

https://dspace.org/

Factors influencing Grade 7 teachers' implementation of outcomes-based approaches in the national curriculum when teaching 'human reproduction'

Doidge, Megan Caroline

2014-09-01
http://hdl.handle.net/10539/15337

Downloaded from a DSpace repository. https://dspace.org/

Chapter 1
Introduction

South Africa has experienced a period of continual curriculum change over the past 20 years. The change was initially politically driven with high expectations of a resultant more democratic and economically empowered society. Subsequent changes to the curriculum have been in response to perceived problems in its design. My research focuses on a particular group of teachers (Grade 7 Natural Sciences teachers) teaching a particular topic (human reproduction) during one phase of this ongoing change, i.e. the implementation of the Revised National Curriculum Statement after 2002. I was interested in the factors affecting teachers' use of outcomes-based approaches outlined in the National Curriculum Statement. Research shows that a number of factors affect teachers' implementation of new approaches (De Feiter, Vonk, & Van Den Akker, 1995; Fullan, 2001; Hargreaves, 2002; Rogan & Grayson, 2003), influencing their beliefs and thus their behaviour (Ajzen & Madden, 1986). These factors are investigated in this research.

This chapter provides a brief outline of the background to the study, an introduction to the reasons for teaching human reproduction at the Grade 7 level, a statement of the problem, the purpose of the study and the research questions, as well as an outline of the study and the theoretical framework that was used to guide my study. My positionality as a researcher and some further limitations to the study and an argument for the importance of the study and its contribution of new knowledge to the field of science education will then be presented.

1.1 Background to the study

A new curriculum, Curriculum 2005, was introduced into South African schools in 1997. Some background to the introduction of the new curriculum is provided in this section, i.e. a brief comment on why a new curriculum was introduced, the initial attempts at introducing the new curriculum and the revisions that followed. Features of the new curriculum such as outcomes-based and learner-centred approaches, the place of the Natural Sciences Learning Area within the National Qualifications Framework, and the relevance of human reproduction as core knowledge within the senior phase of the Natural Sciences Learning Area are all described in this section. This section is concluded by a brief argument for the important role that Natural Sciences teachers can play in teaching human reproduction.

1.1.1 A new national curriculum for South African schools

After the ANC government gained power in 1994 in South Africa, the newly formed national Department of Education began to plan a new national curriculum. Many educators involved in the

process of curriculum change had expressed concern about the ineffectiveness of the content-based traditional approaches to teaching and learning which seemed to be prevalent in South African schools. The Department of Education examined new curricula in other countries and, in particular, curricula that were based on outcomes-based approaches to teaching and learning. The Department of Education decided to introduce a particular version of outcomes-based education into South African schools and produced a new curriculum which they called Curriculum 2005 (C2005). The document describing this new curriculum was later described as the Statement of the National Curriculum (Grade R-9) (Department of Education, 2002b). Curriculum 2005 was first introduced in Grade 1 in 1998 and then progressively into other grades.

A Ministerial Review Committee was appointed in 2000 to evaluate the design of the new curriculum and its implementation. The review committee identified problems in the design of the curriculum that created confusion and resulted in the difficulties that teachers experienced in implementing this curriculum (Chisholm, et al., 2000). These are described in Chapter 3. In response to the report of the Ministerial Review Committee on Curriculum 2005, the curriculum was revised and published as the *Revised National Curriculum Statement Grades R-9* (RNCS) in 2002 (Department of Education, 2002b). According to the Department of Education, this Revised National Curriculum Statement was "not a new curriculum but a streamlining and strengthening of Curriculum 2005" (2002b, p. 6). The revised curriculum was introduced into Grade 7 at the beginning of 2006, and into Grades 8 and 9 in 2007. My research took place during the period in which this curriculum was implemented. The curriculum was later revised again and published as the National Curriculum Statement: Grades R-12 and included the Curriculum and Assessment Policy Statement (CAPS) for all subjects (Department of Basic Education, 2011). Implementation began in 2012.

1.1.1.1 Outcomes-based education in the national school curriculum

One of the most distinctive features of the South African school curriculum described in the Revised National Curriculum Statement was its outcomes-based approach to teaching and learning. Spady describes outcomes as demonstrations of learning, i.e. "what learners can actually do with what they know and have learned" (Spady, 1994, p. 2). The outcomes in the RNCS included both seven *critical* and five *developmental outcomes* that all learners should achieve, as well as the *learning outcomes* for each learning area or subject. The critical outcomes that learners needed to demonstrate, at increasing levels of complexity in all learning areas and subjects throughout their education, included critical and creative thinking, problem-solving and decision-making; working cooperatively with others; managing one's own activities; collecting and processing information critically; communicating effectively; using science and technology effectively and critically showing responsibility towards the environment and others; and a global view of the world as a set of related systems. Developmental outcomes included demonstration of the use of effective learning strategies, responsible citizenship in the local, national and global context, cultural and aesthetic sensitivity across a range of social contexts, and an ability to explore career and education opportunities and develop entrepreneurial opportunities (Department of Education, 2002b).

1.1.1.2 New approaches to teaching and learning

Learner-centred and activity-based approaches, the Department of Education asserted, should be used to achieve the critical, developmental and learning outcomes. Using these approaches, teachers would be mediators of learning, assisting learners to construct knowledge and develop skills and appropriate attitudes and values (Department of Education, 2002b).

Learner-centred approaches refer to approaches which take into account and make provision for differences in prior knowledge and experience, styles of learning, home languages and competence in the language of learning, and cultural backgrounds, beliefs and practices (Brodie, Lelliott, & Davis, 2002a; Department of Education, 2002b; Sanders & Kasalu, 2004). In learner-centred approaches, the teacher helps the learner to construct new knowledge by identifying their prior knowledge, scaffolding the learning of new concepts and providing suitable activities during which learners can work alone and in groups to develop new concepts and skills and to explore and perhaps adjust their values and attitudes. Through the provision of these learning experiences, teachers provide the opportunities for learners to achieve the desired outcomes at an appropriate level (Department of Education, 2002b).

Other key requirements of the new curriculum included the implementation of a relevant curriculum, continuous assessment for improving learning, and integrating the curriculum across and within learning areas (Department of Education, 2002b, 2003).

1.1.1.3 A National Qualifications Framework

In 1996, the Department of Education presented their plans for a National Qualifications Framework (NQF) which would allow for lifelong learning (Department of Education, 1996b). The National Qualifications Framework placed all teaching and learning within three bands, i.e. General, Further and Higher Education and Training. In General Education and Training (Grades R-9), all learning takes place in what was described as 'learning areas' in the RNCS (Department of Education, 2002b) and in the latest revision are now described as 'subjects' (Department of Basic Education, 2011). I will use the term 'Learning Area' since my study took place during the period in which the RNCS was used. In the senior phase (Grades 7-9) of General Education and Training there are eight learning areas, one of which is the Natural Sciences Learning Area.

1.1.1.4 The Natural Sciences Learning Area

The Natural Sciences Learning Area consisted of four main strands (or content areas), *Planet Earth and Beyond*, *Energy and Change*, *Matter and Materials*, and *Life and Living*. The *Life and Living* content area, in the RNCS, was further subdivided into three sub-strands, *Life Processes and Healthy Living*, *Interactions in the Environment*, and *Biodiversity, Change and Continuity* (Department of Education, 2002a). The Revised National Curriculum Statement for the Natural Sciences Learning Area provided an outline of the core knowledge in these sub-strands. This core knowledge provided a context within which learners could work towards, and demonstrate their achievement of, the three Natural Sciences learning outcomes at the level described by the *assessment standards* for each grade. The three learning outcomes for the Natural Sciences Learning Area were entitled *Scientific*

Investigations (LO 1), *Constructing Science Knowledge* (LO 2) and *Science, Society and the Environment* (LO 3) and included the following respectively (Department of Education, 2002a, p. 6)

- The learner will be able to act confidently on curiosity (sic) about natural phenomena, and to investigate relationships and solve problems in scientific, technological and environmental contexts.
- The learner will know and be able to interpret and apply scientific, technological and environmental knowledge.
- The learner will be able to demonstrate an understanding of the interrelationships between science, technology, society and the environment.

1.1.2 A rationale for teaching human reproduction within the framework of the Natural Sciences

Human reproduction formed part of the core knowledge specified for the Senior Phase (Grades 7-9) of the General Education and Training (GET) band (Department of Education, 2002a). Core knowledge about human reproduction was included in the sub-strands *Life Processes and Healthy Living*[1] and *Interactions in the Environment*[2] . It was not however clear in the RNCS documents at which grade human reproduction should be taught. While some members of the Gauteng Department of Education believed it should only be taught in Grade 9, teachers felt that it was important to start earlier in Grade 7 (Doidge & Lelliott, 2008). There were some compelling reasons for teaching this topic earlier, as follows:

Schools can play an important role in not only providing information about human reproduction and sexually transmitted infections (STIs) but in developing skills and influencing values and attitudes in relation to responsible sexual behaviour. It is important to ensure that young learners understand the process of reproduction and to promote responsible sexual behaviour. Many young adults in South Africa engage in risky sexual behaviour and they may start at an early age. In a national survey of 15-24 year olds in 2003, 67% of young people reported having had sexual intercourse (Pettifor, et al., 2004). Amongst those who said they were sexually experienced, the average age at which they first had sex was 17 years. Other surveys have placed the average age of onset of sexual activity as 14-15 years (Bhana, Riba, & Vawda, 2011; Hartell, 2005). If we, as educators, are to provide children with the appropriate knowledge and skills to avoid risky sexual behaviour, then we need to do so before they become sexually active.

Sexual encounters are often not a matter of choice since sexual abuse is rife in South Africa. More than a third of girls have experienced sexual violence before the age of 18 (Jewkes, Sikweyiya, Morrell, & Dunkle, 2009). In a survey in the Eastern Cape and KwaZulu-Natal, 28% of men admitted

[1] Core knowledge includes physical changes during puberty, conception and fusion of sex cells, changes in the mother's body during pregnancy, prevention of sexually transmitted diseases and behaviour choices (Department of Education, 2002a, p. 64).

[2] Core knowledge includes birth and raising children, and behaviours associated with finding a mate. Connections are made to behaviour within the animal kingdom (Department of Education, 2002a, p. 64).

to having raped someone. 9.4% of this group had done so before the age of 10, and a further 16.4% had done so between the ages of 10 and 14 (Jewkes, Abrahams, et al., 2009). Learners face rape in both their home and school environment. In some areas, most sexual abuse comes from family members, while statistics for the country show that a third of the offenders are teachers and about 20% are other learners (Terreblanche, 2002) so schools can be dangerous environments for young people. Ignorance about sexual reproduction may result in learners being more open to peer pressure regarding becoming sexually active and to abuse. Learners need to be equipped from an early age with appropriate knowledge, skills and values to make appropriate decisions and to resist abuse or to obtain help when they are abused.

Further motivation for an effective programme on human reproduction for Grade 7-9 learners is the HIV/AIDS pandemic in South Africa. While appropriate sexuality education and HIV/AIDS prevention is essential throughout a learner's life, it is perhaps most critical after the start of puberty when most learners become sexually aware and make choices concerning becoming sexually active. Their choices can be life-threatening. According to UNAIDS (2011), South Africa has the highest incidence of HIV/AIDS in the world with an estimation, in 2009, of 5.6 million people living with HIV. A nationally representative household survey, involving a questionnaire and the collection of an oral fluid sample for HIV testing, was carried out in 2003 among almost 12000 young people between the ages of 15 and 24 (Pettifor, et al., 2004). The results indicated that 10.2% of young South Africans in this age bracket are HIV positive, and 77% of these young people are women. Many young people are however unaware of the risk of contracting HIV when they engage in risky sexual behaviour. 62% of HIV positive young people in the survey said that they thought they had no chance or very little chance of contracting HIV (Pettifor, et al., 2004).

Education about sexuality and lifestyle choices and related life skills are incorporated into the Life Orientation[3] programme early on in the learners' school career (Department of Education, 2002c). However, in the Natural Sciences (in the RNCS), when reproduction is introduced in the Intermediate phase, the focus is on vegetative and sexual reproduction in plants and animals as a way of promoting the continuity of life (Department of Education, 2002a). Sexual reproduction in humans first appears in the Senior Phase. When the Revised National Curriculum Statement was introduced, it did not specify in which grade human reproduction should be taught in the senior phase. In the previous curriculum, it had first been taught in Grade 9. Educators however questioned the value of teaching learners about puberty long after these learners have entered this stage of their development. They proposed that this core knowledge be moved down to Grade 7 (Doidge & Lelliott, 2008). By Grade 7, the majority of learners are entering or have entered adolescence and puberty and they have questions about the physical and associated emotional changes taking place in their bodies. The age range of Grade 7s is about 12 to 14 years old. Appropriate teaching and learning about human reproduction in Grade 7 in the Natural Sciences can provide learners with knowledge about the ways in which their bodies work and can contribute to equipping learners with regard to life skills associated with their sexuality.

[3] Life Orientation is one of the Learning Areas in General Education and Training and includes health promotion, social, personal and physical development and career preparation in its curriculum (Department of Education, 2002c).

1.1.3 The role of Natural Sciences teachers in teaching human reproduction

Although learners receive information about human reproduction from a number of sources, Natural Sciences teachers have an important role to play for several reasons.

Firstly many parents experience difficulty in talking to their children about reproduction and human sexuality (Bhana, et al., 2011; Greathead, Devenish, & Funnell, 1998; Mathebula, 2001). Some children may only learn about reproduction in the classroom or through public programmes and the media. The Love Life organisation, Soul City, the media, peer education programmes and visiting speakers (e.g. qualified sex educators) all play a valuable role, contributing to a multi-disciplinary approach to sexuality education (Bhana, et al., 2011; Clacherty, et al., 1998; Coombe, 2000; Halstead & Waite, 2001). However, not all learners have access to these resources. Natural Sciences, Life Orientation and other teachers, on the other hand, have access to every child attending school and can address issues of human sexuality with these learners.

All Grade 7-9 learners in South Africa have to engage with human reproduction in the Natural Sciences and Life Orientation Learning Areas. The emphasis in Life Orientation is on developing life skills to deal with social issues around human reproduction. The development of life skills forms a smaller component of the Natural Sciences Learning Area which also encourages the development of a scientific perspective, situating reproduction within the normal behaviour and functioning of all animals. Natural Sciences teachers who have completed tertiary studies specialising in Biology and/or Natural Sciences have (or should have) the subject content knowledge needed to teach the biological aspects of human reproduction accurately.

Grade 7-9 Natural Sciences teachers can thus make a valuable contribution to addressing the core knowledge area of human reproduction amongst young South Africans and addressing to some extent sexuality education.

1.2 Statement of the problem

Grade 7-9 Natural Sciences teachers were responsible, during the implementation of the RNCS, for the teaching and learning of the topic 'human reproduction' using outcomes-based and learner-centred approaches. These approaches were believed to be effective in increasing learning and preparing learners for a competitive global economy and have been promoted in many countries (Aldridge, 2012; Coll & Taylor, 2012; Spady, 1994). Some or all of these approaches were new to Natural Sciences teachers in South Africa. There were therefore questions about the extent to which teachers would implement these new approaches within the context of a topic like human reproduction and the factors that would affect their ability or willingness to implement these approaches.

This study was therefore motivated by anticipated problems as Grade 7 Natural Sciences teachers began to use these new approaches in the teaching and learning of the topic 'human reproduction'.

These included the following:

- Teachers may be confused about or may have misunderstood outcomes-based and learner-centred approaches as seen in several studies (Rogan, 2004; Sanders & Kasalu, 2004); or they may choose not to implement these approaches, as is often seen in higher grades (Khulisa Management Services, 1999; Rogan & Aldous, 2004).
- Some of the core knowledge about human reproduction may be new to some Grade 7-9 Natural Sciences teachers. Research in South Africa (Taylor, Van der Berg, & Mabogoane, 2013; Taylor & Vinjevold, 1999) and in other developing countries (De Feiter, et al., 1995; Lewin, 1992) shows that teachers' content knowledge impacts on effective teaching.
- If teachers are to address not only the construction of knowledge about the biological aspects of human reproduction (learning outcome 2) but also values and attitudes, ethics and decision-making skills about sexuality relevant to the age and context of the child, then they are dealing with highly sensitive content. Natural Sciences teachers enter the classroom with their own understanding of, beliefs about, and attitudes towards, sexuality. In addition, they work within multicultural classrooms where knowledge, beliefs, values and attitudes concerning sexual matters vary greatly amongst learners from different cultures, religions and family backgrounds. Inappropriate approaches to the teaching and learning of this topic could cause offence.
- Research shows that the extent of congruence of teachers' beliefs, attitudes and values with that of a curriculum innovation influence the extent to which they can adopt that innovation (Fullan, 2001; Stein & Wang, 1988). Teachers who have different beliefs and values regarding sexuality, and who thus have different attitudes on what should be taught and how it should be taught, will probably vary in the extent to which they teach human reproduction and in the extent to which they use proposed approaches.

Teachers are probably the most influential factor in the teaching and learning process (Coll & Taylor, 2012; De Feiter, et al., 1995; Fullan, 2001). When new curricula are introduced, teachers' ability to adopt new teaching and learning practices to teach new content is of crucial importance to the successful implementation of the new curriculum. However, teachers are often resistant to change (Lumpe, Haney, & Czerniak, 1998b). Thus it is of great importance to understand the changes that are needed, the factors that affect teachers' capacity and readiness to change, and the interventions that can promote or hinder change.

1.3 Purpose of the study and research questions

The purpose of this research then was to find out what factors influence the ways in which, and the extent to which, teachers use outcomes-based and learner-centred approaches to teach human reproduction. Teachers' beliefs about the value and usefulness of approaches that are outcomes-based and learner-centred, their ability to use these approaches, and their beliefs about factors that may hinder the use of these approaches may be very influential in determining the extent to which teachers

take on this innovation.

In order to identify factors that influence Grade 7 Natural Sciences teachers' implementation of outcomes-based approaches when teaching human reproduction, the following research questions were investigated:

1. To what extent do Grade 7 Natural Sciences teachers use approaches that are learner-centred and outcomes-based during the teaching of human reproduction?
2. What factors influence the teaching of human reproduction to Grade 7 learners?
3. What factors affect the use of outcomes-based and learner-centred approaches during the teaching of human reproduction?
4. How do teachers' behavioural, normative and control beliefs affect the teaching of human reproduction in outcomes-based and learner-centred ways?

My research first attempts to identify the extent to which teachers are using approaches that can be described as outcomes-based in the brief period that they are teaching human reproduction. In other words, to what extent do teachers use approaches that enable learners to acquire the knowledge, skills, values and attitudes that they need in order to demonstrate the critical and Natural Sciences learning outcomes at the Grade 7 level? The RNCS indicates that such approaches are learner-centred, activity-based and constructivist. Since 'activity-based' and 'constructivist' approaches are central to learner-centred approaches, I focus on learner-centred approaches. In my research I therefore talk about outcomes-based and learner-centred approaches. Research question 1 is answered in Chapter 6.

I then examine factors affecting the teaching of human reproduction, referring to them as being 'internal' or 'external' to the teacher. I am interested in finding out if there is a direct influence of these factors on the teaching of human reproduction (research question 2) in outcomes-based and learner-centred ways (research question 3). Finally I examine the effect of teachers' beliefs about teaching this topic using the recommended approaches, their perceptions of other people's attitudes to teaching this topic and their beliefs about the impact of external and internal factors on their teaching of human reproduction using outcomes-based and learner-centred approaches (research question 4). Research questions 2-4 are answered in Chapters 7-9.

1.4 An outline of the study

In order to answer the research questions, I looked at the findings from an exploratory case study that I had previously carried out and used to develop my research questions. I revised teaching and learning materials on human reproduction that I had developed for Grade 7 teachers and had used in the exploratory case study. After obtaining permission to work in a particular district in Gauteng, I then carried out a situational analysis to ascertain teachers' needs with regard to the teaching of human reproduction and invited teachers to a workshop. At the workshop, teachers were introduced to some of the workshop activities, obtained advice from an expert in sexuality education on teaching the topic of human reproduction, and discussed their fears, concerns and ideas about teaching human

reproduction. They were invited to complete a survey at the end of the workshop which would provide me with some biographical data, and with information on their understanding and practice of outcomes-based and learner-centred approaches, their concern about and/or interest in teaching human reproduction, and the factors that they felt would impact on their teaching of human reproduction. These teachers are referred to as the survey teachers in this thesis. The survey teachers were offered copies of the teaching and learning materials and were invited to participate in the case studies. Ten teachers were selected for case studies in the multiple case study on factors influencing Grade 7 teachers' implementation of outcomes-based approaches when teaching human reproduction. These teachers are referred to as the case study teachers in this thesis. Additional teachers were interviewed and the data from two of these interviews was used to highlight two factors affecting teaching in my analysis.

The outcomes-based approaches outlined in the national curriculum involved the use of learner-centred and activity-based approaches through which it was expected that learners would be able to demonstrate the critical outcomes of the national curriculum and the learning outcomes of the various learning areas (Department of Education, 2002a). Since learner-centred approaches required learners to be involved in problem-solving activities, activity-based approaches are discussed within the context of learner-centred approaches in this thesis.

An analytical framework, based on the literature on outcomes-based and learner-centred approaches, was developed. This framework enabled me to analyse the extent to which teachers used outcomes-based and learner-centred approaches when teaching human reproduction and so to answer research question 1. The design of this analytical framework is discussed in chapter 6.

1.5 Theoretical framework

The theoretical framework used in this study has been derived from two other theoretical frameworks. Rogan and Grayson's theoretical framework for curriculum implementation in developing countries (Rogan & Aldous, 2005) is used to identify factors influencing teachers' capacity to implement outcomes-based and learner-centred approaches when teaching human reproduction (research question 2). I focus in particular on the influence of factors external to the teacher such as professional development, school ethos and management, physical resources, and learner factors (language, culture and home environment), as well as internal factors i.e. professional and personal teacher factors, on a teacher's capacity to innovate and use these approaches. Ajzen's theory of planned behaviour (Ajzen, 1991; Ajzen & Madden, 1986) is used to guide my analysis of how beliefs influence intentions to use outcomes-based and learner-centred approaches (research question 3) and thus behaviour. In the theoretical framework I construct, aspects of each of the above frameworks will be combined into one framework. This framework can be seen in Chapter 3, Figure 3.3.

1.6 Limitations of the study and positionality of the researcher

This study takes place in the economic heartland of South Africa, i.e. the province of Gauteng. The Gauteng Department of Education placed all their schools within administrative districts based on geographic regions. At the time of my study, there were twelve districts and I chose to work within only one of these districts. There are a number of limitations to this study that should be noted.

Firstly the study cannot be generalised to schools elsewhere, as I discuss again in chapter 5. This is an urban environment and so one cannot generalise to a rural environment. The schools in the selected district do draw learners from a wide range of socio-economic sectors, from those who live in informal settlements and are very poor to those who live in large and wealthy homes. The teachers who took part in the survey and multiple case study taught at schools across all socioeconomic sectors and the case studies took place in a range of different environments, that is, in three city schools, three township schools, and one suburban school. The learners came from a number of different ethnic and population groups and their home languages were diverse. Although the case study teachers selected were at urban schools with diverse conditions, I limited my choice of case study teachers to those that were in schools with the following conditions.

My study took place in a district in which English is the chosen language of learning and teaching (LOLT) in most schools. English was the LOLT in the schools where the case study teachers taught. I did not attempt to find any Afrikaans-speaking schools or any schools in which an African language might be used as the LOLT. In investigating language as a factor affecting the teaching of human reproduction in outcomes-based ways, I therefore only looked at the use of English as an additional language, and the use of home languages to supplement the English used in the classroom.

Only government schools were selected in order to consider factors affecting the teaching of reproduction within one system only i.e. the Gauteng Department of Education. No private schools, whether secular or religious, were included in my study. In addition the study took place in only one of twelve school districts making up the Gauteng Department of Education in 2007, and represented the predominantly African township populations and the mixed populations of the city and suburban schools.

The case study teachers were only observed during the teaching of human reproduction which took place over a 2-4 week period in each school, and only 6-10 lessons were observed. Although I observed most lessons, I did not observe all lessons of each teacher during this period since I was moving between schools. My findings were therefore restricted to the observed lessons and what teachers told me about their lessons during the interview. I am therefore aware that I missed some activities which might slant my findings for certain teachers. In addition teachers may have attempted to portray their teaching in a favourable light during the interviews and may have been teaching in unfamiliar ways which they would not sustain after I left the school. Furthermore the teachers were supplied with teaching and learning materials with activities designed to achieve certain outcomes, and most of them used these materials. Thus my study examines how teachers use outcomes-based

approaches when assisted by appropriate teaching and learning materials.

The case study observations therefore took place within the following contexts: at government schools in one Gauteng district with English as the LOLT whether as first or additional language, with teachers who had attended the workshop, were willing to be observed and had been provided with teaching and learning materials to support their teaching. These limiting factors will be discussed in more detail in the following chapters. However there is another important limiting factor in this study i.e. that I was the researcher.

In chapter 5, I discuss my philosophical assumptions and thus the methodology I employ. My research uses a mixed methods approach but the bulk of it is qualitative. I therefore recognise that, as Henning (2004) and Merriam (2009) argue, I am the main instrument of research and as such, make meaning of the data from a particular perspective or position. In addition, as Merriam points out, I impact on and therefore alter the classroom and interview situation in subtle ways referred to as researcher effects. These researcher effects include the language I speak, my culture and race, the religion I adhere to, my age, gender, personality and other effects. I therefore need to make my position clear, i.e. establish my positionality, and consider how this may impact on my interpretation of my findings.

I am a white, middle class female who grew up during the apartheid era and went to an all-white girls' school. Although my parents were liberal, it was only during my university years during which I completed a BSc Hons degree in Zoology, that I became more politically aware and critical of apartheid. During these years, I was involved as a leader in Christian camping programmes for schools and through this became involved in multiracial activities amongst young people as Christians across the nation came together in conferences like SACLA (South African Christian Leadership Assembly) to explore issues around racial reconciliation.

My first biology teaching post was at a well-known boys' high school (whites only) in a Johannesburg suburb where I taught for six years at the height of apartheid. I taught in a well-stocked laboratory where all learners had textbooks and equipment and materials for practical work. From there I moved out of my insular 'white bubble' in the early 1980s and taught in a co-educational school in Soweto during a period of great tension. My class sizes ranged from 40 to 80 pupils and my only equipment was the two pieces of chalk supplied to each teacher everyday. There was no electricity and no money to purchase materials. I began to experience some of the difficulties that teachers in the townships had to deal with on a daily basis. After a year of travelling abroad and a brief stint in a poorer white school, I returned to Soweto. I became involved in In-service Education and Training (INSET) with a science education non-governmental organisation (NGO) for five years. This provided me with the opportunity of travelling widely throughout Soweto and Alexandra, visiting my teachers in high schools and providing assistance where possible. Here, in the politically fraught conditions of the 1980s, I became even more aware of the seriously debilitating conditions under which teachers attempted to teach, exacerbated by the call for 'Freedom now, education later'. I completed an M Ed during this period. I then moved to a government teachers' training college also in Soweto during which I taught biology for five years to both secondary and primary school pre-service teachers

during the closing years of apartheid before moving to a large university in Johannesburg where I have been involved for many years in teacher training and postgraduate science education programmes.

My period of work in both wealthy and poorer suburban schools in Johannesburg and in a very poor township school in Soweto, and in INSET and PRESET (In-service and Pre-service Education and Training) in Gauteng's largest township, i.e. Soweto, provided me with a much greater insight into the conditions in a range of different township and suburban schools. Nevertheless I was still an English-speaking, middle-class female in this context, an outsider to the township experience. As a result, when I interpret my results, my past history gives me some understanding of the conditions in township schools but not the deep understanding of an insider. This is a limitation in my study.

The second limitation related to the above history is that I have only taught at secondary schools, never at a primary school and I did not visit primary schools during my years in INSET. As a result, I do not have a clear idea of what Grade 7s are capable of academically and the conditions under which primary schools operate. I do have some idea of the biology included in the Primary Teachers' Diploma since I taught the biology courses for this diploma and was the external examiner for PTD Biology for all Department of Education and Training (Black) Colleges of Education for two years.

A third significant limitation is that even though I taught for more than decade in Soweto, I never learnt to speak any African language. English was the LOLT in all high schools and colleges of education, and I lacked confidence in my ability to learn to speak any African language. A brief stint on a Zulu course gave me only a smattering of Zulu words. As a result, when teachers code-switched, I could not follow the conversations in the various African home languages although I could gain a sense of what was being discussed when sentences in a home language made use of English or Afrikaans words for emphasis. This meant that when African languages were used more extensively, I could only describe what was happening in the classroom and suggest the content of verbal interactions in my field notes and transcripts. I did get one lesson translated that was almost completely in the teacher's home language. If I had been fluent in a wide range of languages, my data would have been richer.

1.7 Importance of study

This study took place within a particular period of curriculum change, the implementation of the Revised National Curriculum Statement (RNCS). The curriculum designers were starting to specify content but were still nervous of providing too much detail for reasons discussed in chapter 3. In the second year of the implementation of the RNCS at a Grade 7 level (2007), the Natural Sciences teachers in the district in which I conducted the study decided that they would all teach aspects of human reproduction on a trial basis. A later document provided more details on content to be followed and that detail is clearly provided in the new CAPS documents where human reproduction continues to be taught at Grade 7 level (Department of Basic Education, 2011).

Research on the teaching of human reproduction in the Natural Sciences in primary schools in South Africa is therefore a new area of research since human reproduction was not taught previously in Natural Sciences classes in primary schools. There has been fairly extensive research on sexuality education in schools worldwide, including amongst South African Life Orientation teachers, and the literature review in Chapters 2 and 3 draws fairly extensively on this research. However teaching human reproduction from a Natural Sciences perspective, while it does not neglect values and attitudes, places greater emphasis on providing learners with an understanding of how the human reproductive system functions and thus in understanding the biological basis for changes in their bodies. The findings on the factors affecting how Natural Sciences teachers in primary schools teach human reproduction is therefore particular to this study.

Secondly, while a number of studies have explored the implementation of outcomes-based approaches, notably Rogan and colleagues, this study focuses on the implementation of these approaches within the context of the teaching of a particularly sensitive topic, i.e. human reproduction. This sort of study has not been conducted before. These two aspects indicate that my study makes a new contribution to the field of science education research.

Outcomes-based education, a very controversial approach to teaching and learning in South Africa, is no longer in use in the South African education system. The Minister of Basic Education, Angie Motshekga, announced that by the beginning of 2014 OBE was "a thing of the past" (News24, 2014, p. 1). The RNCS Grades R-9 and NCS Grades 10-12 have been replaced with the National Curriculum Statement Grades R-12 in which there is now a very clear specification on what must be taught in each subject and in each term of each grade. The focus in the sciences is on conceptual development, while still paying attention to skills and values (Department of Basic Education, 2011). The outcomes remain in the new National Curriculum in a different form, with the critical outcomes being referred to as the general aims of the National Curriculum Statement Grades R-12 (pp. 4-5), and the Natural Sciences learning outcomes remain in the Natural Sciences CAPS document as specific aims for the Natural Sciences (p. 15). In addition, human reproduction continues to be taught at a Grade 7 level (pp. 38-39) and expanded upon in Grade 9 (p.78). The findings of this study therefore still have relevance for teachers who are teaching human reproduction to Grade 7s within the latest version of South Africa's new curriculum and the findings also provide insights for pre-service and in-service training of Natural Sciences teachers and for Natural Sciences subject advisors as they seek to assist Natural Sciences teachers within their schools.

1.8 Structure of Thesis

Chapter 1: Introduction

Chapter 1 has provided a brief introduction to the study. In this chapter, I provided some background on the introduction and structure of the new curriculum and the position of human reproduction within the Natural Sciences. I then argued for the importance of teaching human reproduction at the Grade 7 level; I suggested that one is partly teaching sexuality education when teaching human reproduction

and I explored the role of Natural Sciences teachers in teaching this topic. I then outlined the purpose of the study, the research questions, the theoretical frameworks that I used, the limitations of the study and argued briefly for the importance of this study as a new contribution to the field of science education.

Chapter 2: Socio-cultural influences and sexuality education

In Chapter 2, I begin to address factors that might influence the teaching of human reproduction. I therefore start by examining briefly some historical background on Gauteng in order to provide a context for the schools in which I conducted my research. I then provide an outline of the population and ethnic groups that make up South Africa, the religions they may belong to and the languages they may speak, in order to provide a picture of the multicultural and multilingual classrooms of Gauteng. I conclude by exploring issues in sexuality education in this multicultural urban society.

Chapter 3: Implementing a new curriculum

In Chapter 3, I provide a historical background to factors influencing the introduction of outcomes-based education in South Africa in the form of first Curriculum 2005 and then its modification as the Revised National Curriculum Statement. I discuss what learner-centred approaches are, and elaborate on how teachers are expected to facilitate the achievement of outcomes through these learner-centred approaches. I then present my theoretical framework for my study and explore factors identified in the framework that might influence Natural Sciences teachers' approach to teaching human reproduction.

Chapter 4: Interventions and events leading to the study

In this Chapter, I start by describing my initial involvement in developing a module on human reproduction and an exploratory case study on the use of this module in Grade 7 Natural Sciences classrooms during the period in which teachers were attempting to implement Curriculum 2005. I describe a meeting in one district in Gauteng concerning the teaching of human reproduction in Grade 7, and the subsequent situational analysis which then guided the design of a workshop for teachers in this district on teaching reproduction and the updating of the module. Finally, I report on the workshop, feedback on the workshop and the distribution of materials to schools.

Chapter 5: Methodology

In Chapter 5, I describe the research paradigms which guide my research, the methodology I employ as I attempt to identify teachers' beliefs and factors influencing their teaching of human reproduction. I therefore discuss the research methods I use i.e. a survey and a multiple case study, and the research instruments I use i.e. a survey questionnaire, interviews and observations of case study teachers. I conclude with a discussion of how I attempted to provide rigour in my research and to conduct my research in an ethical manner.

Chapter 6: Outcomes-based and learner-centred approaches

An analytical framework for assessing the extent to which outcomes are achieved through learner-centred approaches is described. I then use this framework to provide an analysis of the extent to which the ten case study teachers assist their learners to achieve the critical, developmental and

Natural Sciences learning outcomes using learner-centred approaches.

Chapter 7: Teacher factors

In this chapter, I explore the extent to which factors 'internal' to the teacher, i.e. professional and personal factors, influence teachers' approaches to the teaching and learning of human reproduction. I report on the findings from the survey, i.e. biographical information about the survey teachers, and survey teachers' views or beliefs about how some of these factors, for example religious and cultural factors, will affect their teaching of human reproduction. I then introduce the reader to each case study teacher, providing a vignette of the teacher, describing them, the context in which they work and their teaching of human reproduction in that context. I conclude with an analysis of my findings on the impact of personal and professional factors on the extent to which the teachers in my multiple case study teach human reproduction in outcomes-based and learner-centred ways.

Chapter 8: External factors: the learning environment and support structures

In this chapter, I begin to look at external factors that impact on teaching. I use data from the survey and multiple case study to explore the impact of support structures such as the school principal, colleagues, district facilitators and parents on the teaching and learning in Natural Sciences classrooms. I then describe the extent to which the learning environment assists or impedes the teaching of human reproduction in learner-centred ways.

Chapter 9: Learner factors

This chapter focuses on the learners, the recipients of teachers' efforts to teach human reproduction in outcomes-based and learner-centred ways. Here I explore the extent to which teachers take into account learners' prior knowledge, culture and religion, languages spoken and other personal factors when teaching.

Chapter 10: Discussion and Implications

In this chapter I provide a summary of my main findings and conclude on how these findings provide answers to my four research questions. I provide a critical reflection of the research process I used. I then discuss some implications for future research and practice before finally concluding my thesis.

Chapter 2
Socio-cultural influences, sexuality education and human reproduction in the Natural Sciences

In order to understand the context for this study, I start this chapter by providing a sketch of the history of Gauteng and of some of the cultural, religious and language influences in the multicultural society that makes up Gauteng. These influences constitute some of the factors that I will be exploring as I set out to answer research questions 2 to 4. The history provides some background to how various people came to live in certain areas of Gauteng including those in which my research is situated, sociocultural influences and associated socioeconomic conditions. These all impact on teaching and learning in Gauteng.

South Africa has a population of approximately 53 million people (Statistics South Africa, 2013) who have their origins in South Africa, the rest of Africa, Europe and Asia. These people hold particular worldviews which to a large extent are determined by their culture, religion, language and the environment in which they live. Shumba describes worldview as "the overall perspective from which one sees and interprets the world, i.e. a collection of beliefs about life and the universe held by an individual or a group" (Shumba, 1999, p. 333). Teachers' and learners' worldviews may affect the teaching and learning of human reproduction. I therefore provide some background information on culture, religion and language in South Africa and then elaborate on possible cultural and religious influences as they apply to both teachers and learners. I also explore issues associated with multilingual classrooms. This is followed by an examination of factors affecting the teaching of human reproduction, drawing on the literature on sexuality education. I therefore examine learners' prior knowledge about human reproduction and the contributions made by various stakeholders to learners' understanding of human sexuality, and conclude by looking at the debates about the content and approaches that should be used in teaching sexuality education and consider how this applies to the teaching of human reproduction in the Natural Sciences.

2.1 A brief history of Gauteng

Gauteng is the most densely populated and smallest province and the economic heartland of South Africa. The area that now forms Gauteng was, at the end of the 19th century, the site of a major gold rush which drew people from all over the world. With the establishment of gold mines, towns began to develop around the mines with the financial centre being the rapidly expanding city of Johannesburg. Africans who, as a result of the Natives' Land Act of 1913, had been forced off farming land in rural areas and into reserves where they struggled to survive, began to migrate to the mines to look for work (Bonner, 2012; Freund, 2012; Sparks, 1990). People of all races began to settle in and around Johannesburg and the outlying mining towns. In the years following the change of government

in 1948 and the introduction of apartheid, those that were not 'Whites' were moved away from the city into townships[4] based on their colour (Posel, 2012; Sparks, 1990). A few townships or parts of townships thrived as people accumulated wealth, in particular the Indian townships, whilst others remained extremely poor, in particular most of the African townships. With the change of government in 1994, more affluent and especially professional people living in townships began to send their children to formerly white suburban schools where they perceived that education was of a higher standard. Many of this more affluent middle class moved into the suburbs, as did some of the wealthier Africans from other countries who had been offered positions within companies, hospitals, educational institutions. Immigrants from all over Africa came to seek work in South Africa after 1994 and moved into the townships, suburbs and inner city areas. Schools in the wealthier suburbs became multiracial, whilst many schools closer to the city centre were filled with South African and immigrant children travelling in from the townships or living in the poorer suburbs close to the city centre. Schools in the townships drew learners from the townships and the large informal settlements around these townships.

The schools in Gauteng, whilst no longer divided on racial lines, remain distinctly different. Schools in the townships receive more money per student than the suburban schools, in an attempt to redress the inequality of the past with regard to resources (Taylor, Van der Berg, et al., 2013). However their income from school fees is very low and they lack the resources found in suburban schools. The wealthier suburban schools have well-established infrastructures and have parents capable of paying relatively high school fees which fund additional teachers and resources for teaching and learning. Thus inequality tends to be based on socioeconomic factors with most Whites and Indians still more advantaged than most Africans. Taylor (2013) asserts that socioeconomic status is the most important factor determining educational outcomes in South Africa, and in particular the mean socioeconomic status of a school.

Hopefully this brief description provides the reader with some historical background to the development of the communities in which the schools described in this study are found.

2.2 Socio-cultural influences

Culture, religion and language all contribute to teachers' and learners' thinking about human reproduction and to the teaching and learning that takes place in the classroom. I therefore provide a description of the groups that make up the South African population, the main religious groups and the languages commonly spoken since these will be referred to in later chapters. I briefly discuss matters related to worldviews and the influence of urbanisation.

[4] Townships in South Africa are areas on the outskirts of cities to which people ‘of other colour’ were moved during the apartheid years. They continue to be categorised as townships.

2.2.1 A multicultural society

South Africans continue, in this post-apartheid era, to be classified by government departments into population groups according to colour or race. The main population groups and their proportion of the South African population are described by Stats SA as 'Africans' (79.8%), 'Coloureds' (9%), 'Whites' (8.7%), and 'Indians' and 'Asians' (2.5%) (Statistics South Africa, 2013). While I dislike the use of the term 'African' to describe 'Black Africans' because in my view there are also 'White', 'Coloured', 'Indian' , 'Chinese' and other Africans, I will continue to use this term since it is currently in use in government documents. In addition, while I acknowledge that the notion of population groups distinguished by colour and race is a social construct, I will continue to use these official terms where relevant in this thesis. Part of the problem in any attempt to classify people is, of course, that the boundaries between groups are porous and many children are the offspring or descendents of parents from different population and ethnic groups. These children cannot be neatly boxed. In this thesis it is therefore recognized that these are loose groupings.

Within these population groups are what are often referred to as ethnic groups. Alternative terms for an ethnic group include a 'people' or a 'people group' or a 'tribe' or 'clan' or 'nation' (Jenkins, 2006). An ethnic group is a group of people who regard themselves and are regarded by others as culturally distinctive. Language, culture, a common history, customs, family and clan identities are amongst the factors that can be used to distinguish ethnic groups (Jenkins, 2006).

The main African ethnic groups are the Zulu, Xhosa, Ndebele and Swazi people (all of Nguni origins); the Sotho (Southern Sotho), Pedi (Northern Sotho) and Tswana (Western Sotho) people; the Tsonga and the Venda people (Statistics South Africa, 2011b). There are also Africans from neighbouring countries such as Zimbabwe and Mozambique and from further afield such as the Democratic Republic of Congo and Nigeria. White South Africans are composed mainly of the 'white' Afrikaans speaking people (Afrikaners) and the 'white' English speaking people (the English) but also include immigrants from other countries. Coloured South Africans refer to a very loose grouping which includes the indigenous Khoisan, as well as the descendants of Asian and East African slaves and their colonial owners, as well as anyone else not clearly in another population group. Indian South Africans are descendants of immigrants from India and Pakistan and 'Asian' South Africans are mostly Chinese in origin (Statistics South Africa, 2011b).

In this multicultural society, teachers and learners in schools hold different worldviews which are framed by their culture, religion and personal background.

In traditional African societies, there is, according to some authors, an African worldview i.e. a common 'African-ness', which is determined by cultural and religious beliefs and practices (Abimbola, 1977; Jegede, 1998). Within this worldview, there is a belief in the universe being orderly, and that a moral order has been given by God to ensure that people can live happily and in harmony with one another. To maintain the moral order, customs and taboos are in place (Kwenda, Mndende, & Stonier, 1997; Mbiti, 1991). Ethnic groups in traditional African societies may hold to a

broad African worldview, but some of their beliefs and practices, and customs and taboos differ resulting in some cultural differences (Mbiti, 1991). Likewise cultural similarities and differences occur amongst different Indian, Coloured and White ethnic groups in South Africa. The challenge for the teacher in a multicultural classroom is to take these similarities and differences and associated customs and taboos into account. However societies are not static and this is particularly the case in urban environments like Gauteng.

In Gauteng and elsewhere in South Africa, traditional worldviews and cultural beliefs and practices have loosened their grip on Africans, as they have amongst Indians, Coloureds and Whites. People belonging to different ethnic groups, from different parts of rural South Africa and from elsewhere in Africa, have been migrating into the cities over the past 100 years in search of work. There they may initially live amongst people belonging to their own ethnic groups but tend to mix with individuals from a wide range of ethnic groups at work, in their religious affiliations, in sport, entertainment and elsewhere. In addition they are exposed to the media especially TV and magazines. They may try to retain their traditional worldviews but their worldviews start to change and their children's worldviews may differ widely from their worldviews due to very different influences in their urban environment (Baxen & Breidlid, 2004; Mbiti, 1989). With the disruption of traditional cultures in urban environments, Mbiti points out that many people align themselves to new groups such as churches, trade unions and political parties for support and a sense of belonging. The families have changed from the traditional extended family to parents and children only and often boys and girls are no longer taught about marriage, sex and family life as they would have been taught during initiation. These children now acquire information from a variety of other sources and develop their own set of 'modern' values.

Rose-Innes (2006) suggests that in urban areas (and to a lesser extent rural areas) traditional and modern values often co-exist, but some traditional values such as abstinence from sex before marriage are being eroded. Baxen and Breidlid (2004) likewise propose that individuals moving into an urban environment find themselves somewhere on a continuum between ‘traditional’ and ‘modern’ behaviour. They argue that social and cultural practices are fluid and sometimes contradictory, so that at times traditional practices can dominate and at other times modern practices dominate in people's lives. They point out that there is often a tension in communities that are still very traditional and their youth are influenced by both tradition and modernity. These tensions between traditional and modern worldviews exist in all sectors of South African society, as they do elsewhere. The difficulty for a teacher teaching human reproduction is to cater for learners at different places on this continuum with regard to their attitudes, beliefs and values around human sexuality.

2.2.2 Cultural taboos and biological terminology

Taboos associated with talking about human reproduction are still evident in many societies, particularly amongst those that are more conservative and hold strongly to past traditions. In some traditional African ethnic groups for example, talking about sex and using terms that describe sexual activity has been prohibited except in circumcision schools and by people specially appointed to talk

to adolescents (Helleve, Flisher, Onya, Mukoma, & Klepp, 2009; Malambo, 2002; Mbananga, 2004). In particular, using the biological names of the reproductive organs in the home language is not allowed. Thus, for example, amongst Xhosa, Tswana and other ethnic groups, direct language is avoided and so genital organs are not called by their real names and explicit words for sexual intercourse are not used. Instead metaphorical language is used to identify genital organs and describe sexually related activities to convey ideas respectfully (Mbananga, 2004). In Zambia, for example, terms such as 'sleeping' and 'playing' are used to describe sexual acts (Malambo, 2002).

Metaphorical language or alternative terms are commonly used in most cultures around the world either to express sensitivity to the subject or aggression regarding the reproductive organs and sexual acts. However sexual attitudes and the extent to which alternative terms are used differs amongst different ethnic groups and within ethnic groups. In Mbananga's study in the Transkei, teachers felt that metaphorical language should be used in the classroom since it was acceptable to the community. The Grade 11 girls participating in the study preferred to use the metaphorical terms in isiXhosa and the correct biological terms in English. They felt that translating the real names of genital organs into isiXhosa would be insensitive to their culture. The English terms for the reproductive organs were not considered offensive. Many teachers in Helleve and colleagues' study in the Western Cape and Limpopo province also said they had difficulties using their mother tongue when they were teaching about human reproduction but they too found it less problematic if they used English (Helleve, et al., 2009). One teacher said that in English, it is easy to say 'this is a vagina', 'this is a penis' – but when discussing it in their cultural language (mother tongue), she said it became difficult. Amongst communities where the use of biological terminology associated with sex is offensive but where the English terminology is not offensive, code-switching would provide a solution to this dilemma. Perhaps using English for biological terminology and reproductive processes provides a formal discourse which provides sufficient distance to allow teachers and learners to talk more comfortably about this topic. If the teachers then switch to metaphorical language in their home language for explanations, descriptions and stories, this approach may still help to provide cognitive access whilst not creating offence.

In my study I was interested in finding out in what way culture affected the use of biological terminology in the classroom. Did teachers and learners use metaphors or the English biological terminology? Did they find this formal terminology offensive? I was interested in how teachers addressed this issue (if it was an issue) and showed sensitivity to cultural differences. This would provide some evidence of the extent to which they used learner-centred approaches, i.e. taking into account cultural sensitivities amongst learners, while working towards the outcomes.

2.2.3 Religious diversity

There are, in Africa, three main religions i.e. African traditional religion, Islam and Christianity (Mbiti, 1991). Almost 80% of South Africans (according to Census 2001), identified Christianity as their religion (Statistics South Africa, 2011b). Within this broad classification are many different denominations and sects, all varying in some way in their beliefs and practices. One fifth of these

Christians, for example, said they belong to the independent African churches. These independent churches are to varying degrees influenced by both Christian and traditional beliefs including ancestral worship. In addition, while 80% of South Africans may identify themselves as Christians in a census, for many of them this may be a nominal adherence to Christianity. Islam, Hinduism, Judaism and other religions make up the balance of religions practiced in South Africa (Statistics South Africa, 2011b) and likewise contain devout and nominal adherents. Amongst the 15% of South Africans who said they had no religion, many may adhere to African traditional religions and do not identify themselves with the religious affiliations identified on the census documents. The Natural Sciences teacher, when teaching human reproduction to Grade 7s, may or may not bring their own religious beliefs and values to the classroom. That teacher will probably also be working with children who have a wide range of beliefs and values. In this research I attempted to find out the extent to which teachers' and learners' religious beliefs and attitudes impacted in any way on what takes place in the classroom, and therefore can be considered as one of the factors affecting the teaching of human reproduction in outcomes-based ways.

2.2.4 Multilingual schools and the language of teaching and learning

In South Africa there are eleven official languages, i.e. Sepedi, Sesotho, Setswana, siSwati, Tshivenda, Xitsonga, Afrikaans, English, isiNdebele, isiXhosa and isiZulu (Statistics South Africa, 2011a). In rural areas one home language might be common amongst learners in a classroom, however in urban areas, and particularly in Gauteng, the classes tend to be multilingual with a wide range of home languages spoken. These include some of the above-mentioned languages as well as French, Portuguese and other languages spoken by immigrants from the rest of Africa and elsewhere. The current language policy in South African schools is that the home language is used as the LOLT until Grade 4 when English becomes the LOLT (Dada, et al., 2009). In former White schools, where there may be a mix of learners with English as a home or an additional language, English is used as the LOLT from Grade 1.

The multilingual situation in urban schools is complex and varies from school to school and from area to area. The migration of people from rural areas, where only one home language is spoken and where people rarely encounter spoken English, to urban areas means that they start to learn the languages of their neighbours and the language of the workplace. Their children, influenced by the mix of languages in the areas where they are born and grow up, and also by parents who may belong to different ethnic groups, often speak an 'amalgam' of languages rather than a single language (Fleisch, 2008).

Migrants from rural areas tend to move into informal settlements around the cities and townships before moving into the townships, the inner city and suburbs. Many of the children from informal settlements may be similar to children from rural areas, having few opportunities to hear or speak English, and encountering English as a foreign language in their township school where English is the Language of Learning and Teaching (LOLT) (Fleisch, 2008; Setati, Adler, Reed, & Bapoo, 2002). For these children, as Fleisch points out, their very poor grasp of English is likely to be "a profound

barrier to academic achievement" (p. 119). Learners in the more formal parts of the townships are likely to have much greater access to English than some of the children in informal settlements through TV, radio, newspapers and magazines and so for them English is an additional language rather than a foreign language (Setati, et al., 2002). They may speak some English amongst their peers, at home and in their community, or mix English phrases with other languages in their particular 'amalgam' of languages or communicate most of the time in their home languages and switch to English only in the formal environment of the classroom (or when they want to make a significant statement to their peers!). The English language competency of their teachers will vary, and in most cases the teachers will also have English as an additional language. Language will still be a barrier to learning but not to the same extent as those who have little contact with English. For those African learners who commute to and attend previously White schools in the suburbs, where the LOLT is English from the start of primary school, where there are many more resources in English, and where these learners are joined by English-speaking Indian, Coloured and White learners as well as learners from other countries, the barrier to learning is even less. Then in the wealthier advantaged schools where almost all learners from different population groups have English as their home language, those who have English as an additional language may speak both English and their own language at home with their middle-class professional parents and be fairly or very fluent in English. The teachers in suburban schools are likely to either have English as a home language or will be competent in speaking English as an additional language. Learning in English for these learners will only be a small liability (Fleisch, 2008). Thus across the district in which I conduct my study, there will be a wide range of competency in spoken and written English.

In schools around South Africa (excluding the Afrikaans schools), English is the preferred language of learning and teaching (Setati, Chitera, & Essien, 2009). Setati et al. point out that 'mother tongue' instruction is associated, amongst speakers of African languages, with apartheid and inferior education. English is viewed as the language of access and power. It has political advantage. Parents and learners believe that fluency in English provides them with access to tertiary education, employment, careers and access into the global economy (Rollnick, 2000; Setati, et al., 2009). Their choice of English however, as Setati and colleagues argue, is at the expense of conceptual understanding of their subject.

People construct, develop and understand concepts and practices, and their identities are shaped through language. It is the medium through which they interpret the world (Djite, 2008; Mbananga, 2004). Mbananga points out that language and culture are intertwined and that understanding is influenced by cultural patterns embedded in the language. A person who speaks one language at home, and then another language at school such as English as well as a further language, the language of science, is at a great disadvantage. Learning new science concepts is difficult. Aikenhead and others liken this to crossing borders into a foreign culture, the culture of science (Aikenhead & Jegede, 1999), whilst situated cognition theorists describe learning science as becoming inducted into a new social practice. Lave and Wenger (1991) and Lemke (1997) argue that if one learns a new language at the same time as for example, science, one has the additional challenge of becoming inducted into two new social practices.

The preference for English as the language of teaching and learning is therefore a problem. By Grade 7, most children in South Africa still have poor English language skills. They are facing the difficulty of being inducted into two new social practices during the lesson. The person 'inducting them' i.e. the teacher may also not be fluent in English. This creates many difficulties for learners as they attempt to learn new science concepts such as those associated with human reproduction. Onwu and Stoffels (2005) found that most Physical Science teachers (Grades 10-12) in secondary schools in Limpopo province addressed this problem by teaching physical science concepts in English and then re-teaching them in the learners' mother tongue. Research from developing countries around the world supports the use of home language instruction or bilingual programmes but this is a hotly debated topic (Rollnick, 2000). Rollnick, Setati and others believe that code-switching, i.e. switching between two languages, the learners' home language and the LOLT, may be the best solution for assisting concept formation. The learners' home language acts as a support mechanism allowing learners to participate in lessons and develop conceptually ('they talk to learn') while still acquiring proficiency in English, the language of learning and teaching in most schools (Setati & Adler, 2000; Setati, et al., 2009). This may ease learners' induction into the social practice of mathematics or science, in this case human reproduction. In Setati and Adler's study, teachers mostly used English while teaching the class and then switched to the learners' main language/s to reformulate and explain and to interact with individual learners and small groups.

In order to address language difficulties, some researchers now propose the deliberate parallel use of the learners' home language and English to gain both cognitive access and political advantage (Setati, et al., 2009), or the gradual purposeful introduction of English, i.e. additive bilingualism (Vorster, Mayet, & Taylor, 2013) whilst others argue for only the use of home language for cognitive access (Djite, 2008). Djite claims that when the language of instruction is not the teachers' and learners' first language, teachers engage in ineffective pedagogical practices such as chorus teaching, repetition, rote learning and (in his opinion) code-switching, all of which, he claims, undermine teaching and learning. I would argue that code-switching is not an ineffective pedagogical practice but a pragmatic solution, widely used in everyday language in the South African urban environment, and is an important way of helping learners develop conceptually at the same time as learning to speak English more fluently. As mentioned earlier, in most Gauteng schools there is no single home language and if the teacher were to choose the language of the majority of children in a particular school as the LOLT, there would still be children who would be disadvantaged because they do not have that home language. In addition, as Makoni argued in email correspondence with Vinjevold (Vinjevold, 1999a), children in urban environments tend to speak an amalgam of languages, and a single defined African language would still be an additional language for many children. Thus although cognitive access is of critical importance in learning, other considerations such as the problem of a selected African language being an additional language for some learners and English being seen as the language of power and global access override these considerations in South Africa.

The current language policy in South African schools is that the home language is used as the LOLT until Grade 4 when English becomes the LOLT (Dada, et al., 2009). In former White schools, where

there may be a mix of learners with English as a home or an additional language, English is used as the LOLT from Grade 1.

In my research I was interested in the extent to which language was one of the factors affecting the teaching of human reproduction in outcomes-based ways. If learners struggled to communicate in English, how did teachers address their language differences and their limited understanding of English in the classroom? Did they speak only English, code-switch, translate or speak only a home language? In addition, if a teacher's proficiency in English is poor, how does that affect classroom practices? According to the task team reviewing the National Curriculum Statement, teachers' lack of competency in English has a significant effect on the quality of teaching in South African classrooms (Dada, et al., 2009). This is particularly the case amongst primary school teachers in poor schools (Vorster, et al., 2013) and so may be an important teacher factor in some of my case studies.

2.3 Sources of information about human reproduction

Children are exposed to many sources of information about human reproduction and sexuality outside of the school environment from, for example, initiation schools, parents, other adults, peers and the media. In this section I will be looking at those sources of information since they may be contributing factors affecting the teaching of human reproduction and thus in answering research question 3.

2.3.1 Initiation schools

In traditional African cultures, perhaps the most important event in the life of a child is their initiation into adult life. Initiation differs widely in different ethnic groups both in South Africa and elsewhere in Africa. It may take place when children are quite young but mostly takes place after the onset of puberty. Circumcision is considered an important initiation rite and is practiced amongst the Tswana, Sotho, Pedi, Tsonga and most Xhosa groups (Stinson, 2007). Although historically Zulu men were circumcised, Stinson points out that this practice was later modified or abandoned.

Boys (and girls in some ethnic groups) attend special initiation schools. They 'go to the mountains' or the bush i.e. they disappear into remote areas and go through traditional rites of passage involving physical, emotional and psychological changes which take them from childhood to adulthood . During this period the boys are taught about the history of their people and their traditions and beliefs. They are prepared for marriage by being taught about sexual matters, and about the codes of conduct in their community relating to when, where and with whom sexual relations might take place. They learn about their roles and responsibilities as men in marriage and in raising a family (Kwenda, et al., 1997; Mbiti, 1991; Vincent, 2008). The circumcision ceremony i.e. the cutting of the foreskin has great significance in most African societies. The cutting of the flesh represents getting rid of childhood and getting ready for adulthood. With the shedding of their blood, they form a covenant with their people and are bound to their ancestors, their community and their land. A person who is not traditionally circumcised is considered still a child, no matter how old they are. Such a person is excluded from all

adult male roles in their community and amongst the Xhosa who practice traditional circumcision, they are treated with contempt (Stinson, 2007; Vincent, 2008). According to these authors, medical circumcision, especially in the Xhosa culture, is considered worthless. Girls in some cultures also go to circumcision schools where they are taught about sexual matters and prepared for marriage. They may go through some sort of initiation rite such as the stretching of the labia amongst the Sotho. The process of initiation is both a secret and sacred ceremony, known only to those who have passed through the initiation of their particular ethnic group (Vincent, 2008).

Circumcision schools have, in the past, been an important source of sexuality education and preparation for responsible adulthood. However their educative role has begun to break down due to the impact of societal change. In Malawi, initiation ceremonies are criticised for being explicit and suggestive, and encouraging irresponsible sexual behaviour amongst young men who have been initiated (Munthali & Zulu, 2007). Amongst the Xhosa of the eastern Cape, traditional circumcision originally marked the point at which responsible sexual behaviour began. Vincent (2008) argues however, that it is now the point at which the initiated acquire unlimited rights to coercive sex, multiple partners and irresponsible sexual behaviour. According to Vincent, Stinson and others, the culture of violence in our society, the breakdown of families and intergenerational conflict have all contributed to this changing role.

Initiation is becoming less important in some urban environments where many young people have formed new modern 'cultures' and no longer feel the need to be bound into a traditional community through the process of initiation. However many urban youngsters, especially amongst the Xhosa, still attend circumcision schools. It is a dangerous time for them due to the severe conditions in which they live during their initiation, the harsh treatment to which they are often subjected and the dangers associated with the use of non-sterile instruments such as assegaais, resulting in septicaemia, hepatitis and STIs, and in penile amputation and death for some (Kepe, 2010; Vincent, 2008).

While initiation is a taboo topic, it is the source of extensive media coverage every year due to the number of boys who die or are severely mutilated. It is also the source of great anxiety for Grade 7 Xhosa and Sotho boys who are waiting until they are old enough to attend initiation schools. Boys and girls from more northern cultures may have attended initiation school before entering Grade 7. In both cases, children who have gone through or still plan to go through initiation are silent on the topic while it is a source of intense interest for those who do not attend initiation school.

2.3.2 Parents and relatives

Parents are potentially an important source of information about human reproduction and sexuality education particularly for primary school children. However many parents find it very difficult to talk to their children about this topic (Greathead, et al., 1998; Mathebula, 2001; Walker & Milton, 2006). In many African societies, discussing sex-related issues is not acceptable especially if it is intergenerational communication i.e. between parents and children. Thus studies in Lesotho (Mturi, 2003), South Africa (Bhana, et al., 2011; Mbananga, 2004), and Zambia (Malambo, 2002) revealed

that very few learners discussed sex-related matters with their parents. In a national survey amongst 15-24 year olds in South Africa in 2003, only 44% of young adults had spoken to their parents about HIV/AIDS (Pettifor, et al., 2004). In a younger cohort (12-17 year olds) in South Africa and Zambia, only 12% reported that their parents or guardians had discussed sex and issues of HIV and AIDS with them (Bhana, et al., 2011). A study in Lesotho provided similar findings i.e. only 20% of adolescent females and 10% of adolescent males said that they talked to their parents about sex (Mturi, 2003). Mturi points out that in more traditional homes in Lesotho, as elsewhere in Southern Africa, adult relatives i.e. aunts, uncles, elder sisters or grandparents communicate with young people on sex-related matters, but not parents. Village elders in rural South Africa also provide advice to boys. However for children whose parents have migrated to urban areas, these extended family members and village elders are no longer available to give advice (Rivers & Aggleton, 1999). The children, if they cannot talk to their parents, turn to the media and friends for information.

Children would like to be able to talk to their parents. Turnbull, van Wersch and van Schaik (2008), in a review of research on parental involvement in sex education in British schools, found that children and adolescents want to learn from their parents. In Lesotho approximately one third of the high school adolescents in Mturi's study indicated that they would also prefer to get information about sex-related matters from their parents. However parents give a number of reasons for not discussing matters related to sex and human reproduction with their children. Many parents simply feel embarrassed and uncomfortable talking about sexual matters and feel they do not have the skills or knowledge to do so (Mturi, 2003; Turnbull, et al., 2008; Walker & Milton, 2006). Parents also fear that talking about the body and sexual matters will encourage their children to experiment sexually (Malambo, 2002; Walker & Milton, 2006). In addition, Malambo believes that parents may have their own personal reasons for avoiding this topic such as their own inappropriate sexual behaviour and if they are HIV positive. Where parents do talk to their children about sex-related issues, girls prefer to talk to their mothers rather than their fathers. Boys prefer to gain their information from the media and friends (Bhana, et al., 2011; Turnbull, et al., 2008). Bhana and colleagues felt that one reason for the absence of fathers from such discussions was the 'invisibility' of fathers in the lives of their children. Where boys did talk to their fathers, in one British study, the discussion was superficial and characterised by exaggerated stories and jokes, and the discussion of sensitive issues was kept at a distance (Walker & Milton, 2006). In other cases the purpose of the parents' discussion was to discourage premarital sexual relations. For example, some parents in Mturi's study employed moral reasoning using the Bible and/or health reasons i.e. the HIV/AIDS epidemic, STIs and unwanted pregnancies to discourage them.

In my study, I was interested in the extent to which parents were a contributing factor affecting the teaching of human reproduction. Did parents talk to their children about any aspect of human reproduction? If so, what prior knowledge was passed from parents (or guardians) to their children and how scientifically accurate was the biological information? What beliefs and values had parents instilled in their learners about human reproduction? Did parents support, or object to, their child's participation in the lessons on human reproduction? In other words, in what ways, if any, did parents' input impact on the teaching of human reproduction in outcomes-based ways?

2.3.3 Peers

Both boys and girls talk to their friends about aspects of sexuality such as physical and emotional changes in their body and the act of sex (Clacherty, et al., 1998; Mbananga, 2004; Turnbull, et al., 2008). They continually compare their and their friends' changing breast or penis sizes, the appearance of pubic hair, their experiences with starting menstruating, and stories about sex. They look at pictures in magazines, watch movies together and enthusiastically share lurid and often factually questionable stories they have read in these magazines or heard on TV, and so the stories circulate. In Bhana D' survey in Zambia and South Africa, 12-18 year olds claimed that in addition to school, their peers were their main sources of information on sexuality and reproductive health (Bhana, et al., 2011). However while peers can be an important source of information, they are also often a source of misinformation (Rose-Innes, 2006). This will be discussed more extensively in sections 2.4 and 2.5.

In my observations and interviews, I was interested in finding the answer to some questions concerning the influence of peers on the teaching of reproduction. Were peers an influential source of prior knowledge which teachers would have to take into account when helping the learners construct new knowledge? Would the teacher have to set up situations in which there was cognitive conflict between new conceptions and misconceptions so that learners could accommodate new more accurate biological ideas? How did peers impact on the teaching and learning of human reproduction? I would consider this in my study.

2.3.4 Media

Children learn about sex from watching television, listening to the radio and reading magazines (Bhana, et al., 2011; Clacherty, et al., 1998; Malambo, 2002). The media can make positive contributions to education about the body, human reproduction and sexuality through informative talk shows, thoughtfully-planned stories (soapies) and articles written by health professionals. However Reddy (2005) suggests that the messages from the media, school and home are often contradictory and can be confusing. She points out that children and young adults are caught between messages of 'sexual liberation' in movies and soapies and 'sexual regulation' elsewhere (school, home, religious group). Magazines are another important source of information, However once again the information about sex and relationships provided in many of these magazines is explicit and at odds with the cultural values that parents might want to communicate. The media, for most children, is one of their most influential sources of information about sexuality. This is particularly the case for boys who, as mentioned earlier, are far less likely than girls to discuss 'sex' with their parents.

In my research, I was interested in the 'everyday' knowledge that learners gain from the media and bring into the classroom and the impact of this 'media' information on the discussions that take place about human reproduction. The media may prove to be one of the factors affecting the teaching of human reproduction.

The ideas children bring into class from influential sources all have an impact on the ways in which children construct new knowledge about human reproduction. The teacher's role is to work with these ideas, build on them or challenge them in various ways and so help learners to construct new knowledge about human reproduction (learning outcome 2) through outcomes-based and learner-centred approaches.

2.4 Sociocultural influences on sexual knowledge, beliefs and behaviour

There is a great deal of research on sexuality and HIV/AIDS education, much of it relevant to my study as I attempt to discover the impact of sociocultural factors on the teaching and learning of human reproduction. I am interested in finding out what beliefs, attitudes and values Grade 7 learners bring to the classroom in relation to sexuality. These Gauteng learners are living in a society in transition and their beliefs, attitudes and values developed within this context are likely to have an impact on the teaching of human reproduction.

Coombe (2000) and Baxen and Breidlid (2004), in their reviews of research on HIV/AIDS and education in Sub-Saharan Africa, report that some South African youth, especially girls, have a very limited understanding of puberty, reproduction and sexually transmitted diseases even when they are sexually active. Cultural misinformation about the dangerous effects of delayed sex, for example girls getting evil spirits and boys experiencing pain later, is common in some areas. However young people in many areas are regularly exposed to accurate information on HIV/AIDS (Baxen & Breidlid, 2004). While some research shows that sexuality and HIV/AIDS education can help young people to change their behaviour (Somers & Surman, 2005), a number of studies in southern Africa indicate that knowledge does not necessarily result in behavioural change (Hartell, 2005; Mudaly, 2006; Pettifor, et al., 2004; Reddy, 2005). Here socioeconomic and cultural issues, and gender and power relations play a significant role in how adolescents conduct their sexual lives (Baxen & Breidlid, 2004; Parker, 2001).

South Africans' beliefs about appropriate sexual behaviour range from very conservative, influenced by tradition and religion, to very liberal. People who have been born in urban environments, with their many influences, have developed widely differing perspectives on appropriate sexual behaviour. Our past history has also been influential. Forced removals, the homelands system and migrant labour during the apartheid era disrupted families and communities and together with the culture of violence unleashed during this period, all contributed to social instability, poverty, gender inequality and unsafe sexual practices (Rose-Innes, 2006). New cultural norms regarding sexual behaviour developed in both urban and rural areas particularly amongst people living in impoverished conditions as a result of the instability, the uprooting of communities and the migration to cities in search of work. With traditional multigenerational extended families being replaced by nuclear families, single parent families or child-headed households, and with parents working long hours or unemployed, children have turned to their peers for new social norms (Rivers & Aggleton, 1999). At all sociocultural levels there is increased pressure on young people to be sexually active. Many young

people, particularly those living in impoverished conditions or in dysfunctional families, have adopted new beliefs and norms which endanger their future as they engage freely in sexual behaviour that exposes them to the risk of contracting HIV/AIDS (Mudaly, 2006).

A number of other factors contribute to risky sexual behaviour. South Africa has always been a male-dominated society, but some of the beliefs related to the superiority of men over women have resulted in unsafe sexual practices that have contributed to the spread of HIV/AIDS (Coombe, 2000; Mudaly, 2006; Rose-Innes, 2006). There is, for example, the belief that men from the age of puberty have uncontrollable sexual urges which need to be satisfied. Those who adhere to this belief claim that males are programmed to need sex regularly and with a variety of partners and this is achieved through the practice of polygyny and/or the use of multiple partners and sex workers (Mudaly, 2006; Reddy, 2008; Rose-Innes, 2006). Frequent sex, these men believe, is necessary to maintain their health and gender identity, and abstinence or monogamy is seen as unnatural (Rose-Innes, 2006). Sexual risk-taking in response to biological urges is seen as normal and their right (Reddy, 2005). In some cultures, boys are actively encouraged by peers and family members to use their adolescent years to experiment sexually and boys become sexually competitive, gaining popularity and importance by having many sexual partners (Morrell, 2003; Rivers & Aggleton, 1999).

Mixed messages are however sent by parents and peers to adolescents. Whilst sexual freedom is promoted amongst boys, girls are exhorted to remain virgins until marriage (Bhana, et al., 2011; Munthali & Zulu, 2007; Reddy, 2008; Rose-Innes, 2006). The belief that young girls should be virgins was reinforced when King Zwelethini of the Zulu nation reinstituted virginity testing amongst the Zulu people and 'Umhlanga', the annual Zulu reed dance ceremony celebrating those who had been identified as virgins (Vincent, 2006). Since virginity is so highly valued in both urban and rural communities, parents and communities may attempt to keep girls ignorant about sexual matters (Rivers & Aggleton, 1999). Girls then find it difficult to discuss personal and intimate issues with them because of the social pressure to maintain an image of innocence and sexual inexperience (Reddy, 2005). These mixed messages about boys' and girls' sexual behaviour are confusing in their implications and have a negative impact on attempts to promote more responsible sexual practices.
Teenage girls tend to begin a relationship and engage in unsafe sex out of their desire to love and be loved (Reddy, 2005; Rose-Innes, 2006). Their 'love' and their need to be seen as innocent or faithful means that young girls often do not insist on their partner using a condom. To do so would indicate sexual knowledge, unfaithfulness or distrust of their partner's faithfulness (Coombe, 2000; Reddy, 2005; Rose-Innes, 2006). Coombe suggests that with their limited understanding of their own bodies and the mechanics of sex as well as contraception or condom use and in the face of aggressive male sexual behaviour, they have little chance of negotiating safer sex (Coombe, 2000).

Condom use is not popular and most sexually-active adolescents do not use them at all, or do not use them regularly (Hartell, 2005; Makiwane & Mokomane, 2010; Pettifor, et al., 2004). The main reason that boys in Reddy's study and men elsewhere give for not using condoms is that they reduce sexual pleasure (Reddy, 2008). 'Flesh to flesh' sex is associated with masculinity and a belief that it is necessary for male health (Rose-Innes, 2006). Another reason for avoiding condom use is a lack of

confidence in the ability of condoms to prevent STIs (Mudaly, 2006).

Teenage girls are less concerned about contracting the HI virus than they are of falling pregnant. Pregnancy affects their moral standing with their families, schools and communities whereas HIV is slow acting (Mudaly, 2006). However in some cases, the desire amongst African teenagers to be pregnant to prove their fertility, to provide themselves with greater status as a mother and perhaps to access the child support grant may hinder the practice of safer sex (IRIN, 2007; Rose-Innes, 2006). Rivers and Aggleton (1999) describe adolescence as a 'high risk / low responsibility' period of a person's life. While many adolescents acknowledge the severity of HIV/AIDS, they do not see the disease as a personal threat possibly because, as Mudaly suggests, they have not yet seen its effects amongst their age group due to the latency period. In addition many girls think they can tell if someone is risky or infected with HIV by the way they look (Reddy, 2008; Rose-Innes, 2006). Girls also claim that if they know (and trust) their partner and are aware of their partner's sexual history, they are not at risk (Reddy, 2008; Rivers & Aggleton, 1999). Another myth that has plagued South Africa and resulted in the rape of young girls and babies is that sex with a virgin can cure HIV/AIDS (Rose-Innes, 2006). All these are common and dangerous misconceptions that a Natural Sciences teacher may encounter in the classroom when teaching human reproduction.

The beliefs and values that children living in these communities bring into the classroom are likely to impact on the teaching of human reproduction. A teacher who simply teaches biological content without hearing the 'voice' of the learner in these matters, has missed a valuable component of outcomes-based education, i.e. the need to develop appropriate attitudes and values amongst learners. In my research I will therefore be looking at whether any of the above beliefs, attitudes and values emerge in the classroom and how the teachers address them. I will then be able to comment on the effect of these factors on the teaching of human reproduction (research question 2).

2.5 Sexuality education

My research involves looking at factors that affect the teaching of human reproduction in the Natural Sciences at a Grade 7 level. I have found very little in the literature that is relevant to my study in the research on primary school science. However there is a great deal of literature on sexuality education and HIV/AIDS education at both primary and high school level. I draw on this literature to inform my research.

Sexuality education[5] has been defined in different ways and there is extensive debate on what sexuality education should include. However I will use the following broad definition, i.e. sexuality education refers to education about the "biological, sociocultural, psychological, and spiritual dimensions of sexuality" and addresses these dimensions within the "cognitive domain (information), the affective domain (feelings, values and attitudes); and the behavioural domain (communication and

[5] In this thesis I refer to the term 'sexuality education' which seems to be gradually replacing the term 'sex education' but these two terms are synonymous.

decision-making skills)" (SIECUS, 2001, p. 1).

Sexuality education is taught in a number of ways in schools, both when guest speakers are invited and HIV/AIDS programmes are presented, and during Life Orientation and Natural Sciences.

2.5.1 Sexuality education in Life Orientation and the Natural Sciences

Sexuality education including HIV/AIDS education is taught in Life Orientation at both a primary and high school level. Learners in Grade 1 are taught to recognise situations that may involve sexual abuse and are told who to speak to if they are being abused; in Grade 5 they learn about body changes and are expected to demonstrate a respect for these changes, as well as coping with a range of emotions; in Grade 6 they learn about the causes of communicable diseases including HIV/AIDS; and in Grade 7 they learn about strategies for living with communicable diseases including HIV/AIDS and they discuss personal feelings, community norms, values and social pressures associated with sexuality (Department of Education, 2002c). The emphasis here is on the socio-cultural, psychological and ethical aspects of sexuality education, with the biological dimensions only being touched on briefly.

In the Natural Sciences the emphasis is on the biological aspects of human sexuality with the socio-cultural, psychological and ethical aspects being explored briefly with regard to behavioural choices. This is only addressed in the senior phase (Grades 7-9) as discussed in Chapter 1. Learners are expected to learn about puberty, conception and the changes that take place during pregnancy, the prevention of sexually transmitted diseases and behaviour choices regarding sexual activity, as well as behaviours amongst animals that involve finding a mate, breeding and raising young (Department of Education, 2002a, p. 64). The National Curriculum emphasises the importance of developing knowledge, skills, values and attitudes and so not only the cognitive domain but the affective and behavioural domain need to be explored.

It seems therefore that the Natural Sciences and Life Orientation can support and reinforce one another with regard to sexuality education. However, teaching about sexuality is contentious. There are debates about the age at which it is appropriate to teach young children about the reproductive aspects of their bodies and to explore associated sexual behaviour and who should teach the children about this topic.

2.5.2 Human reproduction and sexuality education in primary schools

There are different views about the age at which sexuality education should start and these views are influenced by permissive or restrictive ideologies (McKay, 1997) which are in turn influenced by factors such as the religion and culture of the people. Berger and colleagues, in their study of sexuality education in Western European, Eastern European, Middle East and North African countries, found very different views amongst teachers as to when sexuality education should commence (Berger, Bernard, Khzami, Selmaoui, & de Carvalho, 2008). In the more conservative countries (mostly Muslim), teachers felt that sexuality topics should not be taught before the age of

15, whereas the more liberal and less or non religious western European countries supported early introduction of sexuality education.

Rivers and Aggleton (1999), in their review of sexuality education around the world, found that interventions are most successful before children become sexually active. They believe that sexuality education should begin in the primary school. Their view is supported by the Medical Research Council in South Africa which proposes sexuality education before the age of 14 (IRIN, 2007), by Hartell (2005) based on his research of HIV/AIDS programmes in South Africa, and by Somers and Surman (2005) whose study amongst high school students in American schools indicated that the early introduction of sexuality education appeared to result in less frequent sexual activity. Girls in particular seemed to benefit from earlier learning about sexual intercourse and the use of birth control. Somers and Surman believe that learning in the school context may help girls to develop their sexual identity and provide social support for resisting sexual pressure. The UNAIDS global reports of 2009 and 2010 shows that early sexuality education delays sexual debut (Bhana, et al., 2011). Several authors (Bhana, et al., 2011; Hartell, 2005; Rivers & Aggleton, 1999) assert that if children receive age and developmentally appropriate messages throughout primary school, they will be better able to make informed choices when they do become sexually active.

There has also been some debate about whether sexuality education should be taught by teachers in schools. Reiss (1995) reports that in the USA, Britain and Europe, those who feel that sexuality education should not be taught in schools assert that teachers do not have the right or the skills and abilities to deal with such matters. According to Reiss , Halstead (1997) and Thompson (1997), there are concerns that teachers may hold very different beliefs and values from those held by the parents. Muslim leaders in Britain, for example, proposed that Muslim children be withdrawn from classes on sexuality education (Halstead, 1997). In Portugal, there has been organised resistance from some pressure groups to the introduction of sexuality education in primary schools (Veiga, Teixeira, Martin, & Meliço-Silvestre, 2006). Some people believe that giving information about sex is a violation of a child's innocence and promotes sexual activity (Casemore, Sandlos, & Gilbert, 2011).

In my research there was some debate amongst the Natural Sciences facilitators on whether human reproduction should be taught in primary schools or only in Grade 9. I was interested in whether Natural Sciences teachers held similar concerns or whether they supported the teaching of human reproduction in primary schools and the extent to which their views on this matter affected the way in which they taught human reproduction.

2.5.3 Meeting the personal needs of learners

South Africa is a multicultural society and many classrooms are multicultural in nature. The challenge for the teacher is to provide learning experiences which are appropriate to the learners in their classroom who may vary widely in their sexual health knowledge, attitudes and behaviours. Hartell (2005) argues that HIV programmes would be more effective if they were culturally appropriate and adapted to the local cultural setting. In Helleve and colleagues' study, Life Orientation teachers

indicated that they valued the flexibility allowed to adjust their teaching to the local culture and religion and to the age and maturity level of their learners (Helleve, et al., 2009). Rivers and Aggleton (1999) point out that programmes which fail to recognise diversity in young people and fail to provide opportunities to think about and talk about gender and sexuality are rarely successful. The challenge is to deliver sex and relationships education in a manner that respects a range of different cultures, beliefs and behaviours whilst focussing on the promotion of risk-reduction behaviour (Coleman & Testa, 2007).

2.6 Concluding remarks

Teaching human reproduction in the Natural Sciences in a way that extends beyond simply teaching structure and function and considers also the cultural-religious context of young people, their language diversity and the diversity in their beliefs, attitudes and values concerning human sexuality is of great importance in teaching this topic in outcomes-based and learner-centred ways. This chapter has therefore explored religious, cultural and language influences on the teaching of human reproduction. In addition, I have examined the literature on possible sources of ideas about human reproduction from which learners may have built their knowledge, beliefs, attitudes and values in relation to sexuality prior to entering the classroom. The ideas learners bring to the classroom are likely to have an effect on the teaching of human reproduction in outcomes-based ways. I have also looked at some of the debates on whether sexuality education should be taught in primary schools and who should teach it, since this impacts on Natural Sciences teachers' beliefs about whether they should be teaching this topic to Grade 7 learners. In the next chapter I explore what is meant by outcomes-based and learner-centred approaches and attempt to identify factors influencing the implementation of these approaches when teaching human reproduction.

Chapter 3
Implementing a new curriculum: historical developments and factors affecting the implementation of the RNCS in Grade 7

My research investigates factors influencing Grade 7 teachers' implementation of outcomes-based approaches when teaching 'human reproduction'. I start this chapter by providing some historical background to the development of firstly Curriculum 2005 and then the RNCS, elaborating on the outline provided in Chapter 1. This provides some insight into competing interests in and the rationale behind the new curriculum. I then provide more detailed information on outcomes-based education, and on learner-centred approaches which teachers are expected to use to enable their learners to achieve the specified outcomes. This is followed by a brief review of some of the literature on factors affecting educational change, followed by a more specific look at factors influencing teachers' capacity and readiness to use new approaches, based on Rogan and Grayson's model. I conclude by examining Ajzen's Theory of Planned Behaviour in order to consider how beliefs can influence teachers' actions when required to use new approaches to teaching and learning. Using Rogan and Grayson's and Ajzen's models, I construct my theoretical framework for this study.

3.1 A new curriculum for South Africa

April 27th 1994 was a turning point for South Africa, the first day in South African history in which all people could vote. A democratically elected government led by the African National Congress (ANC) replaced the White minority government which had instituted apartheid. The new government sought to bring about wide-ranging changes, including a major restructuring of education.

Under the 'apartheid' government, there had been a national department of education and seventeen autonomous education departments. These departments were organised by provinces and homelands and according to racial groups. Inequality, based on the racial divide, was evident in all aspects of education e.g. in funding and resources, infrastructure such as provision of schools, and in the education and training of teachers. This had a profound effect on the quality of education in different sectors. The newly elected government created a national department of education responsible for policy and quality control, and provincial departments of education in each of South Africa's newly created nine provinces. The national Department of Education was responsible for the development of the new curriculum. The policies they developed for the new curriculum were influenced by the competing interests of many stakeholders.

3.1.1 Early influences in education

Prior to the unbanning of the ANC and other political organisations in 1990, various groups of people started to think about how education should be restructured in a new democratic era. However after 1990, there was intense planning for education in the 'new South Africa' that would emerge after the elections in 1994. The 'apartheid' curriculum, based on the philosophy of Christian National Education, was seen as prescriptive, racist, sexist, teacher-centred and content-based by those involved in the restructuring (Department of Education, 1997b; Jansen, 1999a). The new Department of Education claimed that the old curriculum could not provide learners with the attitudes, knowledge and skills that would enable them to participate competently in society (Pahad, Cohen, Marsh, & Tema, n.d.). They wanted to introduce a new curriculum that would be democratic, open, non-prescriptive, non-racist and learner-centred.

In early discussions of a new curriculum, a number of stakeholders attempted to influence the direction of the new curriculum by proposing new policies. The ANC and its allies represented by the National Education Coordinating Committee (NECC) proposed a broad values framework for a new curriculum based on non-racism, non-sexism, democracy, equality and redress (Harley & Wedekind, 2004; Jansen, 1999a). Their National Education Policy Investigation (NEPI) document formed the foundation on which much of the new curriculum would be based. The private sector, with their focus on the economy, put forward proposals for more vocational and entrepreneurial education. In those early years, labour and business were particularly influential (Fleisch, 2002; Jansen, 1999a). The National Training Board and the Congress of South African Trade Unions (COSATU) proposed an integrated approach to education and training and COSATU began to push for the introduction of competency-based education in the labour sector (Jansen, 1999a).

After 1994, there was a shift from the idea of 'competencies' (associated with behaviourism) to 'outcomes' (Fleisch, 2002; Jansen, 1999a). The Ministry of Education began to look at outcomes-based education (OBE) in different countries such as Canada, Scotland, England, Australia, New Zealand and the USA. Spady's transformational OBE seemed most in line with the political ideologies of those in power at that time and so became most influential in guiding the thinking of those responsible for designing the new curriculum (Jansen, 1999a; Nykiel-Herbert, 2004).

3.1.2 Outcomes-based education and Curriculum 2005

In 1997, the national Department of Education (DoE) published the booklet *Curriculum 2005: Lifelong learning for the 21st century* (Department of Education, 1997b) in which they outlined their plans for and presented the ideology behind their proposed new curriculum. Curriculum 2005 was South Africa's version of outcomes-based education (Fleisch, 2002). Outcomes-based education was selected because, as Chisholm (2003) suggests, those who developed the new curriculum saw this approach as the 'pedagogical route' out of apartheid education. Outcomes-based education was built on the notion that learners should, throughout their lives, work towards the achievement of certain important outcomes that would enable them to become "creative critical thinkers living productive

and fulfilling lives" and able to participate in society "as active citizens" (Department of Education, 1997b, pp. 2-3). The inputs from various sources such as from learners and teachers, from learning and teaching support materials, and from the school management might differ, but learners' activities would all be directed towards achieving the common outcomes (Chisholm, et al., 2000; Malcolm, 2000). This ideology was based on the belief that everyone could learn and that all children irrespective of race, ethnicity, gender and religion could succeed, i.e. achieve the outcomes, even if at a different pace (Baxen & Soudien, 1999; Department of Education, 1997b). No one was excluded.

Implicit in this notion of equality was a political agenda. Taylor (1999), drawing on Bernstein's classification of curricula into performance and competence models, asserts that the South African Qualifications Authority (SAQA) has drawn from both the radical and progressive competence models described by Bernstein (1996). Competence or outcomes-based models are radical i.e. aiming at political empowerment. Thus the vision of the Department of Education was:

> A prosperous, truly united, democratic and internationally competitive country with literate, creative and critical citizens leading productive, self-fulfilled lives in a country free of violence, discrimination and prejudice. (Department of Education, 2002b, p. 4)

South Africa's outcomes-based model, according to Taylor, was also based on the progressive competence model i.e. aimed at cognitive empowerment resulting in literate, creative and critical citizens.

A philosophy central to Curriculum 2005 was that it would be transformational OBE. The creators of Curriculum 2005 believed that there was a demand for rapid social change in the 'new South Africa' and the education system needed to be "flexible and able to prepare adaptable learners for life and work in a rapidly changing society" (Pahad, et al., n.d., p. 19).

The first step in producing a curriculum that addressed the transformation agenda was the development of critical and developmental outcomes. A committee in the Ministry of Education devised seven critical and five developmental outcomes which should be demonstrated to varying degrees in learners' lives, depending on the level of education they had reached. Both the critical and developmental outcomes were derived from the New Constitution and were adopted by SAQA (Department of Education, 1997a, 2002b). The critical outcomes, according to the Department of Education (1997a), represent the skills, knowledge and values that learners should gain that would enable them to contribute to their own success in the future and thus the success of their family, community and nation (Department of Education, 1997a, 1997b). These outcomes were retained in the RNCS and describe what learners will be able to do.

1. Identify and solve problems and make decisions using critical and creative thinking.
2. Work effectively with others as members of a team, group, organisation and community.
3. Organise and manage themselves and their activities responsibly and effectively.
4. Collect, analyse, organise and critically evaluate information.
5. Communicate effectively using visual, symbolic and/or language skills in various modes.
6. Use Science and Technology effectively and critically showing responsibility towards the environment and the health of others.
7. Demonstrate an understanding of the world as a set of related systems by recognising that

problem-solving contexts do not exist in isolation.

(Department of Education, 1997a, p. 10; 2002b, p. 11)

The notion of problem-solving and decision-making in the sciences has been discussed at length in the literature around scientific literacy. Scientific literacy is promoted through programmes that allow for the development of informed and proactive citizens who are critical thinkers and creative problem-solvers, able to make decisions and take socially responsible action with regard to science and technology in society (Aikenhead, 1994; Ramsey, 1993).

The critical outcomes represent the kind of citizens and thus society desired in the 'new South Africa' (Department of Education, 2002b; Pahad, et al., n.d.). Pahad and colleagues, writing on behalf of the Department of Education, argue that since change is so rapid, particularly with respect to knowledge, the ability to think and solve problems is of greater value than acquiring knowledge which is likely to be outdated by the time learners complete their schooling. Their argument concerning knowledge is weak with respect to the sciences, since as Bernstein (1999) argues, the sciences are vertical discourses with hierarchically organised knowledge, and one cannot 'think' and 'solve problems' related to the sciences without that knowledge base. The second point that Pahad and co-writers make is that, in this information age, educators need to teach learners how to access the vast amount of information available, judge its worth and use it in life and work. Their third point is that, because we live in a 'global village', learners need skills which will enable them to work together, communicate effectively, be competitive and live meaningful lives in both local and global contexts. The DoE is thus preparing learners for both democratic citizenship and a competitive global economy (Fleisch, 2002).

The developmental outcomes, according to the Department of Education, are designed to promote the personal development of learners and thus the social and economic development of the country. These outcomes also describe what the learners should be able to do, i.e.

1. Reflect on and explore a variety of strategies to learn more effectively.
2. Participate as responsible citizens in the life of local, national, and global communities.
3. Be culturally and aesthetically sensitive across a range of social contexts.
4. Explore education and career opportunities.
5. Develop entrepreneurial opportunities. (Department of Education, 1997a, p. 10; 2002b, p. 11)

The achievement of these outcomes, it is assumed, would demonstrate that these learners are able to play an active role in the workplace and society.

In 1995, the National Department of Education called for stakeholders from a wide variety of contexts to attend a Consultative Forum on Curriculum in order to start the process of producing Curriculum 2005. Representatives from all provinces such as teachers, teacher educators, subject specialists and university and technikon academics were invited to the Forum to assist in constructing outcomes for each learning area (Fleisch, 2002). Other stakeholders included student and teachers unions, NGOs, the business and industrial sector, the non-formal sector and consultants from other countries. I was one of the university representatives for the Natural Sciences. With such a large group of

stakeholders, the Natural Sciences Learning Area working group produced a large number of outcomes for the Natural Sciences.

In subsequent meetings of the Learning Area committees in 1996 with fewer stakeholders, this group of outcomes was whittled down to nine outcomes specific to the Natural Sciences[6]. Assessment criteria and performance indicators were used to assess whether learners were achieving each of these specific outcomes at a level appropriate for that grade.

The Technical Committee took the work of the Learning Area Committees and modified their documents in order to streamline the design in line with new requirements. In 1997, the Department of Education produced the discussion document *Curriculum 2005 Grades 1 to 9* (Department of Education, 1997a) which contained both an outline of policy and specific outcomes, assessment criteria and range statements[7] for each learning area.

The Department of Education asserted that critical and specific outcomes now determined the curriculum. In order to be flexible and relevant, schools were invited to select any content that would address the needs, skills and interests of individual learners and which would guide learners towards achieving the critical and specific outcomes (Pahad, et al., n.d.). In the Natural Sciences, this was a particular problem since there are conceptual structures in the subject, and science knowledge could not be investigated, constructed and understood within the context of society without learners gradually acquiring these conceptual structures. The notion of 'any content' was strongly opposed by the Natural Sciences working group (of which I was a part) who believed that, in the sciences, distinct conceptual structures need to be built on through the grades. While the working group managed to persuade the overall coordinators that in the Natural Sciences there should be the strands or themes (e.g. Life and Living) and sub-strands (e.g. interactions within environments; diversity, change and continuity; and life processes and healthy living), only exemplars of key concepts or investigations were provided in the final document (Department of Education, 1997a).

The notion of 'any content, simply work towards the outcomes', created enormous confusion and anxiety amongst teachers (Rogan, 2007). In a subject with such strong conceptual structures, teachers and textbook writers were at a loss as to how they could build the necessary conceptual structures which learners could use to demonstrate the outcomes, if everything was approached in a piecemeal fashion. Thus Jansen argued that one of the reasons why OBE would fail was that OBE trivialised content by threatening to "atomise and fragment curriculum knowledge" (Jansen, 1999c, p. 152). Content rich subjects such as in the sciences, according to Bernstein, are vertical discourses with

[6] These specific outcomes consisted of the use of process skills; acquisition of scientific knowledge; application of scientific knowledge and skills in problem-solving and decision-making; use of scientific knowledge and skills in management of natural and other resources; understanding the relationship between science and culture between Natural Sciences, technology and socio-economic development, as well as the contested nature of science and ethical issues.

[7] Specific outcomes – 'what learners are able to do at the end of a learning experience', including skills, knowledge and values which demonstrate the achievement of the outcome; assessment criteria - the 'observable processes and products of learning' which demonstrate that the learner has achieved the specific outcome; range statements - the 'scope, length, depth, level of complexity and parameters of the achievement'. Possible concepts and content identified. (Department of Education, 1997a, pp. 12-13).

vertical hierarchical knowledge structures (Bernstein, 1996, 1999). Consequently, as Malcolm (2000), Chisholm et al. (2000), Muller (2006) and others have pointed out, fields such as science and mathematics are particularly dependent on selection and sequencing of content.

There were other implications of the sudden emergence of the new curriculum. Teachers were introduced to a new curriculum discourse around outcomes-based education. They had not been involved in the conceptualisation of OBE or in decisions about its introduction into schools (Jansen, 1999a). Teachers were thus faced with a rather loose framework, complex terminology and this new and intimidating discourse. Most schools were under-prepared, and teachers complained that they had insufficient support due to poor training and inadequate learning resources (Fleisch, 2002; Jansen, 1999a). Fleisch pointed out that disadvantaged schools might be working towards the same outcomes as advantaged schools, but they still had larger class sizes, smaller spaces, little access to photocopying and far less teaching and learning materials.

The public outcry over the new curriculum, and the complexity and 'unworkability' of the curriculum resulted in a comprehensive review of this curriculum in 2000 by a Ministerial Working Committee. Whilst the basic philosophy of Curriculum 2005 was maintained, there was a 'streamlining' of that curriculum which resulted in the Revised National Curriculum Statement (Chisholm, et al., 2000).

3.1.3 Outcomes-based education and the Revised National Curriculum Statement

Small teams of experts were appointed to review the curriculum statement for each learning area, to substantially reduce the number of outcomes and to provide assessment criteria appropriate to the new outcomes. The Natural Sciences team grouped the specific outcomes together, creating three learning outcomes. Learning outcomes have been described in curriculum documents as "what learners should know, demonstrate and be able to do" at the end of the General Education and Training band (Department of Education, 2002b, p. 14). The three Natural Sciences learning outcomes involve scientific investigations, construction of scientific knowledge and exploring the interrelationships between science, technology, society and the environment. The first outcome addresses the development of process skills which are central to investigations in the sciences and which the DoE suggests can be used in learners' everyday life, in their community and in their future workplace. The second outcome draws on constructivist learning theories to enable the learner to develop and apply scientific knowledge and understanding of the physical world. To achieve the third outcome, the learner must understand the relationships between science, society and the environment and develop responsible behaviour in these areas (Department of Education, 2002a). These are valued outcomes in science education.

Assessment standards describe the level at which the DoE expects learners in a particular grade to demonstrate their achievement of the learning outcomes. The learning outcomes (LOs) for the Natural Sciences and assessment standards (ASs) for Grade 7 are:

LO 1: Scientific investigations

AS 1 Planning investigations: learner plans simple tests and comparisons, and considers how to make them fair.

AS 2 Conducting investigations and collecting data: learner organises equipment or sources to gather and record information.

AS 3 Evaluating data and communicating findings: learner generalises in terms of a relevant aspect and describes how the data supports the generalisation.

LO 2: Constructing science knowledge

AS 1 Recalling meaningful information when needed: learner, at the minimum, recalls definitions and complex facts.

AS 2 Categorising information to reduce complexity and look for patterns: learner compares features of different categories of objects, organisms and events.

AS 3 Interpreting information: learner interprets information by identifying key ideas in text, finding patterns in recorded data and making inferences from information in various forms such as pictures, diagrams and text.

AS 4 Applying knowledge to problems that are not taught explicitly: learner applies conceptual knowledge by linking a taught concept to a variation of a familiar situation.

LO 3: Science, society and environment

AS 1 Understanding science as a human endeavour in cultural contexts: learner compares different interpretations of events.

AS 2 Understanding sustainable use of earth's resources: learner analyses information about sustainable and unsustainable use of resources. (Department of Education, 2002a, pp. 16-21)

The assessment standards, which are used to assess learners' increasing competence as they progress through the school and build on the assessment standards for all the previous grades, can be limiting. Competence in learning outcome 1, for example, is seen, according to the NCS, as when the learner "searches for information from books and resource people, generates products and questionnaires, collects data and materials from nature and industry, creates testable questions and fair tests, and explains conclusions" (Department of Education, 2002a, p. 8).

This represents a very broad description of the type of investigations that learners could undertake. It recognises that investigations are not restricted to carefully controlled experiments in the classroom or in the field. However as soon as assessment standards are attached to the outcomes, as seen in LO 1, AS 1-2 above, what counts as an investigation seems to become more restrictive.

Learning outcome 2 in the Natural Sciences is about constructing scientific knowledge. This involves, according to the NCS (Department of Education, 2002a, p. 9), "building a framework of knowledge by using science concepts repeatedly in a widening range of situations". This learning outcome draws on constructivist theories and assesses learners' abilities to work at different cognitive levels. Thus competence in achieving this learning outcome can be seen when learners are able to recall meaningful information, categorise this information, interpret it and apply it to "new and unfamiliar situations" (p. 9). Recalling meaningful information (AS 1), according to the Department of Education, requires more than the recall of simple terms; learners need to see ideas as connected. They then need to show that they can categorise or classify the information they have collected (AS

2). Having done so, learners are expected to demonstrate that they can interpret and use that information in contexts that are familiar and new (AS 3 and 4) (p. 10).

The elaboration of learning outcome 3 is that "the learner will be able to demonstrate an understanding of the interrelationships between science, technology, society and the environment" (Department of Education, 2002a, p. 10). This learning outcome is a restatement of critical outcome 6 i.e. "use science and technology effectively and critically showing responsibility towards the environment and health of others" (Department of Education, 2002a, p. 7), indicating the importance particularly in the Natural Sciences of paying attention to learners' achievement of this outcome. The thinking behind this outcome emerged from a worldwide movement in science education that started about 40 years ago and was called Science in Society, STS (Science and Technology in Society), STSE (Science, Technology, Society and the Environment), SSI (socio-scientific issues) or other similar names. This movement has had an impact on the ways in which science educators in many countries think about their science curricula. Educators recognised the importance of developing social responsibility amongst learners regarding the impact of science and technology on the environment and people's health (Pedretti, 1999; Ramsey, 1993; Sadler & Dawson, 2012; Solomon & Aikenhead, 1994). This social responsibility would develop, according to STS educators such as Ramsey (1993) and Yager (1992), when learners investigated and attempted to solve social problems and issues that related to science and technology in their own local environment.

Aikenhead (1994) attempted to categorise the wide range of STS science programmes along a spectrum, according to the relative importance given to STS content as compared with traditional science content. At one end of the spectrum, some programmes focus on traditional school science and science-in-society content is simply added on to make the science lesson more interesting. At the other end, STS content is the focus, science and technology-related social issues are investigated and only relevant science content is explored. Aldous and Rogan (2009), in a survey amongst Grades 8 and 9 maths and science teachers in Mpumalanga schools, investigated the level of implementation of learning outcome 3. They used Rogan and Grayson's Profile of Implementation in which four levels of implementation of 'science in society' in the classroom are described, from learners simply being made aware of the role of science in everyday life (level 1) to a more sophisticated level in which they participate in community upliftment projects (Level 4) (Rogan & Grayson, 2003, p. 1182). Rogan and Aldous found that most teachers claimed that they used examples and applications from everyday life to illustrate science concepts. Their lessons could be placed at the 'traditional science' end of Aikenhead's STS spectrum. Aldous and Rogan considered these teachers to have reached their level 1 with regard to the achievement of LO3. Fewer teachers claimed that they based their lessons on a problem or issue faced by a local community (level 2) and teachers rarely asked their learners to investigate that problem or issue in order to find solutions (level 4; the other end of Aikenhead's STS spectrum with the focus on STS content). Case studies in ten of the Mpumalanga schools however indicated that the teachers did not contextualise their science and very little progress had been made towards the achievement of learning outcome 3. They concluded that science teachers had no experience in contextualising science and had access to very few resources that showed how science related to society in learners' everyday context. As Aldous and Rogan point out, teaching science in a

social context and basing the curriculum on science-related social issues, although known and widely used in many other countries, is a new concept in South Africa which has not been addressed through professional development. The science-related social or environmental issue that Grade 7s are asked to investigate (second assessment standard for learning outcome 3) deals with a concept central to environmental education i.e. sustainability of the earth's resources, and can be linked to critical outcome 5 (responsible use of science and technology) and developmental outcome 2 (responsible citizenship in local, national and global communities).

There is another aspect to investigating social issues. Aikenhead (1994) points out that there are social issues internal to the scientific community that relate to the nature of science. The first assessment standard for learning outcome 3, science as a human endeavour in cultural contexts, draws on ideas from the nature of science. The RNCS points out that there are different world views in the classroom, both the empiricist world view evident in scientific thinking and traditional worldviews based on culture and religion (Department of Education, 2002a). Traditional worldviews draw on indigenous knowledge systems that have developed over thousands of years. Learners should become aware of and value different sources of knowledge.

When the RNCS was developed, the issue of content and concepts to be taught in the Natural Sciences was not entirely resolved. At the time of the review of Curriculum 2005, Chisholm and her team advised the government to stipulate content and pay attention to its sequencing in content/concept rich subjects (Muller, 2006). When the Natural Sciences curriculum was revised in 2002, the Natural Sciences team developed a content framework for the four strands of the Natural Sciences and their sub-strands and attempted to provide a clear conceptual structure from intermediate to senior phase which would allow teachers to help their learners to construct concepts. While they could specify core knowledge that should be covered in each phase, they were not allowed to specify which concepts should be allocated to a particular grade (P. Moodie, personal communication, November, 2006). This once again meant that teachers and textbook writers had different views on what should be taught in each grade in a particular phase. The topic of human reproduction appears at the beginning of the senior phase description of the Life and Living strands and sub-strands and so several, but not all, textbooks placed this content in their Grade 7 books.

The revised curriculum was made available on the government website for public review, was then revised again by taking into account public comment, and published in 2002.

In my research I examine the extent to which the teaching and learning that took place in the classroom allowed learners to demonstrate the critical outcomes and the Natural Sciences learning outcomes at the level specified by the assessment standards for Grade 7 learners. In order for the learning about human reproduction to take place and for the outcomes to be achieved, learner-centred approaches had to be used.

3.1.4 Learner-centred education and the Revised National Curriculum Statement

Schiro (2008) identified four visions or ideologies that have influenced schooling in America (and elsewhere) over the past one hundred years, i.e. the 'Scholar Academic', 'Social Efficiency', 'Social Reconstruction' and 'Learner Centred' ideologies (p.2). Within each ideology, he argues, there are distinct beliefs about the type of knowledge that should be taught, how teachers should teach, and how children should be assessed. South Africa's apartheid curriculum appeared to fall within the Scholar Academic vision for education, i.e. the induction of children into the academic disciplines built up by the European cultures over centuries (Schiro, 2008). The curriculum developers responsible for the introduction of Curriculum 2005 and then the Revised National Curriculum Statement turned to a very different ideology to guide their new curriculum i.e. the learner-centred ideology.

In the learner centred ideology, the needs and interests of the learner are central and the curriculum emerges from these needs and interests. The teacher has in mind general outcomes which the learner needs to demonstrate and provides learning experiences or activities which enable them to move towards the achievement of those outcomes. Learner-centred and activity-based approaches have been promoted as the most effective way to allow learners to achieve the outcomes. In the introduction to outcomes-based education in the curriculum documents, the Department of Education has this to say:

> Outcomes-based education forms the foundation of the curriculum in South Africa. It strives to enable all learners to achieve to their maximum ability. This it does by setting outcomes to be achieved at the end of the process. The outcomes encourage a learner-centred and activity-based approach. (Department of Education, 2002a, p. 1)

Learner-centredness is an ideology which can be traced back as far as Plato who proposed Socratic dialogue i.e. the use of strategic questioning by the teacher to draw out the ideas of the student (Brodie, et al., 2002a; Schiro, 2008). Early Europeans during the 17th to 19th centuries contributed ideas such as children should be free to explore their own interests and draw their own conclusions; children learn by doing; learning is developmental, proceeding from the concrete to the abstract and schooling should fit children's stages of development (Chung & Walsh, 2000; Schiro, 2008). Throughout the 20th century, the views of writers such as Dewey who saw education as an agent of social change and emphasised individualised learning, Piaget who emphasised developmental stages and the way in which people construct knowledge through assimilation and accommodation, Vygotsky who proposed that knowledge is not transmitted but actively constructed in interactions with other individuals in certain socio-cultural contexts and Gardner with his emphasis on multiple intelligences, helped to shape the learner-centred ideology (Brodie, et al., 2002a; Chisholm & Leyendecker, 2008; Nykiel-Herbert, 2004; Schiro, 2008).

The learner-centred ideology was adopted by a number of developing countries who were making the transition to democracy and believed that social, economic and political goals could be achieved through learner-centred education (Chisholm & Leyendecker, 2008; Nykiel-Herbert, 2004). According to Tabulawa (2003), it was the rise of neo-liberalism in the 1980s and 1990s with its emphasis on democracy as a prerequisite for economic development that led to the promotion of a

learner-centred pedagogy. Learner-centred education, based largely on social constructivism, supposedly promoted democracy in the classroom and thus developed a preferred kind of society and people (Harley & Wedekind, 2004; Tabulawa, 2003). Cuban (1990), when considering why there are continual waves of reforms in schools in the United States, suggests that people turn to schools in times of social turmoil and tend to give schools the responsibility of solving national ills which are so deeply rooted in society, they cannot be solved there. The People's Education movement in the 1980s in South Africa was an early attempt to promote democracy in the classroom (Harley & Wedekind, 2004). When Curriculum 2005 was published in 1997, it contained, according to Nykiel-Herbert (2004), a radical view of learner-centredness.

In the Curriculum Framework for General and Further Education and Training, the features of learner-centredness advocated by the Department of Education have been described.

> Curriculum development, especially the development of learning programmes and materials, should put learners first, recognising and building on their knowledge and experience, and responding to their needs. Curriculum development processes and delivery of learning content (knowledge, skills, attitudes and values) should take account of the general characteristics, developmental and otherwise, of different groups of learners. Different learning styles and rates of learning need to be acknowledged and accommodated both in the learning situation and in the attainment of qualifications. The ways in which different cultural values and lifestyles affect the construction of knowledge should also be acknowledged and incorporated in the development of learning programmes. (Department of Education, 1996a, p. 11)

In a later document, the Department of Education stated that teachers, through using learner-centred approaches, would become facilitators rather than transmitters of knowledge, using a variety of methods of instruction to help each learner to learn (Department of Education, 1997b). They would focus on the critical outcomes of education rather than merely teaching information. All learners would succeed, but would be allowed to develop at their own pace (Department of Education, 1997b).

McCombs and Whisler (1997, p. 9) define learner-centredness as a perspective that focuses on individual learners (their experiences, perspectives, backgrounds, interests and needs) and on learning i.e. how learning occurs, and the teaching practices most effective in promoting this learning. Schiro (2008), McCombs and Whisler (1997) and others have identified features that represent learner-centred approaches and most of these features have likewise been advocated by the Department of Education.

In order for knowledge to be constructed, teachers in learner-centred classrooms need to facilitate learning. This means that they should provide appropriate experiences for the construction of knowledge and thus growth (Schiro, 2008). To do so, the teacher needs to carefully observe the students and diagnose their individual needs and interests. Then they set up "a fertile learning environment" (Pahad, et al., n.d., p. 22) i.e. the physical, social, emotional and intellectual environment in which their students can learn. Within that environment the students are able to "grow, learn and make sense of their world" (Schiro, 2008, p. 109). Teaching then involves facilitating

students' growth by intervening between them and their environment. What learners construct is unique to them.

Teachers thus need to provide a suitable learning environment, be responsive to the needs and interests of learners, facilitate learning using constructivist approaches, accommodate different intelligences and learning styles and accommodate personal differences in learners.

3.1.4.1 Learning environment

One of the roles of the learner-centred teacher is to set up a suitable environment in which learning can take place. This can be described in terms of its physical, intellectual, social and emotional suitability (Aldridge, 2012; Schiro, 2008).

In the schools using the more 'purist' forms of learner-centredness in the United States and elsewhere, Schiro reports on how classrooms and in some cases the school buildings/grounds are designed to promote learner-centred approaches. Thus large classrooms have different work-stations and extensive access to resources so that individual children can express their needs and interests and can be helped to explore these further, working at their own pace through tasks and content they select. A suitable physical and intellectual learning environment, according to Schiro, includes a classroom designed for easy movement to and from resources and people (the teacher and other learners). Furniture is arranged for different purposes e.g. quiet reading centres for individual activities and centres for group activities. These centres contain a wide assortment of books and other materials for promoting intellectual growth. Learners are placed in suitable groups for activities.

A suitable social and emotional environment involves good interpersonal relations in which there is cooperation, respect and trust amongst the learners and between the teacher and learners (Brodie, Lelliott, & Davis, 2002b). Classroom rules that promote cooperation and respect for one another can contribute to creating a comfortable emotional environment in which learners can work (Schiro, 2008). If learners feel accepted and can contribute without being ridiculed and do not experience prejudice and harassment from teachers and/or peers, but rather gain help and support from them, then they are more likely to do well (Aldridge, 2012). Duit and Treagust (1998) point out that the classroom climate and power structures within classrooms influence learners' ability to undergo conceptual change from prior ideas towards science concepts.

3.1.4.2 Needs and interest of learners

Proponents of learner-centred approaches believe that the needs and interests of the learners should determine the content of the curriculum rather than a nationally or locally designed syllabus or learning programme planned in advance by teachers (Cuban, 1993; Department of Education, 1996a; Schiro, 2008). At the heart of this belief is the notion that learners will naturally grow into happy, well-functioning adults if not inhibited. The role of the school is to promote the individual's natural growth by giving them the freedom to determine the nature of their education. It is believed that each individual learner through responding to their own "innate natures, felt needs and organic impulses" grow naturally into the people they will become (Schiro, 2008, p. 104). Thus individuals become independent, self-reliant, self-actualising learners who can direct their own growth. The educator still

has objectives or outcomes in mind and provides a learning environment which will direct the learner towards those outcomes, but the learner's autonomy within that environment is respected.

This radical version of learner-centredness, used successfully in a few primary schools in the United States but abandoned or modified by others (Cuban, 1993) was adopted in Curriculum 2005. Thus the Curriculum 2005 document for the Natural Sciences (Department of Education, 1997a) made suggestions of topics that could be covered in each strand and sub-strand. There was however no clear conceptual framework since each teacher should be ascertaining the needs and interests of their own learners and allowing learners to pursue these interests.

Stears and Malcolm (2005) used this approach in their work amongst learners from townships and informal settlements in the Cape Flats. They identified learners' everyday knowledge and concerns related to science and developed science themes relevant to their lives. Stears and Malcolm reported that, as a result, learners felt more comfortable in class, had a greater sense of belonging, were better able to link their everyday experiences to the science learnt, and were more confident, engaged more deeply and participated more freely in the lessons.

3.1.4.3 Constructivist approaches

Central to learner-centred approaches is a view of knowledge being a human construct, and that learning involves the construction of meaning i.e. people formulate their own ideas from what they experience (Bennett, 2003). Thus in the National Curriculum Statement we find frequent reference to the notion that learners should 'construct their knowledge' and that classroom activities should provide opportunities for learners to do so. In the Natural Sciences document, this is explained in terms of learners being able to "build a framework of knowledge by using science concepts repeatedly in a widening range of situations" (Department of Education, 2002a, p. 9).

There are two main lines of thinking concerning how learners make sense of the world and construct their own cognitive structures or schema. The personal constructivists focus on the personal construction of meanings. They believe that individuals learn by interacting with the world and reorganising their ideas and understandings through cognitive assimilation or accommodation, thus building their own unique constructions of the world (Jaworski, 1994; Piaget, 1964; Von Glasersfeld, 1995). Assimilation occurs when cognitive structures adapt so that new information fits into these existing structures. When new information does not fit, there is cognitive conflict and an individual's cognitive structure has to change to re-establish equilibrium (Duit & Treagust, 1998). Posner, Strike, Hewson and Gertzog's conceptual change theory (1982) has emerged from this notion of a personal construction of knowledge. Posner and colleagues propose that conceptual change comes about when a teacher presents experiences that contradict and challenge children's existing conceptions thus creating cognitive conflict. For new ideas to be accepted however, they have to be "intelligible, fruitful and plausible" (p. 225). According to Hewson, Beeth and Thorley (1998), the status that an idea or concept has for a particular person, i.e. how 'intelligible, plausible and fruitful' the idea is, will influence the extent to which it is accepted. However Duit and Treagust (1998) point out that many studies show that counterevidence does not necessarily change students' points of view. They assert

that it is very difficult to get rid of everyday concepts which are fruitful and valuable in everyday situations.

The social constructivists have a different emphasis. Drawing on the work of Vygotsky, they believe that social and linguistic influences affect learning. Vygotsky (1978) claims that as children communicate their ideas with one another through language, these ideas become organised internally in the children's minds, resulting in learning. Thus social constructivists argue that learners construct knowledge when they 'engage socially in talk and activity about shared problems or tasks' (Driver, Asoko, Leach, Mortimer, & Scott, 1994; Jaworski, 1994). This perspective has strongly influenced ideas around learning in South Africa's outcomes-based education, especially the notion of an activity-based and learner-centred curriculum where learners are organised in groups to talk through and problem-solve together (Chisholm & Leyendecker, 2008; Nykiel-Herbert, 2004).

Linked to the idea of social and linguistic influences is Vygotsky's notion of a zone of proximal development (Vygotsky, 1978). Vygotsky supports the idea that learning should match a child's developmental level. However he argues that there are at least two developmental levels, the actual developmental level where a child can solve problems independently and a potential developmental level where a child can do more and reach higher conceptual levels during problem-solving by being assisted by others. Vygotsky describes the gap between these two levels as the zone of proximal development (ZPD) and the assistance as being provided by adults (e.g. teachers) or more capable peers. The teacher provides direction and guidance within the individuals' ZPD, assisting learners to reach higher conceptual levels than they would be able to achieve on their own (Jaworski, 1994; Putnam & Borko, 1997). The learners are likewise assisted by more capable peers. This assistance may be through a demonstration, leading questions, showing how a problem is to be solved, or starting a solution which the child completes alone or with the help of others (Vygotsky, 1978). These ideas have been adopted in the discussion in curriculum booklets on how teachers should now be teaching e.g. clustered desks or tables where peers can interact, cooperative groups and thus the presence of more capable peers, teachers as facilitators, and learning and teaching support materials that promotes learner interaction and collaboration (Pahad, et al., n.d.).

Over the years learning theorists have continued to put forward theories on how learners construct knowledge. While in the past, people have seen these views in competition with one another, authors are now starting to propose that they are in many ways complementary and all throw light onto the complex process of learning (Driver, et al., 1994; Duit & Treagust, 1998; Hewson, et al., 1998). Bennett (2003, p. 34) summarises key research findings as follows:

- ...children construct their own explanations for scientific phenomena and ... these explanations may differ from the accepted scientific explanations.
- Learning involves the *reconstruction* of existing ideas not just the accumulation of new ideas.
- The ideas and explanations that children construct tend to persist even after formal instruction because they make sense in terms of everyday observation and experience whereas the accepted scientific ideas are often counter-intuitive.
- There is general agreement that teaching strategies should begin by eliciting children's existing ideas and then presenting children with situations which challenge this thinking.

- There is less agreement over the ways in which accepted scientific views might be introduced.

A number of authors have pointed out the limitations of constructivist theory in teaching and express concern about the dominance of constructivism as a pedagogy. Bennett asserts out that there is very little evidence of the effectiveness of particular teaching strategies developed within the constructivist framework over others. Osborne agrees, and argues further that while some of these constructivist strategies such as group work, brain-storming, role playing, and other cooperative activities are preferred by and effective for some learners, this is not the case for all learners. Teaching strategies such as 'showing and telling' may be more useful for learners with different learning styles (Osborne, 1996) or whose culture values a more teacher-centred approach (Richardson, 2003). Richardson furthermore points out that constructivist teaching requires strong subject content knowledge and a deep understanding of the discipline, a problem particularly for primary school teachers who teach a number of different subjects. Osborne, while acknowledging the value of constructivism in helping teachers to become aware of children's ideas about science and to view the learner as an active participant in learning, argues that it is "a flawed epistemology which misrepresents science as it is practiced" (p. 76). He believes that the emphasis on the social and human construction of knowledge so that theories need only be 'viable' prevents children from understanding the processes of science and how these processes enable scientists to test and legitimise their claims and produce reliable knowledge.

Constructivism as a pedagogy was adopted by the Department of Education as a feature of learner-centred practice. Teaching, from a constructivist perspective, involves finding out what childrens' ideas are, which in my research would be ideas about reproduction; what their prior or everyday knowledge is that gives rise to these ideas; and then to provide them with appropriate new experiences. In order to enable learning, teachers then need to scaffold the learning and provide activities in which learners can talk about and work together to solve problems and complete tasks.

Prior knowledge: eliciting children's existing ideas

The starting point in constructivist teaching is the prior knowledge or existing ideas of learners (Ausubel, 1968, p. vi; Bennett, 2003). Ideas about human reproduction are based on many different influences that have helped learners to form their current conceptions. Some of these ideas may be based on scientific knowledge and may have developed during learners' engagement in school science or from the media e.g. scientific or medical programmes on television. However much of it is 'everyday knowledge' i.e. 'everyday' or 'commonsense' ways of talking and thinking that have developed by growing up within a particular culture and social context where those ideas are continually reinforced (Chisholm & Leyendecker, 2008; Leach & Scott, 2000). This is particularly important during the teaching and learning of human reproduction. The learners' contexts may provide them with very different information about reproduction if they come from very conservative and/or religious backgrounds where little is said about reproduction or abstinence is promoted, or from traditional backgrounds where beliefs, taboos, superstitions, customs and traditions help determine their ideas about human reproduction, or from urban subcultures where particular ideas about love, sex and multiple partners predominate. Learners carrying very different everyday knowledge and beliefs about human reproduction (their alternative frameworks) will be present in the same urban

classrooms, and their ideas should form part of the knowledge base (Jegede, 1998) used in the teaching and learning of human reproduction.

Using everyday knowledge as the starting point for learning science, according to Taylor (2001), hinders the achievement of the goal of social equity. He refers to Bernstein's work and to the findings of the President's Education Initiative (PEI) research studies[8], and points out that when everyday knowledge forms the starting point, working class children are disadvantaged since middle class children have access at home to a greater repertoire of school-linked knowledge and thus start in a more advantaged position. While this may be true for most of the sciences, in the field of human reproduction such distinctions in terms of access to information are not possible. As mentioned in the previous chapter, there are many sources of information about human sexuality, both traditional cultural (especially initiation schools), religious, parents, peers and the media. Within a particular context such as religious organisations or parents, information may be withheld by some, and dealt with in detail by others. Some children may have access to a wide range of information about sex in the media while parents of other children restrict their access. This makes it all the more essential for the teacher to gain some idea of learners' prior everyday knowledge (although much of it may be private) and to use the widely varying ideas on human reproduction available in a class as the starting point and during their teaching.

Ivinson (2007) argues for an ongoing two-way traffic between the common sense and scientific discourses when teaching sexuality education. Scientific concepts related to the human reproductive system need to be taught in order to understand reproductive processes. However learners find it difficult to apply this school science knowledge to their own lives. As Ivinson points out, young people communicate with their peers, and share ideas and tell stories of sexual exploits through common sense discourses but often fail to see the relevance of information provided in the scientific discourse to their own lives. However scientific discourses carry information that can directly challenge common sense myths about sex for example about the lack of efficacy of condoms, the spread of STIs, and beliefs about who is prone and who is not prone to such diseases. It is therefore important to provide learners with the opportunity to discuss their everyday knowledge, their subjective views, and personal experiences during class discussions and in particular during peer group discussions in a safe social and emotional environment. The scientific aspects of human reproduction help learners to use their science to interpret everyday situations e.g. menstruation, and provides learners with the tools to question commonly held myths, making a way for alternative ways of thinking. Ivinson therefore claims that the ongoing two-way traffic allows learners to confront their common sense discourses with scientific discourses.

Teachers in Jegede and Okebukola's study made use of this approach. Biology teachers in Nigeria found that when they planned discussions of socio-cultural beliefs[9] about major concepts in human

[8] The President's Education Initiative (PEI) Research Project consisted of a number of different studies commissioned by the Teacher Development Centre on behalf of the Department of Education and involved investigations of teacher practice, the use of teaching and learning materials and the implementation of curriculum within different school contexts (Hindle, 1999).
[9] Example of traditional beliefs from Jegede and Okebukola's study: "an uncircumcised expectant mother would not give birth safely; mating in the daytime gives rise to an albino" (Jegede & Okebukola, 1991, p. 279).

reproduction amongst secondary students, this approach helped students to understand, and often to eliminate, the mismatch between scientific information and ideas from their traditional cultures (Jegede & Okebukola, 1991).

Provision of challenging and appropriate activities

Constructivists differ in their notion of how to help learners reconstruct their existing ideas and, as mentioned earlier, there is little evidence for which are the most effective teaching strategies (Bennett, 2003). However constructivists generally agree that in order to learn, learners must experience a gap between their existing and new knowledge. Drawing on the two lines of constructivist thinking in education, Brodie, Lelliott and Davis (2002b) suggest that teachers provide activities in which there are opportunities and resources for cognitive conflict and equilibration (Piaget) or for moving through the zone of proximal development (Vygotsky). Brodie and colleagues therefore propose that the activities that teachers develop should interest the learners, make them realise the limits of their knowledge and challenge them to extend their knowledge and competence. Likewise Pahad and co-writers, in their discussion of the need for activity-based learning in South African schools, refer to the need for learners to "be involved in learning activities that engage their critical thinking and sharpen and extend problem-solving abilities" (Pahad, et al., n.d., p. 26) They suggest that teachers should select activities suitable to their context and which enable learners to achieve the relevant outcome.

Conditions in schools are often not conducive to teachers providing challenging and appropriate new experiences. Stoffels (2008) found that the two teachers in his study were unable to develop their own activities suitable to their particular context due to a number of pressures associated with the implementation of the new curriculum and resorted to the use of textbook activities. These pressures will be discussed later.

In considering teaching approaches, some authors argue that activity-based learning should not be the only way of teaching. Murphy (2012) points out that, in the sciences, formal instruction is needed to help learners move through their zone of proximal development to a new level of scientific thinking. Others suggest that learning may take place more effectively in oral cultures when teaching strategies include more traditional approaches such as explanations, role-play and storytelling (Hattingh, 2008; Jegede, 1998; Kwenda, et al., 1997). Storytelling, Jegede argues, is a powerful instructional strategy in traditional African societies where elders carry the knowledge of the community and pass it on to the younger generation only during specified events such as ceremonies and initiation. Role-plays allow children to express their feelings and ideas indirectly (it is not about them), and they can appreciate what others are communicating (Jegede, 1998). Hattingh argues that effective learning can take place in ways that are not necessarily activity-based and learner-centred. She points out that Africa has a long history of oral learning which is still employed especially in rural areas. Children are used to learning in this way and some teachers excel in the art of rhetoric and teach effectively using this approach. Teaching through an oral approach, she argues, makes sense in schools with large classrooms and very few resources. In addition she suggests that one possible reason for the failure of C2005 (and thus also the NCS) to deliver its intended outcomes is that the proposed approaches for

teaching and learning are not aligned with the dominant cultural values of teachers and learners in most South African schools.

While Hattingh has a point and there is a place for these more traditional oral approaches, I would argue that uncontested knowledge is passed on to learners in this way. An oral approach, used alone, does not provide opportunities for learners to really engage with the new ideas and compare them with their own ideas and beliefs, engage in critical thinking and allow scientific discourses to confront common sense discourses.

Scaffolding

Scaffolds are support mechanisms that help a child to carry out a task which he/she would not be able to do on their own and which supports them until they are able to complete the task independently (Brush & Saye, 2002). The concept of scaffolding, introduced by Bruner in the 1950s, has been used within the context of Vygotsky's sociocultural theories in trying to describe the role-played by teachers or more capable peers in helping learners to move through their Zone of Proximal Development (ZPD) (Collins, Brown, & Holum, 1991; Murphy, 2012; Verenikina, 2008). Brush and Saye suggest that two types of scaffolding are needed to assist teachers and learners when using learner-centred approaches. Soft scaffolding refers to verbal interactions that occur when teachers identify difficulties in understanding and provide some sort of support that guides the learners. This verbal support may be in the form of questioning, using cues, prompts, hints or partial solutions, demonstrating a solution to a problem; providing guidelines and examples, and dividing a task into simpler steps or dividing content into manageable pieces (Murphy, 2012; Rosenshine & Meister, 1992; Verenikina, 2008). Hard scaffolds refer to any sort of teaching aid or material prepared in advance that can be used to assist learners' understanding (Brush & Saye, 2002).

Perhaps the most common form of scaffolding is the use of questioning to elicit meanings and challenge concepts. The Socratic method of questioning in particular can be used to create cognitive conflict. In this form of questioning, the teacher asks questions that require learners to provide evidence to support their ideas so as to persuade them that there are gaps in their logic (Bennett, 2003).

Brodie and her colleagues (2002b) point out that in South Africa the space between what the learner knows and what they need to know, i.e. their ZPD, in many schools is huge. This is a problem because it makes scaffolding very difficult. This is a dilemma, because if the teacher reduces the space to a manageable size, learning will be more effective, but the pace will be much slower and coverage far less.

Cooperative learning: Encouraging learners to work together to solve problems and complete tasks

According to Vygotskian theory, social context and language are fundamental to learning (Bennett, 2003). Within the social context of the classroom (within a school community of practice), learners listen to the talk of others, try to make sense of it, relate it to their existing ideas, reorganize and reconstruct those ideas and begin to express these ideas through language, thus internalising new

concepts (Bennett, 2003; Vygotsky, 1978). Learners need to interact with other learners with different viewpoints, providing opportunities for the social construction of knowledge, thus the need for heterogeneous cooperative groups. By providing opportunities for peer group discussion of ideas, conceptual change is promoted (Bennett, 2003).

Research does show that the use of cooperative learning strategies can improve learning (Johnson, Johnson, Holubec, & Roy, 1984; Slavin, 1987) To work effectively as a member of a team, each person in the group needs to cooperate by participating, playing a role and taking on specific responsibilities that contribute to the success of the group (Johnson, et al., 1984). In this approach, the groups consist of members of varying ability so that those who are more able can assist those who are less able. The members of the group are responsible for each other's learning. From a Vygotskian perspective, the more capable peers help their less able peers to move through their zone of proximal development; from the Piagetian perspective, the different ideas of the members of the group can create cognitive conflict, disequilibration and then higher quality understandings emerge (Slavin, 1987). The class activities provide learners with the opportunity to help and learn from one another as well as from the teacher and from other sources. This is considered an important social skill in future work environments and promotes learning through the social construction of knowledge.

The idea of group work has been the one aspect of a learner-centred approach that almost all teachers have latched onto. Around the country teachers have reorganised their desks so that learners could sit in groups (Rogan, 2007; Rogan & Aldous, 2005; Taylor & Vinjevold, 1999). However teachers have mostly continued to use a teacher-centred approach, teaching from the front. The PEI researchers reported that discussion amongst learners in groups was rare (Taylor & Vinjevold, 1999). In one of the studies where group work was seen, involving Grade 7 Natural Sciences classes, the interactions amongst learners was only considered beneficial when the learners had meaningful subject content to talk about or work with. The researchers however noted that much time passed in irrelevant or superficial discussion. In another study, Taylor and Vinjevold report that teachers supported the notion of group work because they felt it was one way of increasing learner participation. They assumed that this would somehow improve learning, but were not aware of the need for meaningful support and mediation by the teacher. It seems that teachers have not understood the purpose of arranging learners in groups and their role in mediating learning.

3.1.4.4 Learning styles

Children differ in how they learn. One way of looking at learning styles is to look at children's sensory preferences i.e. the way in which they learn best, i.e. through visual, auditory, kinaesthetic or tactile stimuli. Thus teachers would need to provide opportunities for learners to acquire new information through sight e.g. showing the learners something; hearing e.g..giving explanations; touching e.g. manipulating materials; and by using their body e.g. in drama, interviewing, fieldtrips (Shalaway, 1997). Differences in learning styles can also be seen in whether learners are more orientated to left or right brain functions; the preferred physical conditions in which learners work, preferences for working on their own or in groups or pairs, etc (Hassard, 2005).

Gardner (1983), in his theory of multiple intelligences, asserts that people have evolved to think in at least seven ways which he calls intelligences. He claims that people are stronger in some 'intelligences' and weaker in others and learn best through using the type of intelligences they are strongest in. These help to determine their learning style. For example:

- verbal-linguistic intelligence – people learn best through auditory stimuli i.e. hearing and seeing words, reading, speaking, writing, and discussions
- visual-spatial intelligence – people learn best through visual stimuli i.e. working with pictures and colours, visualising and drawing
- bodily-kinaesthetic intelligence – people learn best through touching (tactile stimuli) and moving and processing knowledge through bodily sensations (kinaesthetic stimuli)
- logico-mathematical intelligence – people learn best by working with patterns and relationships, classifying, abstract thinking
- musical-rhythmic intelligence – people learn best through rhythm, melody, singing, listening to music
- inter-personal intelligence – people learn best through sharing, comparing, relating, interviewing, cooperating
- intrapersonal intelligence – people learn best through working alone, self-paced projects, reflecting.

Teaching and learning that cater for all these intelligences allow learners to demonstrate their strengths and to work on underdeveloped 'intelligences'. Gardner claims that verbal-linguistic and logic-mathematical have dominated and the other five 'non-traditional' intelligences have been overlooked.

An important aspect of teaching in learner-centred ways is giving learners the opportunity to demonstrate their abilities in some areas and to develop those areas in which they are weak. Thus a balanced curriculum should allow for the development of all these intelligences and thus learning styles.

Gardner's Theory of Multiple Intelligences has been criticised by some educators and by a number of psychologists (Klein, 1997; Waterhouse, 2006). They point to a lack of empirical evidence for multiple intelligences and Waterhouse asserts that neuroscience does not support the claims for different intelligences each with its own neural processing circuit. They suggest that Gardner's theories are based on his own intuitions and reasoning, and that it has been conflated with learning styles, talents and abilities It is nevertheless widely used in education.

3.1.4.5 Personal differences in learners

South Africa is a multicultural society and teachers and learners within schools hold different worldviews which are framed by their culture, religion and personal background. Some may hold more strongly to an empiricist worldview i.e. they believe that "if something can be observed and measured in some way, it is real and can be used to explain why events happen in nature" (Department of Education, 2002a, p. 11). Others are more strongly influenced by worldviews that emerge from their cultural and religious beliefs, i.e. traditional worldviews (Shumba, 1999).

Central to the learner-centred approach is recognition and respect for diversity amongst learners (Brodie, et al., 2002b; Department of Education, 2003). Children in urban schools in Gauteng come from a wide range of different backgrounds. They are diverse in their cultural and religious beliefs and practices, in the languages they speak, and in their home background (Brodie, et al., 2002a; Sanders & Kasalu, 2004). In addition, as adolescents approach or are going through puberty, they are at different physical, social and emotional levels of development. They have different learning styles, as noted above, and different rates of learning (Department of Education, 1996a).

In the Natural Sciences, there is an expectation that teachers and learners will recognise, respect and incorporate the culturally-influenced perspectives they and others have on matters related to the Natural Sciences (Department of Education, 2002a). Thus in the area of human reproduction, teachers and learners will respect each person's position with regard to cultural and religious beliefs and practices while allowing science to inform everyday knowledge and vice versa.

Classrooms in Gauteng are mostly multilingual. Teachers will also need to be aware of the language difficulties learners may experience with regard to learning about human reproduction in English, and may support language practices such as code-switching or learning in their home language that will assist learners to communicate more freely with their teacher and with one another while moving through their ZPD and learning new concepts. Rogan and Grayson (2003) believe that learners' proficiency in the language of instruction can influence the capacity of a school to support a new innovation, because learners for whom English is an additional language and who are not proficient in English will be less able to understand new materials and participate in activity-based and learner-centred activities, if the teacher insists on them using only the language of instruction.

A further area of sensitivity needs to be learners' home backgrounds. Teachers would need to be aware of the conditions in which the children live, the resources they have access to, the presence or absence of parents or some guardian, and in some cases the availability of basic necessities such as food, clothing and shelter. The socio-economic conditions for children living in Gauteng range from extreme poverty to extreme wealth and the conditions of those living in poverty will have a significant impact on their learning (Fleisch, 2008).

Learners will differ in their developmental levels and the national Department of Education (1996a) points out that teachers need to take the different developmental stages of learners into account. In the learner-centred approach, there is the assumption that individuals progress at different rates through stages of physical, intellectual, emotional and social development, the rate being determined by genetic and environmental factors, and that people's thoughts are different at different developmental stages (McCombs & Whisler, 1997; Schiro, 2008). This is particularly relevant to learners in grade 7, some of whom have not yet entered puberty whilst others may have started several years previously.

Children learn at different rates and a feature of a learner-centred approach is the teachers' ability to provide opportunities for learners to learn at a rate that suits them, extending the gifted child and

allowing the slow learner opportunities to catch up. In the more radical forms of learner-centred education, each learner would work at their own pace, resulting in learners throughout the classroom working on different tasks (Schiro, 2008).

Teachers are advised to work towards addressing the key principle of inclusivity.

> Inclusivity ... taps into the rich diversity of our learners and communities.... Schools are encouraged to create cultures that ensure the full participation of all learners irrespective of their cultures, race, language, economic background and ability. All learners come with their own experiences, interests, strengths and barriers to learning which need to be accommodated. (Department of Education, 2003, p. 6)

The ideal of catering for diversity among learners is very difficult to put into practice in multilingual and multicultural classrooms. Brodie and her colleagues (2002b) point out that in South Africa, teachers are mostly working in under-resourced schools in extremely difficult socio-economic conditions. As a result, learner-centred teaching is transformed in classrooms in complex ways.

3.1.4.6 Assessment and Integration

Continuous assessment is an important feature of learner-centred approaches to teaching and learning and of outcomes-based education. Teachers need to constantly assess learners so that they can reorganise their teaching and learning to enable learners to continue to develop, grow and learn (Schiro, 2008). Continuous assessment provides information about the extent to which learners are meeting the assessment standards for a particular grade in a learning area like Natural Sciences (Department of Education, 2002a). Teachers did assess what their learners knew through questioning and they did take in their books to mark the answers to the activities. I included questioning in my analysis of how learner-centred each teacher is, but I did not analyse the teachers' assessment of the learners' work. This was considered outside the scope of my study. Thus while assessment is an important component of outcomes-based and learner-centred education, I did not include assessment as a category in my analysis in order to limit the scope of my study.

Integration across traditional subjects (horizontal integration) rather than clearly defined boundaries between subjects is another feature of learner-centred approaches that will not be explored in this thesis. Integration was promoted in Curriculum 2005, but this was criticised by the review committee who pointed out that the emphasis on horizontal integration between learning areas resulted in poor conceptual coherence. (Chisholm, et al., 2000). They advised that there be a new emphasis on vertical integration within a Learning Area that promoted conceptual learning and progression. Since horizontal integration between learning areas was no longer promoted in the RNCS, I did not consider this form of my integration in my analysis.

In conclusion, the emphasis in the new curriculum on "outcomes instead of input"; "learner-centredness instead of teacher-centredness"; "facilitating" rather than directing learning; and "active instead of passive learning" has introduced a revolutionary new way of teaching and learning in South African classrooms (Stoffels, 2008, p. 26). Teachers respond to expectations of radical change in different ways.

3.2 Educational change

The education system in South Africa, at the time this research was carried out, had undergone a major change and teachers were faced with the imperative to implement a radically different approach to teaching and learning, as described in the previous pages. Fullan (1991) claims that large scale curriculum reform aimed at changing teachers' pedagogical assumptions, teaching methods, classroom organisation and assessment strategies is difficult to achieve. Change, he argues, is very complex. He suggests that:

> Neglect of the phenomenology of change – that is, how people actually experience change as distinct from how it might have been intended - is at the heart of the spectacular lack of success of most social reforms. (Fullan, 2001, p. 8)

When confronted by any significant change, according to Marris (1974), people tend to experience loss, a resultant anxiety and a struggle to recover a meaningful relationship. Schon describes their experience as that of "passing through zones of uncertainty.... the situation of being at sea, of being lost, of confronting more information than you can handle" (Schon, 1971, p. 12). Fullan maintains that individuals (e.g. teachers) are members of social systems (e.g. schools) that have shared senses of meaning (e.g. concerning teaching and learning). Threats to the social system, for example the introduction of a very different curriculum such as Curriculum 2005 and the RNCS, have a significant impact on teachers. According to Fullan, teachers are often conservative and individualistic and these teachers may feel that their experience, skills and accumulated wisdom of how to handle the job are being set aside. As a result, they often adjust by changing as little as possible either assimilating the change in a superficial way or abandoning changes they were initially willing to try. This sort of response has been observed in South African schools particularly amongst teachers who felt confident that they were successful teachers (Jansen, 1999b). Many teachers however have been very supportive of the new curriculum and have wanted to implement it but did not know how to do so (Rogan & Aldous, 2005). People may think they have changed as seen in South African schools where teachers think they are using learner-centred approaches when they place learners in groups. However they have not understood what learner-centred approaches entail and the changes are simply surface changes (Brodie, et al., 2002b; Rogan, 2007). Fullan argues that teachers need to be recultured by changing their beliefs and habits. This is very difficult because it involves challenging the core values held by individuals regarding the purposes of education. Fullan believes that change will fail unless we find some way of helping teachers to engage in deep change when using new approaches to teaching and learning. Deep change, he claims, will not occur unless there are changes in belief and understanding of the reform.

The educational change introduced into South Africa's educational system was both politically and educationally motivated. Fullan (1991) describes education reform as largely a political process. Politically motivated change, he says, is accompanied by greater commitment of leaders, the power of new ideas and additional resources. However it also produces overload, unrealistic time lines, uncoordinated demands, simplistic solutions, misdirected efforts, inconsistencies and underestimation of what it takes to bring about reform. This seems to describe the initial efforts of the Education

Department in implementing Curriculum 2005.

South Africa attempted to bring in a new curriculum far too quickly, and Jansen in his famous (or infamous) paper "Why OBE will fail" set out ten reasons why it was not possible for Curriculum 2005 to succeed in South African schools (Jansen, 1999c, p. 147). These include the complexity of the language of innovation, the excessively ambitious demands on the teacher in their role as facilitator, flawed assumptions about how classrooms are organised and what kinds of teachers exist in the system, the speed of implementation, the excessive administrative burdens on teachers, in particular the notion of continuous assessment, the trivialising of curriculum content, the simultaneous implementation of many interdependent innovations creating very complex processes for teachers and schools and the radical revision of assessment. Many of Jansen's reasons have been identified by others as causes for the lack of success or limited success of many of the new curriculum projects introduced at national or local levels in different countries.

A number of factors impact on teachers' ability to implement new practices. Firstly there is a gap between curriculum policy and practice (Lelliott, et al., 2009) or as other authors describe it, a gap between intended and implemented curriculum (Onwu & Stoffels, 2005); a mismatch between expectation and reality (Rogan, 2004); or a disjuncture or dislocation. Lelliott and colleagues argue that the gap between policy and practice is inevitable because policy and practice are different fields.

The gap between policy and practice differs for different schools. Jansen (1999c) and Rogan and Grayson (2003) argue that it is the advantaged schools that have experienced the smallest gap and have been most able to implement C2005. Rogan and Grayson assert that, in South Africa, there is a tendency to ignore the great differences between schools and simply introduce complex and comprehensive changes that most schools cannot cope with. They argue that the only way to address the gap between what is intended and what is feasible is to recognise the current reality of a school, i.e. its teachers, learners, leadership and environment, and by then assisting the school to move through a series of small changes. They refer to the Zone of Feasible Implementation (ZFI), where gradual and feasible change can take place, building on the school's strengths. Other researchers likewise refer to the need for small steps based on what stakeholders can cope with (Coll & Taylor, 2012; Fullan, 2001). Hargreaves however questions the idea of a step by step process because implementation is a messy process due to the complex environments in which change takes place (Hargreaves, 1998b).

Another criticism linked to the notion of an unmanageable policy-practice gap is that the innovation is often too broad and ambitious (Hargreaves, 1998b). Jansen (1999c) points out that the demands of Curriculum 2005 such as radically new forms of assessment, intensive and constant monitoring of learners, new ways of teaching, new forms of learning resources, parental support and involvement; and retraining of teachers and principals are excessive. Stoffels (2008) found that when the pedagogical shifts are too high for teachers, they become dependent on approved science textbooks for teaching and learning, believing that these textbooks contain outcomes-based approaches.

The speed with which the implementation is expected to take place is another factor that results in people being unable to cope (Coll & Taylor, 2012; Hargreaves, 1998b). Rogan (2007) argues that Curriculum 2005 was implemented so rapidly that consultation was limited, and top-down approaches had to be used in order to see new policies implemented in schools. The teachers that Rogan observed in a school in Mpumalanga asked him frequently if they were doing the right thing. They had clearly not had any opportunity to internalise the changes and, while being willing to change, did not seem to really understand what was required. Rogan asserts that massive change was introduced too rapidly in South African schools with disastrous consequences.

The intensification of work for teachers during implementation is a major source of contention (Hargreaves, 1998b; Stoffels, 2008). Much of the intensification of work seems associated with the demands of continuous assessment and excessive administrative work.

Poor resources in schools also hampers innovations (Hargreaves, 1998b). Rogan (2007) points out that when Curriculum 2005 was first implemented, the majority of schools lacked the most basic human and physical resources. While much has been done over the past ten years to address this problem, the lack of basic resources remains a problem and continues to hamper teachers' efforts at curriculum innovation in South African schools.

Hargreaves points out that change is usually complex and chaotic (Hargreaves, 1998b). People involved in change need a sense of personal safety and emotional security in which risk and creativity can flourish. Hargreaves suggests that the emotional dimension of educational change needs to be carefully considered. He argues that one needs to avoid reform strategies, leadership styles and work conditions which create conditions of hopelessness, feelings of guilt (through being overwhelmed) and of shame (being blamed for failure). These sorts of emotional conditions reduce teachers' sense of efficacy and their ability to provide quality education for students.

My research took place in the middle of a cycle of change. The pre-1994 curricula, which continued in the sciences until 1997, had focussed on concepts as the organising structure for the curriculum, i.e. a clear vertical conceptual structure existed through the grades. Curriculum 2005, implemented in Grade 7 from 1998 to 2005, abandoned conceptual structures as an organising factor in the various subjects and focussed on the achievement of outcomes, a horizontal structure. Teachers and textbook developers were left bewildered with no clear understanding of how to meaningfully use unconnected concepts to help their learners achieve outcomes, and the collapse of Curriculum 2005 that Jansen had predicted, began to take place. This resulted in the revised National Curriculum Statement which was implemented at Grade 7 level from 2006 to 2013. The conceptual structures were carefully developed through the grades but only stated in very broad terms. Throughout the implementation of C2005, teachers experienced anxiety and uncertainty, and some felt threatened by the overthrow of their established routines and their understanding of how to teach their subjects, particularly in the subjects with strong hierarchical structures like the sciences. However many teachers also felt challenged by new ideas and the possibility of new and more meaningful approaches to learning. Some engaged in surface change, but others began to go through a process of deeper change. The extent to which

teachers were able and willing to change is affected by many factors. These are the subject of my research. In the next section I look at the theoretical framework for my study.

3.3 Theoretical framework

A theoretical framework is a collection of interrelated concepts used to guide research, helping the researcher to understand the problems and issues to be investigated; enabling the researcher to ask appropriate research questions and choose an appropriate research design; and providing ideas for interpreting data collected and using that interpretation to reflect on the ideas that have contributed to the theoretical framework (Foddy, 1993; Le Compte & Preissle, 1993).

In order to produce a theoretical framework for this study, I start by looking at Rogan and Grayson's theoretical framework for curriculum implementation in developing countries (Rogan & Grayson, 2003). The analysis of the extent to which outcomes-based and learner-centred approaches are being used when teaching human reproduction draws loosely on Rogan and Grayson's construct 'Profile of implementation' in order to answer research question 1. I then use the construct 'Capacity to innovate' to answer research questions 2 and 3. Since the teacher is my unit of analysis, I focus in this section on a discussion of factors that have been identified in the literature as influencing a teacher's willingness and capacity to innovate, making use of the four sub-constructs provided in Rogan and Grayson's framework. I also draw briefly on only one outside influence, that of professional development to inform research question 3. This is followed by a description of Ajzen's model, i.e. the Theory of Planned Behaviour. This second theoretical framework was used to guide research question 4 i.e. to what extent do a teacher's beliefs about the factors affecting the teaching of human reproduction in outcomes-based ways influence their behaviour?

3.3.1 A model for curriculum implementation in developing countries

Rogan and Grayson developed a theory of implementation which took into account the context in which teaching and learning takes place in developing countries. Three constructs were developed on which this theory was based i.e. the capacity to innovate, outside support and the profile of implementation. The constructs and their sub-constructs and the relationships between them can be seen in Figure 3.1. The sub-constructs that were used most extensively have been highlighted in colour.

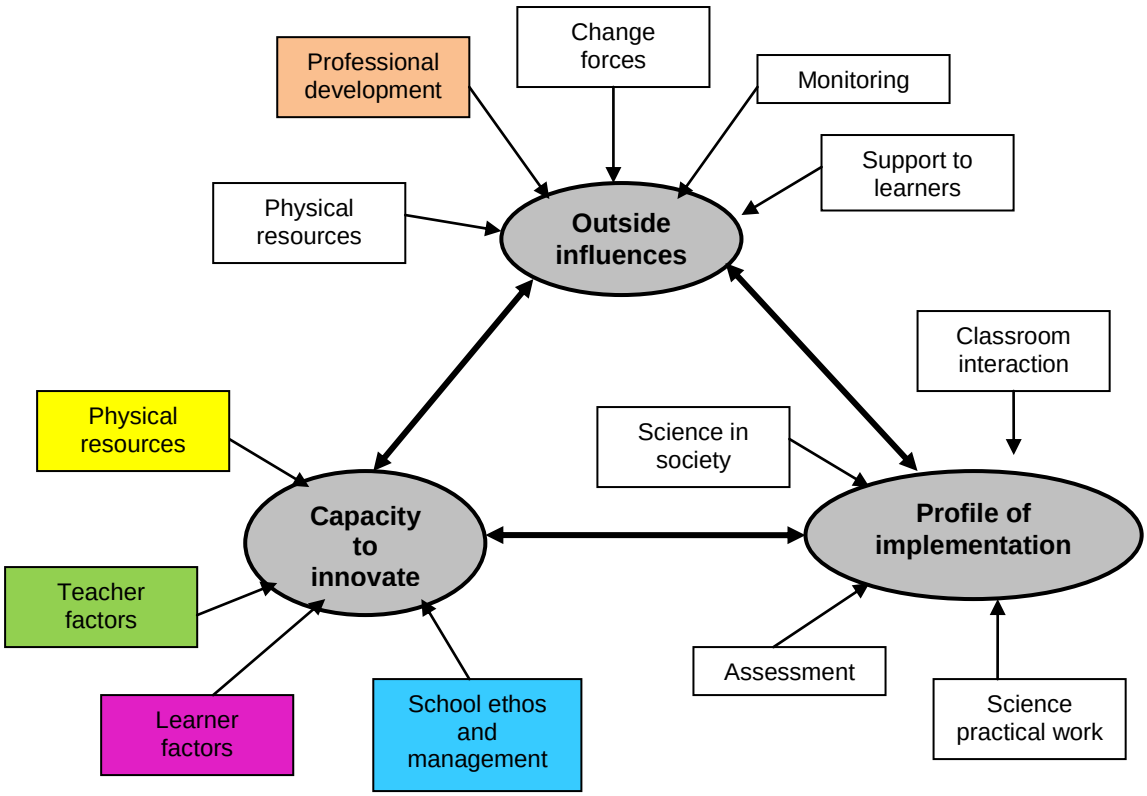


Figure 3.1: Rogan and Grayson's Theoretical Framework for curriculum implementation in developing countries (Rogan & Aldous, 2005, p. 314)

In this theoretical framework, the construct 'profile of implementation' describes levels of implementation for four sub-constructs, i.e. classroom interaction, science practical work, science in society and assessment. The descriptions in the profile allow educators to identify progress in aspects of curriculum implementation. While the profile was not used in this form in my research, some features in the sub-construct 'classroom interaction' were used to identify the extent of the teacher's use of learner-centred approaches. The profile for the sub-constructs 'science practical work' and 'science in society' provided some ideas for analysing the achievement of learning outcomes 1 and 3 respectively. I did not consider assessment in my analysis in order to limit the scope of my research. The profile 'capacity to innovate' was particularly useful in guiding my analysis. According to Rogan and Grayson, the capacity of a school to support an innovation is influenced by the physical resources available, teacher and learner factors, and the school ethos and management. This study focuses on the teacher, but a teacher's capacity to innovate is influenced by not only personal factors but also by the learners they teach, the resources they have at their disposal and the management of the school in which they teach. I have therefore focussed on these factors in my research. These will be discussed below.

The construct 'outside influences' refer to organisations and activities outside of the school which provide support to a school during an innovation. The support may be in the form of advice given by subject facilitators or project organisers, resources, and professional development during in-service

education and training (INSET) and other activities. I will briefly discuss only one outside influence, i.e. professional development of the teacher, since this is of particular interest in my study. The remaining sub-constructs are considered elsewhere e.g. physical resources under 'capacity to innovate', or do not form part of this study e.g. monitoring, support to learners and change forces.

Teachers are one of the major stakeholders in the educational change process. If they are unwilling or unable to implement the change, clearly change will not take place. A number of factors, referred to as sub-constructs in Rogan and Grayson's model, could influence teachers' capacity and readiness for change. These include professional development, school ethos and management, physical resources, learner factors and teacher factors.

3.3.1.1 Professional development

With any curriculum innovation, there should be substantial and ongoing professional development (Coll & Taylor, 2012). Most teachers, when introduced to a new approach to teaching and learning such as an outcomes-based and learner-centred approach, are unlikely to have had any pre-service education and training (PRESET) in the new approach. It seems therefore that they need a comprehensive introduction to the new curriculum during INSET. Teachers being introduced to new ways of teaching and learning need to see theory in action, and experience an innovation firsthand rather than simply being lectured on aims, structure and new jargon (Rogan & Grayson, 2003). According to Coll and Taylor, the type of teacher training that occurs after the launch of a new curriculum is however typically of the 'pit stop' 'one shot' variety run by education officials. This seems to describe the type of workshops held after the introduction of first C2005 and later the RNCS. In the review of the RNCS (Dada, et al., 2009), the task team concluded that the training for C2005 and the NCS was "superficial and too generic ... decontextualised and unsupported" (p. 55). Teachers in Rogan's study (2007) reported that most of their INSET training was focussed on what the policy required of them. If however professional development involved the modelling of new approaches, this would enable teachers to visualise how these approaches could be implemented and they could then experiment to see what is feasible (Bell & Gilbert, 1996). This type of professional development would have helped the science teachers in Onwu and Stoffel's study who did not understand what constructivist and outcomes-based teaching was, and claimed that they had never seen this type of teaching in practice in their classroom context i.e. large under-resourced classrooms (Onwu & Stoffels, 2005). This 'policy-practice' divide or mismatch is a common problem. Onwu and Stoffels point to the need to focus efforts on "helping science teachers bridge the gap between curriculum intentions and classroom implementation" (p.89) in the conditions in which they teach.

In South Africa, outcomes-based education might have been clearly conceptualised in the heads of those who designed it, but those concepts were not communicated well to the leaders of the workshops that were run for teachers, resulting in enormous confusion in schools about what outcomes-based education entailed. This confusion did ease slightly with the introduction of the RNCS and more effective workshops in Gauteng but teachers still do not seem to have a clear understanding of the requirements of the RNCS curriculum.

3.3.1.2 School ethos and management

Rogan and Aldous (2005) found that the most significant factor influencing teachers' change to Curriculum 2005 approaches in Mpumalanga schools was the way in which a school was managed and the school's support for curriculum change. A well managed school provides more opportunity for innovation than a disorganised and dysfunctional school. In addition, leadership and the support of the principal of the school for innovation is crucial (Fullan, 2001; Rogan & Grayson, 2003).

The principal has overall responsibility for organisation and management of the school, for ensuring that a workable timetable is in place, teachers and learners are in class and engaged in teaching and learning and making effective use of their teaching time, that the staff are implementing the curriculum, that resources are available to support the teaching staff, and that suitable assessment takes place (Bush, Joubert, Kiggundu, & Van Rooyen, 2010; Taylor, Gamble, Spies, & Garisch, 2013). The principal should be visible during school hours and their leadership of the school should be evident (Rogan & Aldous, 2005). The leadership role of the principal is of course far more complex than the above description, but ensuring implementation of the curriculum can take place within a well-functioning school is important.

The heads of departments (HODs) likewise have an important role to play to ensure effective teaching and learning within their learning areas and across phases (Bush, et al., 2010). This involves monitoring the implementation of outcomes-based approaches, ensuring that sufficient time and resources are available for teaching a particular topic such as human reproduction, and that there is collaboration amongst the staff on how to teach, and how to address difficulties during teaching. Their emotional support of, and help offered to teachers particularly when dealing with a complex subject like human reproduction is vital. Both principal and HODs need to work with the teachers responsible for teaching human reproduction in advising parents of the intent to teach this topic, for providing parents with the option to withdraw their learners from the class if valid reasons are given, and for dealing with conflict that may arise between teachers and learners or amongst learners.

A variety of styles of leadership have been observed in South African schools from principals simply ensuring that classes take place, to checking the work of teachers and HODs, observing teaching, and effectively coordinating activities in the school (Bush, et al., 2010).

3.3.1.3 Resources

When countries throughout Africa became independent and introduced Universal Primary Education, there was a rapid increase in learner enrolment figures and in teacher-learner ratios (Lewin, 1992; Onwu, 1998). There has not however been a corresponding increase in physical, human and financial resources. The conditions in a school can have a debilitating effect on teachers' perceptions of their ability to implement changes. Very large classes, lack of materials, e.g. books, stationery, teaching aids and equipment, and poor physical conditions in the school do affect teachers' capacity to innovate (Fullan, 2001; Gray, 1998; Hawes & Stephens, 1990; Lewin, 1992; Rogan & Aldous, 2005; Rogan & Grayson, 2003).

Large classes are a source of contention in South African schools and can impact on teaching and learning of human reproduction. In South Africa, the teacher-learner ratio specified by the government at the time of my study was 1:35. Onwu (1998) defines a large class as one in which the teacher learner ratio is more than 1:40; and where available floor space is less than 1 square metre per child. Large classes occur where there is a lack of physical space due to overcrowding, fewer opportunities for learners to participate actively, and limited opportunities to meet learners' own needs (Lewin, 1992; Onwu & Stoffels, 2005). In Onwu and Stoffels' study of physical science teachers in secondary schools in Limpopo province, the average teacher: learner ratio was 1:60, with some teachers having up to 100 learners in a normal size classroom i.e. 5x7metres. These teachers said that it was difficult to use learner-centred and activity-based learning with such large science classes where movement was restricted and resources were limited. Their teaching made use of whole class teaching, lecturing and demonstrating, using the question and answer mode of discussion, and was textbook based. Onwu and Gilbert pointed out that in such a learning environment, it would be difficult for teachers to shift their teaching towards outcomes-based learner-centred approaches. Clark and Linder (2006) agree. They point to the disjuncture between the rhetoric of learner-centred approaches which require teachers to be responsive to the individual needs of the learners in their classroom and the reality of a township classroom where the very large numbers and continually changing classes result in students remaining anonymous. Teachers are unable to get to know even the names of all their students, resulting in a sense of distance from their learners. This is in direct contrast with the intentions of teaching human reproduction in a way that is responsive to the needs and interests of individual learners.

Poor resources in schools also hamper innovations (Hargreaves, 1998b). Rogan (2007) points out that when Curriculum 2005 was first implemented, the majority of schools lacked the most basic human and physical resources. In Limpopo schools for example, teachers were teaching physical science in dilapidated classrooms and laboratories with broken window panes and chalkboards, insufficient desks and space, and with basic facilities such as electricity missing in most schools (Onwu, 1998; Onwu & Stoffels, 2005). Rogan and Grayson (2003) point out that poor resources and conditions can limit the performance of even the best teachers. While much has been done over the past ten years to address this problem, the lack of basic resources remains a problem and continues to hamper teachers' efforts at curriculum innovation in South African schools.

Curriculum implementation in Africa has also been hindered by the lack of support materials for innovations (Gray, 1998; Lewin, 1992; Ottevanger, 2002). According to Ottevanger, curriculum materials can make a difference to the successful implementation of a new curriculum if they are designed to reduce the complexity of the innovation for the teacher, reduce the teacher's workload, provide the teacher with clear and practical ideas for teaching, and can support teachers of varying levels of competence within their very diverse schools.

Teachers in South Africa are supposed to be designers of their own materials appropriate to the needs, interests and experiences of their learners (Department of Education, 2002a; Stoffels, 2008). There was a concern, when Curriculum 2005 was introduced, that reliance on a single textbook would

disempower teachers and reduce their level of professionalism (Adler, Reed, Lelliott, & Setati, 2002). Teachers were therefore expected to draw on a wide range of learning support materials (LSMs) to produce suitably contextualised materials. However these materials, except in the well resourced schools with access to the internet and printed materials, are simply not available in the schools. In addition, most teachers lack the skills to develop their own materials (Magno, 2007; Vinjevold, 1999b). Vinjevold questions whether teachers can and will develop their own materials. She points out that the development of learning support materials is difficult, time-consuming and simply not sustainable. Her claim has been supported by teachers in their submissions to the task team reviewing the NCS (Dada, et al., 2009). They feel that they do not have the time and expertise to develop suitable LSMs and this task should be placed in the hands of experts. Stoffels says that it seems that teachers can only develop materials by enriching or deviating from learning support materials available to them if they feel competent or experienced. If they are not competent and experienced, they use pre-packaged learning support materials which then minimise decision making before, during and after the lesson.

Textbooks are the principal instructional material in classrooms in most developing countries and often the only reading materials available (Magno, 2007). Science teachers with poor backgrounds rely on these textbooks. In Stoffel's study of two Natural Sciences teachers, he found they made their decisions on what and how to teach based on the learning support materials (a learner support book, a learner's activity book and a teacher's guide) that were available in their schools. The books provided a ready-made programme for them which supposedly was outcomes-based, and which saved time and relieved pressure. In the one school the parents insisted on the use of the textbooks since they had more confidence in the books than the teacher, believing the books were in line with the new curriculum. As a result, Stoffels found that the teachers became passive and their own development was stifled.

Textbooks in many schools are simply used as a resource for the teacher and they select and use only what they feel are suitable activities (Adler, et al., 2002; Rogan, 2007; Vinjevold, 1999b). Primary maths and science teachers however tend to use a fragmented selection from textbooks for individual lessons, thus affecting coherence and need help in learning how to use textbooks and other resources effectively (Adler, et al., 2002).

Malcolm and Alant (2007) argue that textbooks are critically important in South Africa as a source of science knowledge, curriculum planning and teaching ideas for teachers and students. After her review of learning support materials in the PEI studies, Vinjevold (1999b) concluded that the provision of suitable learning materials was one of the most important ways of improving the quality of mathematics and science learning in South African schools. In my study, learning support materials on human reproduction were introduced to, and further developed by, the teachers during a workshop and then distributed to the teachers (see Section 4.5.2 and 4.5.4).

3.3.1.4 Learner factors

The learners' home environment, religion, culture and language are factors that could influence both

the subject content taught and the effective implementation of the approaches identified in the National Curriculum Statement. Some of these factors have been discussed in detail in Chapter 2 and in section 3.1.4.5 in this chapter when discussing what a teacher using a learner-centred approach needs to do to address personal differences in learners. I will briefly review some points.

The home environment of learners may have a significant impact on learners. Learners may be less able to participate in learner-centred practices which require independent work if, for example, they come from homes where there is no or very limited support for and help with their studies, where learners are hungry and are tired due to extensive demands on their time, and where there is not a safe and quiet place to study (Mulemwa, 2004; Rogan & Aldous, 2005). These conditions, in my study, are most typical of those experienced by learners living in the informal settlements and the very poor inner city areas.

Cultural and/or religious restrictions by parents or communities with regard to learning about sexuality may also impact on teaching and learning. Such learners may feel less free to participate in activities in which they learn about human reproduction (Halstead, 1997; Reiss, 1995). On the other hand, as discussed in the previous chapter, learners in urban environments such as those found in Gauteng, who are strongly influenced by their peers and the media, may be willing to debate issues related to human reproduction particularly amongst their peers. However children who have been sexually abused may find this a painful and difficult topic and may withdraw from the discussion.

Learners' difficulty with understanding and using the language of learning and teaching is another factor that could significantly influence the implementation of learner-centred approaches. As discussed previously, if a teacher does not allow code-switching or learning in the home language, learners who are not proficient in English may become silent during group and class discussions and so the type of interactions needed for the construction of new knowledge does not take place.

Innovations require learners to change their thinking and behaviour and the success of an innovation depends on whether learners actively participate in the new activities (Fullan, 2001). Learners may resist the change to outcomes-based and learner-centred approaches if these approaches are not congruent with their own values and past experiences (Clark & Linder, 2006; Tabulawa, 1997). Learners growing up in communities where questioning of adults by children is regarded as disrespectful, may be unwilling to question their teacher beyond asking for procedural information, for example, asking them to clarify instructions (Aikenhead & Jegede, 1999; Shumba, 1999). Clark and Linder describe how students exerted a passive resistance to new approaches that were in conflict with their cultural expectations by remaining silent in the classroom. They describe these students as becoming expert in the 'art of hiding'. Questions that were addressed to the teacher were only done on a one-to-one basis so that learners avoided appearing stupid in front of their peers and 'losing face'.

Learners are subject to a wide range of influences both at home, in their neighbourhood, and at school. These have been discussed in greater detail elsewhere in this and the previous chapter. The challenge for the teacher is to become aware of, sensitive to, and responsive to, the particular

circumstances of each learner. This is particularly important when teaching a subject like human reproduction but is perhaps an impossible goal when teaching large classes.

3.3.1.5 Teacher factors

Teacher uptake of outcomes-based and learner-centred approaches when teaching human reproduction may be influenced by both professional and personal factors. These factors may play a significant role in the extent to which a teacher participates in curriculum change. Once again the research on sexuality education provides some indication of the impact that these factors will have on the teaching of human reproduction by Natural Sciences teachers.

Professional factors

Certain professional realities can influence a teacher's readiness to change.

Preservice and inservice education and training (PRESET and INSET)

Teachers' level of education and training has long been considered a factor influencing their capacity to innovate (Beeby, 1966; De Feiter, et al., 1995; Lewin, 1992; Rogan & Grayson, 2003; Shulman, 1986, 1987). Teachers' lack of subject content knowledge in the sciences has been thought to affect their confidence and their pedagogical content knowledge (Lewin, 1992; Shulman, 1986). At a primary school level, teachers tend to be generalists and not specialists (Stoll, 1994) and their subject content knowledge may be limited. Stoll suggests that underqualified teachers tend to have a rigid teaching style, encourage rote learning and allow for minimum interaction in the classroom.

A teacher's level of education and training may influence the content of and their approach to teaching human reproduction. A study across a number of countries revealed that teachers' views on sexuality education are influenced by their level of education and training which in turn tends to reduce religious influences (Berger, et al., 2008). Thus those with high academic levels (degrees), whether atheist, agnostic, Christian, Muslim or of other faiths, all share the same conceptions about the importance of teaching the biological, social, psychological, affective and relational dimensions of sexuality education. Anastácio, Carvalho and Cléments' research (2004) supported these findings. They found that Portuguese teachers with higher academic qualifications and/or with specific training in sexuality education more strongly supported sexuality education in schools, and had fewer difficulties in teaching about aspects of sexuality education. They displayed less fear of learners' and parents' reactions to their sexuality education programmes and of opposition from opponents of their programmes. Those who had more education and training were also more supportive of other contributors to sexuality education programmes e.g. parents, doctors, nurses, psychologists and social workers (Anastácio, et al., 2004).

Teachers participating in Anastácio and colleagues' research agreed that training in sexuality education was important and should provide them with scientific knowledge, help them to respond more easily to children's unpredictable questions, and also help children to develop values awareness. They also felt that suitable training should equip them with the skills to identify and find solutions to the problem of the sexual abuse of children in their schools and with the skills to deal with parents

(Anastácio, et al., 2004; Anastácio, Carvalho, & Clément, 2008). Roscoe (2006) points out that in the United Kingdom there is no specialist initial training course to teach sex and relationship education within primary, secondary and higher education, and this is needed. Greater attention to pre-service and in-service teacher training is needed to develop teachers' competence, confidence and a sound knowledge base for using appropriate methods and developing the teaching qualities valued in sexuality education (Walker & Milton, 2006). This principle applies also to the training of Grade 7 Natural Sciences teachers who will be teaching human reproduction.

While it seems important that new teaching and learning approaches are modelled to PRESET and INSET teachers, and that teachers participate in activities which demonstrate these approaches during INSET, other factors may also play a role in effective implementation of new curricula. Rogan and Aldous, for example, found that teachers' willingness to change played a more important role in their attempts to implement new C2005 approaches involving classroom interactions in the Natural Sciences than their qualifications and their level of professional development (Rogan & Aldous, 2005).

Stage of career

Based on their research, De Feiter and colleagues claim that the stage of a teacher's career and their classroom experience influences their capacity to innovate (De Feiter, et al., 1995). They suggest that teachers who successfully negotiate their first year of teaching are then more open to trying new materials and teaching strategies. If they have had traumatic experiences in their first year of teaching, they avoid change and follow survival strategies.

Communities of practice:

Teachers who are part of a community of practice may be more willing to participate in change. Communities of practice have been described as groups of people who are recognised as having a special expertise in some area of significant cultural practice, e.g. teachers (Nuthall, 1997); who share similar activities and identities, have shared senses of meaning and shared frameworks of theory and values within which they operate (Fullan, 2001); and who deepen their knowledge and expertise by interacting on an ongoing basis (Bockarie, 2002; Wenger, 1998). Social networks or communities of practice play an important role in reform (Fullan, 2001, 2003; Putnam & Borko, 1997) These communities of practice could, for example, be Natural Sciences teachers in a particular area (such as the 'clusters' in each Gauteng school district) or teachers within a particular school. Fullan (2001) found that the extent to which teachers interact with one another, and provide support to one another, is a strong indicator of the potential success of any implementation. Hargreaves likewise reports that there is increasing evidence from research in Britain that "cultures of collaboration" have a significant impact on teachers' sense of efficacy, their willingness to take risks, and on their implementation of new practices (Hargreaves, 1997, p. 1306).

The most significant communities of practice are the teachers' closest professional community i.e. the school or department within the school (Fullan, 2001; Hargreaves, 2002; McLaughlin, 1998). If this community is weak, there is a lack of a shared sense of practice and teachers work in professional

isolation. While out-of-school learning communities e.g. subject area networks and professional organisations are helpful, they are not enough if the professional community in the school is weak and disconnected. In weak communities, teachers carry on as they see fit and understand. Deep and sustained change is very difficult. Strong learning communities in a school where teachers learn about their own and other teachers' practice, learn when and how to use new practices, and debate and argue until they forge new conceptions of practice are essential for, but do not guarantee change. The Change Agent study in the USA showed that traditional norms cannot be unlearned in isolation and teachers cannot change their beliefs, attitudes and practices to those required by the reform on their own (McLaughlin, 1998). Teachers need to wrestle with new frames of learning with others in close community or change will be superficial or non-existent. In the Change Agent study, opportunities for teachers to talk with colleagues about teaching, think about new ways of doing things, and hammer out shared understandings of goals of teaching were important. This gave them the confidence to respond to the diverse needs, interests and talents students brought to the classroom and to implement new ideas. McLaughlin felt that there was a need to reduce teachers' professional isolation and provide increased opportunities for professional dialogue. Rogan (2006) agrees, arguing that structures are needed to provide teachers experimenting with innovation with communities of practice so that peers can support and encourage one another during the innovation.

Change is a learning process which entails willingness to try out new ideas and practices, to improvise, be exposed to uncertainty, to collaborate and support one another. In many developing countries teachers have neither the experience nor the expectation of collaborating with one another and supporting one another. Rogan and Grayson suggest that they may even shun peer collaboration for fear of exposing their areas of weakness (Rogan & Grayson, 2003).

Personal factors

A number of personal factors may influence teachers' conceptions of, and teaching of, human reproduction. Teachers have unique life histories and personalities which affect their capacity to change (Fullan, 2001). Those personal factors are likely to have an impact on the content of and their approach to teaching about human reproduction. Once again I draw on the research on sexuality education.

Life experiences

Firstly, teachers are themselves sexual beings with their own life experiences which may contribute to their ease or difficulty with teaching sexuality education (Helleve, Flisher, Onya, Mukoma, & Klepp, 2011; Rivers & Aggleton, 1999). Their sexual biography i.e. their own experiences both as a child and adult influences what they know about sexuality, how they view sexuality and how they teach aspects of sexuality education (Anastácio, et al., 2004; Kehily, 2002; Morrell, 2003). Baxen and Breidlid (2004), in their research on teachers in Sub-Saharan Africa, found that teachers may be operating in "conflicting discursive spaces" (p. 17). They may be experiencing sexual abuse and they may be at risk of infection or living with HIV/AIDS. Exploring this topic with their learners could be difficult. Teachers' personal situation may thus significantly impact on how and what they teach.

Beliefs about and attitudes to teaching human reproduction

Teachers' convictions about whether sexuality education (and thus human reproduction) should be taught and how much detail should be included, determines what takes place in the classroom. Some primary school teachers in Zambia (Malambo, 2002) and South Africa (Helleve, et al., 2009) do not believe it should be taught. In Portugal, even though sexuality education is compulsory in primary schools, most teachers avoid teaching it (Anastácio, et al., 2004). According to Anastácio and colleagues, this could be because they have low scientific and pedagogical knowledge of the topic. However their beliefs, ideologies and morality could also influence their position on the teaching of sexuality education.

Teachers may also be reluctant to teach human reproduction or sexuality education because they find it difficult to deal with issues regarding sexuality and HIV/AIDS. Teachers often feel vulnerable about their role and complain about being embarrassed and ill-prepared to talk about sex with children (Baxen & Breidlid, 2004; Walker & Milton, 2006). Walker and Milton assert that teachers' openness and comfort levels with regard to talking about sexuality impacts on the content of, and their approach to, teaching sexuality education. Being free and open-minded in talking about sexuality is considered an important attribute when teaching sexuality education (Helleve, et al., 2011). In preliminary workshops that I ran for Grades 7 to 9 Natural Sciences teachers in Gauteng, some teachers were clearly not comfortable about talking about sex-related matters and indicated that they would prefer to leave the teaching of human reproduction to the Life Orientation teacher.

Personal attributes and innovation

Certain personal attributes have been found to contribute to the success of an innovation. Flexibility and open-mindedness is one of these attributes. Fullan (2001) suggests that while exposure to an innovation may stimulate a teacher's curiosity and willingness to explore the potential of the innovation, teachers need flexibility and open-mindedness in order to accept changing professional roles and to act contrary to well established practice.

Commitment and interest are further factors needed for the institutionalisation of a new practice in teachers' classrooms (Rogan & Aldous, 2005; Stein & Wang, 1988). The greater a teacher's level of commitment to and interest in teaching and learning, the greater their willingness and capacity to innovate (Rogan & Grayson, 2003). However research in the United States showed that teachers' willingness to innovate is also dependent on whether teachers believe the innovation is worthwhile and will benefit the students or not (Fullan, 2001).

Teachers who have a strong perception of self-efficacy, i.e. who believe they are able to carry out the new teaching and learning tasks, are more likely to innovate. Bandura introduced the concept of 'self-efficacy' i.e. peoples' confidence in their ability to perform a certain behaviour (Bandura, 1977, 1991). Bandura (1991) proposes that people's perceived self-efficacy influences their choice of activities, how much effort they will expend on those activities, and how long they persist in the face of obstacles and adverse experiences, i.e. their coping abilities. As mentioned earlier, cultures of collaboration can support teachers and contribute to their sense of self-efficacy (Hargreaves, 2002).

Congruence of the teacher's beliefs, values and attitudes with those of the innovation can impact on change. Teachers whose ideas, values, beliefs and goals are congruent with the curriculum developers are more likely to use new approaches (Davis, 2002; Fullan, 2001; Stein & Wang, 1988). If they are not congruent, there may only be surface change (Fullan, 2001) as described in section 3.2.

Gender and age

Gender may play a role in the teaching of human reproduction. Portuguese female teachers found aspects of sexuality education e.g. body growth and expressions of sexuality more difficult than male teachers and were more reluctant to work with other sexuality educators. However they had fewer fears than their male counterparts about opposition from learners, parents and the conservative milieu to their teaching of sexuality education (Anastácio, et al., 2004). In a South African study, some teachers felt that girls would only talk to female teachers about certain intimate topics, and boys to male teachers (Helleve, et al., 2011). However a male teacher in Helleve's study disagreed. He felt that boys' and girls' reluctance to discuss reproductive matters with him could be attributed to the fact that in his culture, fathers seldom talked to their children about sex. His role as a sexuality educator was thus in conflict with his cultural role as a father figure. While this may be true, in circumcision schools, men specifically assigned to this role do talk at length to boys about sexuality.

Age is another factor that should be considered. In Anastacio and colleagues' study of Portuguese teachers, younger teachers (less than 30 years old) had fewer difficulties in teaching sexuality education than older teachers but were more reluctant than older teachers to accept the contributions of other sexuality educators (Anastácio, et al., 2004).

Religion and culture

Teachers' own religious and cultural beliefs and practices may play a significant role in how and what they teach when dealing with human reproduction (Aikenhead & Jegede, 1999; Greathead, et al., 1998; Reiss, 1995; Rogan, 2000).

Sex before marriage is forbidden in some religions and cultures and so abstinence is likely to be promoted by teachers holding such views. Berger et al. (2008) conclude from their study of teachers from twelve countries in Europe, Africa and the Middle East that that it is not simply religion but the degree of belief in God which determines a teacher's conceptions of what they would allow in class, for example discussions of safer sex or abstinence, and what position they would take on these issues. A teacher's perspective on sex could also influence their teaching. Anastácio and colleagues found that teachers holding religious views of sexuality and pleasure as sin rather than having a biological and psychological interpretation of sexuality found it difficult to teach sexuality (Anastácio, et al., 2004).

The teaching of human reproduction is also influenced by a teacher's normative beliefs i.e. their beliefs about whether individuals or groups whose opinion is valued will approve or disapprove of their behaviour (Ajzen, 1991). Catholic and other religious teachers in Portugal were more fearful of the reactions of parents, pupils and the more conservative community to sexuality education than their

less religious colleagues (Anastácio, et al., 2004).

Cultural values inform pedagogical practice (Hattingh, 2008). Hattingh argues that there is often a misalignment between intended curriculum and the cultural values of a teacher. Teachers in the Transkei for example said that it is taboo in African cultures for them to talk to children about sexual intercourse especially with young children (Mbananga, 2004). They added that they found it difficult to talk to their own children about sexuality since they had not been brought up that way. These teachers said that compelling teachers and parents to discuss sexual topics with their learners impacts on their value systems and is uncomfortable for them. They are being asked to forget about their cultural values at school, but at home their community expects them to conform to these cultural values. They therefore have to play different roles as members of the community, parents and teachers and this creates a conflict for them.

Teachers in Helleve and colleagues' study (2009) said that there were certain norms that should be followed when discussing sexuality with others e.g. discussion between peers was more acceptable than cross-generational communication. Thus group discussion, a feature of learner-centred approaches, would allow for greater exploration of aspects of human reproduction.

It can be seen from the above discussion that teachers are unique individuals whose teaching of human reproduction may be influenced by a number of professional and personal factors in unique and varied ways. These need to be taken into account when attempting to understand the extent to which teachers implement outcomes-based and learner-centred approaches when teaching human reproduction.

3.3.2 Theory of Planned Behaviour

Curriculum change usually requires a change in the way in which teachers teach. While a number of models of curriculum change in developing countries (e.g. models proposed by De Feiter, et al., 1995; Rogan & Grayson, 2003) identify factors that influence the capacity of a school or teacher to innovate, none of these models address teachers' beliefs about whether they can innovate and their attitudes towards the innovation. Interventions that target beliefs and attitudes may stand a greater chance of success. Science education has turned to social psychology in an attempt to find a suitable framework for analysing beliefs and attitudes that could lead to or hinder change in teachers' behaviour.

Ajzen's Theory of Planned Behaviour (Ajzen, 1991, 2002; Ajzen & Madden, 1986) is one of the most widely researched, frequently used and most popular models of behaviour change according to Ajzen (2002), Armitage and Conner (2001) and French and Hankins (2003). This model, which has been used by several science education researchers (Crawley, 1990; Lumpe, Haney, & Czerniak, 1998a; Zint, 2002), provides a useful framework in this study for understanding how beliefs about various factors influence Grade 7 Natural Sciences teachers' behaviour. This theory, represented in Figure 3.2 below, suggests that the best predictor of behaviour is a person's intention to perform the behaviour which is in turn influenced by three variables i.e. attitude, subjective norms and perceived behavioural

control. These three variables are themselves influenced by related beliefs.

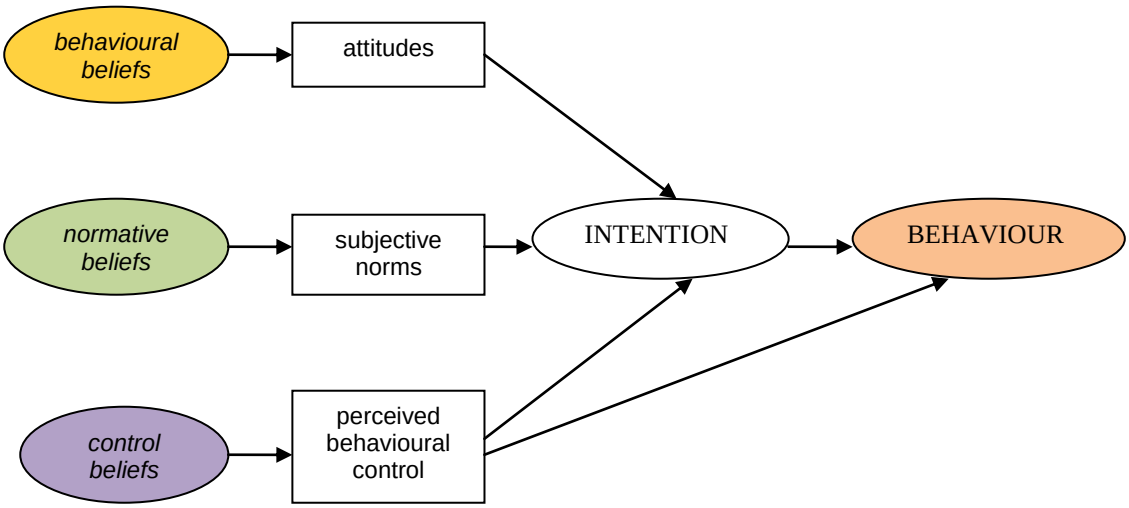


Figure 3.2: Ajzen's Theory of Planned Behaviour (Ajzen, 1991; Armitage & Conner, 2001)

According to the Theory of Planned Behaviour, a person's attitude to the planned behaviour, for example the use of outcomes-based and learner-centred approaches, may be influenced by their beliefs about that behaviour, for example beliefs about whether or not this is the most effective approach to teaching a particular topic. Thus their beliefs about the behaviour influence their attitude to that behaviour which in turn influences their intention to perform the behaviour which then determines the performance of that behaviour.

A person may also be influenced by subjective norms, i.e. "the perceived social pressure to perform or not perform the behaviour" (Ajzen, 1991, p. 38). According to Ajzen, their perceptions are influenced by beliefs that important individuals or groups whose opinion is valued will approve or disapprove of the behaviour. In my study these important individuals may be Heads of Departments and Principals who have to demonstrate to the Department of Education that their teachers are employing outcomes-based and learner-centred approaches and so teachers might believe that the use of these approaches will gain the approval of these important individuals.

The third variable relates to a person's perception of the extent to which they are able to control the behaviour. An example of this may be a teacher's perception of the extent to which they can implement learner-centred approaches in the classroom. This is influenced by their *control beliefs* i.e. a person's beliefs about the extent to which there are resources and opportunities for, or obstacles to, performing the behaviour (Ajzen, 1991). These beliefs are often affected by factors that are internal to an individual such as their personal skills, abilities and knowledge and by external factors such as time, opportunity and the cooperation of others. Ajzen and Madden maintain that if a person does not believe they have the ability, resources or opportunities to perform a certain behaviour, that person is unlikely to show strong intentions of performing the behaviour, and change is less likely to take place

(Ajzen & Madden, 1986).

The notion of perceived behavioural control, according to Ajzen (2002), is very similar to Bandura's concept of 'self-efficacy' in that both theories explore the influence of internal control factors on behaviour. Self-efficacy refers to peoples' beliefs about the ease or difficulty of performing a behaviour and thus their confidence in their ability to perform that behaviour (Bandura, 1977, 1991). Ajzen suggests that both internal and external factors contribute to a person's sense of self-efficacy and control over the behaviour. He suggests that when people believe they have the required resources (both internal and external) and opportunities, and that the obstacles (both internal and external) that they are likely to encounter are few and manageable, then their perception of their ability to control the behaviour is high. However if they believe they lack these resources and they are likely to encounter serious obstacles, then the behaviour will be seen as difficult and they will have a low perception of their ability to control the behaviour. Thus, for example, teachers who believe they lack the material resources (external factor) to teach human reproduction, the numbers of learners in a class are too large (external factor) to attempt to teach in learner-centred ways and they lack the confidence (internal factor) to engage in discussion with learners on this issue, then their perceptions will be that it is both difficult to teach human reproduction, and it is difficult to teach it in learner-centred ways. The intention to teach human reproduction in, for example, learner-centred ways will then be reduced and these teachers will be less likely to spend adequate time on teaching human reproduction and on teaching it in learner-centred ways. Bandura (1991) and Bryan (2012) point out that beliefs are the best indicator of decisions individuals make and are strong predictors of behaviour.

A number of studies warn against ignoring teachers' beliefs about reform (Cuban, 1990; Lumpe, et al., 1998a) and propose that we gain a clearer understanding of the relationships between teacher beliefs and science education reform. Sanders (2006) suggests that models such as the Theory of Planned Behaviour can provide us with useful theoretical frameworks for exploring attitudes to proposed innovations in the new curriculum, teachers' perceptions about their abilities to change, the beliefs influencing these perceptions, and teachers' intentions to change.

In my research, I am interested in whether teachers' beliefs about the influence of internal and external factors affects their teaching of human reproduction in outcomes-based and learner-centred ways (see research question 4). To answer this question, I collected information from both the survey and the interviews about these beliefs.

3.4 Theoretical framework for this study

Rogan and Grayson's and Ajzen's theoretical frameworks were used to construct a framework for my study, as shown in Figure 3.3.

Four research questions guided my research, i.e.

1. To what extent do Grade 7 Natural Sciences teachers use approaches that are learner-centred and

outcomes-based during the teaching of human reproduction?

2. What factors influence the teaching of human reproduction to Grade 7 learners?
3. What factors affect the use of outcomes-based and learner-centred approaches during the teaching of human reproduction?
4. How do teachers' behavioural, normative and control beliefs affect the teaching of human reproduction in outcomes-based and learner-centred ways?

In order to answer research question 1, I use the idea of levels of implementation from Rogan and Grayson's framework and develop my own levels of implementation of outcomes-based and learner-centred approaches. I use these levels of implementation in my analysis to answer research question 1.

Since the study is focused on teachers and their capacity to innovate, I combine aspects of Rogan and Grayson and Ajzen's frameworks in order to explore the internal factors and external factors that influence the extent to which teachers teach in outcomes-based and learner-centred ways and to explore the beliefs of teachers relating to the influence of these internal and external factors. The internal factors refer to personal and professional teacher factors, while the external factors refer to support structures such as professional development and the school ethos and management, and to the learning environment such as physical resources as well as to learner factors. I therefore use four of Rogan and Grayson's sub-constructs under the construct 'Capacity to innovate' and one sub-construct from the construct 'Outside influence' to create my groupings of factors and these guide my collection of data in order to answer research questions 2 and 3. The other sub-constructs in Rogan and Grayson's framework have either been included in the analysis of the outcomes achieved, for example, the sub-construct 'Science in Society' is also LO 3, or they are also categories of learner-centred approaches, for example the sub-construct 'classroom interaction', or they were not directly relevant to my analysis of the teachers. My rationale for excluding some sub-constructs was discussed in section 3.3.1.

The fourth research question about teachers' beliefs draws on Ajzen's theory of planned behaviour. I look at the effect of teachers' behavioural, normative and control beliefs about teaching human reproduction in outcomes-based and learner-centred ways on their approach to teaching the topic 'human reproduction'.

3.5 Concluding remarks

A number of factors influence the implementation of new curricula. In this review of the literature, I have explored factors that I consider most relevant to my study, and have developed a framework that will allow me to explore what these factors are, what teachers' beliefs about these factors are, and how both the factors and the beliefs about these factors influence teaching human reproduction in outcomes-based and learner-centred ways.

In the next chapter, I will describe the events leading up to my study.

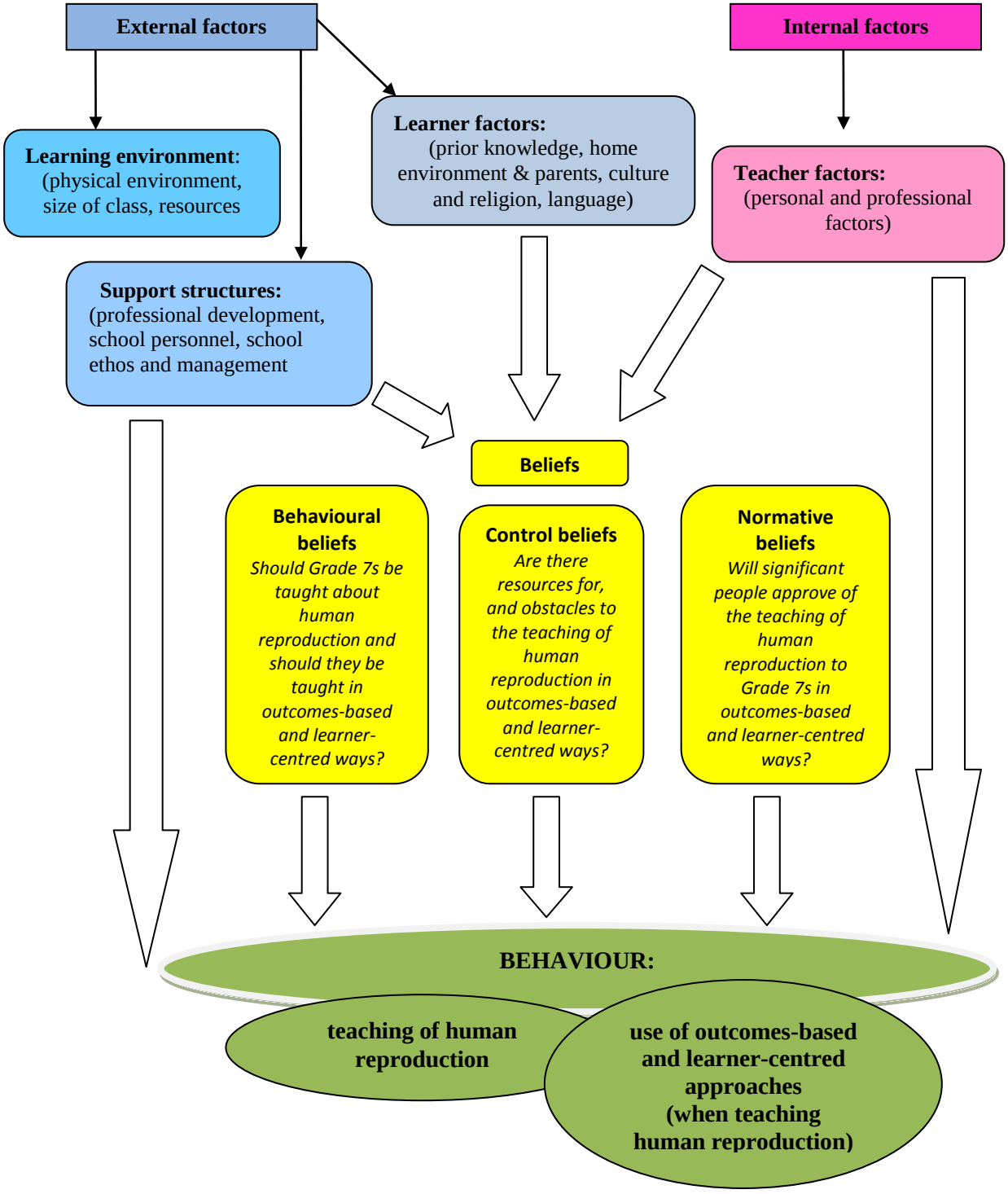


Figure 3.3: Theoretical framework
(based on Rogan and Grayson's Theoretical Framework for curriculum implementation in developing countries and Ajzen's Theory of Planned Behaviour)

Chapter 4
Interventions and events leading to the study

This chapter describes the events in Gauteng, and in particular in one district in Gauteng, that led up to my study. The events described here took place in the context of a changing curriculum where there was a great deal of uncertainty on how to proceed. The guidance provided by the Curriculum 2005 documents in 1997 was vague and this opened up opportunities for curriculum developers and teachers to develop materials and try out new approaches in schools. In this chapter I describe briefly one of these initiatives in which I was involved, the curriculum materials developed as a result of that initiative, and two exploratory case studies that I undertook to test the materials. A revised curriculum, the RNCS, was then introduced and I describe the uncertainty over what should be taught in different grade levels, the initiative shown by one Gauteng Department of Education (GDE) subject advisor in her district and the subsequent events leading to my research in that district.

4.1 Developing materials for C2005

In 1998 the Department of Education in South Africa introduced a new curriculum, Curriculum 2005, into South African schools starting with Grade 1 (Department of Education, 1997b). This process has been described in Chapter 1. In 1999 the Gauteng Institute of Curriculum Development (GICD) appointed teams of consultants to develop exemplar curriculum modules for the intermediate and senior phases of General Education and Training. I was appointed as a consultant on the Natural Sciences senior phase team. As a team we examined the curriculum documents in order to understand the principles that guided the new curriculum. We then selected topics in each of the four strands[10] of the Natural Sciences Learning Area that we believed were appropriate and relevant for Grade 7s. I was responsible for developing a module on reproduction for the 'Life and Living' strand. The content and activities were based on input from other members of the team and on ideas from textbooks and literature on teaching human reproduction and sexuality education in primary schools. The modules were reviewed several times by the team and by GICD experts before being distributed as illustrative learning programmes by the GDE to schools around Gauteng.

4.2 Exploratory case study

I was interested in finding out whether teachers found the materials helpful and how they modified and used these materials. I was also interested in knowing whether learners could understand the language and content in the materials and could carry out the proposed activities. This would enable me to modify and improve the module with regard to the language, subject content and activities.

[10] Life and Living, Planet Earth and Beyond, Energy and Change, and Matter and Materials

I was given the names of two experienced and competent Grade 7 Natural Sciences teachers and I invited them to pilot the materials in their schools (a suburban and a township school). I obtained permission to conduct a case study in their schools, observing their classes during the implementation of the module in 2000. I set out to gather data from teachers, learners and their parents/guardians.

Near the beginning of the year, parents were informed about the proposed pilot study and invited to a parents' meeting where the teaching of the module on human reproduction would be an item on the agenda for Grade 7 parents. I attended parents' meetings in both schools, made the modules available to the parents, and went through the materials outlining the content and the activities. The parents in both schools supported the teaching of the module, feeling that it was very important that the school teach the children this content at this stage of their lives. They expressed their satisfaction that the content of the module was appropriate for their children. Some of the parents indicated that their children were afraid to talk to them about reproduction, and that they found it difficult to discuss this topic with their children. However a number of parents said that they had no problem answering questions and discussing aspects of reproduction with their children.

I observed two township classes and three suburban classes. The age of the learners in the township schools ranged from 11-17 years old and in the suburban school from 11-14 years old. Before teaching started, both teachers asked their learners to complete a content pre-test which would help the teacher to identify what the class knew about human reproduction before teaching started. These pre-tests revealed that learners had a certain amount of knowledge about what happened but wanted to know why it happened. For example learners could give clear descriptions of the changes that took place during puberty but were curious about why and how these changes took place. They knew that only girls menstruated and got pregnant but some wanted to know why girls menstruated and why boys did not menstruate and get pregnant. Very few learners in the township school could explain where the menstrual blood came from. When these learners were asked where eggs are formed, five children suggested the womb, 15 the vagina and 22 the stomach. A number of other alternatives were proposed. These and other responses revealed where the gaps in their knowledge could be found.

The two teachers then began to teach about human reproduction using the module as a support material. I made audiotapes of the lessons and field notes during my observations. The teacher at the suburban school adapted the module to suit the way in which she wished to teach the subject, introducing her own worksheets and including the 'sugar baby project'[11], a menstrual calendar and pamphlets from a clinic to illustrate and discuss STDs in class, while the teacher at the township school stuck more closely to the activities in the module. The 'township' teacher also modified the activities, paying particular attention to the difficulties many of her learners had in understanding the English in the module. In her interview she indicated that in the Natural Sciences classroom she also played the role of a teacher of English. She therefore encouraged learners to look up difficult words in their dictionary or would explain words. She also read extracts and got learners to read sentences in

[11] Learners carry a large bag of sugar which they dress in baby clothes or in a blanket and treat as a baby for a month. They have to feed it, change its nappies, hold it and rock it, experiencing what it is like to be a parent with a small baby. It is intended to get them to think carefully about the responsibility involved in having a baby.

the module or say words out loud. In a number of different ways she assisted them to grasp the meaning of the descriptions in the module. The 'suburban' teacher had fewer difficulties with the language since most children had English as their home language.

Both teachers participated enthusiastically and competently in the teaching of this topic, and involved their learners in group activities (role-plays, discussions, completion of questions) throughout the teaching of the module. The learners for the most part were enthusiastic participants in the class activities. The teacher in the township school was more teacher-centred in her approach particularly when discussing morals and health than the suburban teacher but the approaches used by both teachers could be described as being closer to learner-centred than teacher-centred approaches.

At the end of the module learners completed an anonymous questionnaire that focussed on what they had learned from the module, and what was not useful. The majority of learners in both schools were very enthusiastic about the content covered, especially about the development and functioning of breasts, menstruation, HIV/AIDS and STDs, and how contraceptives work. In the suburban school, learners also enjoyed learning about pregnancy and birth but many of them did not enjoy the sugar baby project.

In both schools, when learners were asked who should teach them about human reproduction at school, approximately two thirds of the learners wanted to be taught by their teacher (62% in the township school and 66% in the suburban school) since their teacher was always available to answer questions, they liked their teacher and they felt comfortable with them. Almost one third (28% in the township school and 34% in the suburban school) preferred a nurse, feeling that they 'knew everything' about reproduction and it was less embarrassing to talk to them. About 9% of learners in the township school had participated in a youth project and felt that a young person from the project should come and teach them about reproduction at school.

During the period in which this module on human reproduction was taught, I held informal discussions with my two case study teachers and interviewed them more formally at the end of teaching the module. The interviews were taped and transcribed.

The township teacher discussed how she encouraged her learners to generate a code of conduct and why it provided a safe space in which her learners could express their ideas. She felt that mixed groups were important so that her learners could find out about the experiences of the opposite sex. The suburban teacher started with separate sex groups and then mixed them because, like the township teacher, she felt that the children had large gaps in their understanding of the experiences of the opposite sex such as with wet dreams and erections vs menstruation. She found that by having boys and girls in each group, the discussions of the structure and functioning of male and female sex organs became open and normalised and a greater understanding of, and respect for, the opposite sex developed.

In both schools, learners found certain module activities difficult such as labelling the side view of the

male and female reproductive systems using the labels on the frontal view of these organs (a 3D switch), interpreting the menstrual cycle and trying to draw a flow chart of how sperm moves from the testis to the ovum to fertilise it. When the township teacher was asked whether difficult words such as the scientific names of structures (for example urethra and Fallopian tube) and processes (such as menstruation) should be replaced with everyday terms, she asserted it was important that learners understand and start to use these terms. She encountered a number of misconceptions from individual learners such as from the girl who was told that if she swam while menstruating, she would bleed to death, the boy who wondered if boys could fall pregnant, and the learners who thought that the Pill could prevent STDs and HIV/AIDS. This teacher described how involved and interested her learners were in all the activities. When asked what activities should be omitted from the module or added to it, both teachers maintained that the content of the module was appropriate for Grade 7 learners and the subject content and activities should not be changed although the suburban teacher did suggest that a menstrual calendar be added to help children grasp the nature of cycles.

The township teacher believed her role in teaching this topic was more than that of a teacher of Natural Sciences content and of a language teacher. It was the age of AIDS and she needed to provide them with some moral guidance and discuss the consequences of sexual activity especially because most parents would not talk to their children about these matters. In her opinion it was very important that children were informed so that they understood what was happening when someone tried to involve them sexually and they could try to avoid situations in which they were raped.

The suburban teacher took a more neutral position on some aspects of sexuality such as sex before marriage since she felt her learners came from a range of backgrounds such as strict Muslim homes where sex before marriage was not acceptable, to homes where parents were single or separated and living with partners. However she too focussed on the consequences of sexual activity and she felt that although some children found the sugar baby project very onerous, that it very effectively communicated the impact of having a baby on their lives. She looked too at the long term emotional impact of aborting a child or having it adopted. Her focus was on normalising discussions about the reproductive parts of their bodies, how boys dealt with erections and girls with menstruation, the action the learners could take to avoid STDs and pregnancy and the need to seek medical help if they did develop STDs. She did not believe that teaching this topic would necessarily reduce teenage pregnancies or abuse in the home, but she hoped learners could make more responsible decisions about sexual activity and would know how to seek help when needed. Like the township teacher, she felt that by exploring this topic of reproduction in depth, helping learners to understand their bodies and addressing misconceptions and responsible action, she was empowering them to deal with threatening situations before they encountered peer pressure in high schools. She too strongly endorsed the teaching of human reproduction in Grade 7, the year before entering high school.

The purpose of these two case studies was not only to inform me and others of the appropriateness and value of teaching human reproduction to Grade7s and later to inform the revision of the module but also to help me to formulate the direction my PhD research would take. They can thus be described as exploratory case studies (Stake, 2000; Yin, 2003a). While these case studies explored a

wide range of aspects of teaching human reproduction and focussed on both teachers and the learners and their response to the module, I decided (many years later!) that in my PhD study I should focus on the teacher.

4.3 Changes in the Natural Sciences curriculum and local responses

During 2000 a Ministerial Review Committee proposed that Curriculum 2005 should be revised (described in chapter 1 and 3). This revision took place over the next two years and in 2002 the Revised National Curriculum Statement (RNCS) was published for each Learning Area. After a few years, the GICD closed down. The modules that had been developed reached very few schools after their initial distribution.

The new Natural Sciences curriculum for General Education and Training was published as the Revised National Curriculum Statement Grades R-9 (Schools) Natural Sciences (Department of Education, 2002a). The topic 'human reproduction' appeared in two sub-strands[12] in the senior phase of the strand Life and Living. The new curriculum only indicated what content should be taught in each phase (foundation, intermediate and senior) but did not specify in which grade the content should be taught. Since human reproduction was placed first in the senior phase, textbook writers and teachers assumed that it should be covered in Grade 7. Most textbook writers placed human reproduction in their Grade 7 textbooks and a number of Grade 7 teachers taught human reproduction in 2006 when the new curriculum was first implemented at a Grade 7 level.

In Gauteng the schools fell within twelve different districts. In each district a subject advisor was appointed for each learning area. Their responsibility was to oversee and promote the effective teaching of that learning area in the schools in their district. During 2006 one Natural Sciences subject advisor expressed her concern over the teaching of human reproduction to Grade 7s in the Natural Sciences. She put forward a proposal to her colleagues that STIs be covered in Grade 8 and human reproduction be addressed only in Grade 9 where it would provide a better link to the human physiology taught in Life Sciences in Grades 10-12. Some of her colleagues agreed. However one of the Natural Sciences subject advisors did not agree with the suggested changes. At the end of 2006 this person called a meeting of all the Grade 7 Natural Sciences teachers in her district to discuss the proposal to move human reproduction to Grade 9. She wanted to provide a district response to the proposal. Over 100 Grade 7 Natural Sciences teachers attended the meeting. They were placed in 16 groups and discussed their experiences of teaching human reproduction and their views on whether human reproduction should be moved to Grade 9 or remain as part of the Grade 7 Natural Sciences curriculum. I attended this meeting as an observer. Each group recorded their views on paper and then gave verbal feedback to the meeting. They spoke of the need to teach human reproduction while girls and boys were going through puberty. This, for them, was a matter of relevance. By Grade 9 they felt learners would already be sexually active and possibly pregnant or infected with HIV. They felt that if the topic was not addressed by teachers early on, the learners would get incorrect information from

[12] Life processes and healthy living; Interactions in the environment

one another. A comment from one group was " Rather let children get correct facts in a scientific way then pick up smut on the playground" (group 13).

Almost all the teachers were very supportive of the teaching of human reproduction to Grade 7s in the Natural Sciences. One teacher however strongly objected to teaching this topic in her school. She felt that her learners were not mature enough or even thinking about this topic. Teaching human reproduction would put ideas in their heads. A few other teachers were also a little hesitant on teaching anything beyond very basic information about the body and sexual reproduction.

The subject advisor asked the teachers what their district should do regarding the new proposal. The teachers came to a decision that they would teach human reproduction and would do so in the 3rd term when the children were a bit more mature. When the groups were asked what should be taught, the commonest topics selected for Grade 7 were fertilisation (11 groups), puberty (10 groups), sexually transmitted infections (STIs) including HIV/AIDS & prevention (8 groups), male and female organs (5 groups), contraceptives (3 groups) and vertebrate reproduction (3 groups). The teachers agreed to meet again at the end of 2007 to report on their experiences. This information was fed back to the other Natural Sciences subject advisors.

4.4 Preparing for an intervention

At this point I started to prepare more formally for my research. In 2007 I discussed with the Natural Sciences subject advisor mentioned above, the possibility of running a workshop on teaching human reproduction for Grade 7 teachers in her district. She indicated her support for the workshop, and after obtaining permission from her district director for the workshop and subsequent research (see Appendix 7.1 and Chapter 5), we scheduled the workshop for a Saturday towards the end of the second term. I decided to first revise the module and conduct a situational analysis which would inform me about how to run the workshop.

4.4.1 Preparing for the workshop – revising the module

The first stage of my preparation for the workshop involved revising the module on human reproduction that I had used in 2000. I took into account the suggestions and advice of the two teachers in the exploratory case study, and ensured that the new learning outcomes and the new content framework (core knowledge and concepts) in the Revised National Curriculum Statement for the Natural Sciences (Department of Education, 2002a) were addressed. The module paid attention to 'conceptual coherence, sequence and progression', providing opportunities for learners to construct knowledge (learning outcome 2), conduct investigations (learning outcome 1) and link science and society, in particular learners' personal lives in society (learning outcome 3).

The revised module on human reproduction used learner-centred approaches and contained a number of activities which promoted the development of knowledge, skills, values and attitudes and thus the

achievement of the critical and developmental outcomes and the Natural Sciences learning outcomes. Appendix 3 contains the revised learners' and teachers' module.

The topics and tasks on human reproduction covered in this module over 3-4 weeks include:

1-3:	Our changing bodies (differences in boys and girls, physical and emotional changes in adolescence)
4-6:	The male sex organs and male responses: (interpreting pictures, playing card game, sharing ideas)
7:	Circumcision: (learning about different cultures)
8:	The female sex organs: (interpreting pictures)
9-10:	The menstrual cycle: (interpreting pictures and other data, writing letters)
11:	Meeting a partner: (sharing ideas)
12-14:	Sexual intercourse and responsibility: (drawing a flow diagram; sharing ideas on social responsibility; collecting information on contraceptives) and sugar baby project (caring for a 'baby')
Research project: Sexually transmitted diseases (STDs) (now more commonly referred to as sexually transmitted infections or STIs).	

While there was a focus on exploring concepts related to human reproduction at a level appropriate to Grade 7 e.g. structure of male and female sex organs and role of hormones in puberty (physical changes and menstruation), careful attention was also paid to the science and society perspective, particularly around issues of personal health and responsibility, and the beliefs of different cultures e.g. concerning menstruation, circumcision and STIs. Small research projects such as finding out about STIs were proposed in the module.

When the module was designed, a progression of content and concepts was planned in order to help learners build concepts relating to the structure and function of the human reproductive system. All content was linked to and reinforced by activities. Thus the module was activity-based, an expected feature of South Africa's form of outcomes-based education and of learner-centred approaches to education. As each activity (task) was designed, careful attention was paid to how the activity could help learners develop certain knowledge, skills, values and attitudes which would enable them to demonstrate some critical, developmental and Natural Sciences learning outcomes at a level appropriate for Grade 7 (see Teacher's Guide Appendix 3.2).

4.4.2 Situational analysis

The purpose of the situational analysis was to gather information on how to design the workshop. I developed a questionnaire containing both closed and open-ended questions concerning any previous experiences of teaching human reproduction that Grade 7 Natural Sciences teachers might have had (see Appendix 1). Teachers were asked whether they had taught human reproduction in 2006. If they

had done so, they were asked what topics they had covered when teaching human reproduction, the resources (textbooks and other materials) used, difficulties and successes experienced, approaches employed, and the extent to which teachers thought their teaching reflected RNCS approaches. In addition, I asked teachers what aspects of human reproduction had been taught in their school in Life Orientation and other learning areas, or had been addressed by visiting speakers or in media presentations. Finally teachers were asked to identify aspects of human reproduction they would like to find out more about at the workshop.

The questionnaire was first piloted with two Grade 7 Natural Sciences teachers. I then selected 14 teachers who planned to come to a workshop that I had advertised. These teachers came from 10 schools from a range of contexts (two suburban, three township and three city schools, one independent school and one LSEN[13] school). This was therefore a purposive sample (Denscombe, 2007) deliberately selected to inform me of the ideas, experiences and concerns of teachers from a variety of contexts.

The 14 teachers were phoned and asked if they would participate in the situational analysis. The purpose and content of the questionnaire (the research instrument used in the situational analysis) was explained to them. The principals of their schools were then contacted and permission was granted for the situational analysis. The questionnaires (Appendix 1) and accompanying letters of consent (Appendix 7.2 and 7.3) were delivered directly to the schools and collected a week later. Two teachers in one township school did not complete the questionnaire so that my sample eventually consisted of 12 teachers from nine schools.

Previous experience of teaching human reproduction:
Less than half the teachers said they had taught human reproduction in Natural Sciences in 2006 (n=5), but a further four teachers said they had taught physical changes in the body in Life Orientation. Thus at least some of the teachers had taught some aspects of human reproduction previously whether in Natural Sciences or Life Orientation. This indicated that at the workshop there would be a mix of teachers with some having experience of teaching human reproduction and others not having taught it before. The workshop would need to cater for both and provide opportunities for teachers to share their experiences.

Topics covered:
The topics these teachers had taught were mostly physical (n=9) and emotional (n=7) changes during puberty, use of contraceptives (n=7), the menstrual cycle (n=6), fertilisation and development of the baby (n=5). This gave us some idea of the content knowledge these teachers might have as a result of teaching the topic. Thus we could assume some content knowledge from at least half the teachers at the workshop. When teachers were asked what they found difficult when teaching human reproduction, they identified a number of problems.

The problems tended to relate to teachers' own sense of comfort or rather lack of it when talking to the

[13] LSEN – Learners with Special Educational Needs

learners about the reproductive organs and their functions. Individual teachers wrote about their sense of awkwardness over using terms like sexual intercourse; talking about structure and function of both male and female parts with learners and particularly as a female teacher having to speak about physical changes in males and the functions of the different male parts. One teacher said he found it difficult to answer some of the questions that learners asked. Another teacher said she could explain sexual intercourse in animals but it was not easy to use humans as examples.

Two teachers identified barriers that learners felt towards them as teachers and between one another. One of the teachers said that some of the learners did not feel comfortable when talking about sex with the teacher. Another teacher spoke about the barrier created by gender:

> When boys and girls are under one and the same roof, they are not free to express themselves.

Thus the workshop needed to address concerns about talking comfortably about the sexual organs, how much should be said, how one should handle questions from learners, and how one should encourage learners to talk with one another respectfully. This was addressed in the workshop by a visiting speaker from FAMSA[14]. I emailed the concerns expressed by the teachers to her and she addressed these in her talk.

Two additional points were made by teachers. A White teacher expressed the need to be culturally sensitive to the beliefs of her Black learners. Her learners had asked her why their elders believed certain things, and if they were true or not. She spoke about how she learnt to avoid offense and expressed a wish to include more on cultural beliefs in class. Another teacher said that it was difficult to find information on initiation schools in different cultures since the secret rituals associated with circumcision could not be revealed. She mentioned that some 'religions' also prohibited the use of the names of the sexual parts. Thus the issue of how we addressed cultural issues needed to be included in the workshop programme.

Approaches employed:
Five teachers said that they used discussion when teaching this topic. All other approaches e.g. brainstorming, writing paragraphs, groupwork, completing worksheets, investigations and projects were used in each case by only one teacher. This indicated that during the workshop teachers needed to be given ideas on a variety of different approaches that could be used when teaching this topic.

Resources used:
Teachers' resources were mainly textbooks (n=8), charts and posters (n=6), worksheets (n=4) and videos (n=4). Further ideas for resources would be given to teachers at the workshops.

Activities that were successful:
Teachers identified successful activities in their classes such as videos followed by discussions (n=1); learners talking about the physical and mental changes they had experienced in their own body or

[14] Family and Marriage Society of South Africa (FAMSA): A national organisation aimed at combating family disintegration. It provides counselling and education programmes to the public and schools.

seen amongst learners at school (n=3); finding out about initiation in different cultures (n=1) and doing the sugar baby project (n=1). Teachers would be given the opportunity during the workshop to share their successes in teaching human reproduction.

RNCS approaches:
Teachers were asked in what way the approaches, methods or activities they used were outcomes-based, learner-centred and activity-based. I wanted to find out to what extent they understood the meaning of this terminology, and thus if these ideas needed to be covered at the workshop. I had explanations from only three teachers on how they thought their teaching was *outcomes-based*. One teacher simply said her teaching addressed assessment standards thus she was relying on the jargon of the RNCS without being able to explain further. Two teachers felt that outcomes were achieved because their learners had gained understanding of concepts; understood how their bodies function the way they do, and had developed skills, attitudes and values (how to control their feelings/ take responsibility for their bodies). This indicates some understanding amongst these two teachers on the meaning of outcomes-based teaching and learning.

Five teachers gave explanations of how their lessons were *learner-centred*. Their understanding chiefly centred around what learners did in the classroom, for example working as a team to investigate something (n=1), presenting their views in discussions (n=2), finding out about body changes (n=1) reporting back (n=1), and practicing being parents and taking care of babies (compromises and responsibilities) (n=1). Their view of learner-centred approaches seemed to focus on what learners were doing and how they collected information and built their own understanding of concepts. This represents one aspect of learner-centred approaches but teachers' answers indicated a fairly limited view of what learner-centred approaches involve.

Topics for the workshop:
Teachers proposed a number of topics that they would like to find out more about at the workshop. One teacher raised a teaching and learning issue, and wanted to know how to make lessons more learner-centred and asked for ideas for more learner activities. Two teachers referred to cultural and religious matters, that is, how to incorporate cultural beliefs into lessons without offending learners, taking into account that children were from different backgrounds, religious standpoints and understandings. One teacher wanted to know about tackling the sex issue especially with shy children who do not feel comfortable talking about sex with an adult. In one school, parents had refused to let their children attend a FAMSA workshop, and they wanted to know how to handle parents who felt that their children were too young or too innocent to learn about human reproduction. Then there were requests by three teachers that human reproduction concepts be discussed as well as how to deal with misconceptions.

The situational analysis acted as a baseline study for the intervention, i.e. the workshop, providing important information which was used in planning the workshop.

4.5 An intervention: the workshop

The workshop was held at the end of May before teachers entered their mid-year exam period.

4.5.1 Inviting teachers to the workshop

The workshop was advertised, with the help of the Natural Sciences subject advisor, by mailing invitations to the Grade 7 Natural Sciences educators using the district mailing system. The invitation (Appendix 2) indicated that, during the workshop, content knowledge with respect to human reproduction would be examined; outcomes-based, constructivist, learner-centred and activity-based approaches explored; and appropriate approaches to addressing issues around human sexuality in very diverse classrooms considered. The invitations were sent to 84 primary schools in this district, most of which were public schools, but three were independent schools and five were LSEN schools.

The workshop was advertised as a curriculum thrust activity of the Marang Maths and Science Education Centre at the University of the Witwatersrand, and was funded by this curriculum thrust. Teachers were asked to fax their intention to attend the workshop to one of the Marang administrators. The administrator compiled a list of the contact details of these teachers and the schools they were from.

4.5.2 The workshop

Fifty four teachers and one principal from 31 schools attended the workshop. The teachers were mostly Grade 7 Natural Sciences teachers, but some were Grade 5 and 6 Natural Sciences teachers and some were Life Orientation teachers. Almost all the teachers were from the public schools, but one independent school and two LSEN schools sent their Natural Sciences teachers.

At the start of the workshop, I provided a rationale for teaching human reproduction to Grade 7s. Statistics and research findings on sexual activity amongst teenagers, sexual abuse of children, HIV/AIDs amongst young people, teenage pregnancy and South African teenagers' understanding of matters related to human reproduction and their bodies, were used to support this rationale. In addition, I reviewed ideas on the meanings of 'outcomes-based' and 'learner-centred' teaching and learning.

An 'expert' on sexuality education from the Family Life Centre provided the teachers with ideas on how to teach this very sensitive topic i.e. getting permission from parents, demonstrating appropriate attitudes to learners (e.g. respect), building a code of ethics in the classroom, and drawing boundaries on personal questions from learners. The situational analysis had shown that teachers wanted to know about how open they should be, how they could overcome their own shyness and embarrassment on this topic, what questions they should allow learners to ask about their personal sex life, how they could deal with boys' provocative language, and at what level they should pitch their discussion especially when it came to talking about sexual intercourse. In addition, teachers wanted to know how

to handle opposition from parents and how to deal with a wide range of personal, cultural and religious beliefs. These issues were addressed in this talk.

I then introduced teachers to the teaching and learning support materials on reproduction that I had developed, piloted and revised. Teachers carried out some of the activities in groups e.g. the card game, group discussion on circumcision, and role-play of a fictional Dr Naidoo responding to children's letters expressing their concerns about menstruation. I used a PowerPoint presentation to illustrate and provide a rationale for the activities. Teachers were asked to discuss how useful and feasible these activities might be in the classroom. They were also asked to share their ideas for teaching this topic and indicate how successful these approaches or activities had been in their classrooms.

By using and then critically reviewing activities in the learning and teaching support materials, rejecting some activities and adding new ideas, these teachers hopefully developed further their understanding of what it means to use outcomes-based and learner-centred approaches when teaching human reproduction.

At the end of the workshop, teachers were invited to participate in my research by completing a survey (not compulsory). The survey (a written questionnaire) forms part of the main body of my research and most of the results will be reported on in the next chapters. The survey also asked teachers to indicate whether they would be prepared to participate in case studies involving observation and interviews or would be prepared to be interviewed only. I will discuss this further in the next chapter.

4.5.3 Feedback on the workshop and learning materials

Only the 40 Grade 7 Natural Sciences teachers' survey questionnaires were analysed, for reasons discussed in the next chapter. In the first part of the survey, teachers were invited to give feedback on the workshop. Several responded that they enjoyed the contribution from the FAMSA representative. Others spoke of the value of learning about one another's cultures and viewpoints. When asked which of the activities they would be able to implement, their responses varied for each activity (see Table 4). The two activities most frequently mentioned by teachers as being useful were the card game (93%) and letter writing (95%). In the first activity (card game), learners in groups had to take turns to answer typical questions from adolescent boys about their changing bodies. In the letter writing, learners had to respond as an imaginary doctor to letters concerning problems with menstruation.

Table 4: Survey teachers' views about the workshop activities

Question item	Response (N=40)			
Q. 1 Response to workshop activities Which of the following teaching and learning activities:	did you find useful? (Q1.1)	would you be able to implement? (Q 1.2)	would you like to implement but would not be able to? (Q1.3)	would you choose not to implement? (Q1.4)
physical changes: diagrams of males & females (puberty & adult)	27 68%	28 70%	2 5%	1 3%
physical changes in males: card game	37 93%	31 78%	0	0
role-play on emotional changes	28 70%	26 65%	0	1 3%
circumcision discussion	26 65%	23 58%	6 15%	5 13%
menstruation diagrams of process	22 55%	25 63%	5 13%	3 8%
menstruation letters (Dr Naidoo)	38 95%	31 78%	0	2 5%
sexual intercourse & responsibility - discussion	30 75%	23 58%	11 28%	4 10%

The learners' responses required some knowledge but there were no 'embarrassing' pictures. The activities, requiring that learners analyse pictures of changes in the body shape of a boy and girl to their adult shapes and changes in the internal reproductive organs when a woman undergoes menstruation, were less popular. 68% of teachers found the puberty-to-adult pictures useful, whilst only 55% found the menstruation pictures useful. Some of the teachers found the pictures possibly too revealing (see Appendix 3.1). Pictures of naked bodies showing external sexual organs and pictures of internal sexual organs were described by three teachers as sensitive material (T1), bordering on pornography (T4) and causing the teacher to feel uncomfortable (T43). Pictures showing naked bodies and naming the parts seems to make some people uncomfortable. One teacher in the situational analysis had said that it was taboo in some religions to name the sexual parts. A number of researchers (Helleve, et al., 2009; Malambo, 2002; Mbananga, 2004) also report on these taboos and they will be discussed in later chapters. There seems to be a personal or religious/cultural influence on what teachers feel they are prepared to show learners.

Teachers were asked whether they would be able to implement the workshop activities. Only 58% of teachers felt they could use the activities on circumcision, and 58% likewise felt they could talk about sexual intercourse (a very brief explanation in the worksheets). So it seems that almost half the teachers found these topics too sensitive. Some said they would like to implement certain activities but could not, that is the discussion on circumcision (15%) and on sexual intercourse (28%). Six teachers gave religion and culture as reasons for not discussing circumcision and/or sexual intercourse. Other teachers said they would choose not to use the discussion activities on circumcision (n=5) and meeting a partner/sexual intercourse (n=4). A few teachers spoke of the secrecy associated

with circumcision in some cultures. Menstruation was another topic where three male teachers indicated their discomfort with teaching this topic to girls. There were some concerns that parents might object to the content.

The remainder of the survey responses relates to the research questions and will be discussed in the results chapters.

4.5.4 Distribution of materials

The learning and teaching support materials were revised in response to suggestions from teachers. The revised package (Appendix 3.1- 3.3) was then distributed to the schools that requested it at the beginning of the 3rd term. Teachers were advised to select from and adapt these materials for their particular group of learners.

4.6 Disruptions to schooling

Teachers in the Gauteng district in which I was conducting research began to teach human reproduction at some stage in the 3rd term. A month-long strike by teachers in the 2nd term in Gauteng schools over an increased wage demand resulted in school learning programmes being disrupted. Some schools started the 3rd term with the postponed June exams, whilst others first completed topics they had been teaching at the time of the strike. During the 3rd term I began the next phase of my research involving observations and interviews in selected schools.

4.7 Concluding remarks

My research took place within the context of a changing curriculum. My initial ideas were formulated during the exploratory case studies at a time when Natural Sciences teachers were allowed to select any content that helped them to achieve the outcomes. Districts then started to tighten up on content and waited for the publication of the RNCS. Content was proposed in the RNCS but not specified initially for grades, and so the Natural Sciences subject advisors began to put forward proposals which were not supported by all their colleagues concerning what content should be covered in different grades. An initiative to push forward with the teaching of human reproduction in Grade 7 in one district provided me with an opening to continue with my research on the teaching of this topic. I revised the original module and conducted a situational analysis to attempt to assess the current situation in the district in which I would be working. This was followed by a workshop for teachers in that district. The survey at the end of the workshop and the subsequent case studies (and interviews only) are the topic of the Chapter 5s. In Chapter 5, I establish my philosophical position and then explore the methods by which I collected data in order to answer my research questions.

Chapter 5

RESEARCH METHODS

In this chapter I describe the research methodology that I used as I set out to find the answers to my research questions, that is the extent to which Grade 7 teachers used outcomes-based and learner-centred approaches when teaching human reproduction, the factors that might affect their use of these approaches and the influence of their beliefs on the action they would take. I start by describing my ontological and epistemological position and how this influences the methodologies used. Within my descriptions of each methodology, I will explain why, how and when these methodologies are used, the design, piloting and use of research instruments for each methodology, and will attempt to justify the sampling procedures used. This is followed by a discussion of how I addressed issues of ethics and rigour in my research.

The sequence of events before and during my research is illustrated in Figure 5.1.

5.1 Personal philosophy and research paradigms

In this section I will attempt to establish my philosophical assumptions and thus the methodology I employed and the research instruments I used.

Social scientists have looked at the philosophical foundations of different types of research and have attempted to identify and classify what different authors refer to as the theoretical underpinnings (Bogdan & Biklen, 2007), paradigms (Denzin & Lincoln, 2011; Merriam, 2009) or worldviews (Cresswell, 2012) within which researchers work and from which their methodology emerges. I will use the term 'paradigms' here when describing the philosophical assumptions within which researchers are working. There are a wide range of terms used for these paradigms. Paradigms which use largely quantitative approaches are usually referred to as positivist (or normative) and postpositivist (Cohen, Manion, & Morrison, 2007; Henning, 2004; Lincoln, Lyndham, & Guba, 2011; Merriam, 2009). Paradigms that use mostly qualitative approaches are referred to by some social scientists as antipositivist/naturalistic/interpretive (Cohen, et al., 2007) and by others in several categories such as interpretivist/constructivist and critical/feminist as well as participatory or postmodernist/ poststructuralist (Hatch, 2002; Henning, 2004; McMillan & Schumacher, 2010; Merriam, 2009). Merriam points out that some categories are considered as interchangeable, such as interpretivist and constructivist, and that there is no clear agreement on which terminology to use.

Some of the ontological and epistemological perspectives held by proponents of these paradigms are as follows. A positivist position assumes that reality exists out there and that it is observable, stable and measurable. The postpositivist position recognises that knowledge is relative, but that the

researcher collects data that can best describe reality. Interpretivist research assumes that reality is socially constructed and that there are multiple realities or multiple interpretations of a single event. In this paradigm, researchers are seen as constructing subjective meanings of their experiences through describing, understanding and interpreting. The purpose, in critical research, is to examine multiple realities that are situated in political, social and cultural contexts in order to challenge, change and empower. The postmodernist/poststructuralist questions reality and sets out to deconstruct, problematise and question.

My ontological position shifts between a postpositivist and an interpretivist position. In other words, I agree with postpositivists that a reality exists, an inherent order in the universe, but that reality can never be fully known due to human limitations (Hatch, 2002). Postpositivists, according to Lincoln, Lyndham and Guba (2011), Hatch (2002) and others, are critical realists who examine truth claims very carefully in an attempt to move closer to that reality. In my research I am not attempting to find a 'reality' and so am perhaps closer to the interpretivist position. The ontological position of the interpretivist/constructivist is that "universal, absolute realities are unknowable" (Hatch, 2002, p. 15), and instead there are multiple realities constructed by individuals who experience the world from their own unique positions (Hatch, 2002; Lincoln, et al., 2011). The enormous complexity of factors influencing a person's view of the world results in their own unique view of and experience of reality. Thus when I look at a group of teachers, I need to explore the unique reality that each individual constructs.

My epistemological position is thus that people do construct their own understandings of truth or knowledge, and it is personal, subjective and unique. However truth or knowledge is also what people agree it is, and so people come to common understandings of what that 'truth' or 'knowledge' is.

My research starts within the postpositivist paradigm for the purpose of collecting initial data that will guide the rest of the research. I use a mixed methods approach in which I collect both quantitative and qualitative data using a small-scale survey. The purpose of the survey is to identify teachers' perceptions of the conditions in which they work and their beliefs about how these conditions will contribute to or hinder the teaching of human reproduction when they teach this topic in the next term.

My research then moves into the interpretivist paradigm as I attempt to probe further and understand the situation more deeply using qualitative approaches such as observation and interviews. I am particularly interested in the influence of external and internal factors and beliefs about these factors on the extent to which teachers use outcomes-based and learner-centred approaches when teaching reproduction. My research is situated most deeply within the interpretivist paradigm since this is most closely linked to my ontological and epistemological position, and my analysis is guided by my own interpretations and positionality.

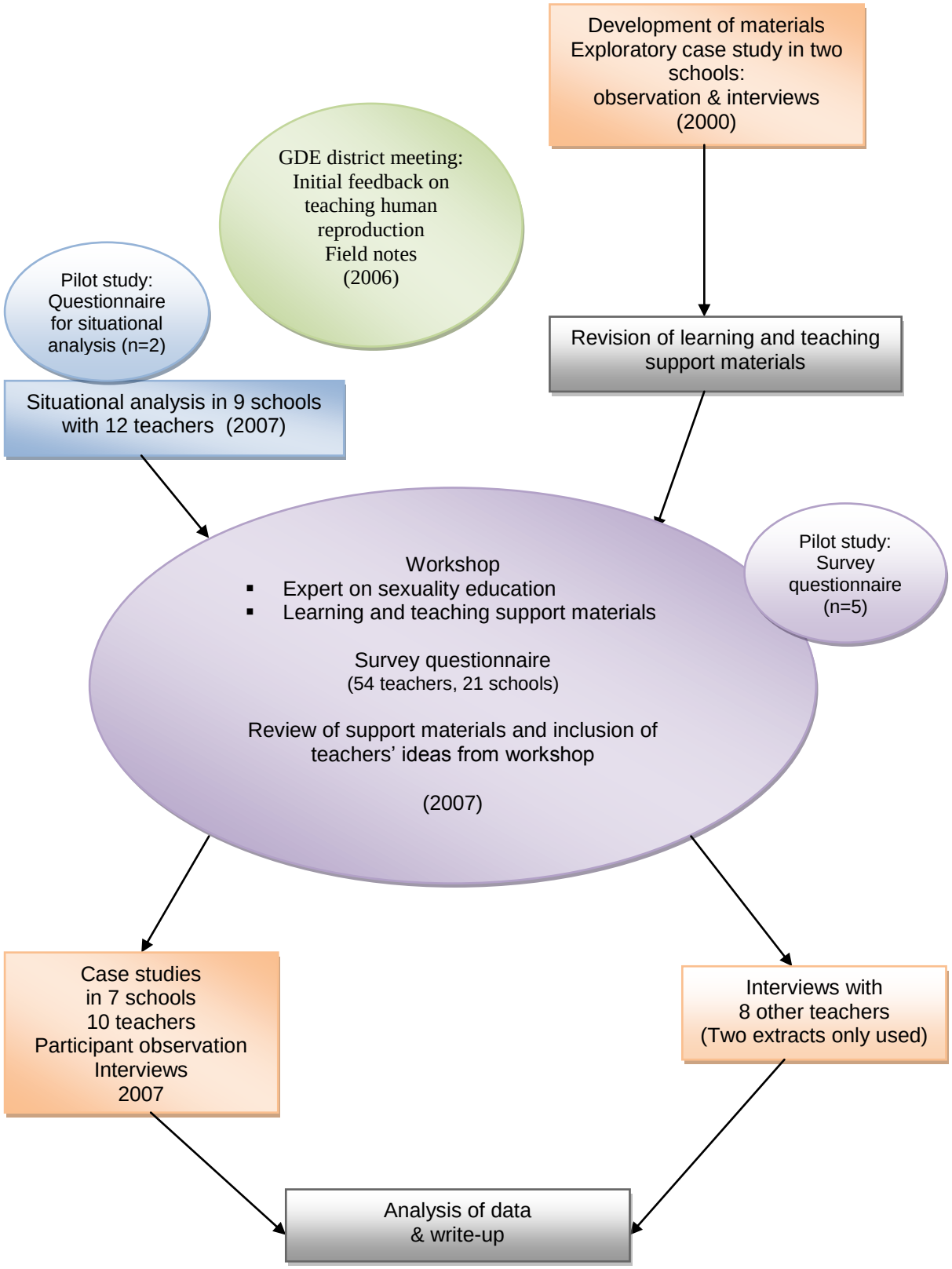


Figure 5.1: Research design

5.2 Research methodology - the mixed methods approach

The research methodology, that is the overall strategy that I selected for this research, is a mixed methods approach (Cresswell, 2012; Greene, 2001; Johnson & Onwuegbuzie, 2004). This, according to Johnson and Onwuegbuzie is a pragmatic approach which allows researchers to select quantitative and/or qualitative research methods on the basis of their ability to generate data that can provide answers to the research questions. Qualitative and quantitative data should, according to Cresswell, be integrated. Cresswell points out that the method is used typically, but not always, when one wants to follow up a quantitative study with a qualitative study to obtain more detailed and specific information or provide an alternative perspective. I used a survey (typical of postpositivist research) to provide me with an overview of teaching Natural Sciences in primary schools in one Gauteng district and then case studies (more typical of interpretivist research) in order to obtain a more detailed picture of the situation.

The survey approach allowed me, as Hatch suggests, to start investigating people's 'lived experiences' and I could begin to search for patterns in the data (Hatch, 2002). The questionnaire used in the survey provided me with data that gave me an entrance into the teachers' world before they started teaching human reproduction in 2007. However my methodology changed to case studies as the focus of my research turned to a smaller group of teachers who started teaching human reproduction. The methods I then used were participant observation and semi-structured interviews. The principal data for analysis were obtained from my field notes on my observations, transcriptions of the audio-recordings of lessons to support the field notes, and from interviews which captured teachers' perspectives.

Qualitative methods such as interviews and observations were intended to help me to "reconstruct the constructions participants use to make sense of their worlds" (Hatch, 2002, p. 15). These methods, used in interpretive research, produce 'thick descriptions', a term introduced by Geertz (1973). These thick descriptions are about the situation being studied, revealing the many interpretations given by different participants and the complexity of the situation. The data includes the intentions, beliefs and values of the participants (Cohen, et al., 2007; Guba & Lincoln, 1983; Henning, 2004). These are of interest in answering some of my research questions.

In my research I recognise that, as several authors have suggested, the inter-subjective reality that is being built is in fact a co-construction between researcher and participant as researcher and researched influence one another (Cohen, et al., 2007; Hatch, 2002). My research takes into account the 'theory-ladenness of facts', in other words what I noticed and observed will be affected by my background, knowledge and experiences; and the 'value-ladenness of inquiry' that is the influence of my values on what I chose to investigate and on what I saw, and how I interpreted what I saw (Johnson & Onwuegbuzie, 2004). In my analysis I thus recognise that the teachers and I will co-construct a particular reality about the factors that influence their approaches to teaching human reproduction.

Greene (2001) says the value of using multiple methods has long been recognised in interpretivist-qualitative and post-positivist-quantitative traditions. Greene claims that a mixed method approach "intentionally incorporates the lenses of more than one inquiry framework" (p. 251), through collecting different kinds of information, using different kinds of methods, and maintaining different philosophical assumptions about social phenomena and our ability to know them. The purpose for doing so is to understand the situation more fully, and to generate deeper and broader insights that include a wider range of interests and perspectives. Cresswell (2012), Gorard and Taylor (2004), Johnson and Onwuegbuzie (2004) and others argue that this approach allows for improved accuracy through triangulation since the researcher can check the findings from one method against findings from a different method. This increases the validity of constructs. In addition, they propose that this approach can be an aid to sampling, as it was in my research, since information from one method can be used to select a sample of people who will participate in the research through a different and contrasting method.

5.2.1 Survey

In the first stage of my research my intention was to obtain a broad picture of teachers' views and beliefs about themselves and their situations before they started to teach human reproduction. While the 'picture' would be superficial, it would give me a sense of the different issues that I would like to explore during the case studies. To obtain this broad picture, I conducted a survey.

Surveys are used in research to gather data from a group of people (the sample) at a particular point in time in order to describe existing conditions or characteristics (e.g. opinions, attitudes, beliefs, knowledge and experiences) of a population to which the group belongs (Cohen, et al., 2007; Fraenkel & Wallen, 1990). I used a small-scale survey to collect data from Grade 7 Natural Sciences teachers in one Gauteng school district concerning their perceptions of the factors that might impact on their teaching of human reproduction (research question 2), and their preferences in terms of teaching approaches (research question 1). Some of the teachers had taught human reproduction to Grade 7 Natural Sciences classes for the first time in 2006 when the RNCS was introduced, and some had taught human reproduction to Grade 9s in high school or had taught sexuality education in Life Orientation. For the majority of teachers, this was their first attempt to teach human reproduction. I was interested in what their control beliefs were about how various external and internal factors might hinder or contribute to the required 'behaviour', i.e. the teaching of human reproduction through outcomes-based and learner-centred approaches (research question 4). The instrument I used to collect the data during the survey was a questionnaire.

5.2.1.1 Questionnaires

I used two questionnaires in my research, the first one being used for my situational analysis (see Chapter 4 and Appendix 1) and the second questionnaire for the survey at the end of the workshop (see Appendix 4.1). Both questionnaires were semi-structured, consisting of some closed and mostly open-ended questions. Several types of closed questions, that is dichotomous, category and list

(Cohen, et al., 2007; Opie, 2004), were used to collect nominal data e.g. qualifications and length of time teaching Natural Sciences. The majority of questions were however open-ended. I simply provided the question, and the respondents answered in the way they chose to. Open-ended questions are useful in small scale research because, as Cohen and colleagues point out, they allow for greater richness and depth of response, a feature of qualitative research. Respondents can give their own explanations and can elaborate on their responses, thus avoiding the limitations of pre-set categories of response. I started with closed questions that were easy to answer concerning nominal data as advised by Cohen and colleagues, and moved to more open-ended questions concerning opinions, attitudes, perceptions and views, ending with more personal data.

In the design of the questions, I attempted to follow the advice provided by Denscombe (2007), McMillan and Schumacher (2010) and others. I therefore attempted to ensure that questions were clear and unambiguous, the style was suited to the teachers, and questions were relevant and not offensive so respondents would be willing to answer. Most of the open-ended questions were fairly short and space was allowed for the respondent's answers. In my attempt however to avoid leading questions, a few questions became long and complicated especially for teachers for whom English is an additional language (for example question 2.4.3 of the survey questionnaire). The outcome was different interpretations of these questions, as will be discussed in the results chapters.

There are certain limitations associated with using open-ended questionnaires. Open-ended questions do take longer to complete and, as Denscombe as well as Cohen and colleagues point out, respondents may be less willing to respond or they may find it difficult to express their ideas on paper. This was evident where some respondents simply did not answer some of the questions. The lack of response may have been due to personal or cultural constraints or the difficulty of responding in an additional language. This will be discussed further in the analysis of the results. A further limitation, as Opie points out, is that although open-ended questions allow for a wide range of responses, one cannot probe further to pursue interesting answers. In addition, one has to take into account possible self-report bias by the respondent; the respondent may wish to present themselves in what they consider to be a favourable light (Cohen, et al., 2007).

The design of the questionnaire is based on my theoretical framework for this study (Figure 3.3 in chapter 3) and provides data on teachers' control beliefs about external and internal factors that might influence their teaching of human reproduction in outcomes-based and learner-centred ways, and their preference for particular teaching and learning approaches. The questionnaire therefore provides some initial data concerning research questions 1 to 3. The questions in the questionnaire, the rationale for these questions and the research questions they are linked to have been summarised in Table 5.1.

My supervisor reviewed the questionnaire for content validity; that is he assessed whether the questions in the questionnaire fairly and comprehensively covered all the items that it intended to cover (Cohen, et al., 2007). He therefore examined whether the factors forming part of the theoretical framework for this study (which were listed on his copy of the questionnaire) were addressed in the questions making up the questionnaire, and whether beliefs about the influence of these factors in the

Table 5.1: Questions in the survey questionnaire and rationale for these questions

Survey question	Research questions addressed	Rationale for question – theoretical framework
1. Workshop activities		
1.1 Identifying useful teaching and learning activities that were discussed or demonstrated at the workshop. 1.2 Activities they would be able to implement?	none	To decide on whether to omit any activities in the revised module. Helps to initially identify teachers' beliefs about factors that might affect their use of different activities. Allows teachers to identify internal (e.g. personal) and external (e.g. learner's culture, parents) factors that might influence their choices of what aspects of the module and thus the topic human reproduction they would use.
1.3 Activities they would like to implement but would not be able to for reasons beyond their control? 1.4 Activities they would choose <u>not</u> to implement?	2 & 3	
2. School factors (school and district support; physical resources and the learning environment)		
2.1 Number of learners in class – influence of class size 2.2 Teaching and learning materials available and effect on their teaching of human reproduction. 2.3 Physical conditions – a help or hindrance? 2.4.1 District support and influence on teaching and learning 2.4.2 Principal's support and influence on teaching and learning 2.4.3 School organisation and influence on teaching and learning activities 2.4.4 School colleagues in other learning areas and support for teaching and learning activities 2.4.5 Natural Sciences colleagues and support for teaching and learning activities 2.4.6 Life Sciences colleagues from other schools meeting together and support	2 & 3	Helps to identify teachers' control beliefs about whether there are resources for and obstacles to the teaching and learning of human reproduction. 2.1-2.3 Physical resources and the learning environment: provides data on the availability of physical resources, and the physical aspects of the classroom environment. 2.3-2.4 Support structures: provides data on whether the teacher feels there is support from different role-players in the district and school and how this might impact on the implementation of new teaching and learning activities.
3. Other influences – support or opposition? (Learner factors – parents and other influential people)		
3.1 Parents 3.2 Religious leaders 3.3 Others not mentioned above	2 & 3	Helps to identify teachers' control beliefs about whether there are external factors from the learner's home environment that either provide support for or obstacles to the teaching and learning of human reproduction.
4. Learners - impact on implementation of topic 'human reproduction'		
4.1 Learner's prior knowledge 4.2 Religious beliefs and traditions 4.3 Cultural beliefs and traditions 4.4 Language – English as first (home) or second language, use of other languages	2 & 3	Helps to identify teachers' control beliefs about learner factors that might impact on the teaching and learning of human reproduction.
5. Internal (professional and personal) factors and effective teaching approaches		
5.1 Professional/academic qualification 5.2 Specialisation 5.3 Teaching experience – years of teaching 5.4 Years of teaching Natural Sciences 5.5 Grades taught previously in Natural Sciences	2	Teacher factors: Allows me to identify professional teacher factors that might influence the teaching and learning of human reproduction.
5.6 Most effective approaches to teaching and learning of Life and Living with their learners 5.7 Preference for new or previously proven methods	1	Approaches to teaching and learning: Provides data on teachers' beliefs on what are effective teaching approaches in their classroom and their preferred choice of approaches, and so may provide some information on whether they are likely to adopt outcomes-based and learner-centred approaches.
5.8 Religion and influence of religious beliefs 5.9 Cultural beliefs and impact on teaching 5.10 Confidence about teaching human reproduction	2 - 4	Personal teacher factors: Provides data on the possible influence of cultural and religious beliefs on the teaching of human reproduction and on the teacher's personal sense of self-efficacy that is on their ability to teach human reproduction.

teaching of human reproduction could be identified. This addressed research questions 2 and 4. The first and third research questions were not addressed beyond simply asking general questions about the teachers' preferred approaches since most teachers had not yet taught human reproduction in the new curriculum. In addition, in the pilot study for the situational analysis, one teacher advised me not to include specific questions about whether teachers were using outcomes-based and learner-centred approaches since outcomes-based education was not yet fully understood. As a result, he felt that teachers would either avoid the question or answer untruthfully. I kept the question in the situational analysis and half the respondents did not answer it. A more indirect question about preferred teaching approaches was thus used in order to see if teachers had begun to teach in outcomes-based and learner-centred ways in the Life and Living component of the Natural Sciences.

Face validation of the survey questionnaire by my supervisor also included checking whether there were other factors (such as poorly worded instructions, ambiguous questions or difficult language which may not be understood) which could affect the results. He provided substantial suggestions about the design of the questionnaire (e.g. listing of items and providing boxes that could be ticked for nominal data); the inclusion of a missing item that is about the prior knowledge of learners; the rewording of some questions for greater clarity, and to avoid a leading question and a double-barrelled question; more space for answering some questions, and a revised ordering of a few questions. The questionnaire was revised taking into account these suggestions. It was then reviewed in a pilot study.

5.2.1.2 Piloting the questionnaires

Two Grade 7 and three Grade 9 Natural Sciences teachers who had completed an Honours course with me agreed to pilot the questionnaires for both the situational analysis and for the survey. I selected these teachers because I knew them and they were becoming familiar with educational research and the value of giving critical feedback on research instruments. The Grade 9 teachers were considered appropriate for the pilot study, even though they were teaching in the high school, since they had taught human reproduction to Grade 9 learners for many years and would be familiar with issues around teaching human reproduction. All the pilot teachers spoke English as an additional language and taught in schools where English was not the home language of learners. They would therefore be more aware of language that learners would find difficult to understand in the questionnaire. The pilot teachers were asked to complete each questionnaire and comment on the clarity of the instructions and questions, as well as the layout. In addition, they were asked to identify any questions that would be too sensitive, offensive or intrusive, as suggested by Opie (2004).

Reviewing the completed questionnaires allowed me to identify any questions where teachers might be unsure of what was required. The wording of all questions appeared to be clear with one exception, the revised question 2.4.3. In revising this question after the science education expert had requested a change, I unintentionally created a double-barrelled question that was difficult for two pilot teachers to interpret. I did not however notice that their answers were inappropriate. As a result, this question remained problematic as will be seen in the results chapter. The second part of question 2.4.2 was also a double-barrelled question which should have been split into two parts. The pilot teachers did not

find this question difficult to interpret. Some pilot teachers however pointed out a few words that would be difficult for learners to understand and proposed alternative words that would be clearer for their learners. I incorporated these changes. One pilot teacher also suggested the inclusion of alternatives in a few questions in both the situational analysis and survey questionnaires. Options were added to question 2.4.1 of the survey questionnaire to guide teachers as to the type of response required. These options were included in brackets. The pilot teachers were able to assure me that questions were not offensive or intrusive and this was evident by their comprehensive answers to each question. The pilot study provided some indication of whether the response categories in closed questions were appropriate, whether the amount of space teachers needed for their responses in open questions was sufficient, and whether the questionnaire was too long (Cohen, et al., 2007; McMillan & Schumacher, 2010). The response categories were considered appropriate, the amount of space for certain questions needed to be increased, and the questionnaire was not considered too long. One pilot teacher's comment at the end of the survey questionnaire was "Generally a very comprehensive and easy to respond to questionnaire". The questionnaire was revised, taking into account the pilot study teachers' comments, and prepared for use in the main study.

5.2.1.3 The sample

The revised survey questionnaire was handed out to participants attending my workshop. Fifty-four Grade 7 teachers and one principal from 31 schools in one Gauteng school district attended the workshop. The schools in the selected district were mostly urban schools with teachers and learners from a variety of cultures, religions and socio-economic backgrounds. Convenience sampling was used, that is data was collected from all the teachers who attended the workshop and chose to participate in the research. This was probably a biased sample in that these teachers chose to attend the workshop and therefore had some interest in finding out how to teach human reproduction from the workshop convenors and from colleagues. They also chose to remain at the end of the workshop and complete the questionnaire. There was however no way of knowing if the teachers who completed the questionnaire were in any way, other than attendance at the workshop, representative of or different to those who did not attend. Many teachers were confident of their ability to teach this topic, as seen in the survey by the GDE in November 2006, and therefore probably did not feel the need to attend the workshop. Some teachers indicated that they would like to have come but had prior commitments.

5.2.1.4 Collecting the data

At the end of the workshop, teachers were asked to complete the questionnaire. The purpose of the questionnaire was explained to the teachers. They were also told that they had a choice on whether or not to complete the questionnaire. Some teachers had left the workshop at lunchtime and a few chose not to complete the questionnaire. All the teachers completing the questionnaire read a statement on the research and signed the informed consent form (see Appendices 7.4 and 7.5). They then completed the questionnaire, identifying their questionnaire by only the number allocated to them at the beginning of the workshop. The number allowed me to identify the teachers so that I could select teachers and schools for the next stage of the research and ensure that all the data I used from the questionnaire had informed consent. For the purposes of analysing the data, I removed the

questionnaires completed by the Principal, the Life Orientation teachers and Natural Sciences teachers not currently teaching Grade 7 Natural Sciences. These questionnaires were not used since the sample for my research was teachers who were teaching Grade 7 Natural Sciences in 2007. Forty Grade 7 Natural Sciences teachers remained in my sample.

5.2.1.5 Analysing the data

The survey questionnaire was used to collect both quantitative and qualitative data. The quantitative data were placed on a large spreadsheet in which the number allocated to each teacher was listed in the first column and the relevant data e.g. teacher's qualification, subjects they specialised in, size of Grade 7 classes and home languages of learners were recorded in subsequent columns. This made counting easy. This data was then used in some of the bar charts shown in chapters 7-9 and in the tables in Appendices 4.2 and 4.3. Teachers' qualitative responses to each survey question were listed, sorted, grouped and recorded in the tables that appear in Appendices 4.2 and 4.3. This data could then be used in my discussion of my survey findings in Chapters 7-9.

The next stage of the research involved case studies of an even smaller group of teachers selected from these forty teachers.

5.2.2 Case studies

Case studies involve the use of qualitative methods to carry out an in-depth exploration, description and analysis of a bounded system (Cresswell, 2012; Merriam, 2009). The cases being studied in my research are Grade 7 Natural Sciences teachers and thus these teachers are my unit of analysis.

My case studies involve the study of ten cases, i.e. ten teachers, and my study can therefore be referred to as a multiple (or collective) case study. This is a group of individual case studies undertaken to gain a fuller picture (Stake, 2006; Yin, 2003a). The teacher is the unit of analysis and is therefore the 'case' but the teacher works in a particular context. The case study is then the teacher in his/her context, and all ten case studies together form my multiple case study. Stake (2006) says that in a multiple case study, individual cases share a common characteristic, for example in my research all the schools are primary schools in one district in Gauteng and all the teachers are Grade 7 Natural Sciences teachers. However Stake says that each case has its own unique social, physical, cultural, economic, political and ethical context. One purpose of multiple case studies is to illuminate some of these contexts since contexts help to make relationships understandable. My case studies, while almost all in urban environments, took place in schools in differing township, city and suburban contexts with learners from a wide range of socioeconomic backgrounds. This is in line with Stake's suggestion that one selects case studies that provide diversity across contexts and provide good opportunities to gain insight into issues and learn about complexity within different contexts. Stake points out that the case studies selected may or may not be typical of other case studies. They are however chosen because it is believed that understanding them will lead to a better understanding of a still larger collection of case studies.

The study of each case takes place within a bounded system. This means that case studies are set in "temporal, geographical, organizational, institutional and other contexts that enable boundaries to be drawn around the case" (Cohen, et al., 2007, p. 253). The boundaries that I have placed around the study of each case are as follows. The curriculum context is the topic 'human reproduction', i.e. I only observed teachers while they were teaching human reproduction. I was also only interested in exploring whether they were teaching in outcomes-based and learner-centred ways and in exploring the factors that might affect their teaching. The time period over which this study took place was three to four weeks in each school. The geographical parameters are one district in Gauteng, thus clearly an urban study. The institutional context is the primary school.

Cases studies are useful if one is working within the interpretivist paradigm as I am, since the methods employed in a case study allow the researcher to probe deeply, and explore each unique context and the 'multilayered realities' in which each case study teacher operates (Guba & Lincoln, 1983; McMillan & Schumacher, 2010).

My multiple case study is a descriptive case study providing narrative accounts (Yin, 2003a, 2003b). In my study several data-collecting techniques were used to find out what the teachers do (participant observation, field notes and audio-recordings) and why they do it (interviews). The purpose was to provide 'thick' descriptions of teachers' experiences, thoughts and feelings. Merriam (2009, p. 43) explains thick descriptions as "the complete, literal description of the incident or entity being studied". She further points out that the researcher is the primary instrument for the collection and analysis of data and for the provision of thick descriptions. This is therefore recognised as a subjective process. The reader likewise selects what is useful from that description. As Stake points out:

> ...(case study researchers) will, like others, pass along to readers some of their personal meanings of events and relationships – and fail to pass along others. They know that the reader, too, will add and subtract, invent and shape – reconstructing the knowledge in ways that leave it ... more likely to be personally useful. (Stake, 2005, p. 455)

Multiple cases are often used to enhance the external validity or generalisability of the findings (Cresswell, 2012). Cresswell suggests that researchers who use multiple cases for this purpose and conduct a cross case analysis, believe that the more cases they study, the greater the range of findings and thus the more compelling the interpretations. In this research there will be no attempt to generalise the findings of the ten case studies to all Grade 7 Natural Sciences teachers in Gauteng. Each case is unique and I cannot claim that my sample is representative of Gauteng Grade 7 Natural Sciences teachers. Rather these findings will contribute to a richer picture of factors that could influence implementation of the new curriculum in South Africa when dealing with human reproduction.

5.2.2.1 The sample

The population from which I selected my case study teachers in my multiple case study were Grade 7 Natural Sciences teachers in one district in Gauteng. Teachers who were planning to teach Grade 7 Natural Sciences in 2007 in the third term, had attended the workshop and completed the survey, and

were prepared to participate in the study were selected. In this sense, my sample was a convenience sample. There were several reasons for selecting teachers from this smaller population. Firstly the workshop provided the contact that I needed with teachers, and they had a chance to get to know me since I had organised and presented part of the workshop. Thus there was some measure of trust and familiarity. I was not coming to them 'cold' or as an unknown outsider. In addition, these teachers all had the common experience of participating in the workshop. Secondly I would be able to compare the survey teachers' beliefs about what factors they expected would influence their teaching of human reproduction, with the case study teachers and my perceptions of what factors did influence the teaching of human reproduction (interviews and observations). Occasionally I compared a particular teacher's views before teaching human reproduction, as expressed in their completed survey questionnaire, with their reflections about their experiences after teaching human reproduction.

At the end of the survey, teachers were asked to indicate on a slip of paper whether they would be prepared to be interviewed and/or observed. Nineteen Grade 7 Natural Sciences teachers from 15 schools agreed to being observed and interviewed, and another teacher agreed to only being interviewed. From this group of nineteen teachers I attempted to select teachers as cases who I felt could provide the most useful data to address the research questions. I was looking for teachers who differed in gender, religion, educational background, personality, and teaching styles. This could, to some extent, be deduced from the questionnaires completed during the survey.

Having compiled a spreadsheet showing these characteristics, I selected teachers who differed in some of the ways described above and who were willing to participate in the research from two city schools, two township schools and one suburban school. When formally invited to be part of the study, the teachers from four of these schools withdrew from the study for a variety of reasons e.g. the Life Orientation teacher or the Principal would now be teaching human reproduction, or the teacher who had attended the workshop had moved to another school and was no longer teaching Grade 7s or an outside organisation, Family Life Centre, was asked to address this topic with the Grade 7s. I then approached other teachers who had indicated that they were willing to participate in the study so that I had eight 'cases' from five schools. As the study progressed, the Natural Sciences subject advisor (responsible for all the Natural Sciences teachers in the district in which I was conducting my study) mentioned the particularly difficult situation in more distant townships in the district, that is, a school held in containers and a school with very large class numbers. I decided to incorporate these schools in my study in order to ascertain from the study the effect of these contexts on the way in which the teacher taught. These two schools both provided me with an additional case teacher, each of whom had attended the workshop and had indicated that they were prepared to participate in the study. I ended up with ten case studies, that is three case study teachers from two city schools, five case study teachers from four township schools and two case study teachers from one suburban school in my sample. Although I chose to include the two teachers who either taught in containers or who had very large classes (purposive), my choice was limited and so I have called my sample a convenience sample.

The convenience sample for my multiple case study was biased in a number of ways.

- The schools from which I could select my sample were limited. Invitations were sent to 84 primary schools in the district in which I was conducting my research, and teachers from only 31 schools attended the workshop. From amongst these teachers, only 19 teachers from 15 schools were both eligible for the study and agreed to being interviewed and observed. Then a further four schools pulled out of the study. Thus 10 teachers from seven schools were finally selected out of the available 11 remaining schools.
- Only one independent school attended the workshop and this was not a religious school. While many of the teachers in the sample were religious, I was unable to include the impact of teaching this topic in a religious school.
- Two teachers from schools that catered for children with special needs attended the workshop but these teachers were unwilling to be either interviewed or observed, so teachers in 'special needs' schools were excluded from the multiple case study.
- Only schools which had sent teachers to the workshop were included in the sample. Thus teachers who were hostile to the idea of teaching human reproduction or simply reluctant to do so or had strong beliefs about not teaching this topic to grade 7s would probably not have attended the workshop.
- Teachers at the workshop who were not willing to be observed or interviewed or may have been reluctant to teach this topic did not give their permission for interviews and/or observations. These people would have provided a different perspective on the issue of teaching human reproduction.

However despite this bias, I consider the sample to be reasonably representative of Grade 7 Natural Sciences teachers in Gauteng. Ten Grade 7 Natural Sciences teachers from seven of the schools that had participated in the workshop and survey were selected for the multiple case study. Their selection was based on their willingness to participate in the research (convenience) and the potential richness and variety of information that could emerge.

City, township and suburban schools were selected since these are fairly distinct urban groupings. I defined ‘city’ schools as schools close to the city centre. These schools drew learners from more densely populated and less affluent areas in the city centre such as densely clustered apartment blocks as well as from areas bordering the city centre and from the townships. The suburban school was situated in an affluent suburb and included learners from a variety of socioeconomic conditions, but who were mostly from far more affluent homes than those in township and city schools. The four township schools were situated in three different townships and drew learners from township homes and informal dwellings. According to the teachers, some of the learners from informal settlements lived in conditions of extreme poverty.

I included three males and seven females in my sample. I attempted to include teachers belonging to different population groups and to different religions in order to explore the impact of culture and religion on teachers’ approaches to teaching human reproduction. My sample was fairly representative here but lacked teachers in the 'Coloured' population group and who adhered to the Muslim religion or to other religions beyond those stated below. My selection was constrained by the teachers'

willingness to participate in the research. These teachers and the contexts in which they taught have been summarised in Table 5.2. Since the culture and background of learners could be one of the external factors influencing how teachers taught human reproduction, I have included the population groups to which the learners belonged and the social conditions in which they lived.

Table 5.2: Background information on the ten case studies – the teachers, their schools and their learners

School area	Schools	Case Teacher	Gender	Population groups: Teachers	Religion: Teachers	Population groups: Learners	Learners' homes
City	1	Sipho Jackie	M F	A I	Traditional None (universal belief in God and values)	Mixed, mainly A	Apartments, houses close to city, houses in townships
	2	Gogodi	F	A	None Christian?	Mixed, mainly A	Apartments, houses close to city, houses in townships
Town-ship	3	Samkele	F	A	Christian	A	Houses, informal dwellings in township
	4	Mphety Zama	F M	A A	Christian None (traditional)	A	Houses, informal dwellings in township
	5	Thobz	F	A	Christian	A	Houses, informal dwellings from surrounding townships
	6	Nsuku	F	A	Christian	A	Houses, informal dwellings in township
Suburb-an	7	Rennie Riana	M F	I W	Hindu Christian	Mixed A, W, I, C, As, & others	Houses, apartments in the suburbs

(Key: F = female; M = male; A = African; W = White; C= Coloured; I = Indian; As = Asian)

I spent three to four weeks in each school observing a teacher throughout the period that she or he taught human reproduction to Grade 7s, and then interviewed the teacher at the end of this period.

Additional cases

In order to search for and address gaps in my data, I interviewed a further eight teachers. Two of these teachers were of particular interest, one because of the impact of hostile staff (an external factor) on his teaching, and one because of the impact of his religious beliefs (internal factor) on his teaching. In the results chapters, I only refer to the interviews with these two teachers since they provided me with unique data. As Stake (2006) has suggested, I refer to these teachers as 'additional cases'.

5.2.2.2 Observation - Participant observation and field notes

The purpose of the observations I made was to build up a richer picture of how each teacher taught human reproduction, the learners they taught and the context within which each teacher worked, that is the school and classroom environment. Cohen and colleagues (Cohen, et al., 2007) say that observation in natural settings allows the researcher to understand the context, to observe the behaviour of the participants and to discover things that participants may not be willing to talk about in interviews. My observation would enable me to construct a thick description (Merriam, 2009) or at least a thicker description than that obtained from interviews only. As Cohen and colleagues point out, the richness of any description partly depends on when and for how long we look. My observations were limited to the short period over which human reproduction was taught.

My observations could best be described as unstructured qualitative observations or at the most semi-structured qualitative observations (Cohen, et al., 2007). Cohen and colleagues argue that in unstructured observations, a rich description of a situation is provided and key issues emerge from these observations whereas in semi-structured observations, one has an "agenda of issues" (p. 397) but gather data related to these issues in unsystematic ways. My 'agenda of issues' were my research questions. They guided my observations and I therefore focussed on:

- whether teachers used outcomes-based and learner-centred approaches,
- to what extent these approaches were used,
- how the teacher handled the sensitive material on human reproduction, and
- what factors appeared to influence the teacher's approach

I therefore began my observations of each case study teacher with the following questions in mind:

- What was the classroom environment like? (physical conditions such as size of classroom and sufficient desks and chairs; teaching and learning materials available such as chalkboards, charts, posters, reference books and textbooks; and the arrangement of desks and the number of learners)
- What interactions took place between teacher and learners and amongst learners?
- What sort of visual material did the teacher use?
- What worksheets did learners complete? What notes did they make?
- What was the relationship between the teacher and learners? Was it tense, relaxed, was there humour?
- How well/enthusiastically did learners work at their task?

My role during observations can best be described as participant observation with the 'observer as participant' (Cohen, et al., 2007; Denscombe, 2007). I place my observations in this category rather than non-participant observation because as Denscombe, Merriam (2009) and others point out, no one is ever fully non-participant. Aspects of non-participant observation were evident so, as researcher, I did not participate in any of the activities that I observed either in a teaching capacity or during any discussion. I simply sat quietly at the back or side of the classroom at the teacher's desk (the only writing space available) or at the back bench in the laboratory in the suburban school,

observing and recording my observations. I attempted, by unobtrusive positioning, by mostly avoiding interaction, and by being present at most or all lessons on reproduction, to 'fade into the background'. Denscombe points out that, in this type of research, the researcher assumes that the longer they are on site, the more their presence is taken for granted, the more `socially invisible' they become, and the less effect they have on the proceedings that is in this case on the teaching and learning that takes place. I did however sometimes walk around the classroom and listen briefly to conversations during group work and in this way became an 'observer as participant'. However I resisted efforts by learners to involve me and get me to answer their questions and referred them to the teacher or suggested they look at their worksheets. I did not want to alter power relations in the class, that is, their perceptions of who had the authority to give subject knowledge. Initially on two or three occasions my role of biology teacher educator took precedence over my role as researcher, and I talked to a teacher after class when they appeared confused on some subject matter or had given clearly wrong information on subject matter. I resolved to avoid doing this as I continued with my research since it had the potential of teachers being afraid to talk confidently about the subject matter in class lest I observe them providing inaccurate information. However when a teacher approached me before or after a lesson for clarity on some content or some question raised in class, I would discuss my understanding of that content or, if I had no idea what the answer was, would say so.

Gaining access to the schools

I gained access to the schools in the district in which I conducted my research through my friendship with the Natural Sciences subject advisor who I had met many years before when working on a science education project with teachers. She put me in touch with the district head, supplying me with his contact details. I outlined the purpose of my research to him in a letter (Appendix 7.1a) and requested access to the schools (Appendix 7.1b), and then met with him briefly to provide further information on my proposed research. I was granted permission to conduct research in the primary schools in his district. Once I had identified my ten cases, confirming with teachers that they were willing to participate in my research, I made an appointment with the Principal in the school to request permission to work in his/her school, and provided them with an information letter (Appendices 7.6 and 7.7). Once permission was provided (Appendix 7.8), I discussed the research with the Head of Department and with the teachers who would be involved. Further information letters were provided (Appendices 7.12 and 7.13) and letters of consent (Appendix 7.15)[15]. Once the ten case teachers had signed these letters, I could proceed with the research.

The process

The first part of my case study research involved visiting the selected schools and in each school observing the teacher and learners for the period during which the teacher taught human reproduction. Human reproduction was taught in most schools over three to four weeks. In my preliminary visits to the school, I explained to the teacher, Head of Department and Principal how I would be conducting the research. I said that I would like to sit unobtrusively in the teacher's classes and write down my

[15] I also obtained permission from the District director, principals and teachers for the additional interviews that I conducted (Appendices 7.1a, 7.1b, 7.6, 7.9, 7.10, 7.11, 7.14, and 7.16). Letters of consent were not required by the ethics committee for the learners since the focus was on the teachers and only excerpts from class discussions were used in my research.

observations of their lesson, as well as make audio recordings of the lesson. I was interested in how the teacher taught human reproduction and how the learners responded.

Once permission was granted, I obtained copies of the teacher's timetables showing the different grade 7 classes they taught. I then engaged in the tricky task of correlating the timetables of teachers from the same and different schools. The teachers in the seven schools fortunately embarked on teaching human reproduction at different stages of the third term. However at times I was visiting teachers in three different schools on the same day and travelling up to 100 km, rushing from school to school in order to get to class on time. I attempted to stay with one class throughout the period of my research. However when there were timetable clashes or I could simply not reach a class in time, I would visit another class if the teacher taught more than one Grade 7 class. This did provide me with a richer picture of how teachers interacted with different classes.

I visited the teachers six to ten times each, observing mostly double periods which lasted for one hour in all the schools. The number of visits depended on the period over which the topic was taught and when I was able to visit the school and was also affected by the illness of teachers (one of whom had an accident and miscarriage resulting in a one month break in her teaching), and by their absence due to workshops, meetings or for some other reason. I visited and recorded ten of Sipho, Jackie and Gogodi's lessons; eight of Mphety and Riana's lessons; seven of Zama, Thobz and Rennie's lessons; and six of Samkele and Nsuku's lessons.

Recording my observations – field notes and audio recordings

During my observation, data was recorded by means of field notes. Field notes have the advantage of being unobtrusive and allowing the researcher to focus on particular aspects of teacher behaviour and to change that focus during the research when new situations arrive (Opie, 2004).

I sat at a desk in the classroom and throughout the lesson wrote down my observations. Where possible, I sat at the back of the class. I felt this was less obtrusive – the learners were more likely to forget about me if they did not continually have to look at me. However in some of the classes, the only available desk was the teacher's desk at the front of the class. This had the advantage of privacy as I wrote but learners initially watched me carefully for my reactions to comments. When I sat at the back, the few closest to me attempted to see what I was writing. The learners did seem to lose interest in me after a few lessons.

During my observations, I simply jotted down my observations and my impressions as the lesson proceeded. However I did have an 'agenda of issues' determined by my research questions (as described previously) and these did guide my observations. The way in which I recorded the data (i.e. not using an observation guide) meant that there was less consistency in the type of data being recorded. However I was trying to build a thick description of the unique situation of each teacher.

In my field notes, I did attempt to record the verbal interactions between teachers and learners, while also describing, for example, what the teacher or learners were doing, what was written on the

chalkboard or drawn on the overhead transparency, or the mood in the classroom. As a result my record of verbal interactions was limited. To provide me with a more detailed record of these interactions, I taped the lessons using a digital voice recorder. I chose not to videotape the lessons because of the sensitivity of the topic. I felt the very small digital voice recorder was easier to use and far less intrusive. I put the digital voice recorder on the desk I was sitting at, if I was at the front of the class, or somewhere where the teacher and class could be heard if I was sitting at the back of the class. The audio recordings were useful in helping me to recall aspects of a particular lesson that could be heard, that is the enthusiasm, despair or disinterest of a teacher, and the response of learners.

Transcriptions were made of five lessons from each teacher, selected from the 6-10 lessons recorded. While I had planned to transcribe lessons on five topics (external physical or emotional changes; male or female sex organs; the card game or circumcision; menstruation; and meeting a partner or sexual intercourse and responsible behaviour), I also used the field notes to guide me in my choice of which lessons to transcribe. I had indicated in the field notes where there were interesting class discussions that had only partly been written down and the full discussion needed transcribing. I did also record group discussions by leaving digital recorders on desks for brief periods during group discussions and moving the two recorders from group to group. I could then listen to the teacher's conversation with a group and to interactions amongst learners and could follow the discussion if the interaction was in English or partly in English. Learners were however less animated in their discussions while the recorder was on their desk.

I transcribed the lessons of five teachers, but found the process very time consuming and so the lessons of the remaining five teachers were transcribed for me by a professional transcriber. One lesson which was almost completely in isiXhosa was translated by a Xhosa-speaking biology teacher.

The field notes and transcripts complemented each other well, the field notes providing a description of what was happening in class, while the transcripts provided a much more comprehensive record of what was said in class, although I could not always hear the learners' responses. The field notes and transcripts were used as a check against bias and misinterpretation, as proposed by Opie (2004). Both writing field notes during the lesson rather than after the lesson, and using the transcripts of the audio recordings reduced the bias of what Denscombe (2007) describes as ‘selective recall’. This bias could not be totally eliminated since, as Denscombe points out, there is always selective perception.

Recording the context: field notes and photographs

The context that is the school and classrooms in which the lessons took place, were described in the field notes. Photographs of the learners at work provided images of the context and this simply was used to support the written descriptions.

The subjectivity of observation

A number of authors (Denscombe, 2007; Henning, 2004) point to the subjectivity of observation, that is what is observed (seen and heard) and what is recorded is the researcher’s version of what is there. While I was guided by my research questions, there would have been what Denscombe refers to as

selective perception (the mind filters information) and accentuated perception (the tendency to highlight some information and reject others), as well as selective interpretation of events during the recording of the event and during analysis of the data. This introduces some bias into the reporting. In the final chapter I will reflect on the extent to which this sort of bias, in my opinion, appeared in my recording of data and analysis.

Analysing the field notes and transcripts

In order to analyse my field notes and transcripts of lessons, I developed a chart based on my interview guide (Appendix 5). This chart became the analytical framework for my analysis. The analytical framework consisted of numbered key words and phrases linked to the twelve sections and subsections in the interview, for example, 7 – School administration; 7.1a – Principal; 7.6 – Facilities; 10 Learners, 10.3 – Prior knowledge; 10.6 – Culture. I then used the numbers and/or key words to code my field notes and lesson transcripts. I therefore had determined the codes beforehand, based on the data I wanted to collect in order to answer my research questions. However as I read through the transcripts and field notes, if there was interesting data that did not fall in one of these categories, I assigned new numbers and headings to this data, adding these to my analytical framework. The interviews were analysed using the same code numbers and words. As I began to discuss my results, I could then search for and extract the relevant data based on these codes from the field notes, transcripts and interviews.

5.2.2.3 Interviews

I conducted interviews with both the case teachers at the end of my observation of their teaching of human reproduction, as well as with a further eight teachers who might provide additional important insights. As mentioned earlier, only two of the additional interviews were included in my analysis. These two interviews provided valuable data on two specific situations, i.e. the impact of staff members' hostility to the teaching of reproduction on the Natural Sciences teacher in one school, and the impact of religious beliefs on a devout Muslim teacher's approach to teaching human reproduction in another school. Of particular interest in the second case was how this teacher grappled with the issue of teaching human reproduction, obtained guidance from his religious leaders, and found a way to teach human reproduction in a way that was in harmony with his religious beliefs.

Interviews are valuable for a number of reasons. They allow one to ask people about their thoughts, feelings, intentions, and the meanings they attach to particular situations and provide them with the opportunity to express their views and ideas (Patton, 2002). The purpose of my interviews, as described previously, was to gain insight into the teachers' understanding of their teaching approaches and the factors influencing their teaching of human reproduction.

Interviews have been described as a 'conversation' between interviewer and respondent in order to obtain information relevant to the research questions (Cohen, et al., 2007; Henning, 2004; Merriam, 2009). As Henning as well as Cohen and colleagues point out, an interview involves an exchange of views (an inter-view) and is thus inter-subjective, allowing interviewer and respondent to discuss their interpretations and position on a particular situation and to co-construct knowledge. However

Henning points out that although there might be co-construction, there is an asymmetry of power. The interviewer determines which questions will be asked and when they will be asked, and the respondent decides on what and how much to divulge and how honest their response will be.

Type of interview used

Interviews range in design along a continuum from formal structured interviews which allow for easier comparison and more quantitative analysis to completely informal unstructured interviews which pursue information which may be unique to an individual and allow for qualitative analysis (Cohen, et al., 2007). I chose to use a semi-structured interview format situated somewhere between structured and unstructured formats, when designing my interview guide.

The semi-structured interview format allowed me to pursue my interpretivist position. In semi-structured interviews, one has in mind the type of data one wants to collect in order to answer the research questions. Questions are therefore planned in advance but they are generally open-ended questions. There is both structure and flexibility. The open-ended aspect of the semi-structured interview allows for richer and more spontaneous responses in which respondents can express their ideas, insights, expectations and feelings. The interviewer can probe and encourage the respondent to explain or expand on his/her answer, often resulting in unanticipated answers (Bell, 2005; Cohen, et al., 2007; Opie, 2004). The researcher can clear up misunderstandings, and establish rapport. As Bell, Opie and Cohen and colleagues point out, probing improves the chances of obtaining valid information from the respondent thus allowing the researcher to make more valid claims or inferences based on the data. In addition, the respondent can ask for clarification from the interviewer. The potential for trust and cooperation are strong in face-to-face interviews.

In semi-structured interviews, as Merriam (2009) and others point out, the interviewer can modify the sequence of questions, change the wording, and explain and add to the questions. In my interviews, while I used the open-ended questions in my interview guide (Appendix 5), I did not necessarily use the exact wording in the guide nor did I follow the exact sequence, but allowed the conversation to continue as naturally as possible. Thus if the teacher raised a particular idea that connected to a question elsewhere in the interview guide, I would move to that question. While one recognises that changing the order means that teachers encounter the questions in a different way, the desire to make the interview more valid by presenting questions in exactly the same order was sacrificed in order to allow the interview to be more responsive to the respondent, allowing the conversation to flow and to allow the teacher to continue along a particular line of thought. At the end of the interview, I referred back to the interview guide to ensure that all questions had been covered. Thus I allowed for some comparability by covering the same questions but by allowing the questions to be open and following a more natural sequence of questions for each teacher, the interview was more responsive. This allowed for unique insights and richer responses on the individual's intentions, concerns and experience of teaching human reproduction.

The interview guide

My semi-structured interview guide was used to explore teachers' control beliefs, that is, their

perceptions of the extent to which external and internal factors influenced their ability to teach human reproduction and to teach this topic in outcomes-based and learner-centred ways. In my research, external factors refer to factors external to the teacher and include physical resources and the learning environment, support structures and learner factors whilst internal factors refer to factors that relate to the teachers' personal and professional backgrounds.

The interview guide, which I used with both the case teachers and in the additional interviews, appears in Appendix 5. The questions are similar to the questions in the survey questionnaire and explore teachers' beliefs, as well as their experiences having taught human reproduction. The rationale for these questions is thus similar to the rationale provided in Table 5.1 for the questions in the survey questionnaire. Additional categories not found in the survey questionnaire were added to the interview guide as a result of my observations.

My first question to the teachers concerning their feelings about teaching human reproduction was designed to raise their interest and capture the emotive side of teaching this sensitive topic. I was interested in their thoughts, fears, anxieties and their level of confidence before and as they proceeded with teaching this topic. This relates to personal internal (teacher) factors in my theoretical framework and to research questions 2 and 4. I probed for further personal internal factors such as how a teacher's personality, personal background, and religious, cultural and/or personal beliefs might have affected their teaching of human reproduction in question 11. In question 2 I asked for information on their background knowledge and teaching experience and how this might affect their teaching (the professional aspect of internal factors). This served as a check against the background information provided in their survey questionnaire.

The third set of questions related to one of the external factors, that is, the availability and use of resources while preparing for their lessons and for use during class, and how teachers felt this impacted on their teaching. The 7th question (7.3, 7.5 and 7.6) also attempted to reveal how teachers perceived that the facilities (or lack thereof) affected their teaching. The 4th to 7th questions and question 9.11 all probed for information on the type of support structures available and the extent to which teachers felt that these structures supported or hindered their teaching of human reproduction in outcomes-based and learner-centred ways. In questions 4, 7, and 9.11, I was interested in the level of support provided by the Principal, the Science HOD, other Grade 7 Natural Sciences teachers also teaching this topic in the school and by the district and GDE, by Life Orientation teachers, by other teachers and by the administration staff in the school.

Question 10 was used to gather information of teachers' perceptions of further external factors, that is, learner factors that might influence the teaching and learning taking place in the classroom. I therefore asked questions about learners' emotional response to the topic (interest, embarrassment, etc), their prior knowledge, personal factors about the learners, their religious and cultural beliefs, and their competence in English, the language of learning and teaching in Grade 7. The data collected from all these questions would enable me to draw some conclusions about teachers' perceptions of the effect of internal and external factors on their teaching of human reproduction (research question 2 and 4). In

question 12, I addressed a part of Ajzek and Madden's framework, that is, attitudes to the teaching of human reproduction determined by behavioural beliefs.

The series of questions on teaching in question 9 provided me with data on teacher's perceptions of their teaching, how they addressed the sensitive nature of teaching this topic with their learners through selecting topics and creating boundaries and the extent to which they believed their teaching was outcomes-based and learner-centred. The data collected here contributed to my analysis of the extent to which Grade 7 Natural Sciences teachers use outcomes-based and learner-centred approaches when teaching human reproduction (research question 1).

In preparing for the interviews, I jotted down a few notes on each teacher's interview guide on particular questions I wanted to ask them as a result of my observations or their responses in the survey questionnaire, or to confirm background information from their survey questionnaire.

Designing the questions

In designing the questions, following the advice given by Breakwell (1995), Cohen et al. (2007) and others, I attempted to ensure that the questions were well-designed, that is, were simply worded, avoiding ambiguous, leading or double-barrelled questions and the use of double-negatives or prejudicial language. I attempted to order the questions in a way that had a flow of ideas, so that the interview had a 'rhythm' to it and avoided jumping from one topic to the next (Breakwell, 1995). However I did not keep to this order as I attempted to let the conversation flow. In my questioning I used prompts and probes. Cohen and colleagues suggest that semi-structured interviews need prompts which allow the interviewer to clarify the questions, and probes which the interviewer can use to ask respondents to "extend, elaborate, add to, provide detail for, clarify or qualify their response, thereby adding richness, depth of response, comprehensiveness and honesty" (p. 361).

Piloting the interview

I first practiced my interviewing techniques by interviewing the two teachers in the exploratory case studies described briefly in the previous chapter. The interviews had fewer questions and were more unstructured. Although the exploratory case study took place seven years before my research study started, the data from those interviews nevertheless provided some ideas for the survey questionnaire and interviews in the main study. I did not pilot the interview guide for the main study since the questions were similar to those used in the questionnaire which had already been piloted.

Conducting the interview

Teachers were informed of the nature and content of the interview beforehand. They were told that the questions were similar to those in the questionnaire and were given an outline of the topics that would be covered in the interview. This was done to alleviate anxiety about the interview beforehand, so that participants had a chance to think in advance about how they would talk about a topic and would therefore be more at ease when the interview began. The problem with giving this outline is that spontaneity of answers is reduced, but it was hoped that by giving them only an outline, they would still respond honestly to the actual questions. It was hoped that the relationship that had developed during the workshop and in particular during the period of observation also served to reduce anxiety

and encourage rich responses.

Audiotaping

Interviews were audiotaped with the teachers' permission in as unobtrusive a manner as possible in order to avoid distracting the respondent. Informed consent was obtained from both the teacher and the Principal of the school for the interviews to take place and for the interviews to be recorded on audiotapes (Appendices 7.10 and 7.16). Videotapes, while useful for providing a richer description of the interview for example facial expressions, were not used because of the nature of some of the information. It was felt that teachers would be more reluctant to talk at length about their ideas when confronted with a video camera. They had become used to the small and unobtrusive digital voice recorder used during classroom observations, and so this was considered less obtrusive. In addition a second small battery-powered audio tape recorder was used as a back-up in case the batteries went flat on the digital recorder or some other problem arose. The two recorders did not seem to bother the teachers once the interviews got going and started to flow.

Length of interviews and place

The interviews were long, ranging from one to 1.5 hours and in one case to two hours long. I did have a large number of questions, that is, 12 questions with a number of sub-questions since I wanted to explore my research questions in detail. The length of the actual interview was however also influenced by the extent to which the respondent wished to make their ideas known. This was a feature of their own personality, their ability and willingness to express their ideas, and their ease in speaking in English. English was an additional language for eight of the ten case study teachers who were interviewed.

The interviews took place at different times of the day for example during free periods or after school, and in different venues depending on where we would have the most privacy. Venues ranged from a parked car (when every available room in the school was being used), staffrooms (where sometimes cleaners or teachers interrupted the interviews), the playground when learners were in class, classrooms (with the noise of adjacent classes and some interruptions) to a plush conference room where the interviews were uninterrupted. The attempt to find a quiet place was an attempt to provide the respondent with a place where they would feel free to talk (Cohen, et al., 2007). The differing conditions for the interviews probably had some effect on the ease with which each respondent spoke about their situation.

Researcher effects

The length of the interview and depth of their response also depended on each respondent's ease with me as a white middle class English-speaking female, and other factors related to me as interviewer. In Chapter 1, section 1.6, I describe my positionality in relation to the teachers. Breakwell (1995) and Denscombe (2007) point out that researcher effects, for example language, accent, age, gender, race, ethnic origins, class, dress, demeanour and accent, all have an effect on how much the participant is willing to divulge and their honesty about what they reveal. Breakwell claims that people are more likely to disclose information about themselves to people like themselves. Only three teachers were

similar to me in any way. The teachers differed in some or all aspects of culture, home language, age, gender and personality. Perhaps the greatest barrier was seen with one interviewee who was shy (personality effects), male (gender effects), African (racial and cultural effects), not fluent in English (language effects), young (age and power effects) and new to teaching (personal situation effects).

I had already established friendly relationships with the teachers over my 3-4 week visits. During the interviews I remained friendly and by being attentive and responsive indicated to the teachers that their ideas were of great interest to me. By being uncritical, considerate of their feelings, and respectful of their views, I hoped that teachers did not feel threatened in any way by my questions, thus avoiding a defensive response. Denscombe points to the need for an interviewer to be courteous, attentive and sensitive.

An attempt was made to increase the ease with which the interview proceeded by following the advice of Cohen and colleagues (2007) and giving appropriate verbal and nonverbal feedback to the respondents during the interview, for example encouraging noises, and reflecting on or probing further on remarks made by the respondents.

The information that I collected was no doubt affected by a number of factors and I will reflect on these in the final chapter. For example, my research does deal with sensitive issues. Denscombe suggests that when dealing with religious beliefs, sexual relationships and other sensitive issues, respondents might provide answers that they feel fit in with what the researcher expects from them or they may try to keep the researcher happy by giving what they think is the researcher's point of view.

Making notes

Henning (2004) suggests taking notes during interviews so as to record factors that would not be recorded such as gestures, facial expressions and general body language as well as tone of voice and change in tempo of speech. During the first few interviews I attempted to jot down some notes about key points and the way the teacher seemed to be responding to the interview. However I soon abandoned these notes because I felt they interfered with the naturalness and ease of the conversation. I did jot down notes about each interview after the interview but for the analysis mainly relied on the audiotapes for tone of voice, ease of response, hesitations, and reluctance to respond.

Transcribing

The interviews were transcribed professionally, and I then checked the transcriptions by listening to each interview and jotting down any relevant notes or corrections on the transcribed interviews. I returned hard copies of the interviews to the teachers so that they could make any desired changes on the transcripts. The teachers made minor changes and then indicated that they were satisfied that the interview transcripts correctly represented their views. The transcripts were then ready for analysis.

Analysing the interviews

Each interview followed a different route as I picked up on ideas from teachers and followed leads. I

read through the interview carefully and coded the responses using the numbers on the interview schedules and sometimes headings. There were 12 main questions with a number of subcategories. Sometimes a conversation could cover four or more categories and subcategories, and the relevant numbers would be listed down the left side of the response. I then cut and pasted each interview electronically into the 12 questions, so that for example wherever questions and responses had a number 10 next to them, they would go into a file marked question 10 which related to learners. Each teacher's interview with responses related to number 10 would be placed in that file. On a hard copy of that file, I then jotted down what each number referred to, e.g. 10.2 – learner's prior knowledge; 10.5 – learner's religious beliefs; 10.7 – language. I was then able to run through all the responses from each teacher for each sub-question in order to start reporting on my findings.

5.3 Rigour in the research

In this research I have attempted to ensure that my findings are trustworthy. Lincoln and Guba (1985) propose that for qualitative research to be considered trustworthy, the researcher needs to pay attention to credibility, transferability, dependability, consistency and confirmability. They use these as alternative categories in qualitative research to internal validity, external validity, reliability and objectivity, categories which are more typically used in quantitative research. I will use the qualitative terms as I describe how I attempted to ensure there was rigour in my research.

5.3.1 Consistency

Throughout my research, I attempted to ensure that my research strategies, style of interacting with participants, data gathering processes, data analysis and interpretation of participants' meanings from the data were consistent (Scaife, 2004). All teachers involved in the survey completed the same questionnaire. All case study teachers were observed in the same way (in an unobtrusive position where field notes and audio recordings were made) and completed the same interview at the end of the period of observation. My interactions with the participants were friendly but confined to interactions during the workshop and then, with case study teachers, to my initial discussion about the research, the time spent chatting to them before or after a lesson, and then the final interview.

Data gathering by means of questionnaires during the survey was consistent in so far as teachers completed the same questionnaires at the same time (at the end of the workshop) under the same conditions. The data gathering processes of audio recording of lessons and taking field notes during my observations and the use of a common interview instrument contributed to consistency of data gathering during the case studies. However because my field notes were fairly unstructured, I could not say that I was entirely consistent in what I recorded. In addition, during the interviews the questions were not necessarily asked in the same order and teachers were probed in different ways. This might have affected the consistency of the type and amount of data obtained from each teacher. However the advantages of these methods, that is, providing 'rich' data that might be unique to a

teacher outweighed the concerns about having exactly the same sort of data collected.

5.3.2 Credibility (and internal validity)

Credibility can be linked to the term 'internal validity' which is more commonly used in quantitative research. Internal validity refers to the extent to which the findings and explanations of an event or behaviour describe accurately the phenomena being researched (Cohen, et al., 2007; Scaife, 2004). However this is difficult to assess when dealing with human subjects and so in qualitative research the more tentative notion of credibility is used, that is, are the findings credible given the data collected (Lincoln & Guba, 1985). Credibility refers to the extent to which the results approximate reality and are judged to be believable, trustworthy and reasonable (McMillan & Schumacher, 2010). The credibility of the findings can be increased in a number of ways.

Scaife suggests that credibility of case study research can be increased by explaining the data gathering procedures used and presenting data clearly so that it is easy for others to re-analyse, acknowledging biases, making clear how claims are supported by evidence and by distinguishing interpretation from description. In this chapter I have explained the data gathering procedures and in the next chapters I will endeavour to attend to the rest of these points.

The credibility of a study can also be increased through triangulation. Triangulation involves the use of two or more methods of data collection when studying some aspect of human behaviour in order to see whether the findings complement each other. This approach also allows the researcher to explain more fully the richness and complexity of human behaviour by studying it from more than one standpoint and making use of qualitative and quantitative data (Cohen, et al., 2007; Gorard & Taylor, 2004). According to Cohen and colleagues, using only one method may distort the researcher's picture of a particular slice of reality being investigated. If different methods yield mostly the same results, one can have more confidence in the findings. I have triangulated my data, comparing my findings at times from the survey questionnaire, my field notes, and the lesson and interview transcriptions in order to see whether what the teacher says and does differs or is the same, and to build up a richer picture of the factors influencing the teaching of human reproduction amongst teachers in the district in which I conducted my research. For example, in her survey Gogodi claimed that her Tswana culture would not influence her teaching in any way, and she confirmed this in her interview. However in her interview she then went on to say that she felt shy about naming the 'private parts' and this made it difficult for her to teach the children. She concluded that this was how she grew up. While I would not necessarily suggest that it was her Tswana culture that made her reluctant, it seems that cultural influences play a role here in her upbringing and to some extent influence her teaching. Taboos concerning the naming of the 'private parts' are common in African cultures as was discussed in Chapter 2, section 2.2.2. However I did note that although she felt reluctant, she did in fact use the biological terminology in class. So her culture or background influenced her feelings, but her beliefs about the importance of teaching the material (behavioural), and the consensus in her district about teaching human reproduction (normative) resulted in her somewhat tentatively using the biological terminology in class.

Member checks of qualitative data collected through participant observation and interviews also contribute to the credibility as well as the dependability of the data (McMillan & Schumacher, 2010; Merriam, 2009). According to these authors, the extent to which the researcher and participants agree on the description of the phenomena gives some indication of how credible and dependable the data are. Member checks were carried out on the interview transcripts. Hard copies of the interview transcripts were delivered to the case teachers and collected a few days later. I asked each teacher to check and confirm that what appeared in their interview transcripts accurately reflected their ideas. They reviewed their transcripts and made corrections that they felt more appropriately represented their perspective. This meant that any gap between what was recorded and what the teacher intended to say was closed. Most of the corrections that teachers made were however grammatical corrections. I did not attempt 'member checks' of my field notes because they were not simply a description of what happened but also a commentary on my observations, my private reflections. I did not want to influence their next lesson by asking them to read my comments in the field notes. However I did check immediately after a lesson on my interpretations of certain events that I had observed during the lesson, asking teachers whether my understanding of what was happening matched their understanding. I jotted down our conversations in my field notes. I followed up on these discussions during the interviews where I asked teachers to explain some interaction, or teaching or learning activity that I had observed. These discussions served as a check on my interpretation of data.

Another strategy is to spend sufficient time collecting data to build up as complete a picture as possible. Merriam (2009) suggests that when you see and hear the same things over and over and no new information emerges, then you have reached saturation point and can stop collecting data. This is very difficult to judge. I was continually anxious that I would miss some critical incident and so started off by trying to visit as many Grade 7 Natural Sciences lessons as possible for each teacher. I soon found myself unable to do so since I was visiting two to three teachers everyday. I then visited each case teacher for only one Natural Sciences lesson in a day, the lesson usually lasting about an hour (a double period). I was also concerned that I would not have a representative sample of teachers and contexts in my multiple case study and so added two cases where teachers taught in contexts that differed in some way to what I had previously encountered. These two special cases were discussed earlier in this chapter. I was trying to capture a wide a range of external and internal factors affecting the teaching and learning of human reproduction in outcomes-based and learner-centred ways. I was aware that I could never hope to capture a full range of these factors, and that was not the intention of my multiple case study.

Another strategy that would assist a reader to judge the credibility of my data is for me to reflect critically on myself as the primary instrument of research (Merriam, 2009), that is to state my positionality. At the end of the introductory chapter I discussed my position as an unknown female outsider from a university, and belonging to a different cultural group to some teachers and most learners, and I stated my philosophical position as researcher at the beginning of this chapter, thus revealing the perspective from which I have approached my research. I will reflect on this further in later chapters.

Peer review of one's research is also valuable and this has occurred in some way through the annual presentation of my work at our PhD weekends. Feedback from fellow PhD candidates as well as from other participants has been invaluable in making some difficult decisions for example to exclude most of the additional interview data, and providing feedback on my analysis of data.

There may be a number of threats to the internal validity or credibility of this study. These include the following:

Subject attrition:
This refers to subjects systematically dropping out or being lost during the investigation (McMillan & Schumacher, 2010). There was subject attrition before I started, in that some teachers that I initially selected as cases were no longer available, as discussed earlier. These teachers were chosen for a particular reason, for example, because of evidence from the survey questionnaire that religious influences might hinder their teaching of human reproduction. However there was no attrition amongst the teachers who were eventually selected to be cases in my multiple case study.

Researcher effects:
These effects are the deliberate and unintentional influences that the researcher has on the subjects such as differential treatment of the case teachers or, for example, the effect of the researcher's personality, interviewing style, language and culture on the case teachers. I have discussed researcher effects and how I have attempted to minimise these effects in section 5.2.2.3 and will report in subsequent chapters on any particular effects that I am aware of that affected the credibility of my findings.

***Subject effects*:**
This refers to the response of the research subjects to the researcher, and the changes in their behaviour in response to the research situation (McMillan & Schumacher, 2010). Respondents may attempt to show themselves in a positive light and to tell the researcher what they think the researcher wants to hear. In addition, teachers may alter their behaviour so as to present themselves to the researcher in the most positive manner. To reduce these subject effects, the questions I used in the questionnaire and interviews were worded so that they did not encourage expected 'favourable' responses. In addition, during observation and the interviews, teachers were assured that I was not passing judgement on their style of teaching. However teachers probably did alter their behaviour because they were the subjects of research. Thus Rennie attempted group work because he was using the module but indicated that he preferred to teach in a classroom where all his learners faced the front and worked on their own. I might well have recorded the type of behaviour that teachers thought I was looking for, as deduced from the learner's module and teacher's guide. However I did feel that, after one or two lessons, teachers tended to revert to their preferred teaching strategies. I have therefore considered these threats where applicable in the interpretation of my results.

5.3.3 Transferability (and external validity)

External validity refers to the extent to which the results can be generalised to other settings (Cohen, et al., 2007; Scaife, 2004). This can only be attempted in the survey and the 'other settings' will be other urban Gauteng schools. The small sample size and the specific urban setting of these schools means that these results cannot be generalised beyond this local context.

The case studies do not attempt to provide results that can be generalised. In qualitative research the researcher does not aim at the generalization of results but the extensions of understanding, that is providing detailed or 'thick' descriptions that enable others to understand similar situations and extend those understandings in subsequent research (Guba & Lincoln, 1983; McMillan & Schumacher, 2010). Lincoln and colleagues (2011) refer to the notion of transferability rather than external validity where a person reading a thick description can reach a conclusion about whether transfer into their situation is possible. Bassey suggests however that one can make 'fuzzy generalisations', that is general statements that are tentative, and which recognise that exceptions to the case are likely (Bassey, 1999). According to Bassey, as long as claims are tentative such as "In *some* cases it *may* be found that ..." (p. 12), and one suggests the possibility of finding a similar situation elsewhere, they are acceptable.

5.4 Ethics

An awareness of ethical considerations was extremely important in my research. I was intruding into the private world of others and this needed to be done with sensitivity and taking into account ethical considerations. Ethical and legal implications were addressed in the following way.

An application was made to the following bodies to conduct research in schools:

- Human Ethics Research Committee (Non-medical) - University of the Witwatersrand
- Gauteng Department of Education (GDE)

The research proposal and the research instruments were supplied to these bodies and all conditions imposed by these bodies were adhered to.

In the Wits ethics form the information supplied included the aim of the study and research questions, an outline of the research, the type of information to be gathered and the research instruments and methods used, information about the participants including how they would be selected and how informed consent would be obtained, benefits for and risks to the teachers, and confidentiality. This ethics application to the university appears in Appendix 7.

The ethics application to the GDE, which requested some similar information, can be found in Appendix 8. The GDE asked for more specific information relevant to the schools e.g. the names of the schools and the name of the district in which this research took place, as well as the amount of time that the researcher expected to be involved in each school. The research could only proceed after

the ethics committees of both organisations approved the research.

Gaining access to schools: Cohen et al. (2007) talk about the need to be honest and open, providing as much information about the aims, nature and procedures of the research as possible and to negotiate the process of collecting data. I took the following action.

- In order to gain access to schools, an application was made to the Director of the district in which the research took place, outlining the purpose of the research and requesting permission to work in selected schools (listed in the application) amongst the Grade 7 Natural Sciences teachers. I then met with the person who deals with applications for research in this district.
- The principals of the schools that I had selected were contacted and then visited so that I could outline the purpose of the research and the research design and we could discuss how this would impact on their school and in particular the Grade 7 teachers involved in the study. I was then able to request permission for the study.
- Teachers were informed of the purpose of the research and the way in which data would be collected before the situational analysis, survey and case studies so that they could choose to participate (or not) in the study. Subject information sheets were supplied with the two questionnaires (situational analysis and survey questionnaire).

Informed consent was obtained from the principals and the teachers involved in the study. (See appendices 7.3, 7.5, 7.8, 7.10, 7.15, 7.16). For the teachers this included consent forms for the situational analysis questionnaire, post-workshop questionnaire, observation and interview. The informed consent dealt with three ethical aspects, that is, the right to privacy, anonymity and confidentiality.

- Right to privacy: Cohen and colleagues (2007) suggests that privacy needs to be considered with regard to the sensitivity of the information given, the setting being observed and the dissemination of the information. The right to privacy was considered in this research by making the purpose and nature of the research clear both in discussions and by providing the participants with a subject information sheet and the informed consent form. The informed consent made clear the voluntary nature of their participation and their freedom to withdraw at any time. The participants indicated their consent to completing the questionnaires, to being interviewed and observed (or in the case of principals, for their teachers to be interviewed and observed), for audio recordings to be made of the interviews and lessons observed and for field notes to be made during lessons. They indicated that they understood that they could review and amend their questionnaire responses, interview transcripts and field notes if they wanted to. They gave permission for verbatim quotes and the material to be used for research or teaching only. Most schools (teachers and principals) gave permission for photographs to be taken of lessons in progress. They were assured that there would be no negative consequences as a result of this research.
- Anonymity and confidentiality: Anonymity means that the information provided should not provide any clue to either the researcher or another person as to the identity of the participants (Cohen, et al., 2007). The participants could not remain anonymous to me as researcher as the questionnaires were numbered and the numbers and names were recorded on a separate list. In addition I interviewed and observed many of the teachers and so their responses are known to me.

Thus while complete anonymity was not possible, I did assure the participants of complete confidentiality that is that no one other than the researcher (myself) would have access to individual data or the names of the participants, and that the data could not be linked to individual participants or schools, as recommended by several authors (Cohen, et al., 2007; McMillan & Schumacher, 2010). This was done by numbering the questionnaires and keeping separate lists of the numbers and names; and by using pseudonyms provided by the case study teachers or numbers for survey teachers and schools and any other persons referred to in the interview or observation transcripts to ensure they remained anonymous.

5.5 Conclusion

This chapter has described my philosophical position, my research approach and research instruments, my sample and how I conducted my research, paying attention to issues of consistency, credibility, and transferability, as well as how I conducted my research in an ethical manner. In the next chapter I describe how I collected and analysed the data that would enable me to answer my first research question, that is, 'To what extent do Grade 7 Natural Sciences teachers use outcomes-based and learner-centred approaches when teaching human reproduction?'

Chapter 6
Outcomes-based and learner-centred approaches

Outcomes-based and learner-centred education, according to the Department of Education (2002b, p. 99), provide the ideology behind the Revised National Curriculum Statement. In Chapter 3, the events leading up to the development and publication of the Revised National Curriculum Statement Grades R-9 have been described. In this chapter I will attempt to answer my first research question, i.e.

> **To what extent do Grade 7 Natural Sciences teachers use approaches that are outcomes-based and learner-centred during the teaching of human reproduction?**

To answer this question, I constructed a framework for the analysis of my observations and interviews.

6.1 Constructing a framework for analysis

In my case studies I observed the lessons of ten teachers and then interviewed these teachers.
The ten case study teachers are as follows:

Township schools:	**Mphety and Zama (same school) and Samkele, Thobz and Nsuku**
City schools:	**Jackie and Sipho (same school) and Gogodi**
Suburban schools:	**Rennie and Riana (same school)**

More details on these teachers and their schools can be found in Chapter 5, section 5.2.2 and Table 5.2.

My perception of the extent to which outcomes-based and learner-centred approaches were used was based on my observations of these ten teachers as recorded in field notes and in transcripts of the audiorecordings of the lessons. In the interviews, I was interested in teachers' perceptions of how they taught human reproduction and how they saw that this represented outcomes-based and learner-centred approaches. I used both my and the teachers' perceptions in my analysis.

In attempting to analyse the very large amount of qualitative data that I have, I developed a matrix for cross-case analysis, using matrices illustrated by Miles and Huberman (1994) as a guide. This allowed me to provide a summary of some aspects of my findings followed by narrative descriptions which allow for some elaboration. In order to construct the matrix I first developed two profiles of each of the ten teachers involved in the case studies. The profiles developed by Rogan and Aldous (2005) were helpful in developing the notion of levels of achievement of outcomes-based and learner-centred approaches. The first profile that I used represented the extent to which a teacher's lessons on human reproduction would enable learners to demonstrate some competence in critical and learning outcomes relevant to human reproduction. The second profile illustrated the extent to which lessons

would display learner-centred characteristics (see Appendix 8.1). In presenting these profiles, I was not passing any judgment on whether one approach was better than another. I was simply looking at the extent to which each teacher was using learner-centred approaches and whether outcomes were being achieved at a Grade 7 expected level of competence.

The matrix, providing a cross-case analysis of outcomes-based and learner-centred approaches, can be found in the analysis that follows. In the discussion of my findings, I frequently quote the teachers and learners, and use the following abbreviations to denote the source of the quote.

S – survey questionnaire; I – interview; F – field notes; LT – lesson transcripts

6.2 Teaching and learning materials: Module on human reproduction

The module on human reproduction that I developed, presented at the workshop described in section 4.5 of Chapter 4, and made available to primary school teachers, contained a modified version of outcomes-based and learner-centred approaches to teaching and learning. In so doing I already began to move away from pure notions of learner-centred approaches in which the curriculum content would emerge from the needs and interests of learners. The very fact that I was providing a module designed in advance of teaching and learning meant that my content was not a response to the needs and interests of learners in a particular classroom. Instead I followed the broad outline of some of the concepts listed under human reproduction during the senior phase of the RNCS (Department of Education, 2002a, p. 64), in which there was an attempt to ensure conceptual coherence, sequence and progression as advised by Chisholm et al. (2000).

At the workshop teachers were introduced to the module and they participated in some of the activities designed for grade 7 learners. The activities, which I refer to as 'tasks' in the module, are summarised in section 4.4.4. The teachers were given a copy of the learners' module and the teacher's guide (see Appendix 3). These teachers were invited to use any aspects of the module that they felt were useful when teaching human reproduction, but were not expected to use it. Some teachers photocopied and handed out the modules to their learners and used them throughout the period in which they covered the topic 'Human Reproduction'. Other teachers selected and copied some activities, whilst some teachers chose to use their own notes or textbooks as a guide. I therefore recognize that the extent to which these teachers used outcomes-based and learner-centred approaches was partially influenced by the learning support materials used.

In my analysis I will discuss briefly which outcomes were addressed through particular tasks in this module since many of the tasks were used by teachers. I have not provided any analysis of textbooks used or worksheets developed by teachers that would enable me to identify outcomes that could be achieved in the activities set out in those learning materials. My focus is on what actually happened in the classroom.

6.3 Outcomes-based approaches and levels of achievement

Outcomes-based education, as has so often been stated, means different things to different people. Killen (2007) believes that the reason for some of the confusion is that outcomes-based education includes three distinct elements i.e. a theory or philosophy of education, a systemic structure for education and a particular approach to education. According to O'Neil (1994), while there are many different perspectives on what OBE involves, the basic principle of OBE that people agree on is that teaching and learning should be driven by the outcomes that learners should demonstrate by the end of their schooling. I will restrict my analysis to this basic principle.

Outcomes have been described as what learners are able to do. In my analysis, I will be looking at the extent to which the critical outcomes and the Natural Sciences learning outcomes were achieved within the short time that human reproduction was taught to Grade 7s in Natural Sciences. However in this case it is not learners who are being assessed on an individual basis; rather I am looking at the extent to which the approaches used by each teacher during the teaching of human reproduction over a 3-4 week period allowed learners to achieve each outcome. I have used four levels of achievement of each outcome in my analysis i.e.

1 – not achieved
2 – partially or superficially achieved
3 – achieved
4 – comprehensive/high level of achievement

These levels are similar to those used in the assessment of the achievement of the learning outcomes in the RNCS (Department of Education, 2002a). In the matrix that I have developed for my cross-case analysis, I have provided descriptions of what each level represents in relation to each critical outcome and each assessment standard for the Natural Sciences learning outcomes.

The developmental outcomes (DOs) have not been included as a category in my analysis. Three development outcomes were not considered relevant for Grade 7 learners while studying human reproduction: to reflect on and explore a variety of strategies to learn more effectively (DO 1), explore education and career opportunities (DO 4) and develop entrepreneurial opportunities (DO 5) (Department of Education, 2002a, p. 1). Developmental outcome 2 (DO2), responsible citizenship, was considered relevant. With the HIV/AIDS pandemic rampant in South Africa, as well as other sexually transmitted diseases, and with teenage pregnancy a source of great concern, responsible citizenship in terms of responsible sexual behaviour in local communities was considered an important outcome. I was interested in the extent to which teachers addressed these issues, exploring attitudes and values in their teaching of human reproduction. Discussions of responsible citizenship were addressed in tasks 6 and 13 of the module and the achievement of this outcome will be linked to critical outcome (CO) 1, as will be discussed later. My analysis of the extent to which teachers addressed values and attitudes, will be discussed particularly in Chapter 7. Developmental outcome 3, concerning cultural sensitivity across a range of social contexts, is also appropriate. Sensitivity towards one another's cultures concerning beliefs and practices around human reproduction should be

an important outcome of teaching human reproduction. I will therefore link this outcome to Natural Sciences learning outcome 3 where I look at the extent to which learners understand that the learning of human reproduction is taking place within different cultural contexts which need to be respected; in the section on cultural and religious beliefs and practices towards the end of this chapter and in Chapter 9.

The Natural Sciences outcomes are an extension of the critical outcomes and all these outcomes should, according to the RNCS, be achieved through the teacher's use of learner-centred approaches. Since these are all closely linked, I have provided a brief summary in some sections and have indicated in which section I have provided a more detailed analysis.

In the next section I will describe how I analysed my data and what I found about the extent to which the ten case study teachers used outcomes-based approaches while teaching human reproduction.

6.3.1 Critical outcomes

The critical outcomes represent the life skills that it is believed all individuals living in a democratic society should acquire at increasing levels of complexity over their lifetimes. These life skills can be developed by teachers over a period of time. While the 3-4 week period of teaching human reproduction provided me, through observation, with a 'window' into the teaching and learning approaches employed by these teachers, the life skills evident would also be an indication of the teaching and learning approaches that preceded my observation period.

In the interviews (I), I asked my case study teachers whether their approach to teaching and learning was outcomes-based. If so, I asked them in what way it was outcomes-based. The teachers were mostly extremely vague in their response. Sipho, for example, claimed that:

> The critical and developmental outcomes were achieved in a holistic fashion. They (the learners) are now very very critical and observant. (I- Sipho)

Some teachers referred to ideas associated with learner-centred approaches such as responding to the needs and interests of learners. Very few teachers spoke about how their teaching was designed to enable learners to achieve the critical and developmental outcomes and the learning outcomes for the Natural Sciences.

The cross-case analysis of the achievement of the critical outcomes appears in Table 6.1. When one looks at individual teacher's profiles (Appendix 8) and the cross-case analysis, it is immediately evident that each teacher's approach did not fall neatly into categories of being outcomes-based or not. Teachers varied in the extent to which they enabled different outcomes to be achieved. The use of teaching and learning materials that were designed to allow certain outcomes to be demonstrated amongst learners probably influenced what the teachers did in class, particularly while I was observing their teaching.

I will discuss the findings below, but to avoid too much repetition, will elaborate on some of them only when discussing the achievement of Natural Sciences outcomes and the use of learner-centred approaches.

Table 6.1: Cross-case analysis of the extent to which the case study teachers used approaches that enabled critical outcomes to be achieved.

Critical Outcomes	Achievement of outcomes during human reproduction lessons			
	1 not achieved	**2 partially or superficially achieved**	**3 achieved**	**4 comprehensive/ high level of achievement**
CO 1: identify and solve problems and make decisions using critical and creative thinking *about one or more relevant problems in society related to human reproduction.*	*No problem-solving and decision-making during lessons or in homework.* **Samkele Mphety Zama**	*Identify and discuss problems, suggest solutions. No decision-making leading to action* **Jackie, Sipho Gogodi, Thobz Nsuku, Rennie Riana**	*Identify and investigate problems, some critical and creative thinking in order to make decisions about a solution*	*Significant amount of time exploring one or more human reproduction problems, using critical and creative thinking to solve problems and take decisions leading to action*
CO 2: work effectively with others as members of a team, group, organisation and community	*Learners work individually or sit in a group; some interactions but no teamwork* **Samkele**	*Some interaction amongst members of group and some teamwork but learners more often work on their own or interact with teacher.* **Jackie Zama**	*Members of group work together often and most learners actively involved; some teamwork evident* **Sipho, Gogodi Mphety, Thobz Nsuku, Rennie Riana**	*Effective team work: group work together to discuss questions, perform tasks and complete activities. Cooperation evident with all members contributing and assisting one another.*
CO 3: organise and manage themselves and their activities responsibly and effectively	*Learners told how to do tasks and guided through each part of the task. Do not work independently.* **Mphety, Zama Samkele**	*Learners manage themselves and their activities to some extent but need frequent guidance* **Sipho, Nsuku**	*Learners manage themselves and their activities responsibly but need some guidance* **Jackie, Gogodi, Thobz, Rennie, Riana**	*Learners manage themselves and their activities responsibly and effectively with very little or no guidance*
CO 4: collect, analyse, organise and critically evaluate information	*Learners given information e.g. in the form of notes, worksheets or textbooks and do not collect information from other sources* **Mphety**	*Learners given some information and also collect information from resources at home and/or in school for a few short activities and provide a brief analysis.* **Sipho, Gogodi Samkele, Mphety Zama, Thobz Nsuku, Rennie Riana**	*Learners collect information from a variety of sources both in and out of school in order to complete short and more substantial activities or research projects, and analyse and organise this information.* **Jackie**	*Learners collect a substantial amount of information from a variety of sources both in and out of school, in order to complete activities or research projects, and analyse, organise and critically evaluate their information.*

Critical Outcomes	Achievement of outcomes during human reproduction lessons			
	1 not achieved	**2 partially or superficially achieved**	**3 achieved**	**4 comprehensive/ high level of achievement**
CO 5: communicate effectively using visual and language skills in various modes *(symbolic omitted here)*	*Very little communication by learners about human reproduction. Learners mostly listen*	*Some communication using visual and/or language skills e.g. answering questions verbally or in notebooks. More time spent listening.* **Samkele**	*Effective communication expressing questions, ideas, understanding using visual and/or language skills in written and verbal modes* **all other teachers**	*Frequent and very effective communication expressing questions, ideas, understanding using visual and language skills in written and verbal modes*

CO 1: Critical and creative problem-solving and decision-making

(Learners should be able to) Identify and solve problems and make decisions using critical and creative thinking

The ability to solve problems and make decisions using critical and creative thinking is an important life skill that requires the use of higher cognitive levels of thinking. Problems that require solving come in many forms and may be purely theoretical or may be actual problems. Some may be easily solved and others may require extensive analysis. I was interested in whether the Grade 7 learners in my case studies used critical and creative thinking to solve problems that they had investigated, and made decisions leading to action (CO 1, Table 6.1)

In my analysis, I have used the notion of problem-solving and decision-making found in the literature on scientific literacy. I therefore looked at whether teachers provided learners with the opportunity to identify real problems in society related to human reproduction. Were learners given the opportunity to examine the problems in a critical manner i.e. in such a way that they could see that there were many factors contributing to the problem and no easy solution? Did they discuss ways to solve those problems in creative ways, and did they make informed decisions on what action they should take to help solve the problem?

My observations and interviews indicated that learners were achieving this outcome, but only at a superficial level (See CO 1, Table 6.1). Neither the module nor any other activity designed by teachers or appearing in textbooks demanded any substantial problem-solving. There was a mild form of decision-making based only on discussions amongst learners, rather than on data collected and analysed around a problem. In the module, task 6 provides learners, at a fairly superficial level, with the opportunity of identifying a problem concerning various behaviours associated with people's sexuality and making decisions on appropriate behaviour. Task 13 likewise asks for decisions on responsible behaviour. Teachers using these activities encouraged their learners to share their ideas and decide on what they considered was important with regard to responsible behaviour. These two tasks address not only decision-making in CO 1, but also responsible citizenship in DO 2. Gogodi, for

example, asked her learners

> What is responsible behaviour? … How many of you want to have babies? How many of you want to be a father/mother? So what will be your responsible behaviour as an adolescent girl or boy?.... What is it to have responsible behaviour if you want to continue your education?
>
> (Gogodi, T – 29/8)

She asked her learners to discuss this issue in groups. Each group constructed a statement which they then shared with the class. Their ideas included the need to resist peer pressure and to wait until the time was right (for sexual activity). Jackie and Sipho, while not using the module, also encouraged their learners to identify problems around behaviour, and take a position. Jackie challenged her learners' views through questioning in class discussions and they had to explain their position. After a discussion on virginity testing of girls in some South African cultures such as amongst the Zulu, she asked the boys how many wanted to marry a virgin. Most of them put their hands up. Then she asked how many of them would be virgins when they married, only some put their hands up. One boy said "Girls must stay pure, boys must practice" (F – 7/8). She asked her class where teenage pregnancies start and they said at parties.

Samkele, Zama and Mphety did not pay particular attention to this aspect in the lessons that I observed. Samkele and Thobz tended to give advice such as:

> You can not say "Haai I do not want a child" if you allow a boy to come to your body. I do not want you to be ignorant. If you let a boy come inside of you, there will be trouble." (Samkele, T – 21/8)

> The important thing is for us to get partners but at the right time. Do not let your studies suffer because you are now concerned about getting a partner - angithi *(do you agree)* … It's not just fun having a baby, it costs a lot of money. So it is best to plan your family. (Thobz, T – 7/9)

The teachers were concerned with learners making responsible decisions (CO 1 and DO 2) about when they became sexually active. Tasks 6 and 13 and class discussions provided opportunities for learners to talk about these ideas, but there could be no evidence that a responsible decision had been made! Problem-solving and decision making skills using critical and creative thinking were therefore not developed in any substantial way by the case study teachers during the teaching of this module.

CO 2: Effective teamwork/ group work

(Learners should be able to) Work effectively with others as members of a team, group, organisation and community

In the context of this study, I looked at whether teachers gave learners the opportunity to work together in a team or group and whether the learners were working together effectively. There is no clarity on what the Department of Education considers to be effective group work but they do view group work as important, as seen in the following statement:

> ... teacher is facilitator; teacher constantly uses groupwork and teamwork to consolidate the new approach (Department of Education, 1997b, p. 7).

Learners were seated in such a way that group work was easily organised in most classrooms. This

seems to be the trend around the country (Rogan, 2007; Taylor & Vinjevold, 1999). In the classrooms of six teachers, small groups were seated around three or more desks or around lab tables. In the classrooms of another two other teachers (Nsuku and Thobz), learners sat facing one another at desks in long rows. Nsuku also taught one class in a classroom where all the desks faced forward and learners swung around to face each other for group work. Two teachers (Mphety and Zama) taught in classrooms without desks. The learners pulled their chairs around so they could face one another for group discussions. In all classes, learners easily moved into groupwork activities.

In my analysis I was interested in whether the individuals in a group actually worked together, with each person contributing. Teamwork amongst members of the group could be seen when they interacted with one another, discussing questions, sharing ideas and planning and completing activities. The categories I used in my analysis of whether learners were working together effectively can be seen in Table 6.1 next to CO 2.

Effective team work suggests that learners should be working cooperatively in their groups. In the module, most activities are designed to encourage some cooperative learning. Learners work on their own with feedback from two others (task 10), in pairs (tasks 1, 9, 11) or groups (tasks 2, 3, 5, 6, 7) sharing their ideas and producing some sort of response such as written descriptions (tasks 2, 6, 9, 10) a role-play (task 3), and a letter (task 10). Most teachers used these and other activities and provided opportunities for their learners to talk with one another and to plan together, for example for role-plays.

Learners actively contributed to discussion and the completion of tasks amongst group members in most teachers' classes (Sipho, Gogodi, Mphety, Thobz, Nsuku, Rennie and Riana). They discussed, decided upon and produced their codes of conduct, enthusiastically engaged in the tasks related to physical and emotional changes during puberty, acted out their role-plays on emotional changes, worked together on answering questions in the card game, wrote letters as Dr Naidoo (in some case studies), and worked together on a research project searching for information on STDs (sexually transmitted diseases). There were, in most activities, some learners who did not participate. In Jackie and Zama's lessons, there was less teamwork and more individual work and teacher-learner interactions, whilst Samkele's lessons tended to involve class discussions led by Samkele. Similar to the teachers in the PEI studies (Taylor & Vinjevold, 1999), Jackie, Zama and in particular Samkele, tended to be more teacher-centred in that, while learners sat in groups, they listened to and responded to their teacher. Jackie's class did engage in a research project in groups and Zama's class, on three occasions engage in meaningful group discussion. Unlike the learners observed in the PEI research where discussion amongst group members was rare and often meaningless, learners in the Grade 7 classes of the remaining seven teachers did engage in substantial and meaningful discussion during their group work. This discrepancy in findings between the two studies may be due to several factors. Firstly the PEI studies were conducted early in the implementation of C2005 when teachers and learners were still unused to group work. My case studies took place almost ten years later when teachers may have been exposed to workshops on group work and may have been engaging their learners in group work for some time. In addition, the activities in the learning support materials (the

module and teachers' own worksheets) were designed for interaction amongst learners, and some teachers using this module who may not normally have used group work, may have done so while using the module. Thus Rennie indicated that he did not normally engage in so much group work, because he believed individual learning was more beneficial. Nevertheless, as in Rogan's study (2007), most teachers and learners appeared to be comfortable with group work, indicating that they had been participating in group work for some time, and learners did work together, talking, helping one another and answering questions.

Certain features of cooperative learning were not seen, for example the arrangement of learners in groups in which there is at least one academically strong learner, one weak learner and several average learners. This sort of deliberate arrangement into mixed ability groups was not evident in any classes.
Another feature of cooperative learning is the allocation of specific tasks to each learner in a group to ensure interdependency and the contribution of each member of the group. This was only seen when learners in some teachers' classes produced role-plays with specific roles (task 3).

Considering the above, I therefore decided that learners in seven of the case studies (i.e. Sipho, Gogodi, Mphety, Thobz, Nsuku, Rennie and Riana's) had achieved this outcome at a level appropriate for Grade 7. This was not surprising since groupwork was commonly viewed as the defining activity of outcomes-based education (Aldous & Rogan, 2009) and most of the teachers clearly engaged their learners in groupwork of some sort on a regular basis.

CO 3: Organise and manage activities

(Learners should be able to) Organise and manage themselves and their activities responsibly and effectively

The extent to which learners were able to organise themselves and their activities responsibly and effectively would be evident in both the work of individuals and the group. For this outcome, I was interested in whether learners only worked on a task when closely controlled by a teacher and/or were given extensive guidance; or were able to plan and manage their activities effectively on their own or in their team after being given instructions on the task to be carried out or the work to be completed. The categories I devised for this outcome can be seen in Table 6.1 for CO 3.

The ability to organise and manage activities responsibly and effectively can be developed in the classroom through careful instruction from teachers, for example on how learners could organise work in their notebooks or plan and carry out activities or research individually or together. This outcome can be closely linked to the Natural Sciences learning outcome 1.

At a very simple level, learners organised their materials by spending a great deal of time cutting and pasting worksheets into their notebooks, particularly in the schools that supplied many worksheets to their learners. This seems to be a common activity in primary schools. Since worksheets were the only learning materials that learners kept for their own use at home in the ten case studies, this activity did ensure they did not get lost or muddled up – an organisational feature. For learners using the module

(or teachers' worksheets and textbooks), all the activities provided opportunities for them to organise and manage themselves, simply because they had to complete an activity. In the module (Appendix 3.1) however, the role-play (task 3), the sugar baby project (p. 19) and the contraceptive (task 14) and STD research project (p. 20) required the development of this skill beyond a superficial level.

In the classrooms of three teachers (Mphety, Samkele and Zama), beyond cutting and pasting, learners did not demonstrate effective and responsible organisational and management skills at a level suited to grade 7s. These skills were most evident in the classes of five teachers (Jackie, Gogodi, Thobz, Rennie and Riana) where learners had to organise and manage their activities while planning and carrying out investigations of sexually transmitted diseases or the costs of caring for a baby (Thobz's class). This will be discussed further in the analysis of the achievement of learning outcome 1.

CO 4: Processing information

(Learners should be able to) Collect, analyse, organise and critically evaluate information

The ability to collect, analyse, organise and critically evaluate information i.e. to process information, is an important life skill. I was interested in seeing whether this skill was developed during the teaching and learning of human reproduction. Activities in the module provided some opportunities for the achievement of this outcome. In the module, tasks 4 and 8 required learners to analyse and interpret frontal and side views of reproductive organs; task 9 and 10 to analyse and extract information from text; and tasks 14 and the STD research project to collect and organise information from other resources. Thus these tasks would provide opportunities for learners to achieve this outcome at a fairly basic level.

This outcome can also be linked to students' research skills used in the Natural Sciences learning outcome 1. I looked at whether learners participated in activities in which they collected information from a variety of sources either within the school or outside the school. I considered whether learners analysed that information, organised it in ways that would be understandable to others e.g. in charts, graphs, and written reports; and whether they were able to critically evaluate that information. The categories selected for each level can be seen in Table 6.1 next to CO 4.

All of the teachers at some stage during their lessons gave learners the opportunity for analysis and interpretation, whether by extracting and using information from worksheets, textbooks or the board. Mphety's classes were not asked to collect information from other sources, whilst all the other teachers at some point asked learners to collect some information from home, clinics or other sources. The development of this skill through investigations will be discussed under LO 1 in the next section (6.3.2).

CO 5: Communication

(Learners should be able to) Communicate effectively using visual, symbolic, and/or language skills in various modes

The ability to communicate effectively is an important life skill, enabling people to share ideas, emotions and beliefs and to learn from as well as influence others. In the Natural Sciences, the most

frequently used communication skills are visual and language skills and I will only consider these two skills here. These skills can be used in various modes such as verbally e.g. discussions, debates and role-plays, and in written modes e.g. written discussions and explanations. Since there is an 'and/or' option for this critical outcome, any form of visual and verbal communication amongst learners or between learners and their teacher was considered in my analysis. My categories in Table 6.1 are listed next to CO 5.

In the module, all the tasks require some form of communication whether verbal (discussion - tasks 1-11, 13, 14, sugar baby project and STD project), visual (tasks 3, 4, 8, 12), or written (tasks 2, 4, 8, 10, 14, sugar baby and STD projects).

There was a lot of verbal communication in most classes. Learners, particularly when they were in groups, chattered freely about their ideas. The relevance of this topic to their lives and their interest in the topic meant they wanted to talk about it. In the process, they were developing language skills. When they were referring to biological structures, they were developing a new vocabulary associated with the sciences. There were however a small number of learners in most classes that remained silent because they found this topic too embarrassing to talk about and so the skill of verbal communication was not practiced much amongst these learners.

Written communication was found in learners' answers to questions in their notebooks, and in activities which required some understanding of a situation and the ability to communicate that understanding, for example in the Dr Naidoo letters. These letters were attempted in a number of classes but learners' ability to express their ideas in writing in English tended to be very limited.

The ability to communicate using visual skills and to interpret visual stimuli could be considered in terms of pictures the learners looked at, for example pictures on external changes during puberty and comparing and interpreting the side and frontal views of the reproductive organs. In addition when learners drew and labelled their drawings, they were to some extent developing visual skills through which they could communicate their understanding of structures.

I considered that all teachers except for Samkele gave their learners sufficient opportunity to achieve this outcome at a Grade 7 level. Learners in Samkele's classes did communicate their questions verbally to Samkele but there was limited group discussion during which a larger number of learners could express their ideas. Thus verbal skills were less developed. The language in which verbal communication was conducted varied i.e. English in the suburban school and mixed mode in the city and township schools. This will be discussed later (Chapter 9, section 9.3.3) when I look at the use of the language of teaching and learning versus the use of the home language during class and group discussions.

Critical outcomes not included in the analysis

Two critical outcomes were not considered in this analysis. While the use of science and technology effectively and critically showing responsibility towards the environment and the health of others (CO

6) is an important outcome of science teaching, it was an outcome that only had some relevance in this module where the focus was not on the use of science and technology. A minor way in which this outcome could be achieved would be in considering the safety and suitability of the design of sanitary pads, tampons and contraceptives, and healthy and appropriate ways to get rid of these products of technology after use. However this was a minor outcome in this context and therefore not analysed.

Critical outcome 7 (learners should demonstrate an understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation) was also not considered a central outcome to be achieved through teaching learners about human reproduction. Once again one could find links e.g. HIV/AIDS as a global problem needing a global solution. However this was not considered as a central focus for this module.

6.3.2 Natural Sciences Learning Outcomes

The Department of Education points out that there are links between critical outcomes and the Natural Sciences learning outcomes i.e. as learners work towards the achievement of certain learning outcomes, they are also demonstrating certain critical outcomes (Department of Education, 2002a, p. 8). These learning outcomes and their assessment standards for Grade 7 were discussed in Chapter 3. The cross-case analysis of the achievement of the Natural Sciences learning outcomes appears in Table 6.2 below.

Table 6.2: Cross-case analysis of the extent to which learning outcomes were addressed in class and thus could be achieved by learners during the teaching of human reproduction

Natural Sciences learning outcomes & assessment standards	**Achievement of outcomes during human reproduction lessons**			
	1 not achieved	**2 partially or superficially achieved**	**3 achieved**	**4 comprehensive/ high level of achievement.**
LO 1: Scientific investigations (& LO 3 Science in Society investigations)				
1. Planning investigations	*Learners do not plan any investigation. Any investigations simply involve following instructions.* **Sipho Mphety Zama**	*Learners follow the teachers' instructions or the worksheet, but plan how to carry out these instructions in their context.* **Jackie, Samkele, Thobz, Nsuku, Rennie, Riana**	*Learners plan their own investigation of a given task, with some assistance from the teacher.* **Gogodi**	*Learners plan very thoroughly their own investigation/s.*
2 & 3. Conducting investigations and collecting	*Learners do not carry out any investigations.*	*Learners collect information from sources at home and/or in school for one or more short activities,*	*Learners collect information from sources both in and out of school in order to complete short and*	*Learners collect a substantial amount of information from a variety of sources both in and out of school, in*

Natural Sciences learning outcomes & assessment standards	Achievement of outcomes during human reproduction lessons			
	1 not achieved	**2 partially or superficially achieved**	**3 achieved**	**4 comprehensive/ high level of achievement.**
data; evaluating data and communi-cating findings (also CO 4)	**Mphety**	*record the information in their notebooks and/or communicate their findings in class discussions.* **Sipho Zama**	*more substantial activities or a research project. They record this information, provide a brief analysis, draw conclusions and communicate their findings in some way.* **Jackie, Gogodi Samkele, Thobz Nsuku, Rennie, Riana**	*order to complete activities or research projects. They analyse, and organise their information, critically evaluate their data, draw conclusions and communicate their findings effectively to other learners or to a wider audience.*
LO 2: Constructing science knowledge				
1. Recalling meaningful information when needed	*Learners are not asked to recall any information about human reproduction.*	*Learners are sometimes encouraged to recall information about human reproduction.* **Mphety Thobz**	*Learners share their ideas and knowledge relevant to the topic being discussed.* **Sipho, Samkele, Zama, Nsuku, Rennie**	*Learners frequently share their ideas and knowledge relevant to the topic being discussed.* **Jackie, Gogodi Riana**
2&3. Categorising and interpreting information	*Learners record new information but do not analyse and interpret this information.*	*Learners make some attempt to analyse and interpret the information they are provided with.* **Samkele Mphety**	*Learners identify some key ideas; organise, analyse and interpret the information both verbally and in their written work, make some inferences and change the information from one form to another.* **Sipho, Jackie Gogodi, Zama Thobz, Nsuku Rennie Riana**	*Learners identify key ideas; find patterns; organise, analyse and interpret the information both verbally and in their written work, make inferences, change the information from one form to another and relate it to other information.*
4. Applying knowledge to new problems	*Learners do not apply knowledge gained to new problems.* **Samkele Thobz**	*Learners sometimes apply the knowledge gained to new situations.* **Sipho, Jackie Mphety, Zama Nsuku, Rennie Riana**	*Learners apply the knowledge gained to understand new situations.* **Gogodi**	*Learners continually apply the conceptual knowledge gained in order to understand new situations and solve new problems.*
LO 3: Science, society and the environment				
1. Understanding science as a human	*Learners do not discuss / or do not respect different beliefs and practices*	*Learners show respect for the beliefs and practices of different cultures with*	*Learners listen to and respect one another's beliefs and practices based on traditional*	*Learners actively search for more information on the beliefs and practices*

Natural Sciences learning outcomes & assessment standards	Achievement of outcomes during human reproduction lessons			
	1 not achieved	**2 partially or superficially achieved**	**3 achieved**	**4 comprehensive/ high level of achievement.**
endeavour in cultural contexts	*related to human reproduction*	*regard to human reproduction but different perspectives/ beliefs/ practices only occasionally referred to.* **Mphety, Thobz, Rennie, Riana**	*(and scientific) understandings of reproduction amongst different cultures/ethnic groups and compare different interpretations of events.* . **Jackie, Sipho Gogodi, Zama Samkele, Nsuku**	*of different cultural groups, and listen to and respect one another's ideas based on traditional (and scientific) understandings of reproduction amongst different cultures/ethnic groups and compare different interpretations of events.*

Learning outcome 1: Scientific investigations (LO 3: Science in Society investigations)

Scientific investigations are central to science education and can be carried out in many different ways. The first assessment standard (AS) for Grade 7 learners however narrows down the type of investigation that learners should be assessed on, to the concept of fair testing.

> AS 1 Planning investigations: learner plans simple tests and comparisons, and considers how to make them fair.
>
> AS 2 Conducting investigations and collecting data: learner organises and uses equipment or sources to gather and record information.
>
> AS 3 Evaluating data and communicating findings: learner generalises in terms of a relevant aspect and describes how the data supports the generalisation.
>
> (Department of Education, 2002a, p. 17; 2003, p. 69)

It is not clear what is meant by comparisons in this context, but the simple and fair tests relate to controlled experiments in traditional science. Since controlled experiments were not appropriate for this topic (except perhaps experiments to identify the sanitary pads with the greatest absorbance, or the strongest condoms), I considered excluding LO 1 from the analysis. However I decided to take a broader view of what counts as a scientific investigation, considering some of the descriptions of LO1 provided in the RNCS Natural Sciences (p. 8). In the Natural Sciences document, competence in LO 1 can be seen when the learner searches for information from both written and human resources, uses appropriate materials or research instruments to collect data, and carries out investigations that allow them "to solve problems in scientific, technological and environmental contexts" (Department of Education, 2002a, p. 8). Since the topic was human reproduction, these investigations could equally be placed under LO 3 since they relate to exploring science in a human context or science in society (Aldous & Rogan, 2009). They do not however fit with the LO 3 assessment standards for Grade 7 and so I have placed investigations in society under LO1.

For AS 1, I therefore took into account any situation in which learners planned an investigation involving searching for information, and looked at the extent to which learners were dependent on the

teacher's instructions or planned the investigation independently (see Table 6.2). AS 2 and 3 essentially addressed the same outcome as CO 4 (and relate also to CO 3 and 5). I have therefore combined these two categories in my analysis and I explored the achievement of AS 2 and 3 and CO 4 together during my discussion of the Natural Sciences LO 1. I considered the extent to which learners conducted investigations by collecting information from textual or electronic sources e.g. from books in the library, classroom or home, from the internet in a computer lab or on their cell phone, or from pamphlets obtained at clinics; as well as from human sources e.g. family and friends, community and nurses at clinics. I then looked at what the learners did with their data. Did they simply record it in their notebooks and/or bring it back to class for class discussion, or did they work with their data, analysing and evaluating their data, drawing conclusions and communicating their findings in an appropriate way e.g. in posters, talks and written assignments?

The types of investigations learners engaged in ranged from simply finding out information from their parents to more substantial investigations. Teachers using the module, for example, involved their learners in investigations if they sent their learners out to collect health pamphlets on contraceptives, and asked them to report on their findings on how safe various contraceptives were and how condoms protected against sexually transmitted diseases (STDs) (task 14) and/or collected information on three STDs, and tabulated comparisons of these diseases (the research project). These applications and investigations all related to science in society. These activities provided learners with an opportunity of developing the skills of finding information, collecting and analysing it and reporting on it in written assignments i.e. the activities enabled learners to achieve, at a modest level, learning outcome 1. However no significant problem-solving or decision-making was involved in these tasks. Some teachers used one or both of the investigations described above but they also asked learners to carry out other investigations and these will be discussed below. I searched for evidence of investigations in the field notes, transcripts and interviews in each case study since I was not able to attend every lesson and may have missed some instructions and activities. In the interviews, several teachers reported on investigations that students were in the process of carrying out when my study ended.

Planning an investigation (LO 1, AS 1)

I found no evidence of Mphety's learners being asked to conduct any investigations. They therefore did not appear to have been given opportunities to develop and demonstrate their competence in investigative skills. In Sipho and Zama's classes, I did not find evidence of any planning of an investigation by learners. They simply followed the teacher's instructions e.g.

> Go home and look for any pictures of girls and boys showing changes. (F - Sipho, 1/8)

The skill of planning a science in society investigation was partially achieved in five cases, i.e. there was some independent planning of the investigation but also significant guidance from the teacher. Thobz's learners, for example, were given a scenario: "You are pregnant, alone, chased out of your family. How are you going to make a living? Go to Checkers or Pick 'n Pay. Find the cost of everything a baby needs e.g. food, nappies, baby clothing. Then find out the cost of accommodation and maintenance e.g. a creche or nanny". This was a group project and so required some planning concerning where they would go and who would collect this data. Nsuku's sugar baby project

(Appendix 3, p. 19 of module) and Samkele, Riana and Rennie's STD research task (Appendix 3, p 20 of module) all required some level of planning by learners, either individually or as a group, but as with Thobz's activity, the learners were given instructions on what to do. Jackie also gave her learners an STD project, but there appeared to be more independent planning by learners, as was the case with Gogodi's portfolio task on initiation and customs.

Conducting the investigation: collecting, analysing, organising and recording the data; evaluating the data, drawing conclusions and communicating the findings (LO 1, AS 2 & 3 and CO 4)
Mphety did not involve her learners in any type of investigation. The remaining teachers did however provide opportunities for at least some of these skills to be developed. The tasks set by the teachers allowed learners to partially achieve or achieve this outcome at Grade 7 levels as specified by the assessment standards. The difference lay in the extent of the investigation, processing of information and reporting back in written and verbal form.

Two teachers were considered to have only partially reached this assessment standard. Sipho's learners did collect data (pictures) at home and showed these pictures to other learners in class. Sipho then used these pictures to illustrate physical changes in boys and girls during puberty. He considered the collection of pictures as an investigation. He had a very superficial and partial notion of what an investigation entailed. Zama's investigation involved a little more research i.e. they had had to go home and find out from parents about circumcision and menstruation and also find out about one contraceptive. However there was no evidence of any processing of this information, simply a verbal report back.

The remaining teachers were considered to have reached the Grade 7 level specified by this assessment standard, and they did so through collection of data and reporting back as with Zama and Sipho, but also through more substantial assignments.

Parents were useful sources of information in several classes for short activities. Riana's learners had to ask their mothers and sisters about their experience of menstruation, for example how long they menstruated, and whether they felt pain. In Jackie's classes, questions that were raised in class (e.g. do ladies get sexually aroused, what are testicles, how big are the eggs, what happens to the eggs, what is abortion, what is menstruation?) also became the subject of learners' investigations. Learners wrote down these questions and then had to go home and ask their parents for answers to these questions. There was limited feedback from Jackie's learners in the next lesson since most children said they could not talk to their parents since their parents would become suspicious. Those who did ask about abortion mostly asked their mothers, who gave a variety of responses. For example, one mother told her son to ask his father, another changed the subject, and yet another warned her daughter that it was none of her business (but if she got pregnant, she would have to leave the house), and informed the child that God did not want them to do this. Only two reported talking to their mother, and two obtained information from books at home e.g. nursing books. This practice continued throughout the teaching of human reproduction. Learners had to find the answers to their own questions e.g. in the third observed lesson, learners had to find the answers to the following questions that they had asked:

> How is sperm produced and where is it stored? .... How do boys know if they are virgins? ...Can the hymen grow back if it's cut? (F - Jackie, 3/8)

Jackie felt this made her lessons very learner-centred, that is, learners going out and collecting information from their parents and other human and material resources. When learners collected this type of information from their parents and other family members, there was a verbal report back in class.

Jackie, Samkele, Nsuku, Riana and Rennie's classes also carried out a more formal investigation on sexually transmitted diseases (STDs) as an assignment which would be assessed. They collected and recorded information from clinics, books and the internet, and then illustrated, described and compared the methods of infection, symptoms and treatment of these diseases in a written report. In Jackie's class, each group had to research a different sexually transmitted disease, collect their data and present their findings to the class on a poster. They were given time to search for information in the computer room, or collected pictures from a variety of sources at home. In her interview, she said the learners "did not skimp on it", "ran with it" and "the majority loved it". "They loved finding the most gross pictures they could find". This took place after my final observation of her classes.

> So a lot of the work they did themselves. Like I said, even that STD, the posters and the presentations they did, every single bit of that came from them. Then I made the opportunity for them to be in the computer room and the net, but they took the opportunity to do it. Not to fool around or whatever. So in terms of that taking responsibility for your own information, for your own education, this really did that for them. And I do not think for me that's going to change when I teach this. (I - Jackie)

The investigation that Thobz's class were given (the supermarket project described above) required planning, collection of data from a variety of sources, and recording of that information. The learners worked in pairs and the teacher used the data from one pair of learners in class to show learners how to analyse the data, and work out the monthly costs of having a baby (for example these two boys found that the cost of looking after a baby per month was R1500 while the child support grant was only R200 and so they concluded that until they were able to work and bring in an income, they would be unable to support a baby on the government support grant). All learners in Thobz's classes had to submit their written project. Learners in Gogodi's classes investigated initiation and customs with respect to puberty and wrote a report on their findings. This report was assessed for their portfolio.

One can see in these investigations that learners have demonstrated some of the critical outcomes e.g. Thobz's classes working in teams to collect information from shops and creches (CO 2); Thobz, Jackie, Nsuku, Samkele, Riana and Rennie's learners working either individually or as a team and managing themselves and their investigation responsibly and effectively (CO 3), collecting, analysing, organising and critically evaluating their information (CO 4) and communicating it mostly using written language skills (assignments) but also visual (and written) skills (posters). Thus in these investigations, both learning outcome 1 and several critical outcomes have been demonstrated.

The investigations can also be seen as science in society (LO 3) investigations, as argued at the start

of the discussion on LO 1. These teachers seemed to allow for the achievement of learning outcome 3 at a slightly higher level than the Grade 8 and 9 teachers described by Aldous and Rogan (2009), i.e. closer to Aldous and Rogan's level 3 where "learners actively investigate the application of science and technology in their own environment mainly by means of data gathering methods such as surveys" (p.66). In the Mpumalanga schools, the focus was on the content, and in a few cases this was followed by some application in society. My research took place about six years after the research in these Mpumalanga schools and the type of appropriate professional development that Aldous and Rogan felt was missing for the Mpumalanga teachers with regard to science in society investigations may have been provided to Gauteng teachers. In addition the teaching and learning materials that the teachers were using (module and textbooks) provided some guidance by outlining short investigations of reproduction-related social issues, whereas few resources with contextualised science were available for the Mpumalanga teachers.

Learning Outcome 3: Science, society and environment (CO 6 & 7; DO 2 & 3)
I will discuss the achievement of this learning outcome before LO 2 since I have discussed science in society investigations in the section above. LO 3 is described as follows: "the learner will be able to demonstrate an understanding of the interrelationships between science, technology, society and the environment" (Department of Education, 2002a, p. 10).

As mentioned in Chapter 3, this learning outcome, linked to CO 6, is an expression of the move in science education towards a type of scientific literacy in which learners understand the impact of science and technology on society and the environment, and they also understand that science takes place in cultural contexts and is influenced by society. The Grade 7 assessment standards for LO 3 are:

> AS 1 Understanding science as a human endeavour in cultural contexts: learner compares different interpretations of events.
>
> AS 2 Understanding sustainable use of earth's resources: learner analyses information about sustainable and unsustainable use of resources.
>
> (Department of Education, 2002a, p. 21; 2003, p. 71)

Only AS 1 will be considered in my analysis, in particular the extent to which teachers encourage learners to discuss their worldviews relating to human reproduction and to respect the knowledge, beliefs and values of learners from different cultures. For this assessment standard, the NCS draws on ideas from the nature of science and recognises that there are both empiricist and traditional worldviews in the classroom, the latter based on indigenous knowledge systems that have developed over thousands of years. Thus in attempting to see whether this outcome is achieved in any way during the teaching and learning of human reproduction, I assessed whether learners were encouraged to listen to, and respect, one another's ideas based on traditional understandings (e.g. food that can or cannot be eaten by menstruating females) and technologies (e.g. birth control). AS 1 can be linked to DO 3 in which learners should demonstrate cultural (and aesthetic) sensitivity across a range of social contexts.

The tasks on sharing information about circumcision in the cultures/ethnic groups to which learners

belong (and respecting their right to privacy if they do not want to talk about it - task 7), or about religious, family and cultural rules concerning sexual activity (task 13) provided opportunities for learners to share the knowledge, values and attitudes of different cultures towards human reproduction.

In most classes, learners frequently asked questions concerning what they had been told at home, heard from friends or read in magazines. Teachers such as Jackie, Gogodi and Samkele encouraged learners to talk about these ideas e.g. beliefs that girls should not eat eggs after puberty, ways of determining if a girl is a virgin and initiation. Some teachers such as Sipho and Samkele reported on their own experiences of cultural practices. There was a strong ethic amongst the teachers regarding listening to and respecting the reported practices of different cultures and not pushing a personal point of view. This will be discussed in more detail in Chapter 9.

AS 2 assesses learners' ability to analyse information around sustainability. Outcomes related to sustainability cannot be demonstrated in any significant way through teaching about human reproduction unless one argues that learning about the use of contraceptives and birth control can contribute to ensuring that the use of the earth's resources is sustainable. Since this link is indirect, the achievement of AS 2 was not assessed here.

Learning Outcome 2: Constructing science knowledge (CO 4 & 5; DO 1)
Learning outcome 2 in the Natural Sciences is about constructing scientific knowledge. Once again, but on a more theoretical basis than LO 1, this is about learners being able to collect information from various sources, and organise and analyse it, thus developing concepts which contribute to their 'framework of knowledge'. As they build concepts, they use these concepts to interpret information by "interrogating pictures and diagrams, transforming information from one form to another ..., looking for patterns in data, or expressing a relationship between two variables" (Department of Education, 2002a, p. 9).

The achievement of LO 2 in Grade 7 is measured by the following assessment standards (ASs):

AS 1 Recalling meaningful information when needed: learner, at the minimum, recalls definitions and complex facts.

AS 2 Categorising information to reduce complexity and look for patterns: learner compares features of different categories of objects, organisms and events.

AS 3 Interpreting information: learner interprets information by identifying key ideas in text, finding patterns in recorded data and making inferences from information in various forms such as pictures, diagrams and text.

AS 4 Applying knowledge to problems that are not taught explicitly: learner applies conceptual knowledge by linking a taught concept to a variation of a familiar situation.

(Department of Education, 2002a, p. 19; 2003, pp. 21, 69-70)

Finds out prior knowledge (AS 1)
In my analysis, the ability to recall meaningful information (AS 1) refers to a learner's ability to recall information relevant to the topic of human reproduction. This includes information about human

reproduction taught during the lesson and during previous lessons in Natural Sciences and Life Orientation and learnt from a variety of external sources, for example, media and parents.

Learners' everyday knowledge develops within the culture and social context within which learners grow up (Chisholm & Leyendecker, 2008; Leach & Scott, 2000). Their ideas are often very different from scientific knowledge i.e. they are alternative conceptions or as Leach and Scott suggest, the scientific view is the alternative perspective for the learner. The learners in the seven schools in which the case studies took place came from a wide range of different cultures. It would be important for the teacher to explore their prior conceptions about reproduction. From a Vygotskian perspective, the teacher would need to start with what the learner knows in order to create opportunities for the learner to move from that position through their zone of proximal development in order to acquire new knowledge and skills. In my analysis I therefore examined the extent to which teachers tried to ascertain learners' prior knowledge and provided learning opportunities based on this. I have combined my discussion of what teachers did (a category of learner-centredness, Figure 6.1 and Table 6.3) with a discussion of the extent to which this assessment standard was demonstrated amongst learners.

The case teachers all, to a greater or lesser extent, started with learners' prior knowledge (both everyday and school knowledge) of human reproduction and continued to explore this knowledge as they taught the topic. It was important that they found out what learners knew and believed so that they could help learners build on correct conceptions, address misconceptions[16], and explore alternative conceptions including beliefs and values.

Teachers used questioning extensively to explore learners' existing knowledge and beliefs about aspects of human reproduction. The type of prior knowledge that teachers drew on included learners' observations and reflections on physical and behavioural changes during puberty, their understanding of how the male and female organs function, menstruation, cultural practices e.g. circumcision and the Zulu reed ceremony, and the development and birth of a baby. The way in which teachers found out what learners' prior knowledge was, can be demonstrated in three teachers' lessons.

Samkele started by exploring her learners' ideas around the changes taking place in their bodies as they have grown up e.g. girls getting breasts and wearing a bra, becoming 'fatter', menstruating; boys 'private parts' getting bigger, having wet dreams; emotional changes in boys and girls, pimples, circumcision and birth of a baby. Their questions to Samkele revealed some of their prior ideas, concerns and misconceptions and included:

Do boys menstruate? Last year I heard of that small boy who menstruated.	(F – 30/7)
(Concerning a child)…Is it true that your father is 99% and your mother is 1%?	(LT – 29/8)
Are pimples there because of an erection?	(LT – 1/8)
Why does a baby have a hole in its head?	(F – 29/8)
Why do they close the umbilical cord?	(F – 29/8)

[16] I choose to use these terms as follows:

- misconceptions – incorrect biological concepts
- alternative conceptions – alternative conceptions emerging from their culture/everyday experience

Sipho's questions related to learners' current experiences e.g.

> What is the temperature this morning? 15°C? Boys, what have you experienced with your scrotum today? Did your scrotum expand? (Boys - No!) What? Contract! (F - 3/8)

He proceeded to joke about it. He felt that by joking he was getting his learners to treat these changes as normal and not something to be hidden. He used their experiences to get them talking.

Jackie claimed that she always started by locating where the learners were, what they knew about a topic and what misconceptions they possessed. She did this through extensive questioning e.g." What is human reproduction, what organs are involved?" Her first two lessons appeared to be taken up with locating where the students were. Some of the learners were initially awkward whilst others were interested in the questions. She continually probed, tried to get responses from the learners and challenged these responses. Towards the end of the first lesson, learners started to get more animated and began to participate more freely. Gaps in their knowledge and misconceptions started to emerge. For example, Jackie told me that learners asked her what it means for a man to be a virgin. One learner wanted to know whether a man was no longer a virgin after masturbating and ejaculating. Another learner asked whether the hymen would grow back if it was cut. Several learners seemed to have the notion that menstruation occurs after the egg breaks. Alternative conceptions were also expressed which seemed to have cultural origins e.g. a boy in Jackie's class offered this opinion:

> If you eat salt ... you produce lots of sperm....My cousin said Ma'am.. if you eat peanuts... you start developing sperm. (LT - 30/7)

and a girl added:

> When you start your periods, you are not supposed to eat eggs and drink milk... my mother told me. (LT - 30/7)

These ideas emerged from the everyday knowledge that learners have acquired over the course of their lives. Eliciting learners' prior knowledge about human reproduction played an important role in building learners' confidence to talk about aspects of human reproduction that many of them felt embarassed about, for example menstruation, and breast and penis development.

While the information that the learners brought to the classroom was an important starting point on which they could construct new concepts, sometimes the classes seemed to get stuck at this point. Learners would discuss at length what they had observed, experienced, heard from their friends and family members, seen on TV (often late night eTV pornographic movies!) or films or DVDs, seen in magazines, etc, and there would be enthusiastic class discussion. However some teachers and learners seemed reluctant to move on to deal with substantial new information.

Nykiel-Herbert (2004) has argued that South African teachers have adopted the incorrect notion that learners' experiential knowledge is not just the starting point but the main point of schooling.

> Thus, celebrating what the children already knew replaced the idea that they must expand their mental horizons by learning new things – the reason why they were sent to the school in the first place (Nykiel-Herbert, 2004, p. 258).

Rogan likewise has questioned what he described as "the new orthodoxy" in which learners work in

groups and spend their time discussing a question related to their everyday knowledge and then report back on information that they all know already (Rogan, 2004, p. 172).

In Rogan and Aldous' study in Mpumalanga schools (Rogan & Aldous, 2005), one of the topics that they felt typified the problem was "What changes take place to your body between the age of 10 and 15 years?" (p. 328). Rogan and Aldous concluded that at the end of an hour the learners in their study had not gained any new knowledge and they described this as an unproductive activity. A similar question was also posed to learners in the first activity in my module and the case study teachers also took at least an hour discussing this topic. However, I would suggest that such an activity is very productive. Talking about the reproductive structures in their bodies in a formal context, rather than in the toilets and playground, changes the nature of the information from something that is secretive to a normal topic of conversation. Every learner would be able to make some observation and so there is an opening to share their ideas about reproduction in ways that are not too embarrassing. It also allows them to start talking about the often strange mix of ideas that have accumulated in their minds about reproduction. The problem however arises when the teacher does not take the learners beyond the question of physical and emotional changes and into an understanding of the role of hormones in bringing about these changes, and the structure and function of the external and internal reproductive organs in reproduction and the continuation of the species. This will be discussed further in section 6.4.1.2 on scaffolding and in the next chapter.

One of the arguments against the use of prior knowledge as a starting point in science is that it disadvantages working class children who have less access at home to school-linked knowledge than middle class children (Taylor, 2001). However, as pointed out in the literature review, while such a position might be relevant to a physics concept, it does not apply to a topic like human reproduction where class structure does not determine how much access learners have to information about human reproduction. In an urban environment, learners are constantly receiving some sort of information about reproduction from a wide range of sources, and some learners have much greater access to this information than others irrespective of class (as will be discussed in chapter 9). As one teacher commented, learners are constantly surrounded by messages about sex.

Some teachers did well in maintaining the sort of "two-way traffic between common-sense and scientific discourses" that Ivinson (2007, p. 202) proposed for sexuality education, throughout their teaching of human reproduction. This then provided learners with opportunities to use their scientific discourses to challenge the beliefs and myths in their common-sense discourses and then hopefully adjust their ideas. Some teachers got stuck in the common-sense/ everyday discourse and struggled to move on from there.

Categorising and interpreting information (AS 2 & 3)

AS 2 and 3, the ability to categorise and interpret information, refers to learners' ability to construct knowledge about human reproduction from this meaningful information by identifying key ideas, organising and analysing these ideas, finding patterns, developing concepts, making inferences, changing (or translating) the information from one form to another and relating it to other information

(Department of Education, 2002a). I assessed these two assessment standards together since there is some overlap when considering the achievement of these assessment standards in the context of learning about human reproduction.

At Grade 7 level, learners are expected to be able to identify key ideas in text, find patterns in recorded data and make inferences from information in pictures, diagrams and text. In task 2 of the module on human reproduction, inferences could be made on physical changes by examining the pictures of boys or girls becoming men or women respectively. Tasks 4 and 8 require that learners make sense of diagrams of the front view of the sexual organs and identify and extract 'key ideas' in the text boxes in order to identify structures and their functions in the side view. Task 5 uses a card game to present scenarios on typical questions from teenage boys, whilst task 10 similarly presents scenarios in the form of letters written by teenage girls to a Dr Naidoo. Learners have to make sense of the information provided in each scenario and construct biological answers to the situation presented on each card. Task 9 involves learners understanding and interpreting information in text boxes and speech bubbles on the menstrual cycle, and extracting relevant information that will help them answer the questions. Since eight out of the ten teachers used some or all of these activities, learners were being given tasks that required them to interpret information in some way during at least half their lessons. Those that also used textbooks (Samkele) or their own worksheets (Sipho and Jackie) completed similar activities.

Both during class discussions, when teachers like Jackie and Gogodi encouraged learners to explain their observations in their own words and during the activities, learners were given the opportunity to interpret information. The extent to which they did actually manage to interpret information from the data given, varied greatly. The tasks which were familiar and drew from their everyday knowledge were answered with ease. However many learners really struggled with some of the tasks. They found it difficult to use the information provided in diagrams and text in a different context e.g. moving from front to side views, using information in the menstrual cycle and speech bubbles to provide substantial answers to the dilemmas girls face when menstruating. This required the use of higher cognitive skills and they found these tasks challenging.

Applying knowledge to problems that are not taught explicitly (AS 4)

Applying knowledge to problems that are not taught explicitly (AS 4) refers to the ability to select relevant concepts about human reproduction and use them to make sense of, or interpret, 'new and unfamiliar situations'. In my analysis, I therefore looked at the extent to which learners applied knowledge they gained to new situations.

In task 9, learners use knowledge about menstrual cycles and the information provided to complete a calendar indicating when two girls will start their menstrual cycles. In task 10, they take on the role of a medical expert (Dr Naidoo) and respond to typical concerns of teenagers about pimples, stomach cramps, depression, breast size, thrush, exercise and swimming. By understanding the questions, and using knowledge gained about the menstrual cycle, breast development and infections to provide answers, the learners are demonstrating their competence in this assessment standard i.e. using a

taught concept to make sense of a familiar situation which is not taught. Likewise in task 5, learners are using knowledge gained about the male reproductive system to address some common concerns and assess the accuracy of some common beliefs amongst adolescent boys. These tasks require the use of higher cognitive skills (analysis, application, synthesis).

As can be seen in Table 6.2, most teachers started well with providing opportunities for their learners to recall prior meaningful knowledge. Most of them also helped learners to start constructing new knowledge, but applying this knowledge to new problems was addressed less frequently by most teachers.

6.3.3 Teachers' understanding of outcomes-based approaches

During interviews, teachers were unable to provide clear and comprehensive statements on ways in which their teaching was outcomes-based. It seems that for most teachers, teaching towards outcomes is a fuzzy notion that they are not particularly comfortable with. Jackie had a particular view:

> I think (my teaching is) one of the most true to the spirit of outcomes-based education because a lot of the work the kids did themselves. (I - Jackie)

She spoke about her learners doing research and carrying out investigations (CO 4 and LO 1, AS 1-3) and communicating their findings e.g. through posters and presentations (CO 5 and LO 1, AS 3). A further two teachers (Gogodi and Sipho) also referred to communicating (CO 5) through discussions; whereas for Thobz, learning outcome 2 and CO 4 were referred to in terms of learners gaining knowledge (Thobz).

Riana felt that "all teaching is outcomes-based no matter which route you go". She paid attention to both content and skills. Riana said she did not start with outcomes, only worked towards their achievement. One new teacher (Zama) said that he had only just started teaching and did not really know what outcomes-based education was supposed to be.

Two teachers (Rennie and Nsuku) did not identify any outcomes and did not seem to be sure about what an outcomes-based approach was. They indicated however that by following the module provided, they were achieving the outcomes listed. They pointed out that if they use teaching and learning materials that are designed to achieve outcomes, then they are comfortable using those materials and feel satisfied that they are meeting departmental requirements concerning outcomes-based education. In Stoffels' study, the science teachers likewise indicated that this was one of the reasons why they stuck closely to the learning support materials they were provided with (Stoffels, 2008).

All teachers who were observed had attended the workshop and had thus received a copy of the learners' booklet on human reproduction and the teacher's guide. Some teachers followed these materials very closely, whilst others prepared their own worksheets or used a combination of the booklet and textbook activities. Thus for most teachers, using carefully designed teaching and learning materials possibly helped them to teach towards outcomes.

6.4 Learner-centred approaches

The emergence of learner-centred ideologies in the USA, other countries and in particular in the South African education system, have been described in chapter 3. Learner-centred approaches have been viewed as a means of enabling learners to achieve the outcomes. I was therefore interested in whether teachers used learner-centred approaches and how this may have influenced the achievement of outcomes.

In order to analyse the extent to which teachers use learner-centred approaches, I have drawn up a framework based on categories identified by Schiro (2008), McCombs and Whisler (1997) and others as representing learner-centred approaches. This framework has been illustrated in Figure 6.1 on the next page. These categories include the provision of a suitable learning environment, the teacher facilitating the learning using constructivist approaches, catering for the needs and interests of the learners, and accommodating personal differences as well as catering for different intelligences and thus learning styles amongst learners. Most of these categories or features of learner-centred approaches have likewise been advocated by the Department of Education (Department of Education, 1996b).

In my analysis, I take each of these categories, describe what they represent, present the results in a cross-case analysis, discuss the results and where possible link the results to the achievement of outcomes. In the matrix that I have constructed for each of the above categories of learner-centredness, I have simply used a sliding scale from less to more learner-centred, for example Table 6.3.

6.4.1 Teacher facilitates learning using constructivist approaches

In looking at how teachers teach, I will be examining the extent to which teachers manage to provide opportunities for learners to construct knowledge rather than simply trying to transmit knowledge. Within this perspective I will consider both Vygotskian and Piagetian views of how learners construct their knowledge since, as pointed out in Chapter 3, it is recognised that both contribute to our knowledge of how learners construct knowledge. Constructing new science knowledge (NS learning outcome 2) involves learners recalling meaningful information about a scientific concept, and then extending their knowledge about that concept and applying it to new situations. In order to achieve this outcome the teacher needs to facilitate the learning using constructivist approaches.

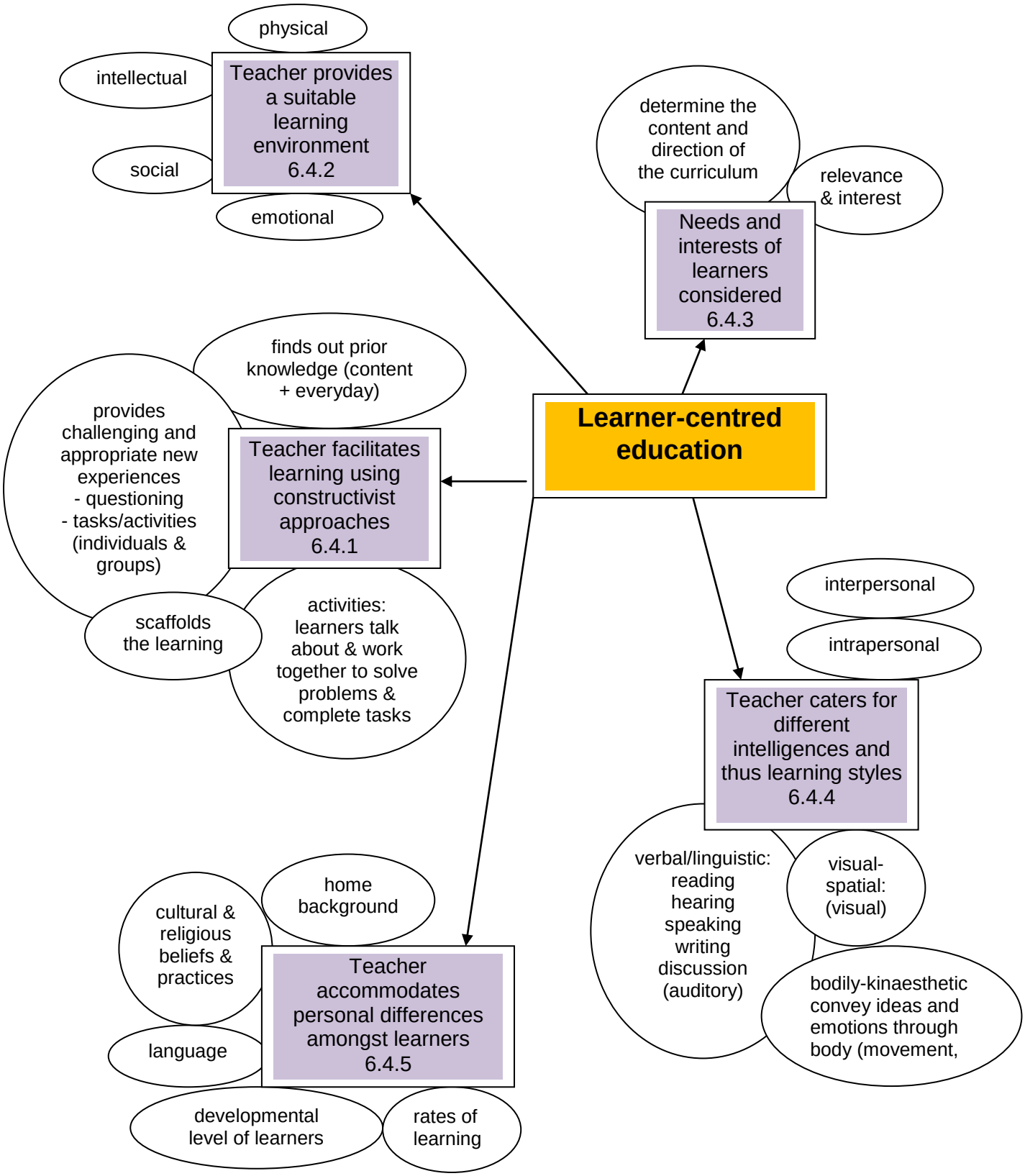


Figure 6.1 Framework for analysis of learner-centred approaches

Table 6.3: Facilitation of learning using constructivist approaches

Feature	**less ----------->more learner-centred**			
Teacher facilitates learning using constructivist approaches				
Teacher finds out prior/existing/everyday knowledge/ ideas/beliefs of learners	*never*	*sometimes* **Mphety Thobz**	*often* **Sipho, Samkele, Zama, Nsuku Rennie**	*always* **Jackie Gogodi Riana**
Design of activities: Teacher provides challenging and appropriate new experiences/activities just ahead of level of development – ZPD; creates cognitive conflict	*Activities repetition of what they know, no extension/ conflict*	*Some extension of knowledge& skills/ challenge their conceptions* **Samkele, Mphety Thobz**	*Activities reasonably effective in being able to extend learner's knowledge & skills/ challenge their conceptions* **Sipho, Gogodi Zama, Nsuku Rennie, Riana**	*Activities challenge learners beyond own knowledge/skills, create cognitive conflict – challenge their conceptions* **Jackie**
Teacher scaffolds the learning Links learners' current understanding to new knowledge through	*never*	*limited*	*frequent*	*extensive*
a) soft scaffolding e.g. explanations, prompts, examples, demonstrating how to solve a problem.			**Sipho, Jackie Gogodi, Samkele Mphety, Zama Thobz, Nsuku**	**Gogodi Rennie Riana**
b) soft scaffolding – questioning: Teacher listens to learners, tries to elicit their meanings and work with them, questioning at lower/ higher cognitive levels:	*try to get answers they want from learners (push their own meanings)*	*looking mostly for specific answers, limited probing* **Thobz**	*questioning for understanding, probing to elicit their meanings* **Sipho Samkele, Gogodi Mphety, Zama Nsuku, Rennie**	*questioning at lower and higher cognitive levels. Uses Socratic questioning, learners to provide evidence to support their ideas* **Jackie Riana**
c) hard scaffolding - the use of teaching aids or materials to assist learning	*never*	*sometimes* **Zama, Sipho Samkele**	*often* **Jackie, Thobz Mphety, Nsuku**	*always* **Gogodi, Riana Rennie**
During activities - **learners talk about and work together** to solve problems, complete tasks (to assist one another to move through ZPD or to resolve cognitive conflict) e.g. debate, reflection, problem-solving, decision-making	*Brief/occasional interactions between learners recalling what they know, their everyday experiences; teacher-learner interaction dominates* **Samkele**	*Some interaction between learners, especially during activities that explore their everyday experiences e.g. observations of physical changes in puberty, emotional changes* **Jackie, Zama Thobz, Mphety**	*Often talk about and work together on activities that explore their everyday experiences and new content concepts; some debate and talking about and working together to solve problems* **Sipho, Gogodi Nsuku, Rennie, Riana**	*As for 3 in all lessons, extensive use of cooperative group work. Learners actively debating, questioning one another, assisting one another to grasp new concepts, solve problems and complete activities.*

This means that the teacher had to start the topic by finding out learners' prior knowledge and beliefs about human reproduction. This knowledge would be considered meaningful (LO 2, AS 1) since new knowledge needed to be constructed on this basis, alternative conceptions considered, and if learners had incorrect biological information, new conceptions would need to replace old conceptions and be accommodated into their cognitive framework thus promoting learning. Once teachers had identified their learners' prior knowledge, they would then need to provide challenging and appropriate new experiences/activities which would provide opportunities for learners to move through their zone of proximal development (ZPD) and develop new concepts and understandings. The teacher would facilitate this process by scaffolding the learning and learners would also assist one another to move through their ZPD by talking about the problems to be solved and working together to complete the tasks.

My analysis of the extent to which constructivist approaches were used by the ten case study teachers in order to enable learners to achieve the critical and learning outcomes can be seen in Table 6.3. My discussion of case study teachers' exploration of learners' prior knowledge can be found in the previous section (6.3.2) under LO2.

6.4.1.1 The teacher provides challenging and appropriate new experiences/activities

In order to promote learning about human reproduction, activities need to be designed which explore learners' prior knowledge and then extend learners' conceptual thinking a short distance beyond their prior everyday or formal science knowledge. If the gap is too big, learning will not occur. Structured discussion tasks provide opportunities for learners to explore and develop their own ideas and address other ideas which may conflict with their own.

The activities provided in the module were designed to achieve different purposes. For example, the tasks on physical differences between boys and girls and physical and emotional changes taking place during puberty to a large extent drew on their everyday knowledge and experience whilst those on behaviour encouraged learners to examine their role in making choices on responsible behaviour. The tasks on the structure and function of organs and on the menstrual cycle were intended to extend learners' understanding of the reproductive system, providing a ZPD which the teacher and their peers could help them to move through. The questions were designed to make learners work with the material, search for, extract and apply information, and by working in groups, achieve greater understanding. Tasks that required learners to analyse and evaluate information such as in the card games on male responses or in the letters from Dr Naidoo to teenagers on menstrual and other female issues required an understanding of how the body works in order to complete the tasks. The questions were intended to be challenging, introducing learners to new concepts, addressing alternative conceptions and providing opportunities for cognitive conflict amongst peers when they disagreed on certain aspects.

As mentioned previously, eight of the ten teachers in the main case study (observation and interview) used part of or the entire module and worked through the activities while Sipho and Jackie used their own materials.

What was interesting was the different emphases. Some teachers seemed to place more emphasis on exploring the ideas and experience of learners around physical and emotional changes during puberty, and on questions related to sex, menstruation and having babies. In other cases, the focus seemed to be on building a moral background before teaching human reproduction e.g. Thobz, or on exploring learners' concerns and interests e.g. Jackie.

While some of the initial tasks were easy for Grade 7 learners since they could draw on their own experience for answers, some of the teachers did provide challenging activities, thus promoting new learning about human reproduction. However during my 3-4 week observation of their lessons some teachers (Samkele, Mphety and Thobz) did not, provide learners with activities that would enable them to move sufficiently far beyond their own experiential knowledge.

6.4.1.2 The teacher scaffolds the learning

Scaffolding can be considered as any form of support provided by the teacher (or peers) to help learners cross their ZPD. The support may come through verbal interactions, i.e. soft scaffolding, or through using some sort of teaching aids or materials, i.e. hard scaffolding (Brush & Saye, 2002). In analysing the field notes and lesson transcripts, I examined how frequently the teacher used soft scaffolding in the form of explanations, examples, partial solutions, demonstrations etc to help the learner to move from what they knew to new knowledge.

All the teachers provided explanations and examples, however the extent to which they did so varied greatly between teachers. Jackie gave very few explanations, preferring to probe further so as to constantly challenge learners to think about the topic whereas Samkele was quick to give explanations in answer to learners' questions. All teachers explained tasks, for example how to play the card game, and some teachers demonstrated what to do, for example how to draw mind maps (Sipho, Mphety) and flow charts (Sipho, Gogodi), or how to write letters (Sipho). Some teachers scaffolded the learning by breaking up a task into simpler steps and going through each part of the task. Jackie, for example, explained how to construct a summary by going through the process step by step, and assisted her learners to understand menstrual cycles by counting days on the menstrual calendar with her learners. Zama put words on the board and asked learners to use these words to complete a diagram. Cues and prompts were also used to help learners focus their attention in the right direction. Thus Nsuku used her body language as a prompt by smiling, and indicated her interest by being animated, involved and supportive.

Teachers would listen to learners' questions, or to their responses to the teacher's questions, and to learners' presentations. They would then pick up on ideas, elaborate and give examples, use analogies or tell stories. The examples related to learners' everyday lives. For example, when dealing with the issue of respect, Gogodi asked her learners if a boy was being respectful if he walked around with his fly unzipped. Nsuku continually related menstruation to the girls' lives e.g. the pain of the lining of the uterus breaking away. Riana elaborated on the wonder of a baby being born, a gift from God. Stories were told, sometimes based on the teachers' own experience (Sipho – girl menstruating) or

obtained from the media e.g. a story on in-vitro fertilization (Samkele). When explaining to learners how to develop their own role-play on emotional changes, both Nsuku and Riana elaborated and imitated teenage behaviour. Riana, for example, acted out a mother shouting at her teenager to do homework, at which the teenager grunted and walked out slamming the door. This gave them the idea and they moved on with planning their role-play.

I focused in particular on the use of questioning as a form of scaffolding and in table 6.3 represent teachers' use of questioning separately from other forms of soft scaffolding. Questioning plays an important role in the continuous assessment of learner's understanding and in helping them to grasp new concepts (Black & Harrison, 2000; Brooks & Brooks, 1999). Some teachers even equated learner-centred approaches with asking questions. For example, Zama said that his teaching was learner-centred because "...I did involve them quite a lot. In the questions and answers and then their group work...." (I).

I tried to assess how often teachers asked questions, listened to responses, tried to elicit learners' meanings and work with them, and questioned learners at higher cognitive levels. All of the teachers asked questions to draw out their learners' prior knowledge, to check they had understood and learned the content (e.g. names and functions of various structures) and to explore learners' ideas on what appropriate behaviour between boys and girls is. Most questioning involved recall and comprehension, and so the questioning was at the lower cognitive levels. Thobz tended to simply look for specific answers, whereas other teachers probed their learners' understanding but only at the comprehension level (Gogodi, Samkele, Mphety, Zama, Nsuku and Rennie). An example of superficial probing was thus:

Gogodi: What will number 5 be?
Response: Under the arms.
Gogodi: Armpits, what about it? .. What is growing under your arms?
Response: Sweaty
Gogodi: Yes. We do not grow the same way. Some sweat a lot, some do not sweat. (LT – 8/8)

Only Sipho, Jackie and Riana employed some higher level questioning that required analysis, synthesis and application thus helping learners to move further through their ZPD to new understandings of the subject (Table 6.5). Their extensive questioning was followed by probing and challenging learners concerning their responses. Jackie used a Socratic style i.e. asking questions, probing and provoking, drawing out their ideas, demanding that learners provide evidence to support their ideas or claims. If they could not supply the answer, her intervention was usually to direct the learners to where they could search for the information. She saw this as her facilitation role.

Sipho used extensive questioning about content and behaviour. Like Jackie, he explored learners' ideas, probed for understanding and meaning and provoked and challenged their perceptions. In this extract, he explores notions of readiness for sex and personal responsibility.

Sipho: Boys, who do you feel comfortable with in your own space and time talking about these developments and changes?
Boy: Boys

Sipho: Boys?
Boy: My mother
Sipho: Your mother? Just take us through, what do you discuss with your mother.
Boy: Little things my mother tells me and...
Sipho: So what are those things? .... What does your mother .... tell you?
Boy: Lots of things, Sir, that girls when they start to develop their hormones, they are silly enough that I must run away.
(Laughter and comments from class) .....
Sipho: And your hormones, yes?
Boy: And my mother tells me that I do not need a condom. .. Run away. *(laughter)*
Sipho: Run away? Right now, are you ready to get in contact?
Boy: No, Sir
Sipho: When do you think you will be ready?
Boy: 15, Sir
Sipho: Right. .... You can see now that there is that idea of when you're 15 you are ready to interact sexually. What do others say? ....
Girl: Sir, I say that 15 is not the right age. .... He's still under his mother's care, he's not responsible for money, he's not working yet .... Maybe like his girlfriend gets pregnant and that boy he finds out that it is his, what will he do because he's got nothing? He's only depending on his mother.
Sipho: Exactly. So .. that is a responsibility as well....
Boy: Sir, you know why I say 15 Sir?
Sipho: No I do not
Boy: Sir, because when you become 15 Sir, you know lots of things in your mind, and then not having experience. (LT-31/7)

Rennie got feedback from group work, complimented them on some points and questioned some points. He avoided criticising or challenging his learners' responses but simply questioned them further. For example, on a similar theme to the extract above, groups reported back on their discussion of when they were ready for sex.

Rennie: Everyone must be quiet so we can hear what each group feels (about) when we must have sex. K's grp, it is up to you.
K: After marriage and by the age of 20 you'll start having children....
Boy 1: Why 20?
K: Just because people get married in their 20s so that...
Boy 1: Oh, in your twenties?
Rennie: So are you saying that a good age for maturity for a girl or boy is 20?
K: Not 20, maybe a little bit older because they marry in their late twenties.
Rennie: Okay. And what will determine that age? What will determine that age where a girl or boy will decide to have children?
K: Well it depends. Some people would like to have a respected relationship then maybe they wouldn't be ready to have intercourse with their partner.....And then with other people like in high school they just want fun or whatever, so they have intercourse at a very young age.
Rennie: So then what are some of the dangers then if people at a young age are going to have intercourse?....
Boy 2: They could have emotional damage, there could also be like in physical damage.
Rennie: Physical damage. Well he did mention physical damage in other words the girl can be physically injured if she has sexual relations at a very early age because the body has to be

physically ready. . Another point of view? T – your group.

T: Also like I thought, in some cultures you should have sex only after you've gotten married, so that's also a big factor. (LT – 9/10)

Questioning was not used by most teachers to challenge learners' concepts and to move them through their ZPD. However questioning did play an important role in identifying learners' views on a range of topics related to human reproduction and their subject content knowledge.

Teachers engaged in soft scaffolding not only in class discussions but also when they circulated around the classroom, chatting to students and questioning their approach to a difficult problem and providing constructive feedback. This was evident for most teachers but they engaged differently. Some teachers like Mphety, Riana and Jackie become deeply involved in group discussions, questioning and challenging ideas. Other teachers, perhaps due to the nature of the topics discussed, circulated quietly, and simply listened in and checked that learners understood the task and could answer the question (Gogodi and Rennie) but then generally left learners to work on their own.

Hard scaffolding refers to the use of any teaching aid or material to assist learners' understanding and help them move through their ZPD. All teachers used hard scaffolding to some extent, whether shared copies of worksheets (most teachers), textbooks (Samkele), flip charts (Mphety), overhead transparencies (Gogodi) or health charts (Gogodi, Riana and Rennie). Gogodi, Riana and Rennie used their visual aids throughout their teaching of human reproduction to help learners make the link between what they knew already and new information, whilst other teachers used hard scaffolding less frequently. This will be discussed further in section 8.1.3 in Chapter 8.

So teachers continually scaffold in small ways to help learners make connections, grasp concepts or understand tasks. Brodie and colleagues have pointed out that the teacher's role of mediating and scaffolding between the knowledge of the learner and the knowledge of society is a difficult one (Brodie, et al., 2002b). This is because it assumes there is a manageable space between what the learner knows and what is to be learned, and this is not the case as soon as the knowledge becomes more conceptual and moves away from everyday knowledge. In addition the ZPD for each learner varies, and as we will see later, some learners are very knowledgeable about aspects of human reproduction whereas others for whom the topic is culturally taboo, have a few misinformed ideas about aspects of human reproduction.

Some of the teachers found it very difficult to scaffold for learners the move from prior knowledge to new knowledge, supporting them while they acquired new concepts. Thobz, for example, rather chose to spend time reading from notes that focussed on moral issues and this was followed by rhetorical questions to which the class chorused 'yes'. What caused teachers to avoid engaging in new subject matter, and helping learners move through their zone of proximal development and acquire new concepts? Perhaps the teacher's lack of subject content knowledge was one factor i.e. they were afraid to take learners into unknown territory.

6.4.1.3 The teacher encourages learners, during activities, to talk about and work together to solve problems and complete tasks

Central to the social constructivist notion of how learning takes place is the social and linguistic aspect of learning. Vygotsky (1978) has spoken of the valuable role of children talking to one another as they attempt to solve problems, since during this process their ideas become organised internally, resulting in learning. We have seen that teachers have arranged learners in groups so that they can easily talk and work together but that the amount of group work varies amongst teachers (see discussion of CO 2). For some teachers, groupwork was equated with a learner-centred approach. So Zama claimed his teaching was learner-centred "because I did involve them quite a lot in ... group work." (I). In addition we have seen that only some of the teachers are providing suitably challenging problems and tasks which provide opportunities for learners to engage in cognitive conflict and to move from their current conceptual level to a higher conceptual level. In my analysis, I assess the extent to which teachers encourage cooperative learning during which talking, working together and problem-solving can take place.

Cooperative group work was not evident in Samkele's and most of Jackie, Zama and Thobz's lessons. Samkele was aware that cooperative group work could promote learning, but she felt unable to use this approach and cited the noise levels and large classes as reasons.

> I restricted them to do more work on their own, because when they do work on their own it felt like they were making noise, so I feel like I ripped their rights, they could not do it in groups, most of the work I gave them to do as homework, whereas they could have done it as groups where they were going to come up with different ideas or where they were going to get some more skills from others. Their development was restricted. Some develop when they talk to others. Some develop when they're doing it on their own. Children learn in different ways. … I feel maybe if they were a smaller number they were going to have a chance to teach each other. While they were learning. To get development while they were learning. (I - Samkele)

Both Samkele and Jackie tended to control interactions in the class by asking questions throughout the lessons so that the interaction tended to be teacher–learner interactions but there was some interaction particularly in Jackie's classes amongst learners when debating a point. Jackie did allow groups to play the card game but became deeply involved with groups as she circulated, listening to answers, joking, questioning them and challenging their answers. While this showed her deep involvement in the activities, it also retained her in a position of control. Gogodi, on the other hand, tended to circulate silently, only intervening when asked for help or when learners appeared to be off-task i.e. discussing something else. Gogodi claimed that her teaching style was learner-centred because

> … in most cases I do not do the talking. I mainly would introduce a topic to them, let them brainstorm that, and report back, help one another, then look at the activity. Then if they did not understand that, then it is easier that I can intervene and explain further about what I want them to do or maybe what I want them to achieve at the end. (I - Gogodi)

Later on Gogodi said that only a few of her lessons were based on group work, so they could work on their own and understand some things on their own. However my observations indicated that learners were frequently engaged in group work. This may have been because Gogodi used the module extensively and possibly used far less group work during the rest of her teaching.

Nsuku said that although she mostly asked them questions which they discussed and responded to in groups, sometimes she gave them activities which related to their lives e.g. drama (emotional changes) and circumcision where groups of learners from different cultural groups could learn from one another.

Learners enjoyed group work where they were able to give their opinion or relate a story or experience. In these activities learners drew on everyday knowledge and were confident in sharing ideas. These were valuable activities in terms of providing an environment of openness about a topic which is so often discussed in a secretive manner amongst learners. These activities helped learners to realise the commonness of their experience and that differences exist amongst people in terms of body structure and function e.g. with regard to breast size, length of menstruation. Thus some anxieties were dispelled while learners explored topics that they found very relevant to their lives. While this was everyday knowledge, it was not openly talked about 'everyday knowledge' – and the opportunity to discuss many of these issues in the formal and hopefully safe environment of the classroom was, it seemed, of great value to the learners. Perhaps in some ways learners extended their understanding of the subject by learning from one another rather than just understanding their own personal situation.

However when the activities involved dealing with new conceptual knowledge regarding the reproductive organs and the menstrual cycle, many learners and some teachers found this difficult. Thus some teachers avoided these activities and taught the content in a teacher-centred manner, showing a lack of confidence in learners being able to extract ideas from text and learn from one another. So Nsuku for example would read from the worksheet and explain the processes and answer questions. This meant that when she did so, her learners did not have the opportunity to use the information provided, talk through a given problem with other learners, and together explore possible answers to difficult questions, thus organising new ideas internally. She did not allow the social construction of knowledge when that knowledge went beyond everyday knowledge. Zama said his learners became restless during these activities, struggling with the new biological terminology and concepts which they found difficult. They also seemed to resist the difficult academic task of reading and interpreting. This may have been due partly to their struggle to understand the English but also because of the difficulty of engaging with any really challenging academic activity.

In some teachers' classes such as those of Sipho, Gogodi, Rennie and Riana, there were opportunities for learners to socially construct knowledge (Vygotsky, 1978). Learners worked together on both the activities that explored their everyday experiences and new content concepts (e.g. structure and function of reproductive organs, menstrual cycle). Learners did help one another with answering questions, thus exploring new concepts, and they worked together to solve problems. This was most evident in Riana's classes.

Teachers' views on the purpose and value of the activities (tasks in the module) and the extent to which they used activities varied. Thobz tersely responded to the question about whether her teaching was activity-based by saying: "Activities weren't everything" (I). Riana followed the module closely

and felt that the activities were valuable because they "kept them active, part of class and group discussions" (I). She said

> I do not talk more than about 10 minutes because I do not think the kids are going to concentrate more than 10 minutes. Then they start wiggling around. Then you're talking to the windows to be honest. So you have to have activities. The activities were excellent.
> (Riana – I)

The role of group work, according to the teachers who were interviewed, was:

- *getting their ideas*
  For Thobz, the purpose of group work was to 'get their ideas'. She said the group work activities provided learners with opportunities to come up with information from their culture and their family background. Rennie claimed that
  > ... all the kids had an opportunity to voice an opinion on something even when in groups. In that sense the learners did contribute and were involved in the lesson as learners.
  > (Rennie - I)
- *learning from one another*
  Nsuku and Sipho both felt that their learners learnt from one another, Sipho mentioning that they had lots of debates among themselves.
- *more competent peers helping those who are struggling(and code-switching to help)*
  Gogodi arranged her learners so they could help one another with overcoming the language barrier e.g. she put children from Kwa-Zulu Natal who could not understand English with those who understand Zulu; and did the same with foreigners.
  > So the one who has the language barrier will be helped by the one seated next to him just to explain what is it that I want them to do. Then they work. (Gogodi- I)

Learners did not always want to work on the activities, and the reason for this varied. Jackie said that many of her learners were more interested in getting answers to their questions than in working in groups on activities. She commented that their attitudes were more "I want to know this. I'm not really interested in what you think you want to teach me." (I)

Zama claimed that he gave a lot of activities to learners individually and in groups but these were observed on only three occasions. They were based on the worksheets plus the text book. The activities were probably often completed individually and at home. He mentioned loaning textbooks to learners to complete activities at home and marking learners' response to the activities.

PEI researchers exploring the implementation of C2005 reported that SAIDE[17] teachers believed that once learners were in groups, they would participate and learn, and that mediation or meaningful support by the teacher was not needed (Taylor & Vinjevold, 1999). This resulted in teachers viewing themselves simply as 'babysitters' while the class somehow gained new knowledge (Nykiel-Herbert, 2004). This was not the case with Gogodi nor with any of the case study teachers, possibly because some of the misconceptions about learner-centred approaches had been addressed when the NCS was introduced.

[17] South African Institute for Distance Education

In conclusion, it can be seen that teachers are helping learners to construct new knowledge but for some teachers the new knowledge is minimal whereas for other teachers it is more substantial. Some teachers such as Samkele have not really promoted learning through constructivist processes, but rather through traditional oral teaching and the use of rhetoric which Hattingh and colleagues have described as a form of teaching and learning widely used in Africa and possibly more suited to traditional cultures (Hattingh, Rogan, Aldous, Howie, & Venter, 2005). All teachers explored learners' prior knowledge either briefly or more extensively allowing misconceptions to emerge, as well as learners' cultural understandings i.e. their alternative conceptions. Teachers scaffolded the learning in various ways both in whole class discussions and whilst moving from group to group, provided some challenging tasks, and some teachers allowed learners to construct their knowledge by talking to one another and through effective mediation. Thus the conditions were set up by the teacher for the achievement of LO 2 (constructing knowledge), CO 1 (problem – solving), CO 2 (teamwork) and CO 4 (the processing of information) to varying degrees.

6.4.2 Teacher provides a suitable learning environment

The suitability of the learning environment can be described in a number of different ways including its physical, intellectual, social and emotional suitability for learner-centred approaches (Schiro, 2008). I was interested in the type of classroom environment the teacher worked in and selected these four aspects for analysis. I therefore considered whether the physical design of the classroom was suitable for learner-centred activities (size, arrangement of desks, colour, light etc), for example was the classroom large enough to set up work-stations with resources so that learners could move around and work at their own pace and select or create tasks to engage in? The suitability of the intellectual environment was considered in terms of the resources available to learners. In this chapter I will discuss these two aspects very briefly and will provide a more detailed analysis in chapter 8 where I look at external factors affecting the implementation of outcomes-based and learner-centred approaches.

The social environment is revisited several times in my analysis when I look at the activities learners engage in, and whether teachers cater for intrapersonal and interpersonal intelligence. I will therefore comment only briefly on this aspect in my analysis of the social environment. Here I look at whether children have opportunities for interacting socially by working in groups with opportunities for cooperative learning. The emotional learning environment is, in my opinion, particularly important when exploring the topic of human reproduction. I therefore tried to observe whether learners appeared at ease with their teachers or maintained barriers to protect themselves. I looked at the way in which the teacher handled the topic, asking and responding to questions. My judgment was clearly subjective. Table 6.4 indicates the extent to which the learning environment catered for a learner-centred approach.

Table 6.4 Learning environment

Feature	less ----------->more learner-centred			
Physical: classroom pleasant, stimulating environment to work in	**Samkele, Mphety, Zama**	**Thobz Nsuku**	**Jackie, Sipho, Gogodi, Rennie, Riana**	
Intellectual: range of resources available	**Mphety Zama, Nsuku**	**Sipho, Samkele Thobz**	**Gogodi, Rennie, Riana**	**Jackie**
Social: Uses mixed groups/ presence of 'more capable peers'		**Jackie, Samkele, Zama**	**Sipho, Mphety Thobz, Nsuku Rennie**	**Gogodi Riana**
Emotional: good interpersonal relationships amongst learners and between learner and teacher – a safe environment.		**Sipho Mphety**	**Jackie Thobz**	**Gogodi, Samkele Zama, Nsuku Rennie, Riana**

6.4.2.1 Physical environment

The physical environments in which the case study teachers taught varied widely, from the large laboratory in which Riana and Rennie taught in an affluent school to the container classrooms of Thobz's school which were extremely hot in summer and noisy, the dark classroom/hall that Samkele used and the classrooms without desks in Mphety and Zama's school which although new, according to Zama, already had broken windows and doors. Teachers' efforts to make their classroom an attractive environment, as in Gogodi and Jackie's classrooms, contributed to the relaxed and pleasant atmosphere in which learners worked. Posters of learners' work in Sipho's classroom and attractive manufactured posters in one of Nsuku's classrooms also improved the classroom environment visually. The posters however were not related to the topic of reproduction and did thus not serve as a learning resource.

It was not evident during the teaching of this module that the use of a large laboratory by a small class helped teachers to teach in a more outcomes-based and learner-centred way, except perhaps in providing more room for role-plays. However large classes in small rooms and a lack of resources did have an impact. I will elaborate on this in chapter 8.

6.4.2.2 Intellectual environment

The intellectual environment was assessed in terms of resources which learners and teachers could use. These resources were generally very limited and consisted, in some of the schools, of the reproduction modules or worksheets from the teacher, classroom sets of textbooks, charts, pamphlets and a few reference books. Mphety, Zama, and Nsuku had the least resources and Jackie, Gogodi, Rennie and Riana the most. Jackie made use of an additional important resource i.e. the internet. The resources available in the ten case studies and the impact of these resources on the achievement of the outcomes will be discussed in more detail in the chapter 8.

6.4.2.3 Social environment

The social environment encompasses many different classroom 'factors', some of which will be

discussed later. I was interested in the arrangement of groups so that learners were provided with the initial conditions for achieving critical outcome 2, i.e. working effectively with others as a team or group. This arrangement has been described under my analysis of critical outcome 2. Henderson (1994) suggests that working in pairs or small groups is an appropriate strategy to help learners overcome shyness and encourage contributions when discussing sensitive issues. I would agree. While some learners would openly engage in class discussion, most learners enthusiastically discussed questions only within the safety of their own groups. In almost all classes observed, learners sat in groups for all their lessons.

In examining the social environment, I looked at whether the boys and girls were placed in separate classes for this topic or remained in the same class; whether the teacher used mixed or single sex groups and whether learners were placed in mixed ability groups or simply chose their own groups.
All classes had both boys and girls, and the case study teachers felt that this was important.

> I want the girls and boys to be in one class. Because it is nothing to be ashamed about, you need to be honest about it. It is always this behind the corner whispering that the kids wonder, is something wrong with me? ... So talk about it straight. So the boys can hear what the girls are going through and the girls can know what the boys have done and how the boys develop.
>
> (I - Riana)

> I wouldn't like to see girls and boys doing it separately in different classes. Because from the questions the boys and girls ask, the girls are learning by being there. There are certain things that they would ask from which the girls can learn, and there are certain things that they would ask from which the boys would learn. So in that way I think that's what brings a good balance there.
>
> (I - Rennie)

Some teachers had particular views on whether the groups should be single or mixed sex groups, and this is reflected in their arrangement of groups. In Rennie and Riana's classes, learners were placed in single sex groups while teaching this topic. Both Rennie and Riana felt that learners in boy or girl groups would feel less inhibited thus contributing to a more suitable social environment for the safe discussion of aspects of human reproduction such as breast and penis size, menstruation and wet dreams.

> I only put them in girls and boys groups for the girls to talk freely about their problems ... They need that little bit of security in their own boy group or girl group so they can chat and hear – "listen I'm not that alien, she's also got small breasts and she's also feeling insecure about it" - stuff like that, that you can not really talk to boys. But we did feedback to the boys so they know what's going on. (I - Riana)

For Rennie, the advantage of feedback from single sex groups was that, while girls and boys learn from one another and hear their concerns and perspectives, it is from a safe position. The person reporting back or asking a question does so on behalf of the group. It is not their own question.

> ... assuming a girl has a very pertinent question, she wants to ask it, but because she's asking it from the group's standpoint, it doesn't make it her own question. So she can ask it. In that way it gives them the freedom to ask the question they want to ask because its group-based. It is like strength in numbers. (I - Rennie)

Gogodi started with single sex groups but later moved the learners around to form mixed groups. She had considered only talking to the girls about menstruation after a few girls approached her and asked

her not to discuss this subject.

> I ended up with mixed groups, so that .. the girls were able to talk to the boys, to explain what menstruation is all about. (I - Gogodi)

Gogodi claimed that this empowered each sex and made them feel they had an important role to play in helping the other sex understand their concerns. Jackie deliberately had a gender mix so that learners could "find out about each other" (I). In all other classes there was no planned separation or mixing of sexes and there were mixed and single sex groups.

Thus teachers organised their learners in groups that in some case studies were single sex groups whereas in others were mixed. There are different opinions on whether groups should be mixed or single sex groups (Halstead & Waite, 2001; Reiss, 1998; Walker & Milton, 2006). Henderson (1994) for example suggests that students may be more relaxed, open and honest if surrounded by only members of the same gender. It seems to me that a teacher and a school should try to gauge what is appropriate for them. Learners may speak more openly in single sex groups but may also learn less about the opposite sex regarding sensitive issues like menstruation and wet dreams even if there is a report back later. There are matters that learners will discuss amongst themselves which they would never discuss openly in a class with adults listening in. Sometimes it is those who are in charge in the school or the teachers who feel most sensitive about the topic. Thus a principal of a primary school would not allow one of the male teachers, who had agreed to be part of my research, to teach the topic. Instead the female principal taught the boys and girls about human reproduction and sexuality in separate classes. Principals and teachers and learners have different levels of ease when discussing this topic and their school may draw from a conservative or liberal community. Teachers have to therefore find their own way when addressing this topic.

6.4.2.4 Emotional environment

In this category, I tried to gauge how safe the environment was for Grade 7 learners studying human reproduction. I tried to assess whether there were good interpersonal relationships amongst learners and between learner and teacher. This is difficult to gauge and so I can only comment on events observed in classrooms. Interactions in the classroom and the extent to which learners felt safe were influenced by many factors such as working in 'safe' groups, adhering to a code of conduct, the personality of the teacher and the approach to teaching this topic.

Group work seemed to provide a safe environment for many, but not all, learners. Mphety describes the groups as safe havens for shy children where they can ask their questions, draw for the group or hold up a poster while a bolder child is reporting back, and where they can experience some success at a task as a group instead of getting it wrong everyday. However in Mphety's classes, there was sometimes animosity expressed among learners. Rennie and Riana's description of single sex groups as safe places to discuss sensitive matters has been described above.

One of the features advocated in the module that could contribute to a safe emotional environment was a code of conduct. Schiro (2008), Aldridge (2012) and others point out that in classrooms that promote cooperation and respect, and where learners feel comfortable, safe, supported and accepted,

they are more likely to participate and learn. Each of Gogodi's classes produced their own code of conduct. Items in their code of conduct included "respect others, confidentiality, do not mock or criticise other learners' opinions, be open" (F – 7/8). While she did not contribute to the items, Gogodi used them throughout the module to remind learners to consider if what they said was acceptable behaviour. Mphety, Thobz, Nsuku, Rennie and Riana also invited their learners to produce codes of conduct either in groups or as a whole class, and like Gogodi, they reminded the learners of their own code. Mphety's code was not however always enforced, as indicated below. The fact that the learners had constructed their own code of conduct made it more powerful and useful for these teachers. For many of the learners, looking at pictures of naked men or woman was initially embarrassing. So for example when Gogodi put up a chart of a boy and a man, there was some giggling especially from the younger boys. Her response "you can giggle for a while, this is natural" provided them with an outlet for their embarrassment. I did not see any code of conduct used in Jackie, Sipho, Samkele and Zama's lessons. Schiro (2008) argues that a comfortable emotional environment can be created by putting in place classroom rules that promote cooperation and respect for one another.

The personality of the teacher and how they approached the teaching of this topic contributed to whether learners felt safe or not in their discussions about human reproduction.

Rennie appeared to be one of the 'safest' teachers to be with. He was quiet, mild, and non-confrontational, a peacekeeper. He saw himself as very approachable and in his interview mentioned that learners came to him with their problems from time to time because they trusted him.

> I try to be more informal than formal. And my style is more relaxed. I'm not very hard and fast when it comes to discipline for example. ...The moment you bring the hammer down on them, then they close up and they wouldn't talk. ... they do trust me because they do come to me with their odd problems every now and then and talk to me. (I - Rennie)

Zama, a young teacher, likewise was gentle, dignified and quiet and treated learners' questions seriously. He seemed to have the respect of learners and the boys in particular questioned him extensively on personal matters in some lessons. Perhaps the fact that he had assisted his cousin, a medical doctor, in medical circumcisions in the Transkei imbued him with some level of authority on reproductive matters.

Riana was a powerful personality, very colourful, very expressive, humorous and kind. She engaged with her learners, being very dramatic at times and then chatting quietly to shy learners, crouching next to groups, listening to them and getting involved in discussions with them. The learners seemed to accept, enjoy and respect her, and they wanted to tell her things. Amongst one another, there were good relationships in most but not all groups, as they worked on tasks together.

Gogodi was a dignified older woman, insisting on learners adhering to their code of conduct and respecting one another's views. She encouraged confidentiality so that matters discussed in class did not become the subject of playground discussion, and her quiet unobtrusive manner and use of humour resulted in a pleasant atmosphere. Learners seemed to feel safe about discussing personal matters both with one another and with her.

Jackie was a younger but mature and experienced teacher who also taught the class Life Orientation. She believed that her role as a learner-centred teacher was to draw out learners' ideas and challenge thinking around a number of issues related to human reproduction. She describes her relationship with the class as follows:

> I try to be honest with them but not to influence too much because ... they're at a stage where everything is ... they're teenagers, so everything is curiosity.... So they know that, and in terms of sexuality and self esteem, ... listen, it is your choices. (I - Jackie)

Jackie talked very openly but she tried to ensure that there was always respect, that personal boundaries were not crossed. At times however she did seem to cross those boundaries, for example, asking personal questions about the extent of their kissing in one lesson. While everyone was listening, some learners were very shy, especially some little boys who sat with their hands over their faces. So for them, the class discussion was becoming embarrassing.

Samkele was also a younger woman with a strong personality, loud voice, direct and open manner, who was kind and used humour a lot. The learners seemed at ease with her and one another except for some boy-girl tensions when they were shown diagrams of male and female reproductive organs. There was a lot of laughter, chatter and many questions were asked.

Nsuku was a modern and lively young woman who tried to enthuse her learners. Her classrooms seemed to be a reasonably safe environment, but with 60+ learners packed together, it was difficult to reach all learners and be aware of what was happening in groups.

Thobz was a soft spoken, gentle, kind person with strong Christian convictions who took a strong moral stand in her classes. She was a Grade 6 Natural Sciences teacher who offered to take the Grade 7 classes for this section of work while the usual Grade 7 teachers took her classes. It was possibly not a good idea since the learners did not know her, and her appearance as their teacher for this section indicated there was something unusual about the content of the lessons. In this school, sexual cartoons appeared in the toilets, and some learners circulated pornographic pictures. Thobz felt she had a friendly relationship with learners and that they were comfortable with her and respected her. However this clearly did not appear to be the case with all learners.

Mphety, another young, modern and very accommodating teacher in her first year of teaching, perhaps had the most chaotic classroom and while she had some lessons in which there was group discussion, at times there was no control and thus the classroom ceased to be a safe environment for exploring the topic of human reproduction.

Perhaps the most difficult person to assess was Sipho. He had grown up in a rural area of KwaZulu Natal but attended a university in Gauteng. While he claimed to be reticent about teaching human reproduction, I frequently felt he crossed personal boundaries, becoming too personal and too intimate in his questioning. Thus when a group did a presentation on physical and sexual maturity, he asked the group "What makes you to be sexually aroused" (F – 1/8) and both the presenter and the class

went quiet. This was now too personal. In the next lesson, he asked what is found inside the scrotum. One learner said "balls" and Sipho responded – "if you do not know (what the scrotum holding the balls is), so ask your friend to go and show you" (T – 3/10). Throughout his lessons there were personal questions about penile erections, masturbation, producing sperm, etc. For example, he asked the boys:

Sipho: Today, boys, how many of you have experienced a penile erection today? Today, meaning 12 o'clock. 12 o'clock last night all the way to now. Penile erection.

Boy: But sir!

Sipho: That's what I'm asking. I see people now wanting to raise their hands.

(Class makes comments) (LT- 3/8)

This seemed inappropriate, especially in mixed classes with young learners. In Chapter 7, I look in more detail at this aspect of Sipho's teaching, and speculate on his possible motives for what I considered personal and intrusive comments. Sipho told me that some learners complained to the HOD that his level was too high. Sipho said that this meant he was very open and talked about things in depth in class. If being open was the cause of the complaint, then some learners may have been unhappy about the nature of the discussion. In his interview, Sipho saw himself as the boys' confidante since many had single mothers who did not talk about such matters. He felt he was educating learners about the realities of life. He did not believe he was invading the children's privacy with his personal questions but he seemed to do exactly that in a number of instances. He was soft-spoken with a macabre sense of humour, and most learners seemed to enjoy his classes and respect him. However maybe they were also rather anxious, as seen when learners became quiet and pensive or refused to answer his questions.

It is difficult to pinpoint exactly what makes children feel safe when discussing human reproduction. It seemed to me that children felt safer where there was mutual respect amongst learners and between learners and teachers and personal boundaries were not crossed. Learners felt more confident in asking teachers questions when their teachers' subject content knowledge was good and they could explore the topic with humour but also in a sympathetic and respectful manner. However if the knowledgeable and humorous personality crossed personal boundaries and intruded into the private world of learners, as did Sipho, a different atmosphere permeated the classroom (risky, dangerous, exciting). A further factor that Riana identified, that contributed to the safety of discussing human reproduction, was that much of her teaching focused on the scientific basis for what was occurring e.g. changes in puberty, structure and function of reproductive organs, menstruation rather than the focus on feelings.

Sugrue (1997), asserted that, when learner-centred practices were introduced into Irish primary schools, one of the most significant long term changes was in the area of interpersonal relationships. Teachers developed friendly caring relationships with learners thus creating a comfortable emotional environment in which learning could take place. Similarly, in my study, most teachers provided a relaxed, safe and comfortable emotional environment in which learners could ask their questions and address their anxieties in relation to the topic of human reproduction.

6.4.3 Teacher responsive to needs and interest of learners

In the most radical form of a learner-centred approach, the content of the curriculum should emerge from the needs and interests of a learner rather than follow a pre-planned programme determined by a teacher or a Department of Education (Cuban, 1993; Department of Education, 1996a; Schiro, 2008). The Department of Education attempted this approach in Curriculum 2005, but in the Revised National Curriculum Statement, began to move away from this approach and provided a framework of core knowledge that needed to be covered in the Senior Phase of the Natural Sciences including an outline of topics in human reproduction.

The module that I developed on human reproduction did not therefore represent the most radical form position mentioned above since there was a clear progression of ideas (an expansion of the outline in the RNCS), i.e. content was specified but opportunity was given to learners to explore further. This allowed for the sort of hybrid practices reported by Cuban (1993) in some schools in the United States in which teachers decided the content to be covered and the activities learners would engage in, but allowed the concerns and interests of learners to help determine the direction and extent of coverage of this content. In my analysis I explored whether teachers did indeed allow the needs and interests of learners to determine what they explored within the topic of human reproduