no Xhosa name which you can code switch and use when explaining fertilisation. (1B).

The meaning of *wilted flower* (in Figure 12) is explained fully in the second focus group interview section (Appendix 18), where one of the participants volunteered to explain the drawing. I should hasten to explain I tried to preserve anonymity during the focus grouping questioning by asking a general question without tracing the author of the personal drawing.

4.3.1.3 Culture is a barrier to effective teaching of sexual concepts

The question of gender was not included as part of the initial research question as the study focused on teachers' perceptions without any sex bias, when teaching sexual concepts. However, a dominant theme of respect and obedience of Xhosa cultural beliefs by female teachers emerged as results showed that female teachers felt they could not explain copulation, male reproductive system, circumcision and sexually transmitted infections (STIs) in the presence of circumcised learners.

Xhosa beliefs acted as a barrier as female teachers were held back by Xhosa cultural beliefs related to circumcised men:

According to our culture, as a woman you have to respect men especially those who have reached 'manhood' (circumcised). (1G).

I feel like culture is a barrier in teaching reproduction. (1G).

Teaching about the penis is very difficult. It seems as if you are invading the privacy of men. (1B).

Additional supportive comments confirm that fertilization is not taught effectively as participants felt ashamed. A participant drew a picture of a female titled '*dark cloud of shame*' (1D in Appendix 12) with a sad face in a big head, explaining the sad state the teacher was experiencing when teaching fertilization:

Fertilisation is the fusion of egg in female with sperm in male, forming a zygote. I won't say these words-bad things-my mouth is zipped. (1D).

The same sad-face drawing had a subheading titled '*young female teacher*' with labels that expressed fear of parents and learners' views about female teachers talking about fertilization. The labels (1D in Appendix 12) had these comments:

Confused teacher.

Fearful of parents and learners' views.

Do not feel safe.

Scared. (1D).

The participants reported additional expressions of fear and confusion on how to teach fertilization and vagina:

My Xhosa culture stops me and does not allow the pronunciation of these terms. (1D).

It becomes difficult for me to call vagina, I use substitute terms to call it. Terms that are acceptable to use in my culture. (1A).

The unexpected gender trend continued to develop from data analysis as results showed male teachers felt uncomfortable and disrespected when teaching sexual concepts, particularly when teaching male sexual concepts (1E and 1F in Appendix 12). Male participants felt naked as if learners could see the anatomy of the male reproductive system through their clothes while presenting the topic:

I am a male teacher and these parts are in me and kids start to see these parts in me. It made me feel uncomfortable to disclose some of the sensitive parts such as testis. Learners

want me to explain their personal issues because they start talking about their male and female problems. (1E).

Testes, it is easy to draw and label both the testes. It is difficult to explain in Xhosa language. I do not feel comfortable to say it (penis) in my own Xhosa language. (1F).

In addition, male participants feared being disrespected by learners when having to teach both male and female sexual concepts. Male participants feared losing their respected status as men when having to explain the structure and functions of sexual concepts:

The kids disrespect me as a male teacher because I have disclosed some of my private parts such as penis and testis and these kids look at me that way (funny and disrespectful way). (1E).

I am unable to call sexual terms by their name in my language. I explain in English as I am uncomfortable to explain in Xhosa. (1F).

In contrast to how females felt about cultural influence on teaching sexual concepts (see section 4.3.1.2 of this chapter), male participants were scared of being viewed as having disclosed secret Xhosa cultural practices that occur in male rites of passage to manhood such as circumcision:

Kids start to doubt that I am a Xhosa guy because I am disclosing everything in front of the female kids and they doubt that I am a man. It made me feel uncomfortable to disclose some of the sensitive parts such as testis. (1E).

Because of culture, I am unable to call (parts of) the female reproductive system by their name using my own Xhosa language. (1F).

4.3.1.4 Therapeutic nature of the study

It was observed that some of the female participants were mumbling to themselves during the drawing session and their behaviour was recorded in the observation protocol (Appendix 11). Upon enquiry, one of the participants indicated that she has experienced the therapeutic nature of the study and was letting her frustrations out for the first time:

I am making my hidden frustrations known. They have been stored in my head for so long, now I am making them known and this is the first time that I can let go without any fear in a professional environment’.

These observations revealed a theme around healing and therapeutic effects achieved during this exercise. Further data analysis revealed that more female teachers also felt restrained by Xhosa culture and shared their views of feeling free and relieved to share their frustrations in a protected environment. Further details are enclosed in the focus group discussion section before the professional development workshop with CAT (CATPD).

4.3.1.5 Menstruation is the most culturally sensitive sexual concept to teach in Xhosa culture

Direct quotes from the drawings were used to generate codes such as ‘*menstruation*’ in Atlas ti.8. Results based on data analysis of codes that appeared frequently and were automatically enlarged around the centre of the world cloud by the software, with the most frequently appearing code on Atlas ti. 8 analysis being menstruation and sex (see Figure 13). However, menstruation became the focus in this study (and sex was ignored) because menstruation is one of the themes prescribed by the Department of Basic Education (2011) under the heading of human reproductive systems (see chapter 3). Moreover, the term sex forms part of many sexual concepts or terminology and is also therefore bound to appear more often.

As explained earlier, the descriptive drawing phase looked at getting teachers' teaching strategies and views about language used. Therefore, the emergence of menstruation as the most frequently appearing concept (word cloud in Figure 13) spearheaded a response to a yet unasked question, namely 'which sexual concept or process do you feel is the most uncomfortable to teach to learners of the same Xhosa culture'.



Figure 13: Identification of menstruation as the most culturally sensitive sexual concept to teach by Xhosa teachers using Atlas ti. 8 word cloud

Further supporting comments identifying menstruation as a sensitive concept to teach, cite embarrassment of the girl child due to Xhosa cultural taboos that prevent talk about menstruation in the presence of males:

Coming to menstrual cycle, it is not only males who found difficulties - female learners as well get embarrassed when I teach it. (1A).

I cannot explain menstruation. I feel like a tortoise (skolpad) when I have to say these sexual terms. I feel like hiding my head inside my shell like a tortoise, I am scared. (1D).

Parents are supposed to teach children about puberty, menstruation, STDs and that is not done properly in our culture-it is not done. (1D).

4.3.2 Analysis of focus group interviews before Contiguity Argumentation Theory Professional Development (CATPD)

Results presented in this section are derived from thematic data analysis of audio transcripts (Appendix 14), generated during the first focus group interview. The aim of the focus group interviews was two-fold. Firstly, it was planned to determine the language used by the teachers to clarify sexual concepts when teaching to learners of their own culture, specifically in the presence of reported cultural restrictions. Secondly, the interviews were held to determine more in-depth data pertaining to the perceptions held by the teachers towards the teaching of sexual concepts to Grade 12 learners sharing the same Xhosa culture and attending rural secondary schools. There were two focus group interview sessions. One was held immediately after the drawings' session, before the professional development (PD) workshop with Contiguity Argumentation Theory (Ogunniyi, 2007). The other focus interview was held after the CATPD session and teaching with Xhosa Indigenised lesson.

As explained in section 3.1 of this chapter, the study had seven participants as one participant had transport challenges due to damaged roads after her village was hit by rain. After noting data that talks to gender issues in the drawing's session of this chapter (section 3.1), coding of participants included categorisation into male and female participants. Therefore, data analysis is presented consistently as consisting of four females, colour coded as yellow and three males, colour coded green, throughout from phase two to three of CPALAR. Each participant

was coded as P for participant, with a number denoting sequence as they were seated in the room and gender as M for male or F for female. Males were sequenced as PM3; PM6 and PM7 and females as PF1, PF2, PF4 and PF5.

The following themes emerged from data analysis and were similar to themes already discussed and confirmed during the drawing activity in section 3.1 of this chapter, namely:

- Avoidance as a defensive teaching strategy due to cultural restrictions.
- Female teachers fear confrontation by male learners.
- Culture is a barrier to effective teaching of sexual concepts.
- Therapeutic nature of the study.
- Menstruation is the most culturally sensitive sexual concept to teach in Xhosa culture.

Therefore, the aforementioned themes have not been repeated to avoid repetition of presented results except for the theme on ‘female teachers facing confrontation’, where new data on resilience and nature of confrontation was generated and the theme was adapted to suit new data. In essence, results are presented on two themes that emerged, namely:

- Resilience of female teachers in confrontation with parents and male learners.
- Different regions have different substitute terms for sexual concepts.

4.3.2.1 Resilience of female teachers in confrontation with parents and male learners

Data analysis of specific scientific terms and perceptions of teaching sexual concepts confirmed that the participants did not teach this section as required by the syllabus due to cultural restrictions imposed by their context and confrontation with Xhosa parents and male learners. Female participants showed resilience as they reported continuing to teach these sexual

concepts despite being confronted by parents (PF1) and male learners making sexual advances to young, female teachers (PF5). This was despite the fact that male teachers who were principals did not defend them during confrontation by parents (PF1) and some male principals delegating the teaching of sexual concepts to female teachers (PF2):

What happened is: I was called in the principal's office as a male parent came angry to enquire about this teacher teaching his child 'amanyala' (vulgar sexual concepts). I told myself that I am not going to answer (rudely) this father. I went to take the curriculum policy booklet from the staffroom, and I presented to him that this is not my own thing, it is from the Department of Education. He understood a bit and said he thought I was teaching my own thing to his child. He said, according to his own culture and church, what I am teaching his child was just out and not right (gesturing with a throw of both hands in the air as a sign of loss of hope and a sigh). (PF1).

As noted earlier, some male colleagues who are principals avoided teaching sexual concepts by delegating the section to a female teacher. A participant shared that a male school principal sharing the same subject with her avoided teaching sexual concepts and expected her to do it:

In school X, I was teaching Grade 12 Life Sciences with my male principal. When it came to the section on human reproduction, he would ask me directly that Miss Y, 'please, it must be you who is teaching this thing as I'm not comfortable about these things'. (PF2).

Resilience of the female teachers emerged from data that indicated determination to continue teaching these sensitive sexual concepts while confronted by a hostile parent and a male principal who 'ran away' from teaching this section. Data analysis reveals that the school

principal (PF1) did not defend the teacher or say anything during the exchange with the angry parent; the participant defended herself in the principal's office:

I waited for the parent's response and was helped by that view of telling him that it is from the syllabus. (PF1).

It is seriously a very sensitive topic to teach because especially these learners get very excited about sexual concepts (shaking her head and other colleagues murmuring in agreement). As they get excited, they also ask you very sensitive things. They will ask you what causes a drop (sexually transmitted infection). Hmm...hmmm (confirmation from colleagues as the speaker has paused). They will ask you very difficult questions (silence). (PF2).

In addition, female teachers were told to stop teaching circumcision and male sexual parts by male learners due to their knowledge of Xhosa cultural beliefs prohibiting the use of Xhosa terms on circumcision and penis:

It is because some of these concepts are a taboo as we do not talk about at all. Like those who have been circumcised, they do not want teachers to talk about circumcision, they do not. When you start talking about circumcision they say, 'No, yibamb'e kanjalo, yibamba'a pho' meaning 'that the teacher must stop right there'. (Other participants all agree and talk sporadically and say 'heeke'-affirming the use of this term of avoiding a lesson on circumcision and male teachers laugh laugh). (PF2).

In support, a participant reported a direct confrontation in class where male learners told the female teacher that 'can't you see that you are a female for talking about men issues that you know nothing of' (PF4):

And their comments when you speak as a female, you are barred by these male learners and tell you that 'can't you see that you are a female for talking about men issues that you know nothing of. (PF4).

Additional supporting comments for male learners stopping and confronting female teachers were (PF1):

You are seen as if you are invading and disrespecting the privacy of traditional Xhosa men and entering into the terrain of manhood which you as a female, you have no knowledge of (other female participants join in the conversation). You see that the learners are so uneasy and some learners state clearly in class that 'no Mam, some names (terms) you are not supposed to say'. (PF1).

However, female participants shared how they persisted to teach sexual concepts and tried to salvage whatever remained of their authority as teachers:

Then, I become authoritative and say "heey, this is a class, I am not going to listen on what to say and not to say, I am going to call things by their proper names, (all female participants spontaneously agree with this view and say heeke, ewe, heeke which is affirmation in isiXhosa, while the speaker is still talking). You know, while saying that all of that to the learners, I am not realistic as I am shielding myself by creating a protective front as I have nothing more that I can do to defend myself as I know that deep down, I am scared deep inside. (PF1).

In addition to confrontation, young female teachers were exposed to security risks of sexual advancement from male learners who saw them as targets. A young, female participant (PF5 in

Appendix 14) shared her insecurity of being sexually approached by a male learner after her presentation of a lesson on the penis:

The problem is...especially when you are a female when there are those who are circumcised, there is our cultural belief that they are men, that certain names like penis, cannot be said out loud. It becomes very difficult. You will find out that in us as young female teachers, you say these words like penis and you find out that may be when the male learner meets you then there are some strange behaviour from the male learner. It is as if he is following up what was said in class whereas I was teaching. (Others join and they continue the sentence at the same time with the speaker with laughter from some. It is like that. (PF5).

A male teacher (PM3) confirmed sexual advances were made by male learners on young female teachers, explaining that the male learners see the young female teachers as being of the same age:

They see you as equals. (Chorus of hmm..hmmm from other participants as the speaker was talking). (PM3).

Further thematic data analysis revealed moments of anger and frustration about the lack of safety, confrontation, and disrespect of female teachers by male learners who made sexual advances. A female participant (PF4) spontaneously burst out in the background while the male teacher (PM3) was explaining that these male learners saw young female teachers as equals:

Where does that really get in, really? (PF4).

There were moments of excitement emanating from the use of the vernacular ‘*yiyeke kanjalo mam, yibamb’a pho*’ meaning ‘stop there, just there’ (PF2) in addressing the issue of

female teachers being stopped by male learners in class, observed from simultaneous talk as more female participants continued talking while PF2 was still talking:

When you start talking about circumcision they say, 'No, stop there Mam, stop just there (yiyeke kanjalo mam, yibamba'a pho' (immediately there is a confirmation from others while the speaker is on of 'heeke' and laughter from others and excited talk amongst each other. (PF2).

The reported negative learner activity of male learners towards female teachers was exacerbated by staying in the same rural village with the learners:

Heey! It is more difficult to teach these sexual things as we are staying in the same vicinity with them and you also see the manner they look at you that it is totally disrespectful and different than before the sexual lesson. (PF1).

Reports of incidents where female teachers felt insecure and at risk were reported however, their resilience filtered through data analysis as reported by continued acts of defence such as 'changing the face', maintaining authority while scared inside and standing up to parental and male learners' confrontation.

4.3.2.2 Different substitute terms for similar sexual concepts

Probing for the actual Xhosa terms used in simplifying sexual concepts was key to getting the language used by the teachers to clarify sexual concepts to Grade 12 learners of Xhosa culture in rural secondary schools started on a negative footing as teachers kept quiet and did not respond to the question. Participants were required to say these Xhosa sexual terms out in the focus group session. There was a total silence, nobody was talking and men looked down after I have posed this question, followed by unintelligible murmurs, some fidgeting with a pen, looking down on

table, coupled with turning and tossing on turning on swivel chairs. I could sense that my question has created some tensions as participants kept quiet (see Appendix 13).

Generating this data proved difficult as participants continued to share their challenges instead of giving specific responses to the direct question requiring examples of Xhosa terms used in clarifying sexual concepts. The teachers kept deflecting questions on the naming of Xhosa sexual concepts expressing their frustration. Even though I felt anxious that I was not addressing the research question, I allowed the participants to communicate their views as allowed by the selected research design. For example, a participant reported on the difficulty of being labelled as non-Christian for teaching sexual concepts (PF4):

In my school, I used to teach human reproduction and had learners who labelled me. Learners who were saved by Jesus labelled me as a person who was no longer part of the Christian brethren, not 100% saved because of what I was saying in class. (PF4).

I was stressed a bit as I thought that my study was about to fail due to a lack of responses. At the same time, I thought the participants required guidance as they they stayed and continued to be part of the study. Probing the participants to say out loud (to name) Xhosa concepts that are known and used in their mother tongue when referring to sexual concepts, I elaborated on the question and used specific Xhosa substitute terms (Appendix 14) such as ‘inkomo’(cow), ‘igusha’ (sheep) when referring to the vagina.

I had to alleviate tension as the teachers could not share openly the specific terms that they use to explain how they teach sexual concepts. Silence and occasional un-intelligible sighs and shock mumbling in isiXhosa like ‘mnxccxx’, indicating helplessness and frustration emerged from the data. I had to think quickly and made an inoffensive joke about specific sexual concepts,

this exercise helped to break the ice, and they all laughed. I had to identify with them and really be an insider and they openly shared their isiXhosa terms after this playful activity.

An inoffensive joke about the penis was the icebreaker in this tense situation. Saying out the penis out loud in its real Xhosa name 'umthondo', without using nicknames or substitutes, produced emotions of shock as 'yhuuu' in Xhosa mingled with laughter, broke the silence. The 'yhuuu' is an exclamation term in isiXhosa therefore, the results show that the participants were shocked at first on the use of the term 'umthondo'. However, the shock was followed immediately by laughter and participants shared their views (see PF4 in Appendix 14):

I, in my personal teaching experience, I would never explain in isiXhosa such that I use simple English that I think they can understand because I am avoiding to say these things. I get scared of saying these scary things. (There is an emotional minute where participants spontaneously talk, some saying 'yhuu' (shock) and helplessness, mxxcm (disdain) and hands thrown in the air to show loss of hope). (PF4).

Adhering to the principles of PALAR requiring that participants should always be free to communicate their views and share their anxieties, I became concerned about a quiet participant (PM7). One male participant (PM7) kept quiet during the verbal, focus group sessions. However, he participated in all the other written activities and stayed throughout the research study but never shared any suggestions or comments. Instead, during the explanation and use of isiXhosa terms for penis, he covered his face with his hand (see Appendix 11). I approached him during the break session to enquire about his wellbeing, checking whether he was offended by any of the sexual talk that was taking place in the study. In response, he indicated that he was not offended and still wanted to be part of the study.

An opportunity for self-critical reflection and supportive learning as required by PALAR (Wood et al., 2017), provided space for me to reflect on a continuous basis by investigating whether I was listening and supportive of the participants' hidden perceptions. The icebreaker joke identified with their avoidance, by talking openly about one of the sexual concepts (penis) that they have reported in the research as being avoided in Xhosa culture. Barriers about pronouncing Xhosa names were broken as participants joined in, in a jovial atmosphere and shared Xhosa substitute terms that they used for sexual concepts. A male participant revealed that the penis is a *kettle* (*iketile*), and this substitute word was used to avoid saying *vulgar terms like penis*:

On my side I use my home experience for example, the kettle is a substitute for the penis. So, when teaching, I use the kettle instead of using penis as a substitute as a way of avoiding the use of repeated English vulgar terms like penis. (PM6).

Data analysis showed that there were less suitable substitute Xhosa terms as some sexual concepts have more than one substitute for the concept. A different substitute name for a penis was given by another participant, calling it a *tososo*. The *tososo* produced laughter among the participants:

The penis is also a 'tososo' (laughter from all the participants. (PF4).

No additional substitute terms were given as participants shared only the two substitute terms for the penis (*ketile and tososo*).

4.4 Analysis after professional development

The participants engaged in professional development on Contiguity Argumentation Theory (CATPD) using it as a conciliatory theoretical framework between Xhosa IK and WMS

concepts in the form of sexual concepts. The CATPD aimed at answering the question on ‘how do Xhosa teachers view the influence of Contiguity Argumentation Theory (CAT) in the design of culturally based teaching strategies. Data analysis is presented on four activities that took place during CATPD and after its completion:

- Contiguity Argumentation Theory (CAT) professional development and Xhosa IK.
- Design and teaching of Xhosa Indigenised lesson (XIL) on menstrual cycle with an Indigenised Teaching Strategy (ITS).
- Second phase of drawings after CATPD and ITS implementation.
- Participant confirmation of findings.

The report is based on thematic data analysis and Atlas ti.8 analysis of the same group of seven participants who took part at the beginning of phase two of the study (section 3 and 3.2 of this chapter). In the CATPD, thematic data was generated from an audio-recorded lecture presentation on CAT and sexual concepts (Appendix 15). A transcript of the second activity is derived from the video recorded Xhosa Indigenised lesson on the menstrual cycle (Appendix 16). Drawings with explanatory texts generated third activity data (Appendix 18). Finally, the last activity is recorded in a flow chart designed by the participants as a group, confirming the findings of the study (Appendix 19).

4.4.1 Contiguity Argumentation Theory Professional Development (CATPD)

The CATPD was aimed at getting closer to teachers of Xhosa culture in a professional setting, with the aim of sharing research theory on CAT and how CAT could assist teachers from indigenous groupings to find ways of harmonising conflicting IK and WMS views. Without considering deeper, philosophical definitions of CAT, the CATPD was used to provide grounded evidence on how two conflicting thought systems (IK and WMS) can co-exist and create a

balanced thought system. Using thematic data analysis and Atlas ti. 8 software, codes and common patterns were generated (Appendix 15) based on the responses of the seven participants on CAT's five conception levels, namely:

- Dominant: a scientific claim is more convincing than a cultural belief.
- Suppressed: a worldview is controlled by a culturally dominant view.
- Assimilated: a thought has been taken over by another one.
- Emergent: no previous knowledge, as when something new has been discovered.
- Equipollent: two competing worldviews exert a comparable yet, equal intellectual force.

With the aim of answering the research question on 'how Xhosa teachers view the influence of CAT in the design of culturally based teaching strategies', the researcher presented a lecture on CAT based on literature already discussed in chapter two and three of this study. Surprisingly, the usually enthusiastic group was quiet as participants did not respond to the question requiring identification of their current CAT level.

The researcher probed by using an inoffensive joke on philosophical English usage 'I hope you understand my philosophical English', hoping that as they are all Xhosa speakers, they would relax and contribute. The prompt worked as a participant responded after some hesitation. One of the quieter male teachers (PM6) provided a response, addressing integration. Hesitation was noted from cues received from the non-verbal speech such as *hmmm...hmmm*, at the start and during the speech:

I would say Mam, it depends on the individual because I usually, when I tackle this lesson, I integrate IKS with scientific knowledge. (PM6).

I prompted gently by first thanking the unexpected response on *integration* from PM6 and identifying with the group as a person sharing the same culture (Xhosa), by reflecting that I know the terminology is not that easy.

Finally, a participant (PF1) responded, revealing that they were thinking on the suppressed CAT level. Furthermore, the participant argued by giving a reason for thinking on the suppressed conception. The reason was that, *strong Xhosa cultural values suppress the need to say these things inside my brain*. Therefore, the need to use and pronounce science sexual terms such as menstruation and penis, which are viewed as contradictory to innate cultural beliefs is refuted inside one's thought systems:

I think our Xhosa cultural values suppress and push down the need to say these things inside my brain, the naming of these things like menstruation and penis. I am avoiding calling these words which are not wanted by my culture, my culture is strong and resilient.
(PF1).

The participants reported that they found the five CAT conceptions (Appendix 15) difficult. This perception of difficulty was reflected in the responses made by the few participants who responded to the questions (PM6, PF1; PF5): They felt that they could not discuss their views on CAT levels openly as they felt like they could be wrong – as if they were answering an oral test:

I think these steps are difficult to explain when talking in a group like this because I may be wrong. Now, I don't want to look like I am answering to an oral test question. (PF5).

Alternative suggestions and commitment to continue with the study surfaced with suggestions of capturing their responses about CAT levels on individual drawings rather than on a verbal, open group discussion platform:

It would be better also if our response about CAT thinking can also be in writing, individually as we did with the first drawings. This is what I think. (PF5).

The second activity in the CATPD was sharing scientific context knowledge as prescribed by the department of education. Therefore, a lecture was presented on the four themes falling under human reproduction were presented (see Figure 14), supported by additional visuals on menstruation (see Figure 4 in chapter four of this study). Those were, the structure of the male reproductive system, with the organ, which is the testes. Supporting parts which are part of the system, the epididymis, vas deferens, seminal vesicles, prostate gland, Cowper's gland, urethra and penis as in Figure 14.

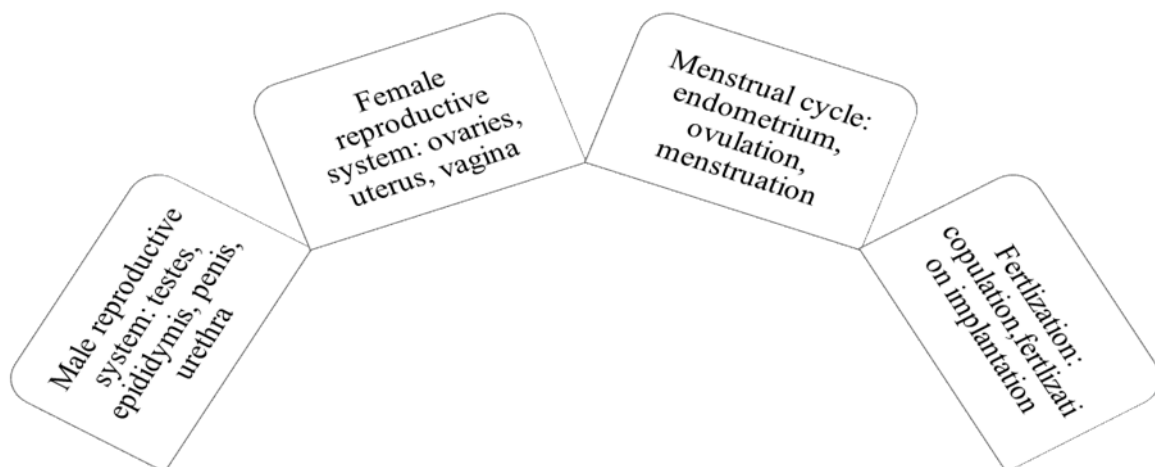


Figure 14: Simplified sketch showing sexual concepts presented in CATPD (adapted from Department of Basic Education, 2017)

Participants were notably quiet and the researcher prompted engagement with the subject matter by presenting a visual image (see Figure 14), instead of talk only. Due to the intended research question requiring a new IK-CAT lesson on a sexual concept in Grade 12, it was essential that participants be coached and supported on curriculum expectations (see supporting comments) to ensure that they are fully aware about curriculum content on sexual concepts, I said:

We have these themes that you are supposed to teach, they are prescribed. It's the structure of the male reproductive system, with the organ, which is the testes. Then on the female, it's the structure which shows the position and functions of the two ovaries, the fallopian tubes, the uterus which is lined by the endometrium, cervix, and the vagina with its external opening which a vulva. Looking at the menstrual cycle, we are looking at the development of the Graafian follicles, ovulation and the formation of the corpus luteum. Remember, the roughly 28-day cycle that we use when counting the days where the endometrium thickens, gets removed and ovulation. There is also copulation, fertilization, development of the zygote, implantation and gestation.

4.4.2 Indigenised Teaching Strategy on menstrual cycle using CAT and Xhosa IK

An Indigenised Teaching Strategy was developed by the teachers with the aim of allowing them to take action and actively change their pedagogies by developing a Xhosa-embedded sexual concept lesson using CAT knowledge (see 3.5.3 in chapter 3 of this study). The IK lesson presentation was preceded by a briefing session about how the group had arrived at a decision on designing and teaching the XIL (Appendix 16). This update was noted in the researcher's observation schedule. Video recorded data were analysed with Atlas ti.8 software to show a specific time frame of when a particular view was stated so as to gain more credibility for the study. There was one presenter of the IK-based lesson who acted as a teacher, coded as T in part

two of the transcript (Appendix 16). A transcript of an audio recording after the presentation of the IK-lesson using an Indigenised Teaching Strategy (Appendix 17), presented findings about the Xhosa cultural counting program for the stages of the menstrual cycle in comparison to Western Modern Science (WMS).

The original plan of choosing a human reproduction theme in the group was changed by the participants to a brain storming session where I was asked not to engage in the process. My exclusion from the planning stage of the Xhosa Indigenised lesson was expressed clearly as *yes, this is our collective voice* (PF1) after the speaker's input:

I feel it would be better to first discuss and agree as a group, away from you. This is what I think, we can come with our response to you about CAT and IK lesson, all of that. For example, how we will design and teach on the IK topic. (PF5).

Then, we can decide how we are going to choose and design a lesson on sexual concepts. Then, we come back and one of us teaches. (PF1).

Agreement was reached in an informal verbal exchange that the private group session should not exceed 60 minutes and this was noted in the researcher's observation protocol (Appendix 11). We reached this agreement amicably and in a respectful, casual way. As a result of being left out of the brainstorming session, little data is available on how the Xhosa-Indigenised lesson was prepared in this session. However, participants' views just before the presentation of the IK-based lesson by a model teacher were shared with the researcher in the group session (Appendix 11).

My personal reflections about being excluded from a discussion with teachers of my own Xhosa culture (Appendix 11) indicate that, sharing the same culture does not necessarily translate

to total acceptance and trust from a cultural grouping. I felt less trusted (Appendix 11) by people whom I share the same culture with, speak the same language and who have initially opened up and shared their innermost experiences about how they felt when teaching these sexual concepts in previous data generation stages (drawings and focus group in this chapter explained in Appendices 10, 11, 12, 13, 14). However, I recognised that the selected CPALAR allows changes to original plans due to its flexible nature. Also, my selected critical paradigm allows marginalised groupings to be actively engaged in the articulation of their voices to bring change to their current, social issues. Therefore, I put my feelings aside and continued with fieldwork as proposed by the participants.

The principle of democratic participation, in a study like this one, means that the participants were free to communicate their views, make suggestions and share power in a controlled manner with the researcher (Appendix 16). Therefore, the selection of the specific sexual concept, the preparation of the IK-WMS embedded lesson and selection of the model teacher was done in private as I was excluded as the researcher.

As menstruation was the most frequently mentioned concept in the personal drawings (Figure 13 in this chapter), it was not surprising that it was selected for it to be selected as a topic taught with the ITS. Data trail from a male participant (PM3) gave the report of the brainstorming session before the actual lesson presentation, indicating that consensus was reached on the topic selection, the model teacher and final structuring of the IK-embedded lesson:

We agreed that this beautiful lady is going to be our teacher...laughter...and the lesson is on the menstrual cycle. This is a very sensitive and very, very difficult lesson to teach for both male and female teachers. I think it's worse to us as males. We chose it collectively without any disagreements. (PM3).

The talkative and confident female participant was selected by consensus as the model teacher to implement the ITS, based on her leadership qualities and active engagement in the discussions:

We trust our vocal lady teacher here who has been leading us in discussions (simthembile u Miss wethu lo obesoloko ethetha esikhokela kwezi discussion)...applause...clapping and yheeeee as he is finishing to speak. (PM3).

No lesson draft on the new XIL was presented before the presentation by the model teacher. However, participants confirmed their high level of confidence in preparing a compliant CAPS-based and IK-CAT lesson:

On the question of a lesson plan, no, we didn't do it but we made sure that we can link clearly those Xhosa concepts versus science concepts on menstruation based on CAPS and CAT-IK. (PM3).

As explained earlier, Atlas ti.8 was used to link the main theme of '*geographical regions have different Xhosa terms for menstrual concepts*' to codes generated for Xhosa indigenous knowledge terms for menstruation. In addition, Xhosa IK used the terms of '*on the grass*' and '*on time*' synonymously to refer to menstruation depending on *geographical positioning of the Xhosa people* (Figure 15). As mentioned earlier, Atlas ti.8 uses data analysis software with specific timeframes with time stamps of when a particular phrase was uttered (see Appendix 16), allowing one to see how the discussion develops over time. The times are included in the brackets recorded time of each statement.

According to our culture, some people refer to menstruation with different terms based on the geographical location that we come from. Some say 'on time or on the grass'. (T: 00:00:26:15).

Xhosa older people were reportedly able to count the time for safe and unsafe days (see Figure 15) for falling pregnant even though they were unlearned:

This 'on time' is traced from our parents, even though most of our parents have not attended formal schooling, they were able to count the number of menstruation days. (T: 00:00:26:15).

Xhosa IK was used to count menstruation days (grass or time days) where copulation was prohibited. This finding is provided by documentary evidence with supporting quotations from Atlas ti. 8 (Figure 15) as data trail. Firstly, the theme *geographical regions have different Xhosa terms for menstrual cycle* was coded pink. The graphical data display shows four categories of different names used by Xhosa people when referring to the *menstrual cycle* such as *endometrium is the real grass* and these were coloured green.

During menstruation, Xhosa women knew that the uterine lining (endometrium) was in the process of growing:

So, when we are talking about menstruation, some geographical regions refer to menstrual cycle as being 'on the grass', meaning that dirty blood comes out for a certain number of days in preparation for something new that is going to be formed. [T: 00:00:45:00].

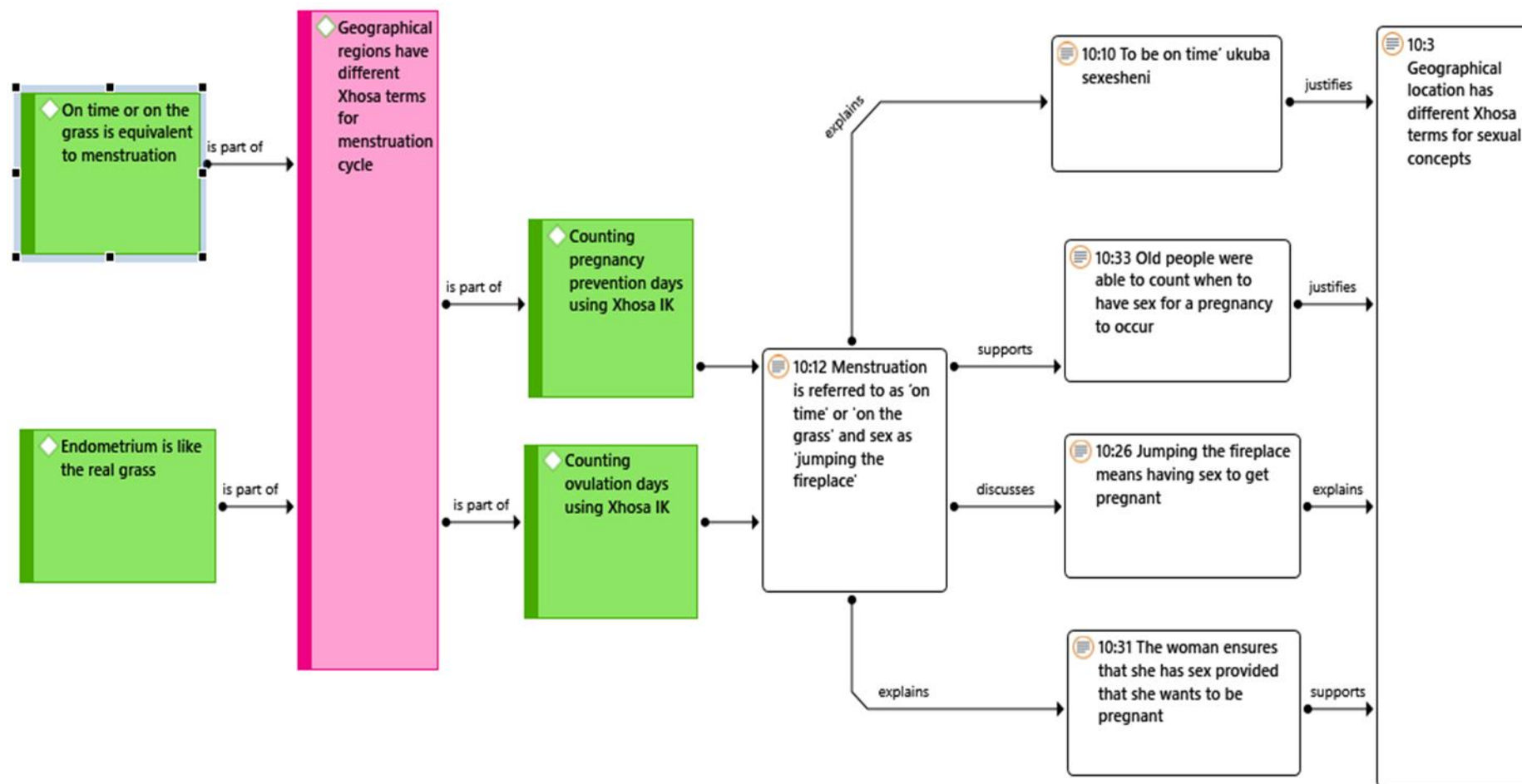


Figure 15: Development of an Indigenised Teaching Strategy from different culturally sensitive concepts used for menstrual cycle terms

That was a cultural practice used to explain the process of the peeling of the endometrium during menstruation (removal of the grass) and sexual intercourse (jumping the fireplace):

When one is menstruating, the process involves...the...the... the removal of the endometrium. The endometrium represents what old people refer to as 'the grass'. It is like the grass which is covering the real soil. [T: 00:01:00.00].

There was a time schedule culturally calculated as a family planning program where sex was avoided during the period after the completion of the actual menstruation as data indicates that *'in terms of our culture, that is why our parents could not 'jump the fireplace' when they are 'on the grass' (Figure 15). Therefore, the cultural counting program could count ovulation days as reported, there was a correct time for 'jumping the fireplace' after the completion of menstruation. The endometrium was seen as soil ready to receive something new, meaning that the endometrium was ready for receiving a fertilised zygote in scientific terms (pregnancy to occur):*

After having been removed, it leaves soil that is ready to receive something new. That is, jumping the fireplace means having sex now with the husband. [T: 00:01:15:00].

Cultural counting was used to prevent a pregnancy as the woman would avoid having sex during fertile days falling after the completion of menstruation (Figure 15 and Appendix 16):

Old people were able to count when to have sex for a pregnancy to occur and also how to avoid getting pregnant. [T: 00:02:15:00].

The teacher was not able to illustrate the exact number of days (scientific calculation) that were required for abstinence and link them directly to the ovulation and uterine cycle as part of

menstrual cycle (Appendix 16). The model teacher's explanation is complemented with participants' additional views in the second focus group session (Appendix 17).

However, the Xhosa cultural time period used by the model teacher explained the menstrual process using 'gentle' Xhosa concepts for fertilization and active sex days for women wanting to fall pregnant:

We know that ovulation from the science curriculum is the release of the egg cell. Therefore, we can integrate the period of 'jumping the fireplace after being on the grass or on time' as equivalent to having sex after menstruation and that is the ovulation period.
[T: 00:03:00:00].

A cognitive shift from the suppressed level to the balanced, equipollent level of CAT (see Figure 16) was reported by the model teacher and confirmed by the model learners:

We have integrated our cultural terms which were used by the elderly as we use them now in our menstruation talk. We have moved to what is called ...chorus response from colleagues...equipollent cognition. [T: 00:02:30:00].

In addition, evidence of *moving from the suppressed context* was illustrated by means of a graphical data display of Atlas ti. 8 networks showing categories of different statements (Figure 16) used by the participants as supporting evidence for the cognitive shift:

Can you see that we are correlating our culture with science?

We can integrate the 'jumping the fireplace' after being 'on the grass' with sexual intercourse.

Cultural terms that were used by the elderly, we use them now in our science teaching.

The pink-coded theme *cognitive shift from suppressed context after CAT* was illustrated with supporting statements for *moving from the suppressed context*, in the form of small, documentary files with quotations (see 10:36 in Figure 16).

Each quotation was drawn from the same file numbered 10 on the Atlas ti. 8 project. For example, 10: 42 in Figure 16, represented file number 10, common to all the seven statements in terms of uploading on Atlas ti. 8 for the XIL. What differed were the direct quotations (shown by the second figure next to the number 10) used by the participants while expressing their cognitive shift views. Each of the seven quotations enclosed in document 10 in Figure 16 namely, 10:42; 10:39; 10:41; 10:44; 10:46; 10:43; 10:47, represented different expressions that were coded similarly as representing a cognitive shift from suppressed context to equipollence:

41 in 10:41: *We have moved from suppressed context to equipollent cognition.*

43 in 10:43: *Our culture co-exists with science and we have merged it with science.*

44 in 10:44: *That is why we have cultural terms such as 'grass, on time'.*

Results show a Xhosa culture counting program that compared similarities in the counting of the number of days in the 28-day menstrual cycle, using Xhosa euphemistic concepts (Figure 15 and Appendix 17). Ovulation was counted from day 11 of the menstrual cycle and was regarded as the *free time* for copulation (jumping the fireplace) for families that wanted a pregnancy:

After 10 days, from day 11 it's free time to jump the fireplace and is regarded as ovulation because the egg cell has been released, although old people did not have this term of ovulation.
(PF1).

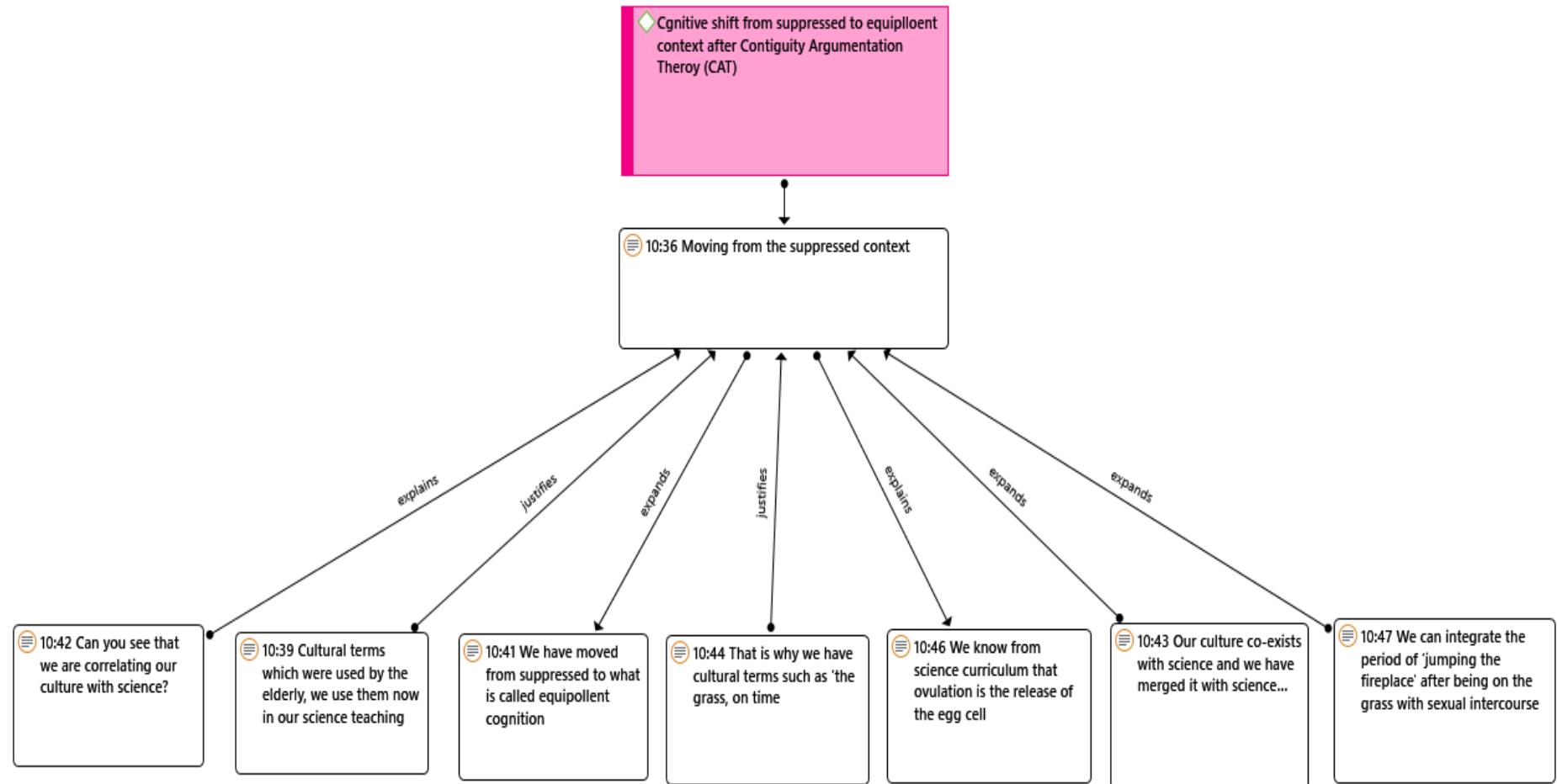


Figure 16: Identification of Contiguity Argumentation Theory cognition shift from suppressed to equipollence

Thickening of the endometrium (*grass*) and nourishment by the blood capillaries (*soil*) was known as a preparation for receiving a fertilised egg cell (Figure 15) that would be implanted in the readily-prepared grass (endometrium):

As our teacher explained just now, the grass which is the endometrium and its soil which is the blood vessels, have become thicker and ready to receive something new for attachment, that's a fertilized egg cell that will be implanted inside the fertile grass which is the womb or endometrium. (PF1).

The importance of an endometrium that was reported as becoming *thicker like a thick carpet*, signified that Xhosa women, although they were reportedly unlearned, instinctively knew about developmental challenges that took place inside a young woman's body. More so, knowing that the thickening of the endometrium takes place on completion of menstruation and a thickened endometrium represents a state of readiness for fertilization is important for integrating IK into the teaching of sexual concepts:

Once menstruation or 'being on grass' stops, the endometrium inside the womb grows and grows thicker just like a thick carpet for the attachment of the embryo while the soil (capillaries), get ready to provide nourishment for the growing embryo. (PF1).

There was a change from avoidance to naming of sexual concepts (Figure 16), to using the euphemistic Xhosa words first before using the 'avoided' scientific sexual concepts. Participants reported feeling less frustrated as they shared and they could not believe that they were talking amongst each other openly about concepts such as copulation and fertilization 'without stress' (Appendix 17):

Can't believe that I'm saying these things like copulation, fertilization and menstruation without stress ...laughter...seriously this IK and CAT information has made saying and using these terms lighter ...yes....from group members. (PF1).

4.4.3 Second focus group interview after CAPTD and Indigenised lesson

As reported earlier, I was not present during the planning phase of the lesson, and the teacher did not describe the process they used. However, a second focus group interview addressed this issue (Appendix 17) as the participants supplemented the model teacher's presentation after the lesson by explaining how they linked Xhosa IK terms and western Modern Science ovulation counting:

I'm going to add on what our Miss has just presented and use the 7-day schedule as we normally teach our learners. (PF1).

A Xhosa culture counting program compared similarities in the counting of the number of days in the 28-day menstrual cycle, using Xhosa euphemistic concepts (Appendices 16 and 17). Ovulation was counted from day 11 of the menstrual cycle and was regarded as the *free time* for copulation (*jumping the fireplace*) for families that wanted a pregnancy:

After 10 days, from day 11 it's free time to jump the fireplace and is regarded as ovulation because the egg cell has been released, although old people did not have this term of ovulation. (PF1).

Thickening of the endometrium (*grass*) and nourishment by the blood capillaries (*soil*) was known as a preparation for receiving a fertilised egg cell that would be implanted in the readily prepared grass (endometrium):

As our teacher explained just now, the grass which is the endometrium and its soil which is the blood vessels, have become thicker and ready to receive something new for attachment, that's a fertilized egg cell that will be implanted inside the fertile grass which is the womb or endometrium. (PF1).

The importance of an endometrium that was reported as becoming *thicker like a thick carpet*, signified that Xhosa women, although they were reportedly unlearned, instinctively knew about developmental challenges that took place inside a young woman's body. More so, knowing that the thickening of the endometrium takes place on completion of menstruation and a thickened endometrium represents a state of readiness for fertilization is important for integrating IK into the teaching of sexual concepts:

Once menstruation or 'being on grass' stops, the endometrium inside the womb grows and grows thicker just like a thick carpet for the attachment of the embryo while the soil (capillaries), get ready to provide nourishment for the growing embryo. (PF1).

Participants revealed that before the CATPD, teaching sexual concepts make them feel like *dying inside because of pain* of having to talk about sexual concepts to learners (Appendix 17):

To me, feeling like a wilted flower means that I feel like dying inside because of pain of saying these sexual words. These things that we teach strip us of our humanity so much and kills the self-respect that we have deep down inside just like this wilted flower. (PF4).

There was a change from avoidance to naming of sexual concepts (Figure 16), to using the euphemistic Xhosa words first before using the 'avoided' scientific sexual concepts. Participants reported feeling less frustrated as they shared and they could not believe that they

were talking amongst each other openly about concepts such as copulation and fertilization ‘without stress’ (Appendix 17):

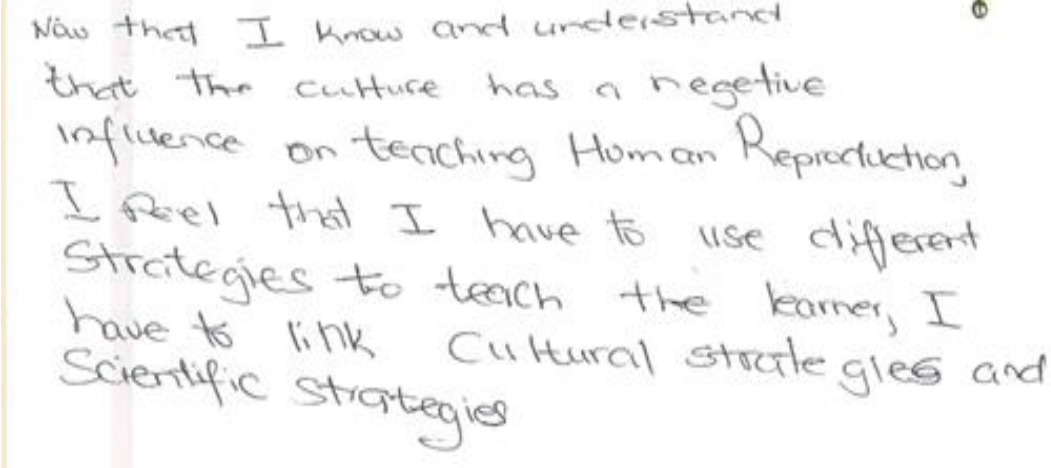
Can't believe that I'm saying these things like copulation, fertilization and menstruation without stress ...laughter...seriously this IK and CAT information has made saying and using these terms lighter ...yes....from group members. (PF1).

After the CATPD, data analysis indicates that participants shifted their level of cognition to the highest CAT level, the equipollent level (Appendices 16 and 17). The two worldviews (Xhosa IK and WMS sexual concepts) exerted comparable and equal intellectual force on participants' thinking:

Can you see that we are correlating our culture with science?

4.4.4 Second phase of drawings after professional intervention and IK lesson

As described earlier, there were two sessions of descriptive drawings (see 3.1 in this chapter). This second cycle was coded numerically as two (2), with alphabetical letter A representing the first participant up to the last member, 2F (Appendix 18). The final drawing session aimed at generating data on how the participants teach WMS curriculum content on sexual concepts to learners after going through a professional intervention session on IK and WMS (Appendix 18) and developing a lesson on Xhosa IK on the menstrual cycle, using CAT. The Xhosa Indigenised lesson was designed using the knowledge gained from the professional development, using menstruation as a theme that was voluntarily selected by the teachers and taught by a model teacher using an Indigenised Teaching Strategy (ITS) developed by the teachers. The data generated from the descriptive drawings revealed cognitive changes from CAT's suppressed level of ‘avoidance’ to naming sexual concepts based on Xhosa IK (see Figure 16).



Now that I know and understand that the culture has a negative influence on teaching Human Reproduction, I feel that I have to use different strategies to teach the learner, I have to link Cultural strategies and Scientific strategies

Figure 17: A teacher's comment on the effect of culture and the development of integrated IK and science teaching strategies

Teacher reflections (2B in Appendix 18) reported that new knowledge of CAT's equipollent conception and research study on how other countries experienced teaching sexual concepts was beneficial (Figure 17). Other findings were that the participants needed more workshops such as these presented on IK and WMS presentations (2A, 2B and 2G in Appendix 18) to help with alleviating the challenges they face at their schools. For example:

After the discussions we had, my mind-set changed. I believe that if sessions like these can occur regularly, teaching human reproduction will be much better. (2A).

I know that culture has a negative side (avoiding calling sexual concepts) on teaching sexual concepts, I feel that I have learnt ways of designing different teaching strategies that have a link between the culture and science. (2G).

I learnt how to integrate my indigenous knowledge with scientific knowledge especially in teaching menstrual cycle. Curriculum developers must do a lot more work of closing the gap between cultural beliefs and scientific concepts in Life Sciences. (2A).

Taboo feeling related to human reproduction language and my home language is removed. Now that I have knowledge of culturally responsive teaching strategies (CRTs), it is going to be different as I am feeling better when approaching the topic on human reproduction. (2B).

A conceptual change from CAT's suppressed category to equipollence (Figure 17) was acknowledged as a beneficial mind set change:

I feel a change now that my cultural view has been integrated with science and this has made teaching human reproduction easy. (2D).

As a teacher, I can easily say these sexual words that I avoided before by using the words from Xhosa IK. I can tackle the topic in a better way by accommodating both worlds of knowledge in my teaching. I am feeling more comfortable and saved by this knowledge (noko umntu uziva e-saved ndiziva bhetele ngoku) (2E).

I feel comfortable to teach human reproduction and link my culture with science without feeling nervous. For example, teaching menstrual cycle by integrating Xhosa culture with science concepts. Now, it is going to be easy to call names that I avoided initially including male and female parts. (2F).

The equipollence category was identified as the ideal link between Xhosa culture where cultural teachings of the menstrual cycle by older, unlearned women were compared to the phases of the scientific menstrual cycle (Figure 17):

I reached equipollent thinking where it became clear that IK needs to be integrated with science because there is a lot of old people's knowledge regarding issues of menstruation, fertilization, pregnancy and childbirth that we did not know. (2C).

Our parents were not educated but they were able to count safe time of avoiding a pregnancy or making sure that one gets pregnant. They counted the different stages of menstrual cycle starting with menstruation where female avoided sex (no jumping of fireplace). (2B).

Old people counted the time for prevention of copulation and therefore, practised contraception. They practised abstinence and avoided the transfer of semen into vagina. They counted the days after menstruation and knew that when someone engages in sexual intercourse, that person must be an adult who is ready to have kids. Even after childbirth, a woman did not engage in sexual activities in the early months. They stayed in bed for 10-14 days and old people knew that resting was good for healing the body. (2C).

4.4.5 Participant confirmation of findings

The final phase was a presentation of the thematically analysed results obtained from a flow chart (see Appendix 19 and Figure 18). Due to the worldwide covid-19 lockdown restrictions, movement and time spent in contact with people was controlled, hence the seminar process had to be modified. For example, amendments were made to continue with the study using the widely used and cheaper modes of communication WhatsApp (Ngaleka & Uys, 2013) to alert participants about the planned visit. After numerous communications, the participants accepted an invitation to attend the last stage of the CPALAR process, with the aim of confirming their findings. Firstly, I did not tell them my findings, instead I asked them to write down how they viewed their experience of each stage of the research process.

They decided to share their views about the findings of the study by asking one participant, their model teacher who presented the Xhosa Indigenised lesson on the menstrual cycle, to write down their collective views as shown in Figure 18. Hence, there was no clear identification of each individual's perception, as done in previous reporting sections. They reported their views collectively in the flow chart (Figure 18). I agreed and explained that we were adhering to the nature of the critical paradigm encompassing the study and CPALAR by trying to accommodate changes initiated by participants. With this in mind, I allowed the participants to use their own design in the form of a flowchart or mind map as a reporting tool, instead of writing down individual comments.

The flowchart (Figure 18) was preceded by a discussion among the research group members. I was present during their discussion; however, I did not contribute nor ask any clarity seeking questions since I wanted their unbiased, personal views about the whole research process. The flowchart was designed in such a way that there was a cycle numbered from one to four, with supporting explanations of their findings and experiences in each stage.

Results indicate that participants confirmed the initial *asibizi* avoidance in stage one, commenting that *asibizi* prohibited teaching and talking about sexual concepts (Figure 18):

Avoiding naming sex concepts is deeply rooted in our Xhosa culture because asibizi.

We do not talk about sex things-it is taboo.

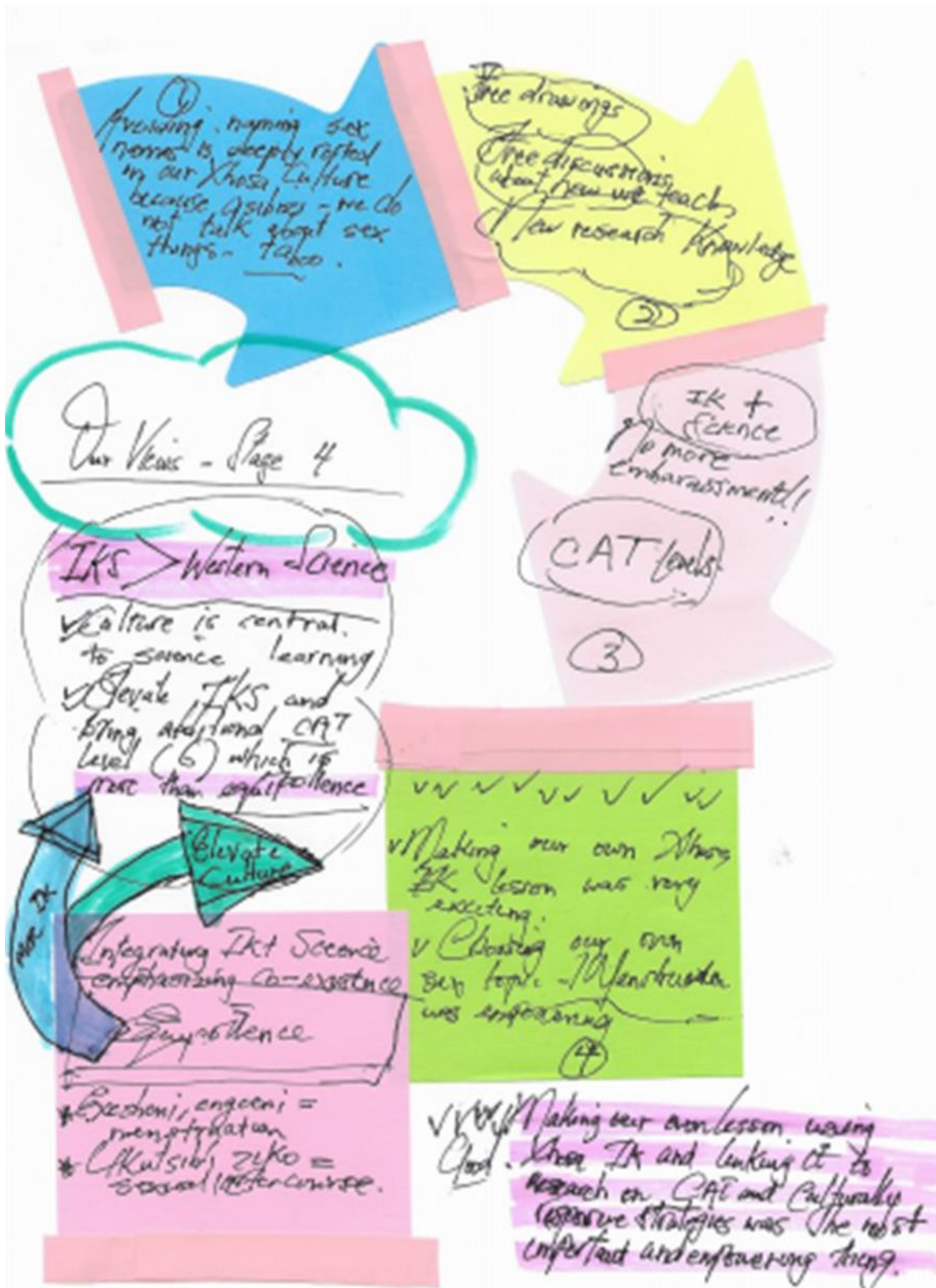


Figure 18: A summary of research findings presented by participants in the form of a flow chart

Despite previously regarding the equipollent position as having greater value due to co-existence, the participants revealed in their flow chart diagram a need for IK to be held in a 'greater' position than Western Modern Science (Figure 18 and Appendix 19):

IKS must be greater than Western Science.

Elevate IKS and bring another CAT level (6) which is more than equipollence.

Integrating IK and science emphasises co-existence, therefore equipollence has been achieved in our thinking levels by showing that exesheni and engceni is equivalent to menstruation, ukutsib'i ziko is equivalent to sexual intercourse.

Making my own Xhosa IK lesson was very exciting and choosing our own topic which was menstruation was empowering.

Choosing our own topic on menstruation was empowering.

Our view is-culture must be elevated by having more IK concepts that can be used to teach science concepts.

4.5 Summary of the main findings

The overall findings of each of the phases of the CPALAR research process are presented in Table 2.

Table 2

Findings on the use of an Indigenised Teaching Strategy for teaching sexual concepts to a homogeneous cultural group of learners during CPALAR by Xhosa teachers

Phase activity	Main findings
Open-ended questionnaire	<p><i>Asibizi</i> sexual concepts in isiXhosa language as avoidance of explaining sexual terms such as vagina, penis and menstruation in isiXhosa language talk.</p> <p>Cultural taboos restrict teaching of sexual concepts due to innate Xhosa cultural beliefs.</p>
Drawings before CATPD	<p>Avoidance teaching strategy as participants do not simplify sexual terminology due to cultural restriction.</p> <p>Female teachers fear confrontation by male learners in rural schools.</p> <p>Culture is a barrier to effective teaching of sexual concepts in the presence of circumcised men.</p> <p>Therapy to female teachers as an opportunity of releasing frustrations about teaching sexual concepts.</p> <p>Menstruation is the most culturally sensitive sexual concept to teach.</p>
Focus groups before CATPD	<p>Female teachers are resilient as they continue to teach sexual concepts in the presence of confrontational male learners and authoritative male superiors and parents.</p> <p>Different substitute terms used for similar sexual concepts in the same language.</p> <p>Avoidance of culturally sensitive sexual terms.</p> <p>Reluctance of voicing out in isiXhosa language the substitute terms for sexual concepts.</p>

CATPD and Indigenous lesson development	<p>CAT research knowledge is difficult for teachers' understanding.</p> <p>Identification of individual teacher's CAT levels in the presence of the researcher threatened the participants.</p> <p>Brain-storming and planning sessions in the absence of the researcher (even if the researcher is of the same culture), promote achievement of pre-determined research goals.</p> <p>Xhosa culture has equivalent terminology that can be mapped sufficiently to the scientific pattern of the menstrual cycle (<i>engceni, ixesha, ukutsib'i ziko</i>).</p> <p>Changes from suppressed CAT level to equipollent level identified during the presentation of the IK lesson.</p>
Second drawings	<p>Avoidance of using Xhosa concepts has been eliminated by IK and WMS integrated strategies.</p> <p>Change from CAT suppressed level to highest equipollent level.</p> <p>Equipollence category identified as the ideal link between Xhosa culture where cultural teachings of the menstrual cycle by older, unlearned women were compared to the phases of the scientific menstrual cycle.</p>
Participant confirmation	<p>Participant group moved from suppressed to equipollent perception of IKS and WNS.</p> <p><i>Asibizi</i>, avoidance of sexual concepts was a Xhosa cultural taboo.</p> <p>Freedom of choice of menstrual topic, language used and design, new research knowledge was empowering.</p> <p>Teaching the Xhosa Indigenised lesson was empowering.</p> <p>IKS must be elevated to a level higher than WNS.</p> <p>A level higher CAT's equipollent level is essential to elevate IK.</p>

4.6 Chapter summary

Data analysis of semi-structured questionnaires (Appendix 18) revealed the importance of cultural taboos and language used in simplifying sexual concepts and that culture restricts teaching of sexual concepts. The data generated also revealed the participants' perceptions of how they teach when they have to teach sexual concepts.

The next set of results was based on descriptive texts (Appendix 12) derived from drawings by the participants about their perceptions of their teaching strategies and how they feel when teaching sexual concepts to learners of the same culture in secondary schools situated in rural villages. Participant quotations and Atlas ti. 8 coding provided these data (Appendix 13). Emotive and value coding revealed reflections beyond the required question on teaching strategies. The data revealed deeper feelings of fear, bullying and gender related insecurities of female teachers.

Xhosa culture was identified as the main restrictive factor preventing naming sexual concepts such as testes, menstruation, vagina and fertilization by both genders (Appendices 10, 12, 13, 14, 15, 16, 17). Specifically, menstruation was identified as the most sensitive and difficult concept to teach an Indigenised lesson on menstruation (Appendix 16) by generating an Atlas ti. 8-word cloud (see Figure 13). A programme was designed to introduce participants to Contiguity Argumentation Theory Professional Development (CATPD) towards culturally responsive strategies (Appendix 15). Thematic data analysis of focus group discussions revealed the important role of allowing participants to choose how they would like to bring change into their environment. In this case, the discussion was open as isiXhosa language was used freely and the theme selection for presentation and the actual plan was left to the participants' choice.

Finally, the identification of change in cognitive levels from the initial, suppressed position to the highest equipollent levels represents knowledge growth (Appendices 9, 10, 11). Lastly, during phase four (the participant confirmation stage), the teachers called for a sixth level of CAT (Appendix 19). Collective written reflections of the participants elevated the need for indigenous knowledge to a level greater than the equipollence level.

CHAPTER FIVE

DISCUSSION OF RESULTS

5.1 Introduction

The implications of the findings presented in Chapter Four are discussed in this chapter. The qualitative data presented in Chapter Four have been integrated, compared, and contrasted against the theoretical underpinnings noted in Chapter Two. The findings are based on multiple data generating instruments used during the four phases of the Critical Participatory Action Learning and Action Research (CPALAR) design. Multiple data generating instruments such as open-ended questionnaires, a researcher's observation sheet, teacher drawings with descriptive text, audio-recorded interviews, video recorded teacher presentation and a flow chart were used to ensure the credibility and dependability of the results. Explanations are triangulated using findings drawn from thematic data analysis and italics have been used for direct quotations. The study's key conclusions, shortcomings, and proposals for future research are presented in chapter six of this research report.

5.2 Perceptions about cultural taboos

The first research sub-question on the perceptions of Grade 12 Life Sciences' teachers of Xhosa culture about taboos that may restrict or enhance teaching strategies used in teaching sexual concepts addresses issues of language, culture and teaching strategies of Xhosa teachers by presenting a conceptual framework of culture and IK-based language issues shared by Xhosa teachers in rural communities. As mentioned earlier (section one of chapter two of this study), the term Xhosa teachers is used generally to refer to teachers who share Xhosa culture, and not on teaching isiXhosa as a subject.

5.2.1 Cultural taboos when teaching sexual concepts

As noted in chapter four, the participants reported cultural taboos manifested in language and inborn cultural practices as prohibiting the naming of sexual concepts in the teachers' home language. They clarified that naming sexual concepts in their mother tongue was taboo in Xhosa culture, and subsequently restricted how they taught science sexual concepts in their rural schools. Convergence of data from two phases of CPALAR namely, the problem-identification phase in stage one of CPALAR (open-ended questionnaires) and the action phase in stage two (first drawings and first focus group sessions), revealed that Xhosa culture was a barrier to effective teaching. These findings are supported by existing research on culture and language issues of indigenous people (Abrams et al., 2014; Aikenhead et al., 2014; Ogunniyi, 2013; Webb, 2013, 2016).

5.2.1.1 Link between culture and language

The participants' views highlighted the link between culture and language, a view that is also epitomised in Odora Hoppers (2002) and Triandis (2018) work where culture is viewed as being linked to the language of a particular group, at a particular time and place. These findings, generated by homogenous groupings of Xhosa people residing in remote, rural villages, emphasise the link between the culture of Xhosa people and use of sexual concepts in the community and at rural schools as places of learning in particular, and expose the need for prioritising the fundamental characteristics of Xhosa culture as far as the use of cultural authority and language when teaching sexual concepts to high-school learners sharing the same culture.

The participants regarded cultural taboos as having more cultural authority compared to Western Modern Science (WMS) based language use, which resulted in the avoidance of the

use of vernacular terms when teaching sexual concepts. The following excerpt exemplifies the importance of cultural authority:

Respect of the cultural values and way of life of the people is important when talking about things that they don't talk about. Therefore, culture must be respected and linked to the sensitive sexual issues (Appendix 10, P8).

Cultural authority was revealed by the participants as they motivated why they avoided using the vernacular sexual terms. As Odora Hoppers (2002) states, IK is local knowledge that is unique to given culture, as is the controlling authority of cultural taboos. The participants argued that cultural authority stems from a value-oriented perspective, citing *respect of the cultural values* frequently through the data trail that was tracked from the multiple instruments (open-ended questionnaires, first drawings and first focus group) used in the study. The participants' responses revealed a unique need for respect, expressed succinctly as *respect way of life of the people is important*. In addition, they stated that *culture must be respected and linked to the sensitive sexual issues*. This revelation was shared during the initial stages of the study and indicated that there was a problem of the power of cultural authority (IK) over scientific sexual concepts (naming of WMS). So, teachers were compelled by cultural authority to avoid naming sexual concepts inherently as they are known as culturally taboo in their indigenous communities.

5.2.1.2 Socio-cultural perspective of Xhosa indigenous people

The reported obedience to cultural authority necessitated an understanding of literature reflecting the IK of Xhosa people specifically so that the findings presented are authentically context-specific understanding of Xhosa teachers working in rural schools as a place of education (Atchoarena & Gasperini, 2003; Budge, 2006; HSRC-EPC, 2005). The socio-

cultural perspective of Xhosa people can be portrayed through the Nongqawuse Xhosa national tragedy (Mda, 2007; Peires, 1987; Pires, 2013), as explained in section 2. 2 of Chapter Two. The Nongqawuse narrative paints a vivid picture of a culture that traditionally adhered blindly to cultural authority and through their loyalty, lost their political sovereignty to the European settlers. In light of the above views, the cultural circumstances of Xhosa teachers are explained to get an understanding of how long-held cultural beliefs have driven Xhosa teachers towards complete obedience, oblivious of the expectations of modern-day cultural expectations. Therefore, research studies affirm the Xhosa teachers' blind loyalty to cultural authority as practised by their predecessors (Mda, 2007; Pires, 2013; Saule, 1996).

Considering that all the participants lived in what can be considered as deep rural Transkei where adherence to cultural authority is strong, the study confirms the uniqueness of culture based on research confirming a link between traditional settings as a place with deep rural beliefs (Mda, 2007). Research on Xhosa IK conveys traditional values of the 'Red' Xhosas (Mda, 2007, p. 92) , presenting a unique socio-cultural group viewed as having strong cultural beliefs and obedience to authority and staying in rural places. Hence, the participants' total obedience to culture affirms the notion of Red Xhosas residing in remote, rural spaces similar to that of the Red Xhosas of those historic times. In other words, the notion of Red Xhosas provided the context in which the teachers were teaching.

5.2.1.3 Geographical positioning between teachers and learners

The issue of rural geographical positioning added another dimension as the participants in this study, that is, the teachers, revealed the prevalent effect of cultural authority (gleaned from multiple data instruments) despite being educated and therefore considered more advanced when compared to their ancestors and unlearned community members. A high level

of cultural authority was shared by participants as *it is more difficult to teach these sexual things as we are staying in the same vicinity with them and you also see the manner they look at you that it is totally disrespectful and different than before the sexual lesson*. This is not surprising as the teachers lived in close proximity with the learners and community members in traditional, rural villages where the schools were situated.

Research in rural education cites the importance of identifying rural areas based on geographical location, social composition of people, forms of activities, nature of social relations, and relations with other spaces (Masinire et al., 2014). Residing in the same rural spaces as the learners and community members (including parents) adds another dynamic to the teaching of sexual concepts, the issue of acceptable relations of authority within different genders and ages in Xhosa culture. I know from personal experience as a former rural school teacher that teachers that are closer to cities, commute daily to places of work. However, these teachers lived within community members' households. The issue of close proximity to community members was due to the nature of their rural geographical position as they were teaching in deep rural schools. Hence, the study participants were acting within acceptable cultural boundaries within their community by avoiding naming culturally taboo terms.

Although existing studies on cultural taboos report the avoidance of using the vernacular for biological terminology (Chilisa & Ntseane, 2010; Doidge & Lelliott, 2016; Phetla et al., 2008), this study approached the issue of cultural taboos and language differently, based on the unique circumstances of a homogenous cultural grouping. As captured in the demographical report generated from open-ended questionnaires and data from focus group interviews, the sample was composed of only teachers of Xhosa culture, teaching sexual concepts to Xhosa learners in rural Eastern Cape secondary schools and residing in remote villages with community members. Xhosa teachers of both genders revealed that cultural taboos prohibited

naming of sexual concepts, causing them to use defensive and threatening strategies. The restrictive role of culture was gleaned from the unanimous *no* responses from all the 30 participants when answering open-ended questionnaires, indicating that Xhosa culture prevented talk about sex entities such as vagina, penis and menstruation.

5.2.1.4 Transitioning between avoidance and non-avoidance

At the start of the research process, many participants revealed that they taught sexual concepts exclusively in English, a view that aligns with much of the available literature. The participants' initial avoidance of naming sexual concepts aligns with the findings of research studies across the globe (Buni, 2013; Chilisa & Ntseane, 2010; Doidge & Lelliott, 2016; Oulton et al., 2004). The views shared by the Xhosa teachers resonate with the views espoused by Buni (2013) in a study done in England, where English First language parents barred teachers from teaching concepts such as vagina and penis to their children. Further views similar to the situation of the Xhosa teachers were shared in an African study by Doidge and Lelliott (2016) where primary school teachers of different cultures in Gauteng avoided naming genitalia. Likewise, arguments on the prohibitive role of cultural taboos were linked to sex and sexuality among women of SePedi culture (Phetla et al., 2008).

However, at the end of the study, and after engaging in Contiguity Argumentation Theory professional development (CATPD), and using the Indigenised Teaching Strategy (ITS), a change from exclusive English use to a Xhosa IK and English integrative approach was revealed. While the study findings align with those of Doidge and Lelliott (2016) in as far as the identification of cultural taboos that restrict the naming sexual concepts is concerned, the study data indicate a contrary view as far as Doidge and Lelliott (2016) contention that the teachers should not use indigenous metaphors and that they should propagate the exclusive use

of biological terminology in English. In this study, the data generated from multiple instruments such as the video-taped teaching sessions using an ITS, the second focus group discussions, and the second cycle of drawings as well as the flow chart, show that the participants embraced teaching contentious topics in isiXhosa.

A turning point towards support for using euphemisms was revealed when the teachers used the new IK-based teaching strategy (ITS). There was a shift from predominant English use to an inclusion of Xhosa language terms used by elderly, unlearned Xhosa women. The model-teacher and the participant model-learners revealed the inclusion of 'ingca' as equivalent to endometrium and identification of the origins of the Xhosa terms as being from *abantu abadala* (the elderly), therefore lineage of the terms was ascribed to Xhosa IK. In addition, the biological scientific process of menstruation was illustrated metaphorically in isiXhosa as *engceni*, described as the removal of the *grass* (endometrium) that covers the soil in isiXhosa language. Sensitive terms such as sexual intercourse used Xhosa IK revealed as 'ukutsib'i ziko' 'jumping the fireplace', an important process that is compulsory in the Grade 12 curriculum. Thus, participants used vernacular euphemisms to map similarities between culturally prohibited terms and name them easily after the CATPD and ITS implementation.

Data evidence viewed from Atlas ti. 8 time-stamped video excerpts confirm the participants' revelations:

The endometrium (i-endometrium ke) represents what old people (lento abantu abadala bathi) refer to as 'the grass' (yingca). It is like the grass which is covering the real soil (injenge ngca e-coverish-e umhlaba). [00:01:00.00]

After having been removed, it leaves soil that is ready to receive something new (ke ngoku, ishiya umhlaba o-ready). So, in terms of our culture, that is why our parents could

not 'jump the fireplace' when they are 'on the grass' (abazali bethu ngokwe culture bebesithi xa besengceni bangakwazi ukuthi batsiba iziko). [00:01:15:00]

The use of euphemisms such as the *cake* or *ikhekhe* as a less sensitive term for vagina, was reported in a study in KwaZulu Natal (Govender, 2019, p. 10). This report supports the participants' views confirming the use of euphemisms and metaphors as bridging concepts for teaching culturally restricted sexual concepts.

5.2.2 Asibizi language of avoidance

Findings on open-ended questionnaires, descriptive drawings and focus group interviews revealed a culturally based language restriction, as noted above. The Xhosa language restriction expressed avoidance of naming sexual concepts distinctly in vernacular as *asibizi*, meaning 'we do not name it'. This section of the discussion of the data focuses on the terms that the participants avoid even though they are required to teach them.

5.2.2.1 Restriction on science teaching

With *asibizi*, the teachers avoid naming Westernised Modern Science (WMS) concepts that are viewed as transgressing acceptable Xhosa cultural tradition. The issue of WMS versus IK language has been reported in chronicled studies as being constituted by Eurocentric underpinnings that are different from the worldview of indigenous communities (Aikenhead, 2002; Aikenhead et al., 2014; Aikenhead & Jegede, 1999; Hodson, 2009; Webb, 2009, 2013, 2016).

Hodson (2009) points out that personalising science is an effort to bridge the gap between WMS and IK so that the individuals' cultural traditions and inherent worldviews can be linked to WMS. The language conflict experienced by participants was shared across multiple data

instruments and written in vernacular and in various explanations as shown from data retrieved from open-ended questionnaires (phase one of CPALAR), for example, *Asibizi, not allowed in our culture (P29)* and *we don't say these things, siyahlonipha, asibizi. (P20)*.

The argument posed by *asibizi* reflects a problem in the science education where Xhosa teachers fail to clarify concepts in the vernacular due to cultural inhibitions. Science terminology and biological processes are generally known as difficult to understand and require elucidation by a competent teacher. A point accepted in science education is the use of code switching (Probyn, 2009; Webb, 2009) as an anchoring strategy mediating between English second language speakers and abstract, science concepts. However, participants revealed, before engaging in the professional intervention session, that they did not use Xhosa terms and did not code switch to clarify sexual concepts. On face value, this statement appears to contradict the findings of researchers that Xhosa speaking teachers often use code switching and that this strategy has yielded positive results and improved science understanding (Msimanga & Lelliott, 2014; Probyn, 2015). However, in the case of teaching sexual concepts, the participants were loyal to *asibizi* even though they recognised that it was to the detriment of the learners. The data indicates that they did not intentionally choose to avoid code-switching, instead they were conflicted by cultural authority and that they lacked the knowledge of culturally responsive strategies that they could use to soften the negative view of avoided terms.

5.2.2.2 *Socially stratified avoidance*

The issue of language was collectively reported by the group as being culture-based and, in a sense, *asibizi* was a collective concept that they understood as being consensual and including both genders. However, social stratification emerged from their group views as

women teachers were reportedly culturally prohibited from talking about topics related to circumcision and male parts. For example, questionnaire data from female participants revealed that *penis talk is taboo in the presence of circumcised men*. A female participant affirmed that *according to our culture, as a woman you have to respect men especially those who have reached 'manhood' (circumcised)*.

Earlier work by Triandis (1996) points out the issue of collective group practices and values which are regarded as more important in non-Western communities. Chilisa (2012), points out that cultural beliefs of most communities are not written down, but communities have individual and collective ways of thinking as a group. Other studies affirm the participants' views that avoiding offensive sexual talk is a sign of collective respect for their culture and elders (Taylor & Cranton, 2012). Hence, collective social consensus became a dominant assumption that tended to exclude those who break tradition such that, female teachers did not want to be part of a group that breaks cultural rules regardless of their employment prescriptive (effective teaching of sexual concepts with explanations).

5.2.2.3 *Asibizi as a fifth language issue*

Asibizi in Xhosa culture was conceptualised based on categories of agreement provided by data analysis retrieved from the various stages of the CPALAR (Phase 1 to 4), and the data trail presented evidence of overlapping issues of *asibizi* and culture has increased the credibility and validity of the development of *asibizi*. The data suggests that this language issue, *asibizi*, can be considered as a 'fifth language' issue, along with the language issues noted by Yore and Treagust (2006) and Webb and Treagust (2006), namely the language used in the home, language used at school, disciplinary language, and being taught in a second language. All of these issues are deserving of consideration when teaching science in a second language, and

particularly in cultures that have linguistic taboos. The consistent thread of *asibizi* suggests a new form of communication among the science teachers, a fifth language that presented an issue of *asibizi* as retarding teaching of science concepts. This view is based on data that revealed a notion of a common language understood by Xhosa teachers as a barrier to naming sexual concepts in the vernacular.

Genesis of asibizi from research studies

The issue of language barriers in science teaching, as noted in Yore and Treagust (2006), includes the three-language problem common to most science teachers who are English Additional Language (EAL) speakers (the first three mentioned in the paragraph above). The use of English as the language of learning and teaching for EAL became an additional fourth language issue (Webb & Treagust, 2006). The similarities between the participants' views and the literature are clear, but their data add the notion of taboos such as *asibizi* as a fifth language issue. The unique experiences and utterances of indigenous Xhosa people around *asibizi* as a fifth language issue adds to the language and WMS dialogue in science education.

A research report based on the preliminary stages of this current study by Simayi and Webb (2020) cited *asibizi* as a language based on Xhosa teachers' nuanced understanding of their local language and cultural practices maintains the *asibizi* view. Extending beyond the findings in the preliminary study (Simayi & Webb, 2020), the participants provided triangulated evidence ranging from open-questionnaires to drawings and audio transcripts, giving authentic data-driven documentation of why they do not name sexual concepts in their culture.

Some of the reasons of *asibizi* were listed as '*menstrual talk is cultural taboo*', and '*penis talk is taboo in the presence of circumcised men*'. During focus-group interviews, uneasiness

of naming sexual terms was explained as '*it becomes difficult for me to call vagina, I use substitute terms to call it, terms that are acceptable to use in my culture*'. Due to the variety of explanations revealed by participants for the *asibizi*, two forms of the avoidance were deduced from data namely, a visible form that was captured in text and the hidden, symbolic form of *asibizi*.

5.2.2.4 Meta-analysis of *asibizi*

Reasoning for the two forms of *asibizi* requires a cursory explanation of how the concept was derived from the multiple truths revealed by participants' data. I begin by reminding the reader about my *bricoleur* analogical position, a position where the researcher is viewed as a quilt maker (Denzin, 2012), see section 3.2.1 in Chapter 3. In line with my *bricoleur* analogical position, the attempt at analysing the two forms of *asibizi* was an effort of trying to sew the emerging pieces of data and align them within the epistemological perspective of the study. As stated earlier, the epistemological position of this qualitative study was underpinned by a view that there are multiple truths that are influenced by the participants' culture, language and beliefs (Creswell & Creswell, 2017; Denzin, 2017; Lincoln et al., 2011). Hence, observing visible and non-visible forms of truths such as the participants' culture, language, gestures and beliefs, it was important so make these explicit to validate the study.

To lend credibility and validity of the study, views shared by the participants on *asibizi* were based on data-driven evidence provided by the use of manual thematic analysis and Computer-Assisted Qualitative Data Analysis Software (CAQDAS), using Atlas ti, 8 software (Friese et al., 2018; Saldaña, 2021; Woods et al., 2016). Participants' transcripts were in vivo coded (see section 3.5.6 of Chapter Three and 4.2.3 of Chapter Four) such that direct quotations were used verbatim as codes. The genesis of *asibizi* was revealed from the handwritten

description raw data (see Figure 6 and 7 of Chapter 4), followed by a snapshot of the desktop showing similarities between transcribed text and audio using Atlas ti. 8 (see Figure 8 of Chapter 4). Finally, the emerging *asibizi* (Figure 9) was quilted by using visual displays that electronically showed text that was linked by Atlas ti. 8 to matched documents as evidence of the *asibizi* concept. Therefore, data analysis was used to reveal two types of *asibizi* from triangulated documented data evidence.

The first form of *asibizi*, visible *asibizi*, was revealed in text and in audio conversations. For example, visible text describing the *wilted flower* (see Figure 12 of Chapter Four) from raw data indicated visible *asibizi* as *to me, feeling like a wilted flower means that I feel like dying inside because of pain flower means*. All the other forms of avoidance cited above fall under this category of visible *asibizi* as they could be deduced from transcribed text and audio. However, some of the data could not be made visible in writing as it consisted of gestures and drawings that required confirmation of the interpretation from the participants (drawings) and the researcher's perceptions. This is termed symbolic *asibizi*. Symbolic *asibizi* was revealed on the drawings of *wilted flower* with the shape of a flower head bent down as a symbol of shame and embarrassment drawn and confirmation of this explanation was received from the participants. Recognising symbolic *asibizi* falls within the critical and indigenous knowledge paradigms underpinning this study. Hence, the link between emotion and general bodily movements in a qualitative study, particularly a study dealing with sensitive sexual concepts in indigenous communities, requires a careful record of the fieldwork to substantiate the research report. Also, Kearney et al., (2013) suggest that indications of good relationships, regular reflection and recognition of progress (3Rs) serves as a form of validation for a study.

5.2.2.5 *Dignity of indigenous people*

In a study fitting the context of Xhosa teachers, Webb (2013) argued for including indigenous knowledge of Xhosa people in the language of a discipline as results showed that ‘culture, heritage and dignity were emphasised by more than 25% of the questionnaire responses’ (p. 101). In this case, *asibizi* indicated the respect and dignity of Xhosa teachers expressed by avoidance of saying culturally avoided terms that could lead to being disrespected in society and in the classroom. The participants’ explanations were articulated with punctuated isiXhosa words like *siyahlonipha* (we respect) as reasons for the avoidance of naming sexual concepts. Participants avoided naming sexual concepts considered as taboo, recognising WMS concepts as language representing avoided terminology in their indigenous worldview, hence they were listening to the authority of their internal, indigenous cultural voice. The issue of respect presents another reason for avoiding using Xhosa terms for sexual concepts. As noted at the beginning of this paragraph, the use of indigenous language and cultural issues of respect are supported by literature.

The participants also revealed fear of being seen as vulgar and disrespectful to an extent that they referred in many occasions to sexual concepts as those *things*, as shown in statements such as *I get scared of saying these scary things*. The participants’ revelations confirmed research studies about the high value placed on dignity and respect by Xhosa people (Webb, 2013). The issue of male teachers, who revealed a fear of losing respect (see PM3 in Appendix 14), confirm the need for respect by Xhosa people, especially men. Issues of culture and value include emotions and bodily movements that are not verbalised hence, the language of avoidance was captured in behaviour had to be noted and shared as symbolic *asibizi*. An example of men fearing losing their dignity was shared by two male participants who avoided talking about sexual concepts by *looking down* whenever a dialogue was about male sexual

circumcision and male organs. The male participants' body language signified nervousness and reluctance to share male-sexuality content, was categorised as symbolic *asibizi*.

In addition, male participants revealed a fear of naming sexual concepts in isiXhosa and even teaching them in English as indicated in this statement: *their faces tell you as a teacher that they are surprised and shocked by what you are doing and they will never ever, ever listen to you again with respect again (laughter from other participants, PM3 gestures his helplessness with his hands and raised shoulders)*. Emphasis by the male participant on *never ever, ever listen to you again with respect again* revealed visible fear of communicating sexual content. The teachers collectively agreed on the fear factor, including male participants revealing a fear of demonstrating and showing how sexual parts function as required of biology teachers.

5.3 Teaching strategies used in teaching sexual concepts

In addressing the second research sub-question, 'what are the experiences of Xhosa teachers about the teaching strategies they use for teaching sexual concepts to Grade 12 learners?' the responses of the participants are discussed to reveal the peculiar teaching strategies they used and reasons they gave for their choice. Their selected strategies were brought up during the conversations on Xhosa IK and language used when teaching terms that are culturally avoided. Data analysis across the all the phases of CPALAR were examined for similarities and areas of disagreement, augmented with research studies on pedagogy of sensitive sexual concepts, as the basis of argument.

5.3.1 Ineffective teaching strategies

Research studies indicate that there have been challenges in developing teaching strategies that integrate IK with science:

Another challenge facing the integrating school science and IK is that both are based on distinct worldviews with divergent constituent elements, presuppositions, beliefs, conceptual schemes, linguistic structures, practices and value orientations-all which interact to shape people's lives and behaviours. Therefore, before a community could communicate meaningfully with another, some bridge or correspondence rule is needed. Even when a communication channel or has been found, it is still necessary to devise some strategies to sustain the linkage. (Ogunniyi, 2013, p. 15)

Finding out teachers' current teaching strategies before the CATPD was important to determine whether they were integrating Xhosa IK with sexual concepts during their teaching. The data revealed poor teaching strategies that lacked clarification of biological terms in their own home language. The participants revealed a combination of avoidance and defensive teaching strategies where changes in facial expression and *asibizi* were used. The teachers said that they used defensive strategies indicated as *sometimes I devise a defensive strategy where I change my facial expression, (gesturing by pointing at the face) so that I cannot be disrespected here, (other participants are echoing hmm...hmm...and some are giggling a bit).*

An explanation for fertilization was presented defensively and incorrectly as... '*when that thing of a male enters that thing of a female and releases those things of a male*' (see section 4.3.1.1 in Chapter 4) where the actual scientific terms for penis and sperm cells were summarily referred to as '*those things*'. With the defensive '*thing*' teaching strategy, visible *asibizi* was revealed as avoidance of calling penis and vagina by their biological names. Defensive teaching strategies and fear poses a challenge to science education of indigenous people because teachers are supposed to be at a level where they can extend their knowledge to learners without fear. However, issues of cultural inhibitions and language replace the expected confidence of teachers as purveyors of knowledge (school science) to fearful beings, standing on guard for

cultural approval before stamping their own authority. Hence, developing teaching strategies that integrate IK and sensitive concepts became a priority for this study.

5.3.2 Teaching in fear

As reported earlier, the participants revealed using threatening strategies as a form of controlling confrontation by learners. However, the issue of confrontation experienced by females was surprising. Female teachers reported using threatening strategies as they feared confrontation from males, both from male learners in class and outside and from male colleagues who were in a position of authority as school principals.

The first reported direct confrontation in school was by a parent, accusing a female teacher of teaching vulgar concepts to his child. A female teacher (*PFI*) who was dressed in colourful traditional Xhosa dressing with head gear normally worn by married women, reported this confrontation from a parent about teaching sexual concepts. She said, *I was called in the principal's office as a male parent came to enquire about this teacher teaching his child 'amanyala' (vulgar sexual concepts).*

Another female participant further revealed intimidation and direct confrontation in class by male learners saying in vernacular *yibamba'pho* (stop just there) when presenting lessons on male genitalia and circumcision. These male learners stopped a female teacher openly from doing her work in class. In addition to male learners, one female participant revealed the authoritative delegation by a male principal, asking her to teach the section on sexual concepts as the he could not teach it. No reasons were given by the male principal on why he could not teach this section. However, the question that remains unanswered was why women were blindly loyal to male figures of authority while there were various platforms where they could have raised their concerns. A plausible response to this question is suggested using existing

studies on Xhosa culture (Mda, 2007; Mtuze, 2004; Saule, 1996), that more traditional communities offer blind loyalty to figures of authority, hence affirming the submissive behaviour.

5.3.3 Sexual advances to young female teachers by male learners

The reports shared by female teachers revealed deteriorating relations between female teachers and learners ascribed to having to *'teach these sexual things as we are staying in the same vicinity'* with them. Instances of total disrespect and outright confrontation by male learners to female teachers were revealed as *'and their comments when you speak as a female, you are barred by these male learners and tell you that 'can't you see that you are a female for talking about men issues that you know nothing of' (awuziboni ukuba wena ungumfazi akunathethi nto zamadoda)*.

Sharing the same geographical space with learners emerged as an additional threat which compounded female teachers' fears due to improper sexual advances coming from the male learners. A female teacher revealed fears of being asked for sexual favours by a male learner:

Then you find out that there are young female teachers where you say these words, then you meet these male learners outside the school environment. The male learners follow you up in a sexually suggestive way based on the lesson you have taught in class. You see, you were seriously teaching a lesson without inviting any sexual advances, (speaker looking at colleagues and they agree...hmmm...hmmm with hand gestures signaling agreement).

5.3.4 Endurance of female teachers

The enduring spirit and resilience of females as teachers in African society prevailed as female teachers said that they continued to teach sensitive concepts despite confrontational

teaching environments. As reported earlier, analysis of gender-specific responses was not part of the initial research sub-questions. However, gender was considered as data emerged revealing the persistence required by female teachers when teaching sexual concepts in negative classroom environments and their extension beyond the classroom. It appears that the female teachers were keen to persist in teaching these sexual concepts in the best way they thought possible, including potentially being selected by the group to present the newly developed Xhosa Indigenous Lesson (XIL), namely the IK-WMS integrated strategy on menstruation.

Female resilience and leadership qualities are characteristics that have been long supported by Xhosa IK. Elderly women were tasked with teaching virgin women about menstruation and rites of passage into womanhood during the olden days (Mtuzze, 2004). Therefore, the views shared by the participants were reminiscent of Xhosa culture that was practised in olden days. However, the intimidation, confrontation and lack of respect to a person of authority was different from the Xhosa cultural respect accorded to authority figures, irrespective of the gender. In hindsight, the narrative of the female prophetess Nongqawuse should have been in practice in this instance as the teachers were in rural villages where they were viewed as holding a higher level of authority (school science authority) than the learners and parents. However, the power of cultural authority superseded school science authority as revealed by the confrontation experienced by female teachers.

Female teachers reported feeling undermined, embarrassed, scared and ridiculed by male learners, explained as *you are seen as if you are invading and disrespecting the privacy of traditional Xhosa men and entering into the terrain of manhood which you as a female you have no knowledge of (other female participants join in the conversation)*. In addition, young female teachers in particular, revealed stories of fear of their own personal security as they

were staying in the same rural villages as the male learners. Participants revealed that *it is very uncomfortable and difficult especially as a young female teacher as there is our culture that prevents saying these sexual concepts*. However, in the midst of reported insecurity, female teachers shared social consensus and agreed with their male counterparts on culturally taboos that exclude females from talking about male sexual concepts. The agreement from female teachers about their cultural exclusion from teaching male genitalia content showed the power of cultural authority in rural, indigenous communities.

A male teacher, who was normally very active, revealed in his response to the young female teacher's fears that *'it seems as if then, you are disclosing the Xhosa culture of circumcision that is hidden (hmmm from other female teachers)'*. This response lacked empathy to the female teacher's insecurity. Instead, the male teacher's response revealed a perpetuation of the Xhosa cultural belief that woman had no business in talking about male issues that are hidden. An unspoken response from other female teachers revealed disagreement with the male teacher's response, expressed as *hmmm* in a tone that represented another form of symbolic *asibizi* as the female teachers did not openly confront the male teacher. Therefore, power dynamics of respect within Xhosa society were at play, revealed as subtle, symbolic *asibizi* forms of language of avoidance.

A comforting experience revealed by the teachers was that, despite all the negative views shared, they were experiencing for the first time being in a professional platform where they could share personal challenges experienced in their professional careers. Both male and female teachers revealed feelings of being valued by figures of authority. In addition, female teachers revealed that the various conversation forms used in the study brought a therapeutic, relieved state of being as they were able to release their frustrations about teaching sexual concepts to communities who view them as rude, vulgar and breaking traditional customs.

5.4 Culturally responsive teaching strategies

The third research sub-question on ‘how do Xhosa teachers develop culturally responsive strategies to teach sexual concepts to learners in rural secondary schools?’ is addressed in this section. The aim is to determine IK-based teaching strategies used by the participants and examine their reflections on how they designed and implemented them before taking part in a professional intervention exercise.

5.4.1 Knowledge about culturally responsive strategies

The participants revealed in focus group discussions that they do not know of any form of culturally responsive teaching strategies that they could use to teach sexual concepts to their Xhosa learners. Therefore, there was no data as evidence of their use of culturally responsive strategies since they reported that ‘*we do not know any culturally responsive strategies, we simply teach these things in English*’. Therefore, a gap in knowledge was presented by the participants’ lack of knowledge about IK-based teaching strategies.

The lack of existing culturally responsive strategies is affirmed by researched studies as professional intervention strategies are scarce (Desimone, 2009). Common subject interventions were in the form of fragmented, teacher workshops such as the implementation of a new curriculum and were less effective in translating content knowledge into daily instructional lessons and strategies (Desimone & Garet, 2015; Desimone & Pak, 2017). Adedeji and Olaniyan (2011) comment on a general lack of knowledge about IK-based strategies, citing that there is little to no direction on how to teach IK. The participants’ lack of knowledge is thus not confined to the context of this study but is supported by literature. Therefore, teacher development such as the CATPD approach may be one way of providing such direction, based on an authentic research study. Hence, I went directly to the professional intervention session

of the study without a review of the teachers' existing culturally appropriate strategies. The participants willingness to take part in the CATPD and learn about strategies that might assist them in teaching the avoided sexual concepts, simplified the issue and allowed the research process to flow naturally and smoothly.

5.5 Professional development

This section responds to the fourth sub-question namely, 'what are the perceptions of Xhosa teachers about the Contiguity Argumentation Theory professional development (CATPD)?' In addressing this question regarding teachers' perceptions about CATPD, it would be helpful to remind the reader about the role of Contiguity Argumentation Theory (CAT) as a theoretical framework underpinning the design of the Xhosa IK based lesson teacher intervention program. The views of Xhosa teachers shared in the professional intervention on Contiguity Argumentation Theory were analysed, linked to CAT as an indigenous knowledge based theoretical framework guiding the study. Argumentation on teacher dialogue during the CATPD was examined using CAT's cognition categories, supported by research studies on dialogical argumentation in science education.

5.5.1 Professional development on culturally responsive teaching strategies

As the participants had already indicated that they had no IK-based teaching strategies they were introduced to CAT professional development activities founded on IK based (Gay, 2010, 2013) theories and research studies. The intention was to allow the teachers to reflect, discuss and share their perceptions about the possibility of preparing culturally responsive strategies. Research on culturally responsive strategies that integrate IK in science teaching support IK-based professional development programmes (Aikenhead et al., 2014; Gay, 2010, 2013; Mhakure & Otulaja, 2017; Ogunniyi, 2013). The CATPD was planned to provide an IK-

based professional platform for teachers sharing the same culture, language, content knowledge and grade taught and who live in close proximity to the learners they teach, in order to assist them to develop teaching strategies fitting their context.

5.5.1.2 Curriculum content on sexual concepts

As reported in Chapter Four of the manuscript (section 4.1), the second phase of the study dealt with the five mental states of cognition categorised in the Contiguity Argumentation Theory (Ogunniyi, 2007, 2013; Ogunniyi & Hewson, 2008). As studies in support of IK-based interventions suggest that the curriculum provides strong argument for such interventions, and can act as a bridge between IK and WMS (Stanley & Brickhouse, 2001), the first part of CATPD focused on human reproduction content as detailed in the Grade 12 Life Sciences' curriculum (Desimone & Pak, 2017). The participants revealed understanding of the prescribed human reproduction content knowledge that was presented by the researcher accompanied with diagrams (see figure 14 of chapter 4). They revealed that they have taught this content over many years but still struggled to teach it. Their collective sentiment was expressed by one teacher who said, *'I have been teaching this for years but it is not easy to explain it to those kids because they look at me funnily even though I use simple English'*.

5.5.1.2 Teacher engagement with Contiguity Argumentation Theory during CATPD

Five CAT cognitive states linked with IK and current science teaching strategies were presented during the second stage of the CATPD intervention.

5.5.1.3 Intra and inter-argumentation during CAT cognition level identification

The participants were initially reluctant to respond to the question asking for their own categorisation in terms of CAT cognitive levels. This avoidance of identifying their current

states of CAT levels was a concern as the group has been actively participating and shared their innermost insecurities about teaching sexual concepts in their rural schools. The question was asked again in an inclusive manner using isiXhosa language as an effort of getting a response. Still, there was no answer. Finally, a joke about the use of *philosophical English* as a Xhosa speaker managed to get the conversation started. I shared this joke so that they could not feel overwhelmed by the use of research terminology and I wanted them to feel comfortable and continue with the openness shared in earlier data generating sessions.

Enabling such as discourse was not easy. According to Ogunniyi (2013), the participants' moments of silence revealed intra-argumentation as a form of dialogical argumentation with self. Research confirms that the participants' moments of silence represented mental states where individuals were conversing with their inner self about the new CAT knowledge as compared to their existing knowledge. Therefore, it can be said that the participants were dialoguing with themselves when faced with new, foreign and abstract research terminology. The participant's behaviour confirmed the issue of respect that is regarded highly by Xhosa people therefore, the participants were protecting themselves from giving incorrect choices and possibility of losing respect of their colleagues.

The reported moments of silence affirmed the findings of other research studies on science education programmes, some of which attribute such silences to the fact that little has been done in terms of developing science education programmes that take into account cultural assumptions of indigenous communities (Snively, 2018; Snively & Corsiglia, 2001). Research on dialogue with individuals in a group suggest particular dynamics of how individuals who are in contiguity interact (Ogunniyi, 2013). Ogunniyi (2013) affirms the reported silence of group members in a group setting as intra-argumentation, a form of dialogic argumentation where individuals argue with inner self. Therefore, the silence that emerged unexpectedly in

the research process was a reality that there is paucity of knowledge about why some cultures choose to be evasive instead of giving direct responses when confronted with new (abstract) knowledge. The danger would be to ascribe the silence to a lack of understanding of new, abstract terminology. In this instance, further dialogue revealed that the teachers understood the CAT levels, but they were internalising the new experiences.

Participants responded after probing with *philosophical English* joke, revealing that the CAT cognition levels were difficult, stating clearly that *I think these steps are difficult to explain. Now, I don't want to look like I am answering to an oral test question. So, I feel it would be better to first discuss and agree as a group away from you. (PF5)*. This view set off a dialogue between group members, a conversation described as inter-argumentation by Ogunniyi (2013). Hence, after voicing of the CAT conceptions as *difficult*, other group members reasoned by agreeing that they needed the new CAT knowledge and would continue the discussion by talking among each other and reach consensus. This reported *difficult* view by the individual participant enabled a dialogue to take place as the voices of other group members were heard as they also engaged with the view and offered suggestions.

5.5.1.4 Better reasoning during the CATPD

The participants' revelations are supported in Webb (2019), where better reasoning is suggested as rooted in dialogic thinking, allowing practices that respect the creative co-presence of other voices and ideas of other people. A certain level of anxiety was discerned from the explanation of *I don't want to look like I am answering to an oral test question*. The participants were stressed by the new abstract CAT concepts and felt as if they were required to engage in an oral test, they agreed as a group to proceed on their own and excluded the researcher in that discussion. Therefore, dialoguing within themselves allowed them to reason

better by sharing their views with themselves first and then extend the dialogue to others. Broome (2013) affirms the positive effects of dialogic argument as it allows people to engage consciously and listen to each other and reason by putting their thoughts clearly in words that are understood by each other.

The issue of group consensus was revealed as a preference for group activities for deciding on the design of an IK-based lesson. The question on IK-lesson design required individual responses, however the cultural group perspective continued as participants were in dialogue with each other, giving reasons and reached agreement that the XIL be done on their own as a group, excluding the researcher. Group consensus was revealed as participants revealed as *'I feel it would be better to first discuss and agree as a group, also I think it would be better also if our response about CAT thinking can also be in writing, individually as we did with the first drawings. This is what I think'*. As the participants were experienced science teachers who knew how to design lesson plans and have shared their deeper, perceptions about sexual concepts, I found it confusing that they could not openly respond. However, the group decided that they would meet exclusively (without the researcher) while I waited for them. The request was presented with respect, and they indicated that they would come back as a group and share their plan with me after their exclusive brain-storming session.

5.5.2 Teaching menstruation with Indigenised Teaching Strategy (ITS)

The Indigenised Teaching Strategy (ITS) was designed by the Xhosa teachers through dialoguing within themselves as group members. It should be noted that the participants did not present a written, IK-designed lesson plan before teaching with the new strategy (as reported in section 4.2 of Chapter 4). They revealed a high-level of confidence in presenting a compliant CAPS-based and IK-CAT lesson revealing that *'on the question of a lesson plan, no, we didn't do it but we made sure that we can link clearly those Xhosa concepts versus*

science concepts on menstruation based on CAPS and CAT-IK'(PM3). Hence, I crossed cultural boundaries and showed a level of trust and accepted their suggestion of not presenting me with an IK-lesson in written form. I used my Xhosa IK and accepted their decision with respect while wearing my researcher's cap. I transcended my professional boundaries as a researcher and crossed onto the other side of the Xhosa teacher. That was my act of border crossing to avoid a clash that would have ensued by insisting on the IK-based lesson draft. Hence, crossing this cultural boundary provided a platform for harmony after examining a possible clash in perspectives.

Dialoguing played a critical role during teaching with the Indigenised Teaching Strategy as Webb (2019) suggests:

The success of dialogic thinking together strategies could be attributed to promoting retrieval practice. That is, in order to make an argument, one has to remember the facts and concepts that one has studied to construct the argument, and come back to the same material at different times. Similarly, developing an argument requires analysing data from current findings and constructing a coherent narrative, a process that requires interleaving different tasks to come to a claim. Doing so requires the 'educative ability' noted by Raven et al. (1995), namely problem identification, re-conceptualization of the field, and monitoring proposed solutions for consistency within all available information.

(p. 12)

The manner in which participants interacted with each other was important for the conceptualisation of the IK-WMS integrated teaching strategy. Therefore, dialogic argumentation was examined during the teacher presentation by looking for CAT cognitive levels for signs of cognitive clashes between IK and WMS concepts and see how these were

resolved by the participants. Hence, meta-analysis from different sources of data (questionnaires, drawings, focus group) mapped the levels of CAT to examine areas of cognitive conflict (Ogunniyi, 2013) between IK (avoided terms) and WMS sexual concepts. In this case, dialogic argumentation was revealed through the presentation of the Xhosa Indigenised lesson (XIL) based on the assumption that, when perspectives clash and cognitive dissonance occurs, people look for harmony. With this in mind, cognitive dissonance was noted as the participants engaged in dialogic argumentation. The clash between the use of sexual terms that were avoided in the initial stages of the research process, was harmonised through dialogical argumentation revealing cognitive shifts from the initial suppressed context to the equipollence cognitive state, allowing them to consensually name the IK version of menstruation as *engceni* or *exesheni*.

5.5.2.1 Suppressed cognition state identified through dialogical argumentation

Thematic analysis revealed evidence of cognitive shifts as suggested by Ogunniyi's CAT (Ogunniyi, 2007, 2013). Analysis of their dialogic argument before and during the presentation of the XIL provided evidence of the cognitive shift from suppressed to equipollence, confirming a move from *asibizi* (avoidance) where initially teachers avoided the use of rude language for terms viewed as culturally sensitive. In this instance, *grass time* was used effortlessly without any form of embarrassment to refer to menstruation. Furthermore, there was a change from the blind loyalty to cultural authority brought by the use of the Indigenised Teaching Strategy developed by the group.

Identification of the suppressed cognition state was revealed through the video recording from Atlas ti. 8 software. Argumentation put forward by the model-teacher was confirmed by the model-learners in the model classroom situation as '*so now, it is easy now to see and link*

out CAT and observe that we are moving from the suppressed context which suppressed our cultural practices'. Although the participants struggled earlier with identifying CAT levels, data revealed that they internalised the CAT presentation as shown by their interaction with the XIL presented by the model teacher. The model-teacher's presentation revealed a shift from suppression to equipollence in a teacher-learner classroom situation expressed as *'we have integrated our cultural terms which were used by the elderly as we use them now in our menstruation talk'*. In a typical teacher-learner mode of teaching, confirmation of equipollence was revealed as the model-teacher checked for confirmation from class members by means of an incomplete statement. As revealed by data analysis of the video with time stamped video frames, the model teacher asked:

We have moved to what is called.....?

Participants who were model-learners confirmed the cognitive shift with a group response, indicating that they have moved from suppression to equipollence:

Chorus response from colleagues....equipollent cognition. [00:02:30:00]

Ogunniyi (2007) argumentation theoretical framework was affirmed by these revelations and CAT has been used to develop and explain a harmonised IK-WMS integrated teaching strategy. While recognising criticism of Ogunniyi and Hewson (2008)'s claims where questions around the definition of indigenous knowledge, the source of IK and African ways of debate and argumentation in drawing pedagogical strategies were raised by Easton (2011), this study affirms CAT as a theoretical framework for teacher development as it addresses the socio-cultural environment of the study. A definition of IK fitting the context of Xhosa people in Africa, the source of IK and argumentation in CAT has been explained in section 2 of Chapter Two. In other words, Contiguity Argumentation Theory provided an indigenous theoretical

framework for dialogue about Xhosa cultural practices that restrict teaching of sexual concepts as experienced by teachers in a particular context.

5.5.2.2 *Equipollent cognitive level through dialogical argumentation*

The identification of the equipollent CAT cognitive category provided the ideal link between Xhosa culture and WMS teaching of the menstrual cycle. Participants revealed through dialoguing that they could integrate the period of *'jumping the fireplace after being on the grass or on time'* as equivalent to having sex after menstruation and that is the ovulation period. Participants revealed that older, unlearned women were trusted community teachers for educating the nation about menstruation and issues of womanhood. In so doing, they possessed and transmitted cultural knowledge that was comparable to the scientific stages of the menstrual cycle.

Dialogic argumentation provided a platform for participants to make comparisons between IK and WMS concepts used in the ITS, identified parallels between the two and revealed that IK has been elevated through their own IK-based teaching strategy. This view was stated as they shared that *'our culture co-exists with science and we have merged it with science so that it becomes so easy to teach and understand when it is like that'*. Participants revealed a sense of ownership and internalisation of the CAT cognitive shifts as they contributed during the presentation, with male participants revealing that *'we trust our lady teacher here (simthembile u Miss wethu lo)...applause...clapping and yheeeee as he is finishing to speak'*. (PM3). The dialogue revealed the restoration of the female figure as the bearer of knowledge and a trusted teacher in society.

Keeping within traditional indigenous spirit of "Ubuntu where the individual is a person through other people" (Ogunniyi, 2013, p. 133), the XIL and ITS affirmed the idea of

maintaining a harmonious relationship between clashing perspectives. However, data analysis during the last phase of participant confirmation, presented a new scenario where they expressed that they wanted something new that goes beyond the harmonious, equipollent level espoused by Ogunniyi's CAT.

5.5.2.3 Bakhtin's heteroglossia on language issues on Indigenised Teaching Strategy

The language perspectives of the participants were viewed using Bakhtin's linguistic theoretical framework of heteroglossia (Bakhtin, 2010) to illuminate the interactions between familiar, everyday language versus formal science language in homogenous indigenous groupings. It is worth noting that Bakhtin's theory was developed during the Stalin era in Russia (Rule, 2011) therefore, the context is different from that of African Indigenous communities. However, the study adopted Bakhtin's linguistic analytical theory due to similarities between his linguistic analysis and differences in Xhosa terms due to residing in different geographical areas while sharing the same language and culture. Bakhtin's theory recognises the need for opposing voices such as those of the marginalised and oppressed to be heard by the rulers in order to motivate for social justice. In this case, Bakhtin's theory provides linguistic grounding for validating the trajectory of the multiple voices of Xhosa indigenous teachers emancipating themselves from barriers when learning science in English as the language of instruction.

5.5.2.4 The heteroglossic perspective of the Primitive Cultural Counting Program (PCCP)

The heteroglossic perspective was revealed by different names given to sexual parts and sexual processes by members of an isiXhosa speaking population grouping. The participants

revealed that elderly Xhosa people were able to count the safe and unsafe days for sexual intercourse after menstruation, using different terms for menstruation such as *engceni* or *exesheni*. This represents what Bakhtin (2010) regarded as a polyphony or multiplicity of language that, in this study, was argued from a position of different regions of Xhosa people having variations in language use, which can be regarded as polyphony; double-voiced discourse and multi-voicedness (Bakhtin, 2010; Cooren & Sandler, 2014; Nesari, 2015). What was revealed by considering Bakhtin's heteroglot nature of language, was a Xhosa IK cultural counting program counting system using the different Xhosa terms of *engceni* or *exesheni* similarly denoting menstruation as a basis of counting the safe and unsafe days (see Figure 15 in Chapter 4) for falling pregnant. This Primitive Cultural Counting Program (PCCP) provided a time schedule that was roughly equivalent to the explanation of the scientific menstrual cycle in the school curriculum (CAPS).

The PCCP is used as a family planning program where sex is avoided during the period after the completion of the actual menstruation, expressed as *'in terms of our culture, that is why our parents could not 'jump the fireplace' when they are 'on the grass'*. Therefore, as reported, there was a PCCP for *jumping the fireplace*, an IK term comparable to copulation or sexual intercourse in WMS terminology (see figure 15 in chapter 4). Likewise, the endometrium was seen as *soil ready to receive something new*, meaning that the endometrium was ready for receiving a fertilised zygote in scientific terms for a pregnancy to occur. During video teaching with the ITS, participants confirmed that *some geographical regions refer to a menstruating woman as being 'on time', this 'on time' exesheni is traced from our parents*. In line with dialogic argumentation, when there is a polyphony or multi-voicedness in a dialogue, meaning could be negotiated (Nesari, 2015). In this case, participants revealed negotiation and explanation between the different opinions on sexual concepts (Figure 15). Hence, the CATPD

provided heteroglossic and multiple voiced opportunities for teachers of the same culture who teach the same subject, to negotiate sexual concepts that they can use to refer to the culturally avoided terms.

5.6 Perceptions on indigenized teaching strategy

The fifth sub-question in this study is ‘how do Xhosa teachers perceive the use of Indigenised Teaching Strategies (ITS) when teaching sexual concepts to a homogenous group of learners in rural secondary schools?’ As already seen, the Xhosa teachers welcomed the use of the ITS. They also noted that they never appreciated that their language is very rich and could be used in science. The heteroglossic nature of isiXhosa language revealed through the different terms for menstruation, the endometrium, ovulation and the Primitive Cultural Counting Program, elevated their perception of their culture and they began to see it as being an equivalent way of explaining scientific concepts. Excerpts from the evaluation of the Indigenised Teaching Strategy and the research process illustrate a change in their thinking:

After the discussions we had, my mindset changed. I believe that if sessions like these can occur regularly, teaching human reproduction will be much better. Curriculum developers must do a lot more work of closing the gap between cultural beliefs and scientific concepts in Life Sciences. (2A).

Now that I have knowledge of culturally responsive teaching strategies (CRTs), it is going to be different as I am feeling better when approaching the topic on human reproduction. Taboo feeling related to human reproduction language and my home language is removed. (2B).

The data generated during the ITS implementation affirmed similarities between IK and WMS in terms of the knowledge to be taught. The data also revealed the avoidance strategies used when teaching taboo topics. Most importantly, the participants highlighted the fact that the use of CAT and Xhosa IK has freed them from being completely bound by Xhosa cultural authority. They saw the use of the Indigenous Teaching Strategy as a revival of their Xhosa culture and enjoyed using both new and familiar terms such as *ukutsib'i ziko*, which was familiar to the females but new to the male participants.

5.7 Implications

While recognizing the limitations due to the small sample size in this qualitative study, the challenges experienced by Xhosa teachers when teaching the culturally taboo topic, and their responses to the use of the culturally responsive strategy used, suggest a number of implications and issues in terms of dealing with cultural taboos when teaching.

The first is a curriculum related issue as there was a call from the participants for more professional intervention programmes of this nature. They wanted more exposure to culturally responsive strategies to assist them in presenting other curriculum issues. The argument for more culturally responsive strategies was based on a high level of comfort, as indicated by '*I will be comfortable in my class now when teaching these sexual terms because my culture and scientific knowledge will be integrated*'. This is an important issue when considered against the high level of fear, insecurity and ineffective teaching strategies used by these Xhosa teachers, which they attributed to the contextual factors highlighted earlier in this manuscript.

The second implication is for broader dialogue towards interventions that will provide a more secure teaching environment for teachers in communities that have social restrictions on what and what cannot be said or taught, and the consequences when teachers do not conform.

School Management Teams and department officials are also implicated as part of community and school education interventions. It is during such interventions that the plight of teachers, as is the case of the Life Sciences' teachers who participated in this study, can be shared with parents and community members to create a shared understand of the challenges that teachers face in their classrooms. In so doing so, the aim would be for developing community support for the teachers, rather than confrontation and disrespect.

A third implication is one of an epistemological issue of language of teaching and learning in the classroom. The exclusive use of English as the language of teaching raises questions of epistemic privilege within the same Xhosa indigenous community. The study findings suggest that the evidence based on this small-scale research points to the use of IK-based terms such as Xhosa euphemisms acting as bridging tools for avoided sexual concepts, is a viable strategy. Bringing the epistemic knowledge of people in very remote, rural areas to the broader educational community should assist the discourse on the contribution of Indigenous Knowledge to teaching and learning. In the case of this study, the findings should contribute to growing understandings and of the challenges and imperatives of science education and IK in remote and rural contexts where local culture is a powerful aspect of social life and education.

Maringe and Moletsane (2015) confirm that rural settings have untapped cultural and indigenous knowledge systems that have yet to find space in education. Hence, knowledge systems of homogenous groupings of Xhosa teachers who are indigenous to the Eastern Cape, need to find space within mainstream society and be reported in research studies as filtered through the cultural lens of Xhosa people residing within indigenous community members. The data from this study suggest that language linked to culture can be considered as a fifth language issue in science education and most probably in other disciplines, over and above the

language of home, school, discipline, and use of a second (or third or fourth) language of teaching and learning. All of these language issues are a barrier to learning in one way or another, and to greater or lesser extents. However, while the other language issues have been debated in science education circles, the latter issue, language linked to culture and taboos, has received scant attention.

Although the results and findings of the study cannot be generalised due to the small sample used, the issue of *asibizi* is important as most teachers in the Eastern Cape are in rural schools and many rural school teachers may be suffering from *asibizi* and strong adherence to cultural authority. Therefore, it is probably fair to say that more IK-based professional intervention sessions by the Eastern Cape Department of Education and/or other sources would be of value in terms of better teaching and social change towards improved teacher support in rural schools and communities; a view supported by the teachers who participated in this study.

5.8 Chapter summary

In this chapter the data presented in response to the main research question posed in Chapter One are discussed. The findings are based on the qualitative data generated through the four cycles of the Critical Participatory Action and Learning and Action Research (CPALAR) design using multiple data generating instruments as reported in chapter three (methodology) and chapter four (data analysis). These data are discussed together based on the similarities revealed through all the CPALAR phases, with the aim of answering the research subsidiary questions. The literature review presented in chapter two was used to interrogate qualitative data regarding teaching of sensitive sexual concepts using an IK-based Contiguity Argumentation Theory strategy within a dialogic argumentation theoretical framework and analysis of language differences within Bakhtin's heteroglossia theory.

Discussion of the findings were based on the sub-questions related to Indigenous Xhosa teachers' perception about the role played by cultural taboos in teaching sexual concepts to learners who share the same Xhosa culture in the rural schools where they teach and how Xhosa teachers used culturally responsive strategies when teaching sexual concepts. In addition, discussion of the perceptions of Xhosa teachers on the use of the Contiguity Argumentation Theory Professional Development (CATPD) strategy revealed that the process was received favourably. The teachers developed an Indigenous Teaching Strategy based on CAPTD that they believed was a viable way of surmounting cultural obstacles to teaching biology of a sexual nature in their classes. In other words, the CATPD led to the successful design of Indigenised Teaching Strategy (ITS) for teaching sexual concepts when teaching a homogenous group of learners in rural secondary schools.

CHAPTER 6

REFLECTIONS, RECOMMENDATIONS AND CONCLUSIONS

6.1 Introduction

This study confirms that a connection was made between two situations where the teachers transitioned from a state of *no knowledge of culturally responsive strategies* (as reported in Chapter 4) to a state of collaborative development of a new, Indigenised Teaching Strategy (ITS) for teaching the menstrual cycle. In other words, Xhosa teachers drawn from remote, rural, indigenous communities transitioned from a state of complete language avoidance of *asibizi* to a more open, IK-based articulation of previously-avoided sexual concepts.

As revealed by the literature reviewed in this report, transitioning from content knowledge of a sexual nature in a discipline such as science to IK-admissible knowledge is by its very nature problematic. Nevertheless, this study enabled the identification of two key linguistic issues that enabled such a transition to happen. Firstly, change was brought about through dialogue using the indigenist cognitive perspective of Contiguity Argumentation Theory (Ogunniyi, 2007, 2013). Secondly, change was enabled through the participants collective ability to use their own polyphony (Bakhtin, 2010) of Xhosa terms to develop a culturally responsive strategy that allowed confident teaching and clarification sexual concepts in the vernacular. As such, the claim is made that recognising and integrating the indigenous knowledge of indigenous people is key for developing culturally responsive science teachers who can use their IK to develop culturally responsive strategies for teaching sensitive sexual concepts.

6.2 Change and Indigenised Teaching Strategy (ITS)

The change from the stubborn, cultural authority that was evident in *asibizi* (Simayi & Webb, 2020) to a culturally responsive Indigenised Teaching Strategy was clear, yet not easy to attain. Language contradictions presented by the language of the WMS discipline versus the IK of indigenous people were mediated through the use of an ITS. The ITS addressed the main research question of this study as teachers took action to change their current teaching situation by developing culturally responsive strategies that could suit their school contexts, using the rich language and historical cultural practices of Xhosa indigenous grouping. As reported earlier in Chapter 5 of this study, participants revealed that the strength of Xhosa cultural authority made it impossible (before the CATPD) to name sexual concepts in isiXhosa. Therefore, the ITS addressed the question of restrictive cultural taboos that inhibited effective teaching of sexual terms by providing an alternative teaching strategy framed on Xhosa IK-based language. The ITS was used as a springboard for naming and teaching prescribed English science sexual terms. Hence, the ITS was used as a springboard for effective teaching as it enabled teachers to cross barriers set by cultural inhibitions while elevating and integrating cultural practices and language of indigenous grouping into modern science teaching.

6.3 Change with Contiguity Argumentation Theory and Bakhtin's heroglossia

The ITS was developed through a Contiguity Argumentation Theory-based Professional intervention (Ogunniyi, 2013; Ogunniyi & Hewson, 2008) that recognised language multiplicity accommodated by Bakhtin's heteroglossia theory (Bakhtin, 2010; Cooren & Sandler, 2014). Change emerged through CAT as Xhosa teachers who had no previous knowledge of culturally responsive strategies at the beginning of the study, changed their situation and designed a new ITS. The indigenist CAT perspective created a thinking platform for teachers to argue with themselves first as individuals (intra-argumentation) (Ogunniyi,

2013) as well as with the group members (inter-argumentation) about sexual concept contradictions. Through CAT, participants identified a cognition shift from the suppressed level of CAT that prevented them from naming sexual concepts to the aspired, harmonious equipollent level. Through dialogical argumentation (Ogunniyi, 2013), the ITS gave the teachers room to argue among themselves and negotiate consensus on the use of different euphemistic terms for sexual concepts to reach a common understanding. An example is the use of different Xhosa concepts such as *engceni* (*on grass*) or *exesheni* (*on time*) for menstruation. The dynamics of different language terms for similar parts or objects that are found among same cultures based on different geographical location, were argued through Bakhtin's theory of heteroglossia (Cooren & Sandler, 2014). In addition, the teachers further evaluated the Xhosa IK-based terms on sexual concepts and agreed on its efficacy for meeting Grade 12 CAPS requirements, using their experience as Life Science teachers.

Issues related to Contiguity Argumentation Theory used in the professional intervention:

- CAT research knowledge is initially difficult to comprehend and teachers should be given time to internalise the new knowledge.
- CAT mentally engaged the teachers' thinking abilities by making them aware of indigenous theories that could be linked to WMS, theories that were in line with their cultural beliefs as part of indigenous cultures.
- CAT introduced teachers to indigenist theories that they were reportedly not aware of, theories that confronted the Eurocentric view of science by showing harmonising, cognitive strategies that integrate IK with WMS without conflict.
- CAT allowed voluntary cognition identification of individual CAT levels and changes to more integrated, higher levels of cognition.

6.4 Reflections and lessons learned

On reflection, I can clearly see what I call the hiatus or detour points in my research journey. The virtue of having an experienced supervisor plays a major role on whether a study fails or goes through. During these three hiatus experiences, I was far away from my university as fieldwork was in rural villages that were 900 kilometres far from my urban, residential university centre. Although I was nervous, consultation with my supervisor ensured that the study continued within the selected PALAR research design. What changed was the paradigm. When I felt alone and uncertain and explained to my supervisor that the initial interpretive paradigm was no longer relevant, he confidently explained that the *critical paradigm had found me through the participants*.

As reported earlier in Chapter 3, there were moments where I believed that the research was at a dead end because of moments of non-cooperation by the participants. The first moment occurred when the teachers refused to disclose the vernacular sexual terms that they used to explain sexual concepts. That question was important during the focus interviews as it addressed the research sub-question of language and cultural taboos. I had to make a joke to break the impasse. The second hiatus was when they refused to disclose their CAT cognitive levels after the CATPD. That was important for establishing their identified CAT level to find out if they understood the research content on CAT and their own CAT level identification. The third refusal was when they indicated that they did not want me as part of the Xhosa Indigenised Lesson preparation and I should rather let them prepare on their own.

Lessons learnt from these reflections have implications for future researchers. I believe that listening to the participants and keeping communication lines open with one's supervisor is of utmost importance. In this instance, the participants did not just refuse instead, they

provided alternative strategies to ensure that the study continued according to their own context. In that way they ensured that their voices were listened to and they had a sense of ownership of the study. Also, implications of the instances of research detour or hiatus are that initial research designs can be adapted to produce amended ones that serve their purpose meaningfully and fruitfully. For example, the originally PALAR design which was selected for its flexible nature, was adapted to a Critical PALAR (CPALAR) through participant intervention, which resulted in the research sub-questions being adapted slightly.

6.5 Recommendations

Considering that the different isiXhosa heteroglots used for sexual terms enabled the improved teaching of sexual terms via a CATPD intervention, the following broad recommendations are made for stakeholders with an interest in developing culturally responsive strategies in rural schools. They are:

- Conduct regular professional intervention (Desimone & Pak, 2017) sessions on IK and science teaching using Indigenised Teaching Strategies as a point of focus. Teachers can develop a bank of substitute Xhosa terms that can be used as substitutes for sensitive concepts.
- Extend the professional intervention to include officials of the department of education so that the new knowledge is used by the governing education sections in school material.
- Empower rural-based teachers (Budge, 2006, 2010; Nkambule et al., 2011) through science content-based sessions which are linked with their IK so that they can develop culturally responsive strategies.

- Extend the IK-based sessions and Xhosa heteroglots for sexual terms to rural communities through the Chiefs and Ward Councillors so that Xhosa heritage is maintained.
- Educate males in meetings, radio and media about sexual concepts and IK to spread knowledge and dispel fear of victimisation and disrespect experienced by female teachers.

Although the substitute terms referred to in this study are specific and were drawn from Xhosa history used long ago by unlearned yet authoritative women elders, the methods are transferrable (Gay, 2013) to other aspects of teaching and learning in communities which are positioned in rural spaces. This claim is made as the use of the Contiguity Argumentation Theory (CAT) as a Professional Development with rural teachers in a deeply culturally determined community has been shown to be effective, and because local linguistic heteroglots and history is still known by many deeply rural Xhosa people (Mda, 2007).

6.6 Conclusions

The internalisation of Contiguity Argumentation Theory (Ogunniyi, 2013) through dialogical argumentation enabled verbalisation of culturally avoided, taboo sexual concepts. I believe that the complete avoidance of naming and clarifying sexual concepts in the vernacular was a persistent stumbling block to teaching and learning. Had it remained unchanged, the status quo would continue to have negative implications for teaching and learning in rural schools due to improper teaching of prescribed science concepts.

The use of Bakhtin's heteroglossia theory helped to accommodate the use of different substitute terms to clarify sensitive sexual concepts and processes such as *ukutsib'i ziko*, meaning 'jumping the fire'. As noted earlier, the term means sexual intercourse or copulation.

Legitimising the heteroglossic perspective helped the teachers to use indigenised ways of naming things such as sexual parts and sexual processes with confidence. The heteroglossic perspective helped to position the teaching of culturally sensitive concepts in the “sociocultural context in which learning is located” (Hodson, 2014, p. 250).

In short, this study confirms that the use of an Indigenised Teaching Strategy developed by isiXhosa language speaking teachers broke the barriers of avoided teaching of sexual concepts to a homogeneous group of learners in rural schools. Therefore, the issue of familiar language is regarded as a fundamental form of communication and as a means of empowering teachers working in marginalised, rural and indigenous Xhosa communities.

These findings of this study are important as they confirm that the use of culturally responsive teaching strategies developed by isiXhosa language speaking teachers can break the barriers of avoided teaching of sexual concepts to a homogeneous group of learners in rural schools. Similarly, the issue of familiar language can be regarded as a fundamental form of communication and as a means of empowering teachers working in marginalised, rural and indigenous Xhosa communities.

The claim made earlier in terms of using Contiguity Argumentation Theory (CAT) as a effective professional intervention with Xhosa teachers in a deeply culturally determined community, while not generalisable, should be kept in mind when considering teacher development in other indigenous communities and/or disciplines. This point is made as CAT appears to as an effective professional development tool and because local linguistic heteroglossia and cultural history is known by many indigenous people worldwide (Hodson, 2010).

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APPENDIX 1

H19-EDU-ERE-002 A SIMAYI.29MAY2019ENDIX 1



PO Box 77000, Nelson Mandela University, Port Elizabeth, 6031, South Africa mandela.ac.za

Chairperson: Research Ethics Committee (Human)
Tel: +27 (0)41 504 2347
Sharlene.Govender@mandela.ac.za

Ref: [H19-EDU-ERE-002 / Approval]

17 February 2021

Prof P Webb
Faculty: Education

Dear Prof Webb

A CULTURALLY RESPONSIVE STRATEGY FOR TEACHING SEXUAL CONCEPTS IN RURAL XHOSA SECONDARY SCHOOLS

PRP: Prof P Webb
PI: Mrs A Simayi

Your above-entitled annual progress report (APR) was reviewed by REC-H EXCO for approval. We take pleasure in informing you that the Research Ethics Committee (Human) has approved your report. Please note the following as you continue your study to its completion:

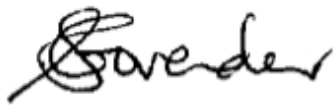
1. In the event of a requirement to extend the period of data collection (i.e. for a period in excess of 1 calendar year from date of original approval of study), completion of an extension request is required (form RECH-005 available on Research Ethics Committee (Human) portal)
2. In the event of any changes made to the study (excluding extension of the study), completion of an amendments form is required (form RECH-006).
3. Immediate submission (and possible discontinuation of the study in the case of serious events) of the relevant report to RECH (form RECH-007) in the event of any unanticipated problems, serious incidents or adverse events observed during the course of the study.
4. Immediate submission of a Study Termination Report to RECH (form RECH-008) upon expected or unexpected closure/termination of study.
5. Immediate submission of a Study Exception Report of RECH (form RECH-009) in the event of any study deviations, violations and/or exceptions.
6. Acknowledgement that the study could be subjected to passive and/or active monitoring without prior notice at the discretion of Research Ethics Committee (Human).

Please inform the REC-H, via your faculty representative, if any changes (particularly in the methodology) occur during this time (forms as above). An annual affirmation to the effect that the protocols in use are still those for which approval was granted, will be required from you.

Please quote the ethics clearance reference number in all correspondence and enquiries related to the study. For speedy processing of email queries (to be directed to Imtiaz.Khan@mandela.ac.za), it is recommended that the ethics clearance reference number together with an indication of the query appear in the subject line of the email.

We wish you well with the continuation of your study.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Govender', with a stylized flourish at the end.

Dr S Govender
Chairperson: Research Ethics Committee (Human)

Cc: The Office of Research Development
Faculty Officer: Education

APPENDIX 2

DOE APPROVAL LETTER FOR PHD STUDY AYANDA SIMAYI



STRATEGIC PLANNING POLICY RESEARCH AND SECRETARIAT SERVICES
Steve Vukile Tshwete Complex • Zone 6 • Zweelitsha • Eastern Cape
Private Bag X0032 • Bhisho • 5605 • REPUBLIC OF SOUTH AFRICA
Tel: +27 (0)40 608 4691/4773 • Fax: +27 (0)86 742 4942 • Website: www.ecdoe.gov.za

Enquiries: B Pamla

Email: babalwa.pamla@ecdoe.gov.za

Date: 12 June 2019

Mrs. Ayanda Simayi

Dear Mrs. Simayi

PERMISSION TO UNDERTAKE A DOCTORAL RESEARCH: TEACHING HUMAN REPRODUCTION CONTENT IN GRADE 12 LIFE SCIENCES – THE ROLE OF TEACHERS' CULTURE IN RURAL SCHOOLS

1. Thank you for your application to conduct research.
2. Your application to conduct the above-mentioned research involving over 28 participants from 27 selected schools in the Eastern Cape Department of Education (ECDoE) is hereby approved based on the following conditions:
 - a. there will be no financial implications for the Department;
 - b. institutions and respondents must not be identifiable in any way from the results of the investigation;
 - c. you seek parents' consent for minors;
 - d. it is not going to interrupt educators' time and task;
 - e. you present a copy of the written approval letter of the Eastern Cape Department of Education (ECDoE) to the Cluster and District Directors before any research is undertaken at any institutions within that particular district;
 - f. you will make all the arrangements concerning your research;
 - g. the research may not be conducted during official contact time, provided that an arrangement to do research at the school including getting inside a classroom has been arranged and agreed upon in writing with the Principal and the affected teacher;



- h. should you wish to extend the period of research after approval has been granted, an application to do this must be directed to Chief Director: Strategic Management Monitoring and Evaluation;
 - i. your research will be limited to those institutions for which approval has been granted, should changes be effected written permission must be obtained from the Chief Director: Strategic Management Monitoring and Evaluation;
 - j. you present the Department with a copy of your final paper/report/dissertation/thesis free of charge in hard copy and electronic format. This must be accompanied by a separate synopsis (maximum 2 – 3 typed pages) of the most important findings and recommendations if it does not already contain a synopsis.
 - k. you present the findings to the Research Committee and/or Senior Management of the Department when and/or where necessary.
 - l. you are requested to provide the above to the Chief Director: Strategic Management Monitoring and Evaluation upon completion of your research.
 - m. you comply with all the requirements as completed in the Terms and Conditions to conduct Research in the ECDoE document duly completed by you.
 - n. you comply with your ethical undertaking (commitment form).
 - o. You submit on a six monthly basis, from the date of permission of the research, concise reports to the Chief Director: Strategic Management Monitoring and Evaluation
3. The Department reserves a right to withdraw the permission should there not be compliance to the approval letter and contract signed in the Terms and Conditions to conduct Research in the ECDoE.
4. The Department will publish the completed Research on its website.
5. The Department wishes you well in your undertaking. You can contact the Director, Ms. NY Kanjana on the numbers indicated in the letterhead or email nelisa.kanjana@ecdoe.gov.za should you need any assistance.



NY KANJANA
DIRECTOR: STRATEGIC PLANNING POLICY AND RESEARCH
FOR SUPERINTENDENT-GENERAL: EDUCATION

APPENDIX 3A

DISTRICT DIRECTOR A SIMAYI 3 MAY 2019

• PO Box 77000 • Nelson Mandela University
• Port Elizabeth • 6031 • South Africa • www.mandela.ac.za

NELSON MANDELA
UNIVERSITY

Appendix 3

The District Director
Chris Hani District
Cofimvaba
Eastern Cape
3rd May 2019

REQUEST FOR PERMISSION TO CONDUCT RESEARCH IN SCHOOLS

Dear Sir

My name is **Ayanda Simayi**, and I am a **PhD Science Education** student at the Nelson Mandela University in Port Elizabeth. The research I wish to conduct for my **Doctoral thesis** involves *the role of teachers' culture in teaching human reproduction content in Grade 12 Life Sciences in rural high schools*. This project will be conducted under the supervision of **Professor Paul Webb (Nelson Mandela University, South Africa)**.

I am hereby seeking your consent to approach rural high schools in the Chris Hani district with Life Sciences as a subject in Grade 12. As a result of your teachers' participation in this study, they stand to gain new skills on how researched cultural-responsive strategies are used to teach human reproduction. Also, teachers stand to gain recognition and understanding by Westernised Science about their own voice as teachers of isiXhosa-speaking culture on how to teach human reproduction.

I have provided you with a copy of my thesis proposal which includes copies of the measure and consent and assent forms to be used in the research process, as well as a copy of the approval letter which I received from the Nelson Mandela University Research Ethics Committee (Human). Upon completion of the study, I undertake to provide the Department of Education with a bound copy of the full research report. If you require any further information, please do not hesitate to contact me on [REDACTED] and email at [REDACTED]

Thank you for your time and consideration in this matter.

Yours sincerely,

Ayanda Simayi
Nelson Mandela University

APPENDIX 3B

SES LETTER H19 EDUERE 002 A SIMAYI3 MAY 2019

• PO Box 77000 • Nelson Mandela University
• Port Elizabeth • 6031 • South Africa • www.mandela.ac.za



Appendix 3

The Subject Education Specialist
Chris Hani District
Cofimvaba
Eastern Cape
3rd May 2019

REQUEST FOR PERMISSION TO CONDUCT RESEARCH IN SCHOOLS

Dear Miss.....

My name is **Ayanda Simayi**, and I am a **PhD Science Education** student at the Nelson Mandela University in Port Elizabeth. The research I wish to conduct for my **Doctoral thesis** involves *the role of teachers' culture in teaching human reproduction content in Grade 12 Life Sciences in rural high schools*. This project will be conducted under the supervision of **Professor Paul Webb (Nelson Mandela University, South Africa)**.

I am hereby seeking your consent to approach rural high schools in the Chris Hani district with Life Sciences as a subject in Grade 12. As a result of your teachers' participation in this study, they stand to gain new skills on how researched cultural-responsive strategies are used to teach human reproduction. Also, teachers stand to gain recognition and understanding by Westernised Science about their own voice as teachers of Xhosa culture on how to teach human reproduction.

I have provided you with a copy of my thesis proposal which includes copies of the measure and consent and assent forms to be used in the research process, as well as a copy of the approval letter which I received from the Nelson Mandela University Research Ethics Committee (Human). Upon completion of the study, I undertake to provide the Department of Education with a bound copy of the full research report. If you require any further information, please do not hesitate to contact me on [REDACTED] and email at [REDACTED]

Thank you for your time and consideration in this matter.

Yours sincerely,

Ayanda Simayi
Nelson Mandela University

APPENDIX 3C

PRINCIPAL LETTER H19 EDUERE 002 A SIMAY I3 MAY 2019

• PO Box 77000 • Nelson Mandela University
• Port Elizabeth • 6031 • South Africa • www.mandela.ac.za



Appendix 4

The Principal
Chris Hani District
Cofimvaba
Eastern Cape
3rd May 2019

REQUEST FOR PERMISSION TO CONDUCT RESEARCH IN SCHOOLS

Dear Sir/Madam

My name is **Ayanda Simayi**, and I am a **PhD Science Education** student at the Nelson Mandela University in Port Elizabeth. The research I wish to conduct for my **Doctoral thesis** involves *the role of teachers' culture in teaching human reproduction content in Grade 12 Life Sciences in rural high schools*. This project will be conducted under the supervision of **Professor Paul Webb (Nelson Mandela University, South Africa)**.

I am hereby seeking your consent to approach rural high schools in the Chris Hani district with Life Sciences as a subject in Grade 12. As a result of your teachers' participation in this study, they stand to gain new skills on how researched cultural-responsive strategies are used to teach human reproduction. Also, teachers stand to gain recognition and understanding by Westernised Science about their own voice as teachers of Xhosa culture on how to teach human reproduction.

I have provided you with a copy of my thesis proposal which includes copies of the measure and consent and assent forms to be used in the research process, as well as a copy of the approval letter which I received from the Nelson Mandela University Research Ethics Committee (Human). Upon completion of the study, I undertake to provide the Department of Education with a bound copy of the full research report. If you require any further information, please do not hesitate to contact me on [REDACTED] and email at [REDACTED].

Thank you for your time and consideration in this matter.

Yours sincerely,

Ayanda Simayi
Nelson Mandela University

APPENDIX 4

INFORMATION AND INFORMED-CONSENT A SIMAYI 3 MAY 2019

NELSON MANDELA METROPOLITAN UNIVERSITY

INFORMATION AND INFORMED CONSENT FORM

RESEARCHER'S DETAILS	
Title of the research project	Teaching human reproduction content in Grade 12 Life Sciences: the role of teachers' culture in rural schools
Reference number	H19 EDU ERE 002
Principal investigator	Ayanda Simayi
Address	Faculty of Education, South Campus, Nelson Mandela University, Port Elizabeth
Postal Code	6001
Contact telephone number (private numbers not advisable)	041 504 2969

A. DECLARATION BY OR ON BEHALF OF PARTICIPANT		Initial
I, the participant and the undersigned	(full names)	
ID number		
OR		
I, in my capacity as	(parent or guardian)	
of the participant	(full names)	
ID number		
Address (of participant)		

A.1 HEREBY CONFIRM AS FOLLOWS:		Initial
I, the participant, was invited to participate in the above-mentioned research project		
that is being undertaken by	Ayanda Simayi	
From	Faculty of Education	
of the Nelson Mandela Metropolitan University.		

THE FOLLOWING ASPECTS HAVE BEEN EXPLAINED TO ME, THE PARTICIPANT:			Initial
2.1	Aim:	<p>To explore the role of isiXhosa culture and teaching strategies used when teaching human reproduction curriculum content in Grade 12 rural high schools</p> <p>The information will be used to create a platform with teachers and education department curriculum planners on how to integrate indigenous cultural knowledge into Life Science teaching.</p> <p>Proposed time-line for data collection in 2019 (June-September):</p> <ol style="list-style-type: none"> (1) 3rd-5th June: Step 1, issuing of exploratory questionnaires to determine whether there are isiXhosa cultural taboos that influence teaching of human reproduction. (2) 13th-14th June: Step 2, workshop over two days. The aim is to share researched cultural-responsive teaching strategies (CRTs) with an expert, followed by the development of own Indigenous (isiXhosa-based) cultural-responsive teaching strategies (ICRTs). (3) 9th-26th July: Step 3, participants teach in their own schools using ICRTs and reflect in their own journals after each teaching session. Discussion and critical reflections about using the new ICRT tool. (4) 27th September: Step 4, researcher presents in a seminar. Invited guests will include participants who are willing to attend, department of education officials, other Life Sciences teachers working in rural areas in the same district, teacher unions and university academics. 	
2.2	Procedures:	<p>I understand that I would be answering a qualitative questionnaire to determine the influence of cultural taboos when teaching human reproduction content. At a later stage, I will attend a workshop to learn and share cultural-responsive teaching strategies. Video recording of group discussions will take place and collected data will be used for the betterment of teaching human reproduction content knowledge. Personal drawings of how I feel when teaching will not be discussed in public however, the researcher will use the drawings and descriptive texts for the study and later conference proceedings. In Step 3, I will teach using a new lesson strategy based in my culture. My reflections will be in the form of descriptive drawings again. Discussions will be audio recorded as we give our personal views about the whole study. Conclusion, the researcher will present our drawings anonymously to show to the Science world how we feel.</p>	
2.3	Risks:	<p>The nature of the study contains sensitive information about sexual-related terminology and impoverished social conditions, therefore the principle of beneficence (Belmont Report, 1978) will be observed to protect participants from the possibility of embarrassment and feelings of shame. To ensure protection of privacy and prevention of harm, alternative arrangements will be made with a counsellor residing in the geographical area of Chris Hani district. Remedial measures in case of trauma will be provided and paid for by the researcher. Participants will be made aware when signing attached consent forms. Also, data collection in the form of individual, personal drawings will remove conditions that may cause harm such as group discussions of personal feelings in public, thereby protecting and preserving human respect.</p>	

2.4	Possible benefits:	As a result of my participation in this study, I stand to gain new skills on how researched cultural-responsive strategies are used to teach human reproduction. Also, I stand to gain recognition and understanding by Westernised Science about my own voice as a teacher of isiXhosa-speaking culture on how I teach human reproduction, the challenges I experience and how our indigenous knowledge can be integrated into the curriculum.			
2.5	Confidentiality:	My identity will not be revealed in any discussion, description or scientific publications by the investigators. Also, my school's name will not be used as a reference.			
2.6	Access to findings:	Any new information or benefit that develops during the course of the study will be shared as follows: Each step of PALAR has a session of reflections where I will have a say on what is happening in that stage, thereby validating the authenticity of conclusions taken.			
2.6	Voluntary participation / refusal / discontinuation:	My participation is voluntary	YES	NO	
		My decision of whether to participate or not to, will in no way affect my present or future care / employment / lifestyle. I may leave the study at any stage and any data collected, will be my property. However, the researcher will get copies of my original data that I consented for to use for continuation of the study.	TRUE	FALSE	

3. THE INFORMATION ABOVE WAS EXPLAINED TO ME/THE PARTICIPANT BY:								<u>Initial</u>
(name of relevant person)								
In	Afrikaans		English		Xhosa		Other	
and I am in command of this language, or it was satisfactorily translated to me by								
No translator as sample of teachers will be speaking both isiXhosa and English								
I was given the opportunity to ask questions and all these questions were answered satisfactorily.								

4.	No pressure was exerted on me to consent to participation and I understand that I may withdraw at any stage without penalisation.	
----	---	--

5.	Participation in this study will not result in any additional cost to myself.	
----	---	--

A.2 I HEREBY VOLUNTARILY CONSENT TO PARTICIPATE IN THE ABOVE-MENTIONED PROJECT:		
Signed/confirmed at	On	20
Signature or right thumb print of participant	Signature of witness:	
	Full name of witness:	

APPENDIX 5

CONFIDENTIALITY CONSENT TO DRAWINGS AND AUDIO A SIMAYI MAY

2021

P.O. Box 77000 • Nelson Mandela University
Port Elizabeth • 6031 • South Africa
www.mandela.ac.za



Research Title: A culturally responsive strategy for teaching sexual concepts in rural Xhosa secondary schools

Participant's Confidentiality Clause and Consent for Audio Recording and Drawings with descriptive text

I (Name, Surname)-----agree to keep all the project information confidential and that the information will only be discussed with other participants. I also consent that **audio recording and drawings** can be used for qualitative data analysis and validation of the study. I append my signature as consent to the use of my audio recording for the final thesis and later article and conference proceedings linked to the study for a period of 5 years after completion.

Signature: -----

Date: -----

I consent further to the use of my **drawings with descriptive text** for the purpose of the study for a period not exceeding 5 years after completion.

Signature: -----

Date: -----

APPENDIX 6

FOCUS GROUP TOOL A SIMAYI MAY 2019

P.O. Box 77000 • Nelson Mandela University
Port Elizabeth • 6031 • South Africa
www.mandela.ac.za

NELSON MANDELA
UNIVERSITY

Focus group discussion for Life Sciences' teachers on the influence of Xhosa culture on teaching of human reproduction content

Facilities: Audio recorder to be used with permission from the participants

Discussion prompt

Using a 'speaking back approach' in the focus group discussion, Life Sciences' teachers will be asked to reflect on the meanings of the three sets of drawings made earlier.

Their critical reflections will act as leverage on how they can come to terms with isiXhosa cultural nuances experienced when teaching of human reproduction in their rural secondary schools. My prompts will steer them to explain their drawings and give reasons for their views.

The probes will refer them back to their drawings and steer the discussion to generate relevant teaching cultural views that can be used to teach human reproduction without restraint.

APPENDIX 7

CONSENT FOR VIDEO RECORDING A SIMAYI MAY 2019

P.O. Box 77000 • Nelson Mandela University
Port Elizabeth • 6031 • South Africa
www.mandela.ac.za



A culturally responsive strategy for teaching sexual concepts in rural Xhosa secondary schools

Participant's Confidentiality Clause and Consent for Video Recording

I (Name, Surname)-----agree to keep all the project information confidential and anonymous and that the information will only be discussed with other participants.

I consent that video recordings of focus group interviews be used for qualitative data analysis and validation of the study. In keeping with anonymity, fairness and transparency as guided by the Protection of Personal Information Act (POPI Act), my personal data in the form of my face or body parts will not be distributed in any media, print or conference proceedings. To protect unlawful access, data will be kept securely by the Primary Responsible Person (PRP) in a password computer programme for a period of 5 years after completion.

I consent to the use of my voice, gestures and body movements generated during group discussions for the final thesis and later article and conference proceedings linked to the study for a period of 5 years after completion.

Signature: _____

Date: _____

APPENDIX 8

VIDEO RESEARCH TOOL A SIMAYI MAY 2019

P.O. Box 77000 • Nelson Mandela University
Port Elizabeth • 6031 • South Africa
www.mandela.ac.za

NELSON MANDELA
UNIVERSITY

Video recording prompts

1. Video recording of group discussions for teachers' understanding about the role of culture in teaching human reproduction in rural secondary schools
2. Discussion prompt about the influence of gender when teaching human reproduction in a rural school environment.
3. Prompts about positioning of rural schools and teaching human reproduction to learners from a traditional environment.

1. Prompts about views on language used when teaching human reproduction.
2. Prompt about the use gestures, artefacts, language, games from isiXhosa culture that can be used to teach human reproduction.

APPENDIX 9

EXAMPLE OF SEQUENCING OF OPEN ENDED QUESTIONNAIRES



Appendix 1. 3: Questionnaire for cultural awareness

**Grade 12 Life Sciences' Teachers
District A**

The Continuous Assessment Policy Statement (CAPS) for Life Sciences in Grade 12 requires you to be teaching content area on human reproduction in the first term of the year. I would like to invite you to participate in research focussed on whether culture has an influence on teaching human reproduction in rural secondary schools. **Please note:**

- We do not need your name and everyone's identities will remain *strictly confidential*.
- By agreeing on answering this questionnaire, you undertake to give us permission to use your responses in our study.
- The questions require you to make **ONE cross (X) in a box** and **write your views** by filling in missing spaces where necessary. Please try to answer all questions.

Demographic details

The responses to the questions will tell us about your *gender, age group, culture, geographical position and type of school* where you teach.

1. What is your *gender*?

1. Female <input checked="" type="checkbox"/>	2. Male	3. Other
---	---------	----------

2. Which subject do you teach?

<i>Life Sciences</i>

3. What is your *home* language?

1. isiXhosa <input checked="" type="checkbox"/>	2. isiZulu	3. Sotho	4. Tswana	5. English	6. Afrikaans	7. Other
---	------------	----------	-----------	------------	--------------	----------

4. The *type* of secondary school where you teach is a school?

1. Public Urban	2. Public township	3. Public rural <input checked="" type="checkbox"/>	4. Private rural	5. Private urban
-----------------	--------------------	---	------------------	------------------

5. In which *province* of South Africa is your school situated?

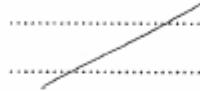
1. Eastern Cape <input checked="" type="checkbox"/>	2. Free State	3. Gauteng	4. North West	5. Western Cape	6. KwaZulu Natal	7. Limpompo
---	---------------	------------	---------------	-----------------	------------------	-------------

1

Influence of culture in teaching human reproduction content

In order to ensure that the research addresses the *question of whether culture has an influence on teaching human reproduction*, you are requested to give your views by answering all the questions. The study defines culture as 'the social legacy the individual acquires from his group, a way of thinking, feeling, and believing' (Odora Hoppers, 2009, p. 604).

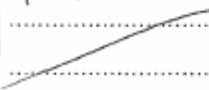
6. Do you *think* that teaching human reproduction topics such as fertilization is *part of the normal, cultural conversation* among young and old members of your culture. Explain in the relevant space.

Part of normal cultural conversation in my culture.	
Not <input checked="" type="checkbox"/> part of normal conversation in my culture.	I was raised in a community of Xhosa people who respected private parts and never called them with their real names. Even now we don't talk about sexual parts and sexuality openly.

7. Do you feel *comfortable* to explain human reproduction concepts such as menstruation, ejaculation, fertilisation, pregnancy and childbirth to your Grade 12 learners?

1. Very comfortable	2. Slightly comfortable	3. Comfortable	4. <input checked="" type="checkbox"/> Not comfortable	5. No feeling
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8. Do you believe that your *culture plays a role* in how you teach human reproduction topics? Explain your response.

Culture <i>plays</i> a role in how I teach human reproduction topics. <input checked="" type="checkbox"/>	Very much. The way I was taught to do things goes on to my adulthood such that if we want this current learner generation to understand their bodies and pass the subject, we need to talk openly about these human reproduction organs.
Culture <i>does not play</i> a role in how I teach human reproduction topics.	

Thank you for answering this questionnaire, I appreciate your time and effort.



Appendix 1. 3: Questionnaire for cultural awareness

**Grade 12 Life Sciences' Teachers
District A**

The Continuous Assessment Policy Statement (CAPS) for Life Sciences in Grade 12 requires you to be teaching content area on human reproduction in the first term of the year. I would like to invite you to participate in research focussed on whether culture has an influence on teaching human reproduction in rural secondary schools. **Please note:**

- We do not need your name and everyone's identities will remain *strictly confidential*.
- By agreeing on answering this questionnaire, you undertake to give us permission to use your responses in our study.
- The questions require you to make **ONE cross (X) in a box** and **write your views** by filling in missing spaces where necessary. Please try to answer all questions.

Demographic details

The responses to the questions will tell us about your *gender, age group, culture, geographical position and type of school* where you teach.

1. What is your *gender*?

1. Female <input checked="" type="checkbox"/>	2. Male <input type="checkbox"/>	3. Other <input type="checkbox"/>
---	----------------------------------	-----------------------------------

2. Which subject do you teach?

Natural Science & hScience

3. What is your *home* language?

1. isiXhosa <input checked="" type="checkbox"/>	2. isiZulu <input type="checkbox"/>	3. Sotho <input type="checkbox"/>	4. Tswana <input type="checkbox"/>	5. English <input type="checkbox"/>	6. Afrikaans <input type="checkbox"/>	7. Other <input type="checkbox"/>
---	-------------------------------------	-----------------------------------	------------------------------------	-------------------------------------	---------------------------------------	-----------------------------------

4. The *type* of secondary school where you teach is a school?

1. Public Urban <input type="checkbox"/>	2. Public township <input type="checkbox"/>	3. Public rural <input type="checkbox"/>	4. Private rural <input checked="" type="checkbox"/>	5. Private urban <input type="checkbox"/>
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5. In which *province* of South Africa is your school situated?

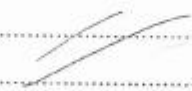
1. Eastern Cape <input checked="" type="checkbox"/>	2. Free State <input type="checkbox"/>	3. Gauteng <input type="checkbox"/>	4. North West <input type="checkbox"/>	5. Western Cape <input type="checkbox"/>	6. KwaZulu Natal <input type="checkbox"/>	7. Limpopo <input type="checkbox"/>
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2

Influence of culture in teaching human reproduction content

In order to ensure that the research addresses the *question of whether culture has an influence on teaching human reproduction*, you are requested to give your views by answering all the questions. The study defines culture as 'the social legacy the individual acquires from his group, a way of thinking, feeling, and believing' (Odora Hoppers, 2009, p. 604).

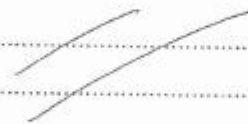
6. Do you *think* that teaching human reproduction topics such as fertilization is *part of the normal, cultural conversation* among young and old members of your culture. Explain in the relevant space.

Part of normal cultural conversation in my culture.	
Not <input checked="" type="checkbox"/> part of normal conversation in my culture.	Adults used to hide the sexual life from kids

7. Do you feel *comfortable* to explain human reproduction concepts such as menstruation, ejaculation, fertilisation, pregnancy and childbirth to your Grade 12 learners?

1. Very comfortable	2. Slightly comfortable	3. Comfortable	4. Not comfortable <input checked="" type="checkbox"/>	5. No feeling
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8. Do you believe that your *culture plays a role in how you teach human reproduction topics*? Explain your response.

<input checked="" type="checkbox"/> Culture <i>plays</i> a role in how I teach human reproduction topics.	To educate our kids about sexual life and the awareness about dangers of reckless sexual practice
Culture <i>does not play</i> a role in how I teach human reproduction topics.	

Thank you for answering this questionnaire, I appreciate your time and effort.

APPENDIX 10

OPEN ENDED QUESTIONNAIRE TRANSCRIPT

Open ended questionnaire transcript on the written responses of Xhosa teachers about the influence of culture in teaching sexual concepts to learners of the same culture

Note: Green colour highlight codes for 'cultural taboos limit teaching, grey for 'cultural taboos do not limit teaching', yellow for no explanation given.

R: In order to ensure that the research question addresses the question of whether culture has an influence on teaching human reproduction concepts, you are requested to give your views by answering all the questions. The study defines culture as 'the social legacy the individual acquires from his group, a way of thinking, feeling, and believing' (Odora Hoppers, 2009, p. 604).

6. Do you think that teaching human reproduction topic such as fertilization is part of the normal, cultural conversation among young and old members of your culture? Give your response by making a mark on the checkbox, indicating whether human reproduction topics are part of or are not part the normal conversation in your culture, then explain your selected response.

Part of normal conversation among young and old people in your culture.	Explanation
Not part of normal conversation among young and old people in your culture.	Explanation

P1: I was raised in a community of Xhosa people who respected private parts and never called them with their real names. Even now, we don't talk about sexual parts and sexuality openly.

P2: Adults used to hide sex life from kids.

P3: Culturally we don't talk about sexual issues with kids.

P4: No, it's called 'amanyala/izimanga' in isiXhosa so we don't do it, parents hit us (then) when we used such vulgar language.

P5: My culture does not allow talking about sex matters, we respect instructions of older people as forebearers of our Xhosa tradition.

P6: According to our culture, adults don't discuss such topics with children.

P7: Traditionally we don't talk about it.

P8: It is not well spoken of because of traditional respect of privacy and nicknames in Xhosa.

P9: According to our culture, it is seen as a sign of disrespect and looking down at our culture.

P10: Talking about sex, reproduction, parts/organs is not normal in our culture, siyahlonipha.

P11: As Black people, we don't relate with elders on the subject and we also do not demonstrate any romance publicly.

P12: It is rude and vulgar to talk sex.

P13: We don't talk about sex matters in our homes, it is disrespect.

P14: Men don't talk about sex things in my culture, it's not manly-private.

P15: No explanation.

P16: No explanation.

P17: No explanation.

P18: No explanation.

P19: No explanation.

P20: We don't say these things, siyahlonipha, asibizi.

P21: No explanation.

P22: My family values don't allow sex talk.

P23: Tradition dictates silence on sex language/talk.

P24: No explanation.

P25: No explanation.

P26: No explanation.

P27: We don't say such things, siyahlonipha.

P28: No explanation.

P29: Asibizi, not allowed in our culture.

P30: Yhoo! Even menstruation is difficult to talk about, it is a No-No! We talk sex things with friends. Boys are very naughty and uncontrollable (in class).

7. Do you feel *comfortable to explain human reproduction concepts such as menstruation, ejaculation, fertilisation, pregnancy and childbirth to your Grade 12 learners?*

1. Very omfortable	2. Slightly comfortable	3. Comfortable	4. Not comfortable	5. No Feeling
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P3, P9, P13, P14, P21, P27, P29 responded with '*no feeling*', making 7 out of 30 participants.

23 out of 30 participants responded with '*not comfortable*'.

8. Do you believe that your *culture plays a role in how you teach human reproduction topics*? Select a response by making a mark in one of the options in the check box, then explain your response.

Culture plays a role in how I teach human reproduction concepts.	Explanation
Culture does not play a role in how I teach human reproduction concepts.	Explanation

All 30 participants selected 'culture plays a role in how I teach human reproduction concepts'.

15 out of 30 did not give explanations while the other 15, gave explanations for the importance of culture.

Explanations given for the selection:

P1: Very much. The way I was taught to do things goes to my adulthood such that I want the current generation to understand their bodies and parts of the subject, we need to talk openly.

P2: We need to educate our kids about sexual life and awareness about dangers of reckless sexual practice.

P3: My beliefs should be integrated in the teaching and learning of children, so as to inculcate cultural values.

P4: Yes, if our beliefs can be brought to school to allow more open talk about those sexual concepts viewed as vulgar, our Xhosa culture can enrich the curriculum.

P5: If my cultural belief of *intonjane* can be brought into the Biology class, there would be respect and link with my culture.

P6: My beliefs have to be part of the Biology lesson taught at school.

P7: My cultural beliefs have to be in line especially to the young.

P8: Respect of the cultural values and way of life of the people is important when talking about things that they don't talk about. Therefore, culture must be liked and respected (ukuhlonipha) to the sensitive sexual issues.

P9: Yes, if we can be open in our culture about these topics, our learners especially the young ones, will relate well with these topics at school.

P10: There must be a link between our culture and what we teach in human reproduction.

P11: No explanation.

P12: Yes, allow our traditional beliefs to be known by scientists and prove that the Black child can make it in the modern world of science.

P13: Yes, for respect of our Xhosa culture and understanding of science.

P14: Respect for our tradition.

P15: No explanation.

P16: No explanation.

P17: No explanation.

P18: No explanation.

P19: No explanation.

P20: No explanation.

P21: No explanation.

P22: Important.

P23: Values are taught at home, they are important.

P24: No explanation.

P25: No explanation.

P26: No explanation.

P27: No explanation.

P28: No explanation.

P29: No explanation.

P30: In my own reasoning, there is no link between culture and sexual concepts (at school) now. The children are very silly. I get scared when having to take a taxi at the same taxi stop with these kids as the boys whistle to me and I pray for my safety. They are of the same age as myself and I have stopped wearing tight pants at school.

APPENDIX 11

OBSERVATION SCHEDULE

Stages of CPALAR	My personal reflections on participants' behaviour and my own views as the study progressed
Phase 1-open-ended questionnaire	<ul style="list-style-type: none"> • Communication was free and verbal in isiXhosa before written responses to the questionnaire began • More female teachers shared their views • Consensual view that sexual concepts are culturally avoided in Xhosa and there is a conflict with department of education which requires explicit teaching was indicated in the talks • Appreciation from teachers about the use of a short, simply colourful questionnaire • Willingness to participate in the study was shared openly by both male and female teachers as they said this section human reproductive 'yingxaki', meaning it is a problem to teach.
My anxieties	<ul style="list-style-type: none"> • How do I create a comfortable environment for communicating this topic on sexual concepts? • How do I control my own personal views (bias) when doing fieldwork? • How do allow the use of my Xhosa culture and experience of Life Sciences' teaching as a communicative strategy with participants? • Will they understand when a small number for the next phases is selected? • Will I get reliable, honest and personal data about the planned study? • Will they continue with the research even though there is no remuneration?
Phase 2 –Drawings	<ul style="list-style-type: none"> • Initial confusion about the meaning of drawing their 'feelings' • This area of research is not understood much by participants as an in-depth, personal research tool but after clarification, they got excited. • Mumbling talk by some female participants while drawing was noted. On enquiry, one indicated that she was making her frustrations which were hidden for long time in her head, now she was making them known (<i>ndiyakhupha</i>) and this was the first time that she can let go in a professional environment.

<p>Phase 2-focus group discussions</p>	<ul style="list-style-type: none"> • Teachers communicated mostly in isiXhosa although questions were asked in English • I had to make clarities in isiXhosa to ensure that communication flows. • They lacked knowledge about CAT and CRTs as they indicated that they were hearing about these for the first time. • The only younger female (early 40's) was the most quiet. <p>Out of the 4 females:</p> <ul style="list-style-type: none"> • 3 were in their late 40s and mid 50s • 1, shared her cultural restrictions first was dressed in full traditional gear with African doek, symbolising that she was married. • She shared her views about her fear and lack of protection from authorities and parent invasion openly. • Noted in her reflections, is her adherence to cultural values of respect for the elderly even though they were wrong and male student behaviour. • 1, was very informative in terms of science curriculum and teaching challenges of this topic. • She shared her views about belonging to a strict Christian doctrine which prohibits sexual talk. • 1, was informative about science curricula requirements and was the subject manager in the area. She surprisingly openly shared her experiences with male teachers with her colleagues. • 1, shared her views only once,
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<p>Tension and frustration</p>	<p>Out of the 3 males:</p> <ul style="list-style-type: none"> • only 1 was contributing freely • 1 contributed only twice. • 1 never talked right through the session. Instead, during the explanation and use of isiXhosa terms for penis (umthondo), he covered his face with his hand. This participant looked down for most of the presentaiton but wrote down the proceedings, When asked, he indicate that he was not offended and still wanted to be part of the study. <p>My role:</p> <ul style="list-style-type: none"> • Alleviate tension as they could not share opnely the specific terms that they used to explain how they teach sexual. Silence and occasional un-intelligible sighs and shock symbols in isiXhosa like ‘mnxcccxx’ indicating helpness and frustration. I had to make jokes about specific sexual conepts which helped to break the ice and they all laughed. I had to identify with them and really be an insider and they openly shared their isiXhosa terms and how some avoid even simplifying sexual concepts.
<p>Phase 3-teaching by model teacher</p>	<p>Preparatiion:</p> <ul style="list-style-type: none"> • Clear request for their own privacy when preparing the indigenised lesson. • Time frame was agreed upon by both parties. • They were allowed to select any topic from thwe four themes of human reproductive systems. <p>Implementation:</p> <ul style="list-style-type: none"> • The talkative and confident saved lady was selected as model teacher by consensus, that was their report. • She appeared nervous at first as she used ‘err’..repeatedly and looked down frequeIntly at the start. • She gained confidence as the she proceeded. • They supported her by finishing up sentences. • There was enthusisasm, they tur ed to look at her (video fraemes), contributed. • Clear link between curriculum requirements and the indigenisedl lesson were noted. • Clear epression of CAT domains and cognitive shidts.

<p>Phase 4- confirmation of findngs</p>	<p>My anxieties:</p> <ul style="list-style-type: none"> • Will they acknowledge my covid-19 clearance certificate sent earlier on and messages communiacted? • Will they participate as there was covid-19 infetions? • Will they own and acknowledge the fndings? • Will they accept the teaching support material brought as part of their request in alleviating their social condotions at school? <p>The final scene:</p> <ul style="list-style-type: none"> • Happiness and welcoming atmosphere. • They collectivly agreed to make an illustratin od their views about the study. • They accepted the teaching supporting materials with enthusiam.
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APPENDIX 12

DESCRIPTIVE DRAWINGS TRANSCRIPT BEFORE CATPD AND IK LESSON

Transcript of descriptive drawings during Action Phase Two of CPALAR

Before Contiguity Argumentation Theory Professional Development (CATPD)

Participants	Views before CATPD
<p>1A (Menstrual cycle, female part, male part and fertilization)</p>	<p style="text-align: center;">Female reproductive organs</p> <p>Menstrual cycle: Male learners as well as females find it difficult to listen to a lesson on menstruation. Female learners get embarrassed when I teach this section.</p> <p>Vagina: Difficult for me to call vagina in isiXhosa, even in English. Instead I use substitute terms which are acceptable in my culture. In most cases, I have to adjust my level of thinking and communication and be on the level of the learners in terms of teaching language. I end up using slang and call vagina <i>usisi</i>.</p> <p>Fertilisation: Sometimes I say, fertilisation occurs when that thing of a male enters that thing of a female and releases those things of a male.</p> <p>Male reproductive system</p> <p>Penis: It is very difficult especially when teaching about circumcision and sexually transmitted diseases. It seems as if you are invading the privacy of men.</p> <p>Testis: It is uncomfortable to teach this male organ (testes). I cannot use the Xhosa name because calling this name is taboo in my culture.</p>
<p>1B (Male part and fertilization)</p>	<p>Fertilisation: there are no Xhosa words which you can codeswitch with and use when explaining except the rude Xhosa name. Explaining seems as if you say that learners must do sexual intercourse.</p>

<p>IC (Female parts, copulation, social beliefs, parents and learners' views,</p>	<p>Female reproductive system Fallopian tubes: No Xhosa names so I become uncomfortable as I cannot explain them.</p> <p>Endometrium and ovaries: I feel embarrassed not to know the endometrium and ovaries in Xhosa. Sometimes I used threats so that learners may be serious (concentrate) in class.</p> <p>Pubic hair: I cannot say it in Xhosa.</p> <p>Vagina: It is not easy to use Xhosa name of 'inyo' for vagina as our culture prevents that.</p> <p>Copulation: In copulation, saying Xhosa term of 'ukulalana' or undergoing sexual intercourse is not easy.</p> <p>Parents: Parents do not understand my duty as a Life Science educator when they hear from their kids what I teach.</p> <p>Socially: If you do not have a child, you cannot teach theory without the practical knowledge.</p> <p>Learners: They disrespect me as if we are of the same age.</p> <p>Religion: It does not allow me to call things by their Xhosa names. That language is seen as rude, some church members say I chose a wrong profession.</p>
<p>ID (Menstrual cycle, fertilization parents, expected duty by employer)</p>	<p>Menstruation I cannot explain menstruation. I feel like a tortoise (skolpad) when I have to say these sexual terms. I feel like hiding my head inside my shell like a tortoise, I am scared.</p> <p>Fertilization: I feel like having a dark cloud of shame. I am scared that as a female teacher, I have to explain fertilisation and talk about fusion of male sperm cell and female egg cell forming a zygote.</p> <p>Fear of the parents: I am confused and live in fear of parents and learners' views when teaching this topic. Homes are supposed to create happy families where parents teach their children about puberty, menstruation, pregnancy, STDs. That is not done properly in my culture.</p> <p>Avoidance in Xhosa culture: my culture does not allow pronunciation of these terms.</p> <p>Department of Education: employer wants us to teach these topics and this is the most difficult thing to do.</p>

<p>IE (male parts, role of gender as being a male teacher, learners' views, respect and cultural belief)</p>	<p>Male reproduction system: Testis: It made me feel uncomfortable to disclose some of the sensitive parts such as testis. Being a male teacher: I am a male teacher and these parts are in me and kids start to see these parts in me. Learners: learners want me to explain their personal issues because they start talking about their male and female problems such as females do not produce because they know males produce until they are old. Disrespect: they disrespect me as a male teacher because I have disclosed some of my private parts such as penis and testis and these kids look at me that way (funny and disrespectful way). Doubt about my Xhosa culture as male: Kids start to doubt that I am a Xhosa guy because I am disclosing everything that is avoided in Xhosa, including male and female parts. The learners doubt that I am a man (<i>ndiyindoda</i>).</p>
<p>IF (Male part, female part and culture)</p>	<p>Male reproductive system: Penis: It is easy to say it in English but I cannot say it in Xhosa. Testes and scrotum: It is easy to draw and label it and use simple English to explain but I cannot explain in my Xhosa language. Female reproductive system: Culture: I am unable to call parts of the female in my language although it is simple to teach, I use English only. Serious facial appearance: In order to finish the prescribed content, I have to have a serious face and avoid laughing at all costs. Otherwise, the lesson will take a long time because my learners ask difficult sexual questions.</p>
<p>IG (Male part, copulation)</p>	<p>Male reproductive system Testes and penis: Teaching to male learners makes me feel like a wilted flower because these male learners feel offended if you call words like penis and testes. According to our culture, as a woman you have to respect men especially those who have reached 'manhood' (circumcised). Culture is a barrier: Culture prevents saying these words so it is a barrier. Copulation: I feel so embarrassed to teach copulation because they ask sensitive questions about sex.</p>

APPENDIX 13

ATLAS TI.8 ANALYSIS OF FIRST DESCRIPTIVE DRAWINGS

Atlas ti.8 analysis of descriptive drawings on the development of *asibizi* theme BEFORE the Contiguity Argumentation Theory professional development (CATPD)

Coding: D is for document (drawing) and the number denotes the sequence of all documents uploaded on Atlas ti.8 software. For example, D15 is document 15 on the program. Content refers to the actual drawing retrieved from raw data (documents uploaded on the program).

Theme: • *Asibizi* avoidance of naming sexual concepts in isiXhosa while teaching

Quotations:

D 15: Avoidance *asibizi* of using Xhosa names to explain sexual concepts due to cultural prohibition.

Content

TEACHING THE TESTIS
 *VERY UNCOMFORTABLE WHEN TEACHING ABOUT THIS ORGAN.
 I CANNOT USE THE XHOSA NAME IN CALLING THE TOPIC/ORGAN TESTES BECAUSE ITS TABOO IN MY CULTURE

Content

- I use to teach it in English and
- Explain in English. I'm not comfortable ukuzolela ngezixhelo
- In order to finish the topic, kumakha ndingahlakani. otherwise it will take me for a long time to finish the topic because my learners will ask difficult queries

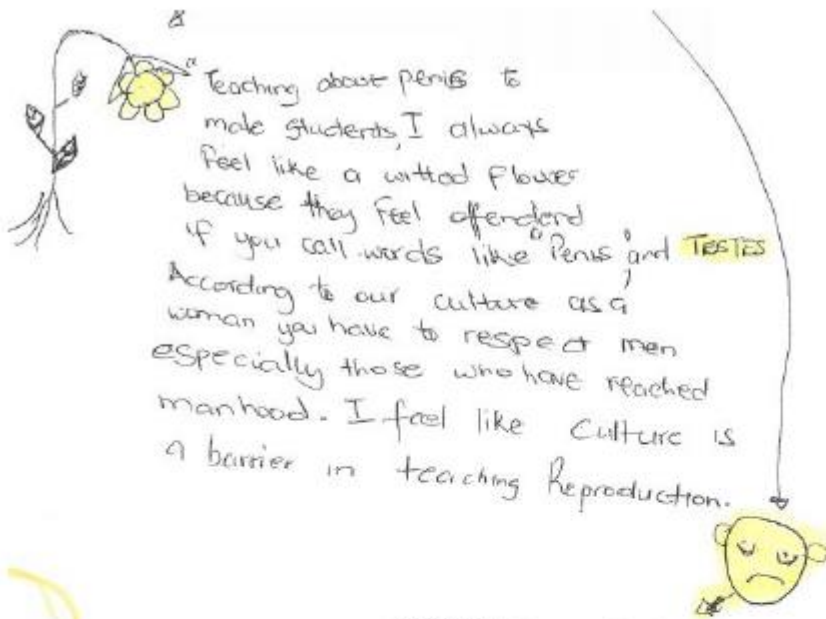
D 13: Xhosa culture is a barrier to teaching sexual concepts by females.

Content

TEACHING ABOUT THE PENIS
 IT'S VERY DIFFICULT TEACHING THE
 TOPIC ESPECIALLY WHEN TEACHING
 ABOUT CIRCUMCISION AND DISEASES.
 SEEMS AS IF YOU ARE INVADING PRIVACY
 OF MEN.

MALE REPRODUCTIVE SYSTEM

Content



Teaching about penis to male students, I always feel like a wilted flower because they feel offended if you call words like penis and TESTES. According to our culture as a woman you have to respect men especially those who have reached manhood. I feel like culture is a barrier in teaching reproduction.

A
(2)

sometimes you feel embarrassed when teaching copulation because they ask you sensitive questions about sex

D 11: Avoiding using Xhosa terms for sexual concepts

Content

The female vagina
↓
USISI

D 16: Fertilisation explained as when that thing of a male enters that thing.

Content

fertilisation

I sometimes, say occurs
 when that thing of a male
 enters that thing of a female
 and releases those things of a
 male. ↑ Com.

D 17: Embarrassment when teaching menstrual cycle and fertilization.

Content

Coming to menstrual cycle,
 is not only males find it
 difficulties, female
 learners as well get
 embarrassed when I teach
 it.

Content

* EXPLAINING, TEACHING FERTILISATION IN
 LEARNERS SEEMS AS IF YOU SAY THEY
 MUST DO SEXUAL INTERCOURSE

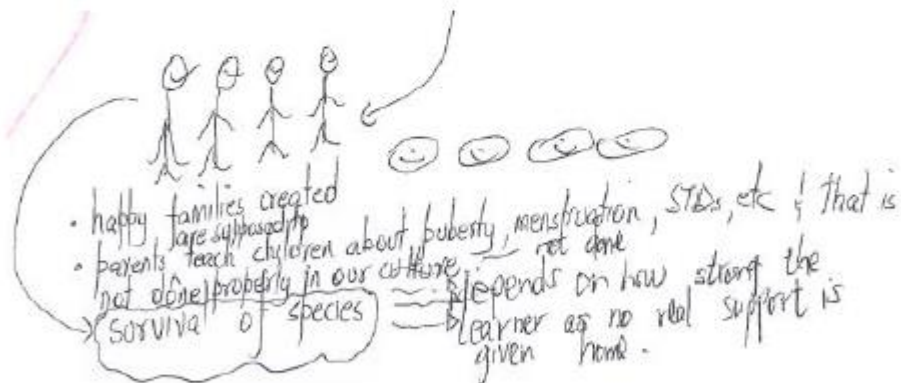
Content

CULTURE

It is not easy to ca
 vagina in Xhosa like
 "Inyo" In copulation - it
 is not easy to say
 ukulalana or undergoing
 sexual intercourse

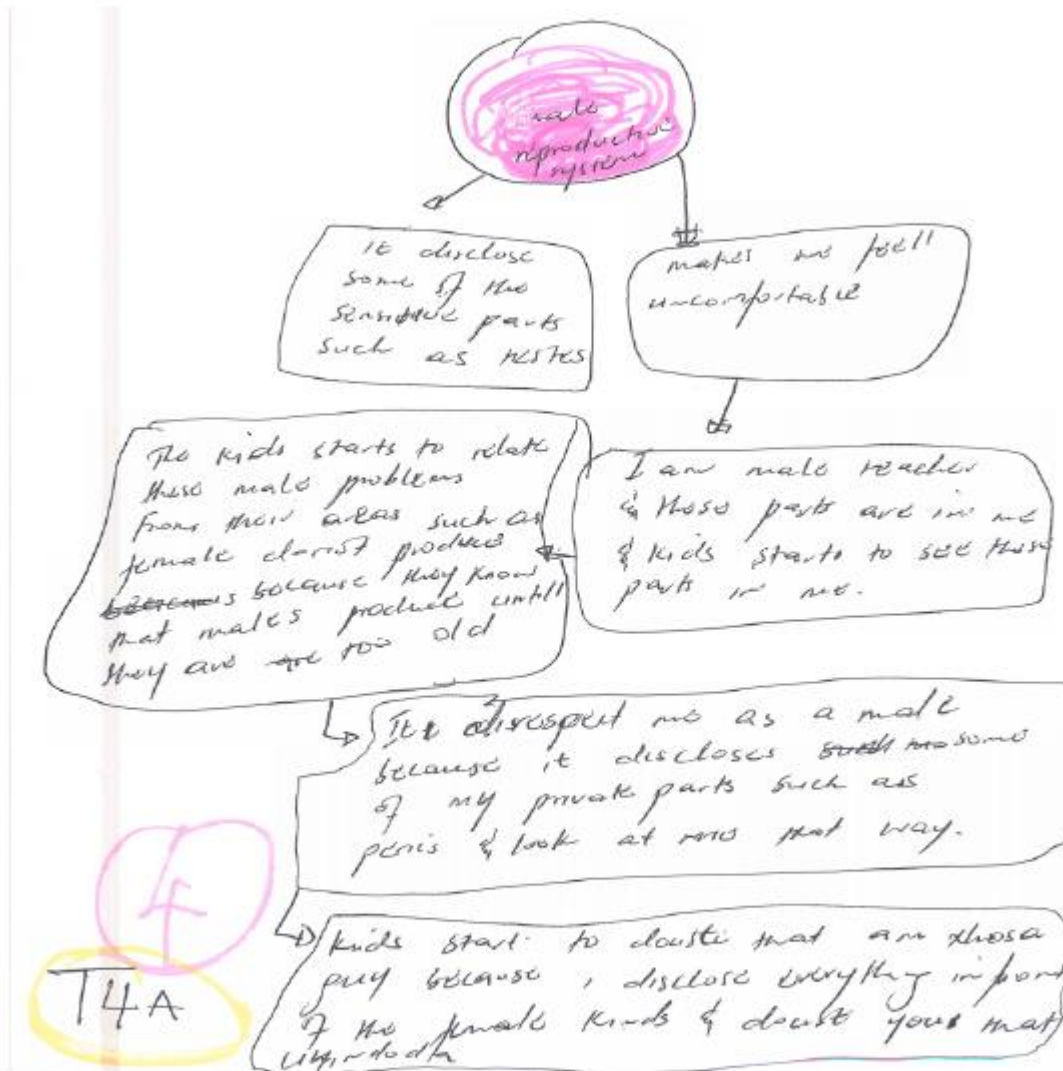
Content

Parents do not
 understand me as
 Life Science Educator

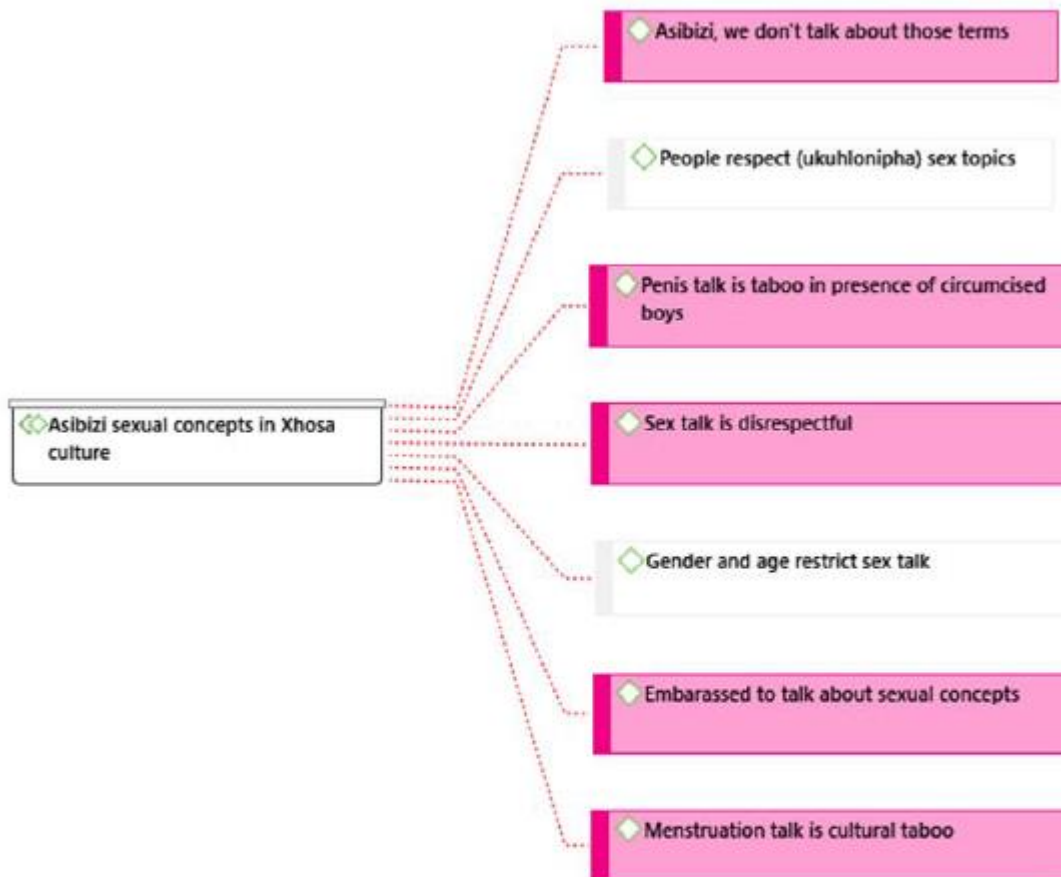


D 14: Embarrassment and disrespect for male teachers to disclose sexual parts during teaching

Content



Content



APPENDIX 14

FIRST FOCUS GROUP AUDIO TRANSCRIPT BEFORE CATPD

Audio transcript on perceptions about teaching sexual concepts before the professional development with Contiguity Argumentation Theory

Participants have been coded as follows: P, participant, M for male, coloured **green**, F for female, coloured **yellow**, all participants numbered from 1 to 7. Females are PF1, PF2, PF4 and PF5. Males are PM3; PM6 and PM7. The researcher is R, coloured **R** in blue.

R: Can you share your experience when teaching this topic on human reproduction systems which includes the structure of the female and male reproductive system, menstrual and hormonal cycle, fertilization, pregnancy and childbirth to Grade 12 learners attending secondary schools in rural areas?

My main question is on how you have taught and currently teaching this section of the Life Sciences' curriculum and how you feel when teaching these sexual concepts.

PF1 (female, wearing colourful traditional Xhosa dressing with head gear normally worn by married women): What happened is, I was called in the principal's office as a male parent came to enquire about this teacher teaching his child 'amanyala' (vulgar sexual concepts). I told myself (ndaqond'ba) I know I am not going to answer this father (lo tata). I just go (went) to the staffroom, took a textbook, hmmm (making a sign with the hand), this thing, the syllabus (i-syllabus) and then presented to him (kuye ukuba) that this is not my own thing. It is from the Department of Education and then he took time to understand (wade wa understand-a ke), so that was it. He was thinking that I'm (was) teaching my own thing to his child (umntana wakhe).

He said, according to his church and culture (icawa yakhe kuye ne culture), (other participants agreeing hmmm...male voice is heard affirming), that what I am teaching his child (lento ndiyifundisa umntana wakhe) is just out and not right (gesturing with

hands with a wave). Another participant sighs...yhoo (sign for loss of hope, silence, participants drink water.

PF1: *pauses before continuing with her contribution. But I waited (ndalinda) for the parent's response and I was helped (ndancedwa yilonto) by telling him that it is the syllabus.*

R: All right; that is very touching (echo...hmm (agreement from participants). It means that our issues as teachers in our particular schools are not well-researched because research done in a First World country shows that parents had an issue about teaching the penis and vagina, in an English First World country where English is the home language. Parents regarded the teaching of this school regarded teaching of penis and vagina as a taboo (Buni, 2013).

Parents indicated that they wanted to be there in class when sexual topics are taught. Now, we get the same experience shared here a colleague. So, you see now in a situation where you are prescribed by the Department of Basic Education to teach these sexual concepts (things). Now, you have to go and take a textbook as a teacher to show a parent to prove that you are teaching what is authorised and written in the curriculum.

Thank you so much about sharing your experiences, anyone who would like to share?

PF2 *(female, middle aged dressed in Western style pants with natural Xhosa hair):*
There is something I would like to share something. In school X I was teaching Grade 12 Life Sciences with my male principal. When it came to the section on human reproduction, he would ask me directly that Miss Y, 'please, it must be you' (mayibe nguwe) who is going to teach this section as I'm not comfortable about these 'things'. It is seriously a very sensitive topic to teach because especially these learners (abantwana) get very excited (shaking her head and other colleagues murmuring in agreement....hmmm) about sexual concepts. As they get excited (njengoba), they also ask you very sensitive things (about sexual transmitted diseases) such as 'what causes

a drop' (syphilis or gonorrhoea)? (Another participant makes a long sigh shaking the head). They ask you very difficult and tricky things about sex which are not part of the syllabus, so this is really the most sensitive and embarrassing topic to teach in Life Sciences.

R: So, this topic is one of the tough (sticky) topics to teach as when it comes to our culture as Xhosa people, we share certain beliefs. There is thing of not calling sexual concepts by their name (*asibizi*) [from open ended questionnaires].

Is this your experience as a person of Xhosa culture?

Do you feel comfortable talking about sexual concepts?

PM3 (*male, young*): *It is not easy at all because we have to change and use other terms. To mention these terms you have to use another term as a substitute because we are fearing using rude language (ukuthuka). Problem is, once you mention these terms, some of these learners seem as if they are on guard and waiting for you to say these terms. You see, when you teach these things, some of the students listen to you very carefully as if you have said something very strange and shocking. Their faces tell you as a teacher that they are surprised and shocked by what you are doing and they will never ever, ever listen to you again with respect again (laughter from other participants, P3 gestures his helplessness with his hands and raised shoulders).*

R: Can we be practical and get specific views where we use examples from our language? For example here (on power-point and CAPS document), there are four main themes that fall under human reproduction systems. The themes consist of the female reproductive system (*hmm-hmm...murmuring among participants*), the male reproductive system, menstrual cycle with hormonal control and fertilization. Check these four themes and share your views limited to any of the four themes. For example, when teaching the menstrual cycle, where do you start your lesson because there are girls in the class who may have reached the menstrual stage so

the lesson is important to them? Do you use the scientific terms without explaining the concepts (if you are doing that, that will be like chalk and talk), how do you present these concepts (how do you do it)? I'm giving this opportunity over to you.

PF4 (female, middle aged dressed in Western way of dress with a skirt with high heels and artificial hair extensions): *I want to share my experience now that "I'm saved" (laughter and Amen from participants, saved means that one have accepted Jesus personally for Christian beliefs as done in Apostolic churches).*

Teaching this topic is difficult but it is just that I like it (mna ndiyayithanda) but now that I am saved (religious belief), it is more difficult to teach it. In my school, I used to teach human reproduction and had learners who labelled me. Learners who were saved by Jesus labelled me as a person who was no longer part of the Christian brethren, not 100% saved because of what I was saying in class. I used to say: I'm going to call a penis a penis only (qha) and you have a penis if you are a male, but you do not really know its structure and functioning (laughter). I am going to explain it clearly what it is without using baby names. So, the learners felt frustrated and embarrassed as 'saved' (religious Christian belief) learners looked at me with disbelief and saw me as a heathen "umhedeni" which is a betrayal of Christian values. So, it is religion and culture which make teaching these terms uncomfortable and difficult because there are words in our Xhosa culture that we cannot say. Otherwise, it is really very difficult and stressful to teach this topic on sexual concepts particularly to learners of the same Xhosa culture because they know we do not talk about these sexual concepts in our culture.

R: Thank you. Now we are moving on to take this discussion to another level and take a look at the rural geographical position of your school as you as an individual staying in a rural area and teaching in a rural school and sharing the same culture with your learners.

How do you feel when teaching concepts, for example, a penis, would it better if you were staying far from the rural school and parents? Would your teaching environment be more comfortable if you were teaching learners of another culture who simply knew that you do not isiXhosa language so you will call a vagina a vagina, a penis a penis (by its name)? Now that the learners know our culture, we do not call a vagina in its Xhosa name of *ibhentse*, as you are explaining the function of a vagina as a birth canal, what do you do? Am I correct to say that you are staying in more or less the same rural village as the parents and learners? Do all these factors make it easy or more difficult to teach this area?

How do you feel when teaching sexual concepts to learners who are staying in the same rural area as yourself as you have shared initially that you're staying in the same vicinity?

Do you feel comfortable as a teacher of the same culture as the learner to teach sexual content to learners when you're staying among them and their family members?

Do you feel comfortable as a teacher of the same culture as the learner to teach sexual content to learners when you're staying far from them and their family members?

How do you feel about the role played by the learners' knowledge of Xhosa culture and language use in terms of naming human reproduction content?

PFI (*female-in traditional Xhosa wear*): *Heey (exclamation mark)! It is more difficult to teach these sexual things as we are staying in the same vicinity with them (sihlala nabo) and you also see the manner they look at you (ubona nalapho kubo nakwi look le yabo) that it is totally disrespectful and different than before the sexual lesson. Sometimes I devise a defensive strategy where I change my facial expression (nditshintshe ebusweni), gesturing by pointing at the face so that I cannot be disrespected here (ndingazokuqhelwa apha), (other participants are echoing hmm...hmm...and some are giggling a bit). When I change my facial look, I want the lesson to progress and also to finish the lesson. Sometimes you see on their face and*

body expression that, then you have to think and devise a strategy. You also find out now that you are using these words such as penis and vagina, it seems as if you are invading their privacy. You see from the bad faces of those learners who are young men (abafana) who have been circumcised and boys who have not been circumcised that heey...this mother (lo mama ingathi akanambeko) looks as if she has no respect (akahloniphi isiko lakwaXhosa) is for our Xhosa culture (chorus, spontaneous talk from peers).

You are seen as if you are invading and disrespecting the privacy of traditional Xhosa men and entering into the terrain of manhood (ungena kwi privacy ne ndawo yoo tata) which you as a female you have no knowledge of (other female participants join in the conversation). You see that the learners are so uneasy and some learners state clearly in class that 'no Mam, some names you are not supposed to say (hayi kodwa Mam, amany'a magama nezinye izinto ufanele ungazibizi). Then, I become authoritative and say "heey, this is a class, I am not going to listen on what to say and not to say (andizova ngawe ukuba ndibize ntoni ndingabizi ntoni), I am going to call by their proper names, (all female participants spontaneously agree with this view and say Heeke, ewe, heeke which is affirmation in isiXhosa). You know, while saying that all of that to the learners, I am not realistic as I am shielding myself by creating a protective front as I have nothing more that I can do to defend myself (ndiyaqobisa) as I know that deep down, I am scared deep inside (ndoyika ngaphakathi). I am scared because I am not used to calling these sexual concepts even from my family and community background (andiyiqhelanga emva). I am just trying to look strong and authoritative (ndiyaqobisa) so that these male learners cannot bully me in my own class.

PFS (young female): *It is very uncomfortable and difficult especially as a young female teacher (kuzima kuthi tishala ezincinci), as there is our culture that prevents saying*

these sexual concepts (kukho le culture kubizwe la magama engavumiyo). What helps really is to change the facial expression (uncedwe yilanto yokutshintsha). Then you find out that there are young female teachers (uzakufumanisa kukho ezi miss zincinci) where you say these words (uthethe ezi words ufumanise xa edibana nawe ngaphandle), then you meet these male learners outside the school environment. The male learners follow you up in a sexually suggestive way based on the lesson you have taught in class (ubone ba lo mfana ulandela lanto ubuyifundise klasini ngela xesha wena ubufundisa lesson ungafuninto ingaphaya). You see, you were seriously teaching a lesson without inviting any sexual advances (ngela xesha wena ubufundisa lesson ungafuninto ingaphaya), (speaker looking at colleagues and they agree...hmmm.hmmm with hand gestures signaling agreement).

R: So, what you are saying is that once you start saying these sexual concepts, they start looking at you in a funny and disrespectful way that what they had before you talked these sexual concepts?

Response: chorus of 'Yes' and nodding sign from all the participants.

PF2 (female, middle-aged with natural hair in pants): *It is because some of these concepts (eziny'i zinto) are a taboo as we do not talk about at all. You find out that circumcised males (sebe ngama doda) do not want teachers to talk about circumcision, they do not. When you start talking about circumcision they say, 'No, yiyeke kanjalo, yibamba 'a pho' meaning that the teacher must stop right there (other participants all agree and talk sporadically and say 'heeke'-affirming the use of this term of avoiding a lesson on circumcision and male teachers laugh laugh).*

PF4 (female in Western style): *And their comments when you speak as a female, you are barred by these male learners and tell you that 'can't you see that you are a female for talking about men issues that you know nothing of' (awuziboni ukuba wena*

ungumfazi akunathethi nto zamadoda). This is followed by another explosive supporting talk of 'yes' (ewe) with the use of hand clapping in exclamation by colleagues while the speaker uses a finger to emphasise her point. In other words, you are silly and disrespectful as a female so you must just stop there (kubonakale uyageza wena so yima apho).

PM3 (male, joins, his body movement shows discomfort as he swerves from one side to the other while the other two male colleagues are looking down): *It seems as if then, you are disclosing the Xhosa culture of circumcision that is hidden (hmmm from others).*

R: At that time the syllabus requires you to talk about circumcision related to the topic on sexual transmitted diseases (chorus 'yes' from the participants). Yhoo! Thank you for your contribution.

Now, this thing of the language, you talked about substitutes earlier. I am interested in the language that you use to explain these concepts. For example, in Xhosa, we hear about 'inkomo' (cow) 'igusha' (sheep) when referring to the vagina, you see, those substitute terms. Now, I want to find out which terms, specifically isiXhosa terms that you use in trying to simplify sexual concepts.

There is a pause...nobody is talking and men look down.

R: (tries to lighten the atmosphere by making a joke): Like right now, if I say penis in its Xhosa 'umthondo' (an immediate chorus of 'yhuuu' symbolising shock from participants and laughter as well), it will be as if you have said something which is very, very bad. Even for adults (laughter and talk as participants join say yhooo...yhuuu), even as you can see right now that as adults you were shocked (burst of laughter from participants) so it is a Xhosa thing to avoid saying these words.

So I still want to know, how do you teach the sexual concepts such that learners understand their structure and functioning. Do you teach them in straight forward English without any Xhosa clarification, how do you teach them?

PF4: *I, in my personal teaching experience (mna kumava am oku tecah-a), I would never explain in isiXhosa (angeze ndicacise ngesiXhosa) such that I use simple English that I think they can understand because I am avoiding to say these things (ukubiza ezi zinto zinkulu, using rounded hands to indicate the big size while others affirm withhmmm). I get scared of saying these scary things (ezi zinto zoyikekayo). There is an emotional minute where participants spontaneously talk, some saying 'yhuu' (shock) and helplessness, hmxxm (disdain) and hands thrown in the air to show loss of hope.*

PM3 joins in: *It is not easy even to demonstrate and show the functioning of these parts because of the fear of getting to talk in my language about these terms.*

PM6 (male, quiet male): *Ok Mam, on my side I use my home experience (sebenzisa lanto ndiyifunde ekukhuleni kwam) for example, the kettle ('iketile') is a substitute for the penis. So when teaching, I use the kettle instead of using penis as a substitute as a way of avoiding the use of repeated English vulgar terms like penis. So, we know from when we were growing up that these substitute terms are used like kettle for penis, so I use them to avoid saying these real (sexual) terms.*

PF4 joins: *The penis is also a 'tososo' (laughter from all the participants).*

R: OK. Now tell me, how do you feel deep inside when teaching these sexual concepts, do you perhaps feel embarrassed such as when they stop you and say 'yibamb'a pho'?

PM3 responds: *Yaaa, we are embarrassed such that you have to change the facial expression (utshintsh'u buso). At the end, the lesson must be taught although I feel angry and frustrated by the treatment they have given me. You are embarrassed but you have to bring your mind back and find ways of bringing back the same person, even if you*

are angry, who said you must stop the lesson. You show them that the examination will test the whole section of work on sexual concepts (izobuzwa iphelele apha) and they are supposed to learn about it. Now, when examination questions are asked covering the whole section including the one some learner said it must not be talked about in class, other learners would not get the correct answers to the examination questions (abanya bantwana abazukufumana mpendulo).

PF4 joins in: *Sometimes I tell them beforehand that I am going to assess them immediately after the lesson as a way of getting their attention and avoid these distractions and in that way, you are trying to draw their attention to assessment.*

R: Thank you, before we move on, remember that I indicated that there is a professional development session of this research dealing with culturally responsive teaching strategies (CRTs). There is this theory by Prof Ogunniyi who is an African scholar, we will simply refer to it as CAT, for Contiguity Argumentation Theory.

APPENDIX 15

SECOND FOCUS GROUP DURING CATPD AUDIO TRANSCRIPT

Transcript of Contiguity Argumentation Theory professional development (CATPD) and argument for the design of a Xhosa Indigenised lesson on menstrual cycle

Participants have been coded as follows: P, participant, M for male, coloured **green**, F for female, coloured **yellow**, all participants numbered from 1 to 7. Females are PF1, PF2, PF4 and PF5. Males are PM3; PM6 and PM7. The researcher is R, coloured **R** in blue.

R: There is this theory by Professor Ogunniyi, a gentleman who is an African scholar (omnye umfo u Ogunniyi oyi Professor usuka aphe Afrika), leave the big term as we will simply refer to the theory as CAT in short for Contiguity Argumentation Theory. Prof Ogunniyi states that they way that we think (as we are here as teachers), we have to help ourselves to think in another level so that we can help these learners that we are teaching by bringing in culture into science teaching. He says that, the way we think-our cognitive levels function at different conception levels (siba ne conceptions ezahlukileyo) when we make our internal thoughts.

We have thoughts which are dominant, so here in our case (pointing at the powerpoint presentaion), we are looking at two worlds. We have our culture which is the Indigenous Knowledge beliefs, language and everything that is enclosed there in Xhosa beliefs. On the other side, we have the Science World. In our case, the science world is represented by the human reproduction terms or concepts. So, we are going to be talking about stages of cognitive thoughts, I want to do this CAT analysis currently so that you may indicate (ukwazi uku indicat-a) which onewe are falling in, you may fall into more than one of these categories.

According to CAT, there are five conception levels:

1. **Dominant:** this is where a scientific claim is more convincing than a cultural belief.

For example, in an experiment performed in the laboratory or in class. In our

research, you may think about experiments that are done, say we are teaching menstruation. The experiment (scientific) to test for ovulation during is available (there), you cannot dispute it. So, in that case, experimentally that has been proven (ovulation) to be true although in our culture we did not know, we used common sense (besihamba ngokwengqondo) to deal with terms or processes like that. So, I am giving you an example of a dominant view. Now we look at this one, the suppressed context.

2. **Suppressed:** this is where a world view is controlled by a culturally-dominant view. Now look at what we have shared and your experiences. You have said that there is this scientific terminology (WSK) that you have to teach and there is this cultural belief (IK), but in our case you will find that although you have to teach this, there is my culture which is trying pull me down.

R: Can you say now perhaps that you believe the suppressed conception is visible in our case, as I'm trying to explain? **There was silence and the researcher prompted).** I hope you understand my philosophical English (niyasiva esi siNgesi same, siya philosophis-a ngoku)...researcher shares a non-offensive language joke.

PM6: *I would say Mam, it depends on the individual because I (mna)..hmm.. usually, when tackle this (le topic)...hesitation...I integrate (ndiyi integrat-a) IKS with scientific knowledge.*

R: Integration.

PM6: *Ee-ee, meaning yes.*

R: OK Sir, ohhh...integration. Thank you very much for that, but can we go back and look at the point that raised, the illustration that we made about the suppressed context.

Can we get views about how do you feel about whether this is your current level of conception? Do you think that right now, your thinking in terms of the sexual concepts and your Xhosa IK concepts is at the suppressed conception level as we have explained? I know the terminology is not that easy, we are philosophising but I have tried to make it simple and I have put in some Xhosa words. Can we just share ?

PFI: *I think our Xhosa cultural values suppress and push down the need to say these things inside my brain (iyasuppress-a, icinezela lento ngaphakathi engqondweni), the naming of these things like menstruation and penis (lento yokubizwa kwezi zinto zomenstruation no-penis). I am avoiding calling these words (ngoba andizibizi ezi zinto) which are not wanted by my culture, my culture is strong and resilient (inamandla and iyanyamezela). (PFI).*

R: Thank you. Then, there is another one called the assimilated conception.

3.Assimilated: this where you have a mental state or thought has been taken over by another one. For example, think about our old practice, for example (umzekelo) 'ukuthomba'. That is health education in Xhosa (ukuthomba) where virgin girls were called to one place where there were old women, and taught about health education.

R: Now that we have talked about assimilation, do you think you are having conceptions right now which are on the assimilated level? In other words, are you having thoughts in your mind about perhaps some IK concepts that you think have been assimilated or some Western Science concepts that you think have been assimilated?

R: It looks like there is no response at the moment, remember, you may note your views if you are not ready now, you may respond in writing later on. There is nothing forcing you to respond now in the group. Thank you.

4. **Emergent:** This one, as we said there are five conceptions is the emergent conception. In this thought, there has is no previous knoweldge as when something new has been discovered. There is a new phenomenon that has been doscovered like the dicoverly of atoms in science, that thought is called an emergent thought. Look at the last one (pointing at the powerpoint presentaion), I want now to come closer to what teacher **PM6** shared about integration.

5. **Equipollent:** an equipollent conception occurs when there are two competing which worldviews (IK and WSK) exert a comparable, equal intellectual force. You've got the cultural view (IK) and scientific view. Our culture is strong because it has got its own values. You have the scientific world which is also strong with its own values. They (two worldviews) are competing but how can they work out? CAT says that they can co-exist in the mind without necessarily resulting in a conflict. This is what we are trying to do. So in other words, we want to integrate our culture into the scientific world (participants finish up the sentence as the researcher is talking) so that they can work together. In other words, we want to reach the level of equipollent thought and move from for example, the dominant, suppressed or ssimulated context to the equipollent conception. Thank you so much.

Is there anyone who would like to share a view on equipollent conception?

PF5: I think these steps are difficult to explain when talking (mna ndicinga zinzima ukuzithetha ezi steps) in a goup like this because I may be wrong (mhlawmbi ndinga wrong-o). Now, I don't want to look like (ngoku, andifuni kuba ngathi) I am answering to an oral test question (ndiphendula i-oral test). So, I feel it would be better to first discuss and agree as a group (ndicinga kungabhetele khe siyoxoxa kuqala sivumelana), away from you (ungekho wena). Also, (enyi nto), I think (cinga) it would be better also if our reponse about CAT thinking can also be in writing, individually (koba bhetele kwakhona xa umntu eziphendulela yedwa ephapheni about CAT thinking) as we did with

the first drawings (njengeza drawings besiqale ngazo). This is what I think. After that, we can come with our response to you about CAT and IK lesson, all of that (sakugqiba, size ne-decision yethu kuwe ngo CAT and IK lesson, yonke lanto). For example (umzekelo), how we will design and teach (kuba sakwe njani) on the IK topic.

R: Thank you Miss, very much. I will take this view as that of the collective as I have noted that fewer people have responded to questions on the CAT conceptions when compared to the previous focus group discussion. Remember the one we did on your perceptions about teaching sexual concepts. Now, we will take a short break then we will have a short session where you as the group. You would select a topic on human reproduction systems in the Grade 12 curriculum, a topic that you feel comfortable to present using new CAT knowledge. You also will decide on how you would like to approach that particular topic using this new information on CAT in relation to sexual concepts that are taught in Grade 12.

PF1: *I have a suggestion Mam, can you allow us to be on our own (ubungenasiyeka sizenzele sodwa kude kuwe) so that we can discuss openly amongst us this new CAT information (ukwenzelu ba sithethe sodwa ngale information intsha ka CAT). Then, we can decide how we are going to choose and design a lesson on sexual concepts (then sikhethe ukuba sizakuyenza njani le lesson intsha ekwezi sexual concepts? Then, we come back and one of us teaches (sibuye, omye ayi -teach-e). To me (kam), this CAT has shown important parallels (lo CAT undibonise izinto ezifanayo) between our Xhosa IK practices and science (phakathi kwezinto esizenzayo ngokwe Xhosa IK neze science) ...colleagues and mumblings of 'yes...this is our collective voice' (ewe...lelethu).*

R: Now colleagues, having learnt about these CAT conception levels, I would like us to come to the curriculum as it is in the Grade 12 Life Sciences policy document. The one that I am clicking here on the powerpoint screen , as you can see, it's the National Guideline for

2017 and the CAPS document for FET, 2011 document. I'm doing this so that they can know that we are following exactly what is in the CAPS document of the department. Now, we have these themes that you are supposed to teach, they are prescribed. It's the structure of the male reproductive system, with the organ, which is the testes. The, the supporting parts which are part of the system, the epididymis, vas deferens, seminal vesicles, prostate gland, Cowper's gland, urethra and penis. In other words, the learner-whether it's a girl or a boy, or its circumcised boys or married females, they must know the structure. This is departmental policy.

Then on the female, it's the structure which shows the position and functions of the two ovaries, the fallopian tubes as you can see that I'm illustrating with my arms, the uterus which is lined by the endometrium, cervix, the vagina with its external opening which is a vulva. For now, we will skip puberty but go straight to the events that take place during puberty in the case of a female. Looking at the menstrual cycle, in that case, we are looking at the development of the Graafian follicles, ovulation and the formation of the corpus luteum. Remember, the roughly 28 day cycle that we use when counting the days where the endometrium thickens, gets removed and ovulation. We will leave out hormonal control.

The third one is fertilization and development of the zygote. Then lastly, the process of implantation and gestation, which is pregnancy. Let me be quick to say, on fertilization and development, copulation is there, that's sexual intercourse. So, you must teach learners. I'm not saying they must do it but you must talk about it. So we have those four themes that you need to choose from when you are going to prepare your IK-based lesson which is founded on CAT. I hope we are together, I can see you are tired but please, we need to unpack these issues so that when you go and prepare, you know that you are OK.

APPENDIX 16

**VIDEO RECORDED XHOSA INDIGENISED MENSTRUAL CYCLE LESSON
WITH ATLAS TI 8 ANALYSIS**

Transcript of Xhosa Indigenised lesson on menstrual cycle

Transcript consists of three parts

Part 1: Briefing before the presentation of Xhosa Indigenised lesson

Part 2: Presentation of Xhosa Indigenised lesson on menstrual cycle

Part 3: Six codes with video time frames generated with Atlas ti.8 software

Part 4: Two themes generated with Atlas ti. 8 data analysis

1. Briefing before by a participant before the presentation of Xhosa Indigenised lesson

We agreed (sivene) that this beautiful lady is going to be our teacher...laughter..and the lesson is on the menstrual cycle (and i-lesson ikwi menstrual cycle). This is a very sensitive and very, very difficult lesson to teach for both male and female teachers (le lesson inobuzaza and inzima gqith ukuyifunda kuthi males and females). I think it's worse to us as males (ingathi ithe chatha kuthi as males). We chose it collectively without any disagreements (sikhethe yona ke savana sona)...hmmm..hmm ..(agreement from colleagues). On the question of a lesson plan (kulo mbuzo we lesson plan), no (hayi) we didn't do it but we made sure that we can link (khangela siyenze kodwa siqinisekile that siqwazile ukuzi link-a ku CAPS ne CAT-IK) clearly those Xhosa concepts versus science concepts on menstruation based on CAPS and CAT-IK (ezinto ze menstruation ngokwe siXhosa versus science). We trust our lady teacher here (simthembile u Miss wethu lo)...applause...clapping and yheeeee as he is finishing to speak. (PM3).

2. Transcript of CAT designed Xhosa Indigenised lesson on menstrual cycle

(pause)

[00:00:02:05]

Model teacher: All right, now class (ke class), we are going want to talk about a topic which is called eh..(pause)...menstruation.

[00:00:15:00]

Model teacher: The topic we are going to talk about menstruation (esizothetha ngayo engu menstruation), according to our culture, some people refer to menstruation with different terms based on the geographical location that we come from (participants turn around to face the model teacher and listen attentively). Some people say, 'on time or on the grass' (*bathi abany'a bantu bethu ngokwe ngingqi zethu use....sexesheni okanye usengceni*).

[00:00:26:15] ..pause.. So [00:00:30:00]

Model teacher: 'to be on time' ukuba sexesheni, to be on time is traced from our parents who are able to count the number of days (pause..eh..eh..). Some geographical regions refer to a menstruating woman as being 'on time'. This 'on time' exesheni is traced from our parents, even though most of our parents have not attended formal schooling they were able to count the number of menstruation days (ukuba sexesheni ke kuvela kubazali bethu abakwaziyo ukubala...ehh...ehhh...iintsuku zokuba sexesheni noba abanye bengayanga kakhulu esikolweni).

[00:00:45:00] So, when we are talking about menstruation, some geographical regions refer to menstrual cycle as being 'on the grass' *sengceni*, meaning that dirty blood comes out for a certain number of days in preparation for something new that is going to be formed (*kulapho umntu aba sengceni for intsuku ezithile meaning kuza kuphuma igazi elimdaka kuba kuza kuphinda kuqaleke into entsha*).

[00:01:00.00] So, when one is menstruating, the process involves...the...the... the removal of the endometrium (*lento i-involv-a i...i...i' endometrium*). The endometrium (*i-endometrium ke*)

represents what old people refer to as ‘the grass’ (*lento abantu abadala bathi yingca*). It is like the grass which is covering the real soil (*injenge ngca e-coverish-e umhlaba*). As the grass is covering the soil (*njengoba ingca iwu coverish-ile umhlaba*),

[00:01:15:00] After having been removed, it leaves soil that is ready to receive something new (*ke ngoku, ishiya umhlaba o-ready*). So, in terms of our culture, that is why our parents could not ‘jump the fireplace’ when they are ‘on the grass’ (*abazali bethu ngokwe culture bebesithi xa besengceni bangakwazi ukuthi batsiba iziko*). That is, jumping the fireplace means having sex (hesitation...the...the...(i...i...i sex) with now (*ke ngoku*) with the husband.

[00:01:30:00] Then, the general understanding is that the woman is unclean and cannot have sex due to the unclean blood coming out (*lonto ibithiwa xa ithethwayo...kuthwe...umdaka akanaze atsib’i ziko emdaka, ngoba kuphuma ela gazi limdaka*).

[00:01:45:00] Otherwise, in reality the person is clean, it is only dirty blood that is being released that is unclean and the person can therefore not have sex (*ngokwakhona u-clean la mntu qha kuphuma igazi eli mdaka*). Therefore, our old parents who were not formally schooled were able to count the safe time or safe period for having sex (*bebekwaz’u bala ke bona abantu abadala nangona bengafundanga*), the safe time or safe period was suitable for having sex (jumping the fire after menstruation has finished, *akwazutsib’i ziko*).

[00:02:00:00] Then, after menstruation has been finished, the woman ensures that she has sex provided that she wants to be...(looks at colleagues and they finish up the sentence)... ‘pregnant’ (*bekusithi emva kokuba yenzekile menstruation, enze sure that uyalitsiba iziko provided that yena ufuna ukuba...pregnant*).

[00:02:15:00] But if she does not want to get pregnant, she would avoid having sex and with the husband. Therefore, old people were able to count when to have sex for a pregnancy to occur and

also how to avoid getting pregnant (*ukuba akafuni ke, aphinde azigcine, bebekwazi ke ngoku ukwabala amaxesha*). So now, it is easy now to see and link out CAT and observe that we are moving from the suppressed context which suppressed our cultural practices (*siya mov-a from la context yoku suppress-a izinto ze culture yethu*).

[00:02:30:00] We have integrated our cultural terms which were used by the elderly as we use them now in our menstruation talk (*siyayidibanisa ngoku i-culture yethu neza terms bebezisebenzisa abantu abadala, zikhona kulento siyithethayo*). We have moved to what is called ...chorus response from colleagues...equipollent cognition (*siya mov-a to what is called ...chorus from colleagues....equipollent cognition*).

[00:02:45:00] Can you see that we are correlating our culture with science?.....response from colleagues...yes... (*niyabona neh, siyayi correlat-a ngoku i-culture yethu ne science?...yes...*). Our culture co-exists with science and we have merged it with science so that it becomes so easy to teach and understand when it is like that (*i-culture yethu iya co-exist-a ne science and siyayidibanisa ne science so ilula xa injalo nokuyifundisa*).

[00:03:00:00] That is why we have cultural terms such as 'the grass, on time'...ehhh...colleagues assist...'jumping the fireplace' and ovulation (*sine zi terms ezithi ingca.ehhh...colleagues assist...nexesha...iziko*). We know that ovulation from the science curriculum is the release of the egg cell (*i-ovulation yile siyaziyo kwi science esikolweni, yile yoku release-wa kweqanda emva kokuphela kwe menstruation*). Therefore, we can integrate the period of 'jumping the fireplace after being on the grass or on time' as equivalent to having sex after menstruation and that is the ovulation period.

[00:03:15:00]

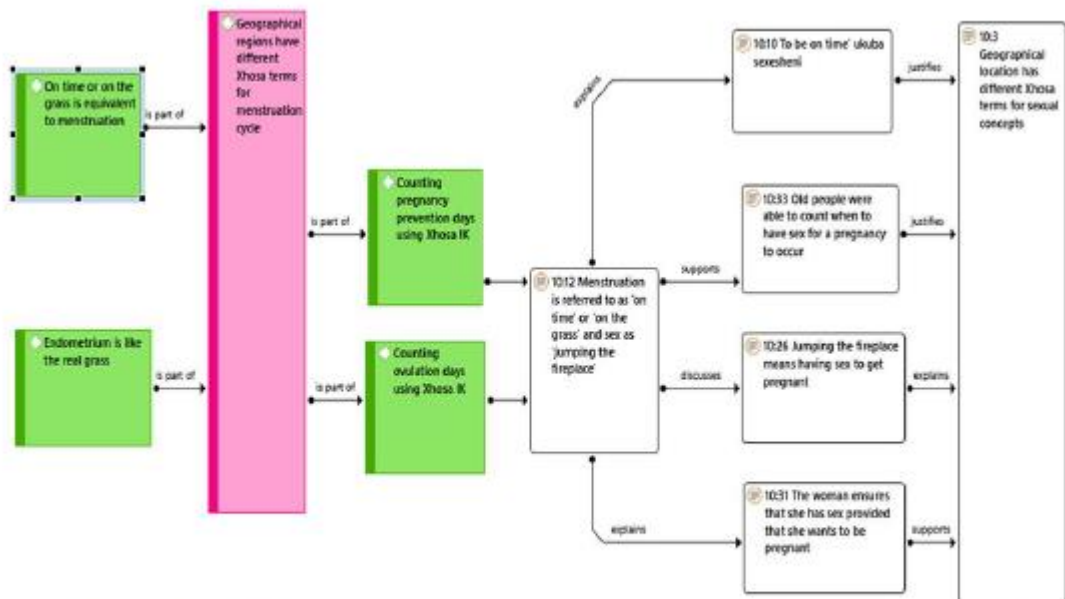
Researcher: Heey, thank you. Let us clap hands for her (*masimqhwabeleni izandla*), (clapping).

3. Six codes with video time frames generated with Atlas ti.8

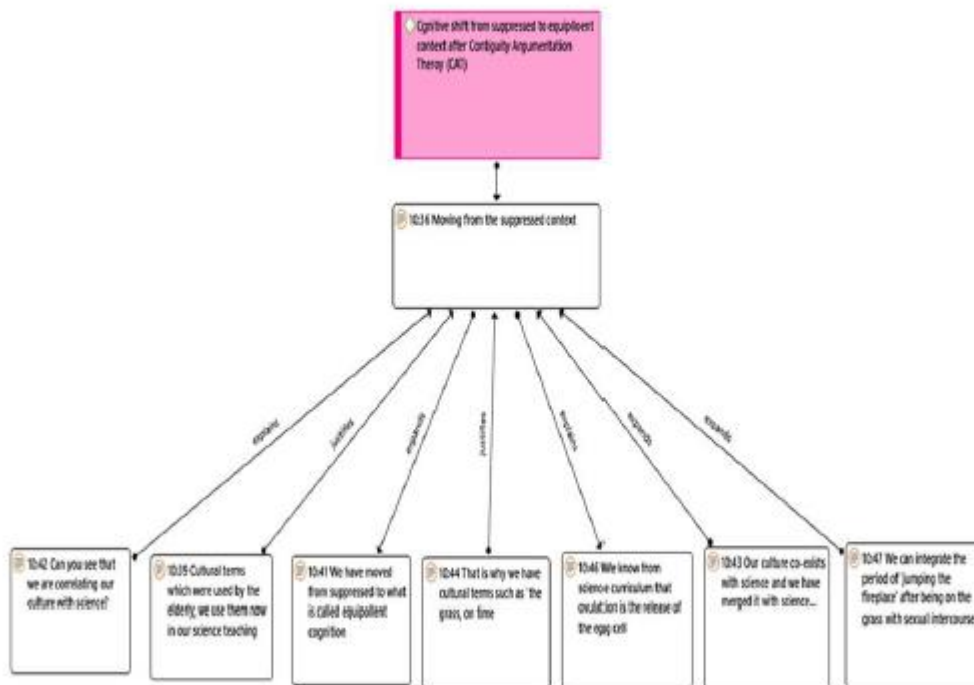
1. Menstruation selected as Xhosa indigenised lesson
(0.00.11 – 0.00.14)
2. Menstruation is on time or on the grass in Xhosa IK
(0.00.15 – 0.00.26)
3. Unlearned old women could count menstruation and ovulation days
(0.00.29 – 0.01.17)
(0.01.53 – 0.02.01)
4. Jumping the fireplace is linked with sex and pregnancy
(0.01.25 – 0.01.36)
(0.02.06 – 0.02.17)
5. Cognitive shift from suppressed to equipollent CAT category
(0.02.22 – 0.02.42)
(0.02.45 – 0.02.55)
6. Equipollence conception makes it easy to teach sexual concepts
(0.02.22 – 0.02.35)
(0.02.45 – 0.02.56)
(0.02.56 – 0.03.12)

Part 4: two themes generated from data using Atlas ti.8 software

Theme 1: Different Xhosa IK terminology for menstrual cycle concepts is due to different geographical location.



Theme Two: Identification of Contiguity Argumentation Theory cognition shift from suppressed to equipollence category



APPENDIX 17

THIRD FOCUS GROUP AUDIO AFTER CAPTD AND IK LESSON

Appendix 17

Third Focus group interview transcript after CAPTD and Xhosa Indigenised lesson presentation

R: Colleagues, I know you said you're going to respond on personal drawings only after this session, may I please, please get just one person to respond to this question as I need clarity:

Can you link the Xhosa counting program using 'grass, time, soil, jumping fireplace/not jumping fireplace' to the specific phases of the scientific menstrual cycle like menstruation, endometrium changes, ovulation, copulation, fertilization?

PFI: *Okay mam, I'm going to add on what our Miss has just presented (ndengeza kulento ibithethwa ngu Miss wethu) and use the 7 day schedule as we normally teach our learners (ndisebenzise le 7 day cycle siteach-a ngayo).*

So, menstruation (engceni/exesheni) takes (ithatha) about 7 days. Even now (nangoku), after childbirth a woman stays (emva kukubeleka umfazi uhlala) for 10 days in the nursing room (efukwini) just like in the olden days. So, 10 days from the onset of menstruation (10 days ukuqala kwe menstruation) the woman does not jump the fireplace (umfazi akatsib'iziko). This 10 days includes 7 days of menstruating (on time or on the grasss) and 3 days after menstruation has stopped when the grass (endometrium) is still growing. .Then after 10 days (emva kwe 10days), from day 11 it's free time to jump the fireplace and is regarded as ovulation because the egg cell has been released although old people did not have this term of ovulation (ku free for utsibi ziko ngoba iqanda liphumile li ready nangona bona bantwa badala babengenalo eli gama le ovulation). They knew that the grass was ready (babe sazi uba isibeleko si ready ufuna uba

pregnant) and the woman must jump the fireplace (umfazi makatsib'e iziko) for fertilization to occur if the woman wants to get pregnant (kwenzeke fertilization if umfazi ufumu mitha). As our teacher explained just now (as Miss wethu esandutsho), the grass which is the endometrium (ingca eyi endometrium) and its soil (nomhlaba) which is the blood vessels (eyimithambo) have become thicker (zidumbile) and ready to receive something new (zi ready for intw'e ntsha ezakuthi nca), that's a fertilized egg cell that will be implanted inside the fertile grass which is the womb or endometrium. Once menstruation or 'being on grass' stops (once kupheli menstruation okanye ukuba sengceni), the endometrium inside the womb (le ngca isesibelekweni) grows and grows thicker just like a thick carpet for the attachment (izothi nca I embryo) of the embryo while the soil (blood capillaries), get ready to provide nourishment for the growing embryo (ze umhlaba ube ready for ukutyisa usana kula mithambo yegazi.. Then, if no fertilization takes place, then the bleeding (ukuba sexesheni or engceni) takes place to restart the cycle (iqale kwakhona ukuba sexeheni).

Can't believe that I'm saying these things like copulation, fertilization and menstruation without stress (ezi zinto like copulation, fertilization ndingena stress) laughter ...seriously this IK and CAT information has made saying and using these terms lighter (seriously le IK and CAT info yenze kwalula ukubiza and use la magama)...yes....from group members.

R: Colleagues, can you help me here, can I have perhaps one or two people explaining what do you understand about a drawing of a wilted flower? What do you think it represents in terms of reflections of how you feel when teaching sexual concepts? Can I have a volunteer just to help to broaden my understanding?

PF2: *Let me put simpler in my own way. To me, feeling like a wilted flower means that I feel like dying inside because of pain (ukushawabaana njeneg flower means ndiyafa ngaphakathi kubuhlungu). These things (ezi zinto sizifundisayo) that we teach strip us of our humanity (zisusa ubuntu bethu gqith) so much and kills the self-respect that we have deep down inside just like this wilted flower (ibulala ubuntu ngaphakathi njengale flower).*

R: Thank you very much Mam. Let's move now to the last session of our study, that's the individual drawings (with explanations) as feedback on your views about CAT conception levels and Xhosa Indigenised lesson.

APPENDIX 18

SECOND DRAWINGS AFTTER CATPD AND IK LESSON

Appendix 18	
Participants	After the CATPD and IK lesson presentation
2A	<p>Outcomes 2A</p> <p>Link <i>ivesha</i> with menstrual cycle: I learnt how to integrate my indigenous knowledge with scientific knowledge especially in teaching menstrual cycle. I learnt how to relate menstrual cycle to ‘<i>exasheni</i>’ which is a term used in my language for menstruation.</p> <p>Change of mindset: After the discussions we had, my mindset changed. I believe that if sessions like these can occur regularly, teaching human reproduction will be much better.</p> <p>Government must close the gap: curriculum developers must do a lot more work of closing the gap between cultural beliefs and scientific concepts in Life Sciences.</p>
2B	<p>Knowledge of (CRTSs) 2B</p> <p>Change in teaching style: Now that I have knowledge of culturally responsive teaching strategies (CRTs), it is going to be different as I am feeling better when approaching the topic on human reproduction.</p> <p>Removal of taboo feeling</p> <p>Taboo feeling related to human reproduction language and my home language is removed.</p> <p>I can now think of using dance and gestures in my culture use in sexual cultural practices to remove the taboo feeling. The program has helped a lot with the difficulty of teaching human reproduction.</p>
2C	<p>Equipollence 2C</p> <p>Cultural knowledge: I reached equipollent thinking where it became clear that IK needs to be integrated with science because there is a lot of old</p>

	<p>people's knowledge regarding issues of menstruation, fertilization, pregnancy and childbirth that we did not know.</p> <p>Menstrual cycle: Old people counted the time (<i>ivesha</i>) for prevention of copulation and therefore, practised contraception. They practised abstinence and avoided the transfer of semen into vagina. They counted the days after menstruation and knew that when someone engages in sexual intercourse, that person must be an adult who is ready to have kids. Even after childbirth, a woman did not engage in sexual activities in the early months. They stayed in bed for 10-14 days and old people knew that resting was good for healing the body. Also, resting was good for gaining energy.</p> <p>Time for safe sex: counting the time for suitable time for fertilisation was also counted by old people, ovulation time in science.</p>
<p>2D</p>	<p>Equipollent conception 2D</p> <p>I will be comfortable in my class now when teaching these sexual terms because my culture and scientific knowledge will be integrated.</p> <p>Change in thinking: I feel a change now that my cultural view has been integrated with science and this has made teaching human reproduction easy.</p> <p>Explanation of menstruation: I can clarify menstruation by correlating 'exesheni' from my culture with the science term in the female. The correlation between my culture and science is used further when the 'grass' (culture) is compared to endometrium (science), where the grass that covers the surface of the soil is removed during menstruation so that a new layer of grass (endometrium) can be formed so that one can be pregnant.</p> <p>Ivesha (time): Our parents were not educated but they were able to count safe time of avoiding a pregnancy or making sure that one gets pregnant.</p> <p>They counted the different stages of menstrual cycle starting with menstruation where female avoided sex (no jumping of fireplace). In that way, they had family planning and children were at regular intervals of say three years although they were no pills to prevent pregnancies during those times.</p>

<p>2E</p>	<p>Now I know: 2E</p> <p>-I can tackle the topic in a better way by accomodating both worlds of knowledge in my teaching.</p> <p>-I am feeling more comfortable and saved by this knowledge (<i>noko umntu uziva e-saved ndiziva bhetele ngoku</i>)</p> <p>-As a teacher, I can easily say these sexual words that I avoided before by using the words from Xhosa IK</p> <p>-Most of my learners can do better in this topic and listen in an improved way</p> <p>-I think the community is accomodated now and they can also easily understand the topics that we teach in Life Sciences</p> <p>-The presentation on this topic (IK) can empower communities now and make them listen and get solutions to problems.</p>
<p>2F</p>	<p>After the presentation 2F</p> <p>Comfortable: I feel comfortable to teach human reproduction and link my culture with science without feeling nervous. For example, teaching menstrual cycle by integrating Xhosa culture with science concepts. Now, it is going to be easy to call names that I avoided initially including male and female parts (<i>ngoku kuzoba lula ukubiza amagama azo zonke i parts kwi male and female reproductive systems</i>). The link between menstruation and <i>exesheni</i> was important.</p> <p>Suitability of the research: the presentaion was perfect because it made teaching human reproduction concepts easy by giving me teaching strategies of how to teach even in other topics, it is going to be easy.</p>
<p>2G</p>	<p>CRTs 2G)</p> <p>Equipollence: I have learnt that what learners already know, can be used to introduce new information and balance these two forms of knowledge. I have learnt that different tecahing strategies can help learners to remember new knowledge by linking it with what they know in their culture.</p>

	<p>Change: My role as educator at the end is to know the scientific side of reproduction, therefore I have to find ways of teaching them and this can change the community's misconceptions.</p> <p>Link culture with science: I know that culture has a negative side (avoiding ncalling sexual concepts) on teaching sexual oncepts, I feel that I have learnt ways of designing different teaching strategies that have a link between the culture and science.</p>
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APPENDIX 19

FLOW CHART DRAWING PARTICIPANT CONFIRMATION

Transcript of a flow diagram during participant confirmation of findings

Our Views in Phase 4 of the research

Phase 1: Avoiding naming of sexual concepts is deeply-rooted in our Xhosa culture because *asibizi*. We do not talk about sex things as they are taboo.

Phase 2 : Free drawings and free discussions about how we teach and new research knowledge created an environment of 'no more embarrassment'. Indigenous knowledge (IK) and science were linked to Contiguity Argumentation Theory (CAT)'s levels.

Phase 3

- Making my own Xhosa IK lesson was very exciting and choosing our own topic which was menstruation was empowering.
- Linking our lesson to research on CAT and culturally responsive strategies was the most important and empowering thing.
- Teaching a lesson on menstruation by integrating IK and science developed our thinking to CAT's level of equipollence was exciting.
- Integrating IK and science emphasises co-existence, therefore equipollence has been achieved in our thinking levels by showing that *exesheni and engceni* is equivalent to menstruation, *ukutsib'i ziko* is equivalent to sexual intercourse.
- Our view is-culture must be elevated by having more IK concepts that can be used to teach science concepts ('IKS must be bigger than science').
- Culture is central to science learning, therefore, elevate IK and make an additional 6th CAT cognition level which is more than equipollence.

①. Growing, naming sex norms is deeply rooted in our Xhosa culture because of taboos - we do not talk about sex things - taboo.

Free drawings
Free discussions about how we teach
New research knowledge
②

IK + Science
No more embarrassment!!
CAT tools
③

Our Views - Page 4

IKS > Western Science
Culture is central to science learning
Elevate IKS and bring additional CAT level (6) which is more than competence

Elevate Culture
Integrating IKS Science emphasizing co-existence
Egymptence

✓✓✓✓✓✓✓✓
Making our own Xhosa IK lesson was very exciting.
Choosing our own sex topic - Menstruation was empowering
④

✓✓✓ Making our own lesson using Qad. Xhosa IK and linking it to research on CAT and culturally responsive strategies was the most impactful and empowering thing.

* Besheni, engeni = menstruation
* Kutsibi, ziko = social intercourse.

APPENDIX 20

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(student number) 200332821 candidate for the (full description of qualification) PhD

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A culturally responsive strategy for teaching sexual concepts in rural Xhosa secondary schools

It is hereby certified that the proposed amendments to the treatise/dissertation/thesis have been effected and that **permission is granted to the candidate to submit** the final copies of his/her treatise/dissertation/thesis to the examination office.

P. Webb
SUPERVISOR

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And

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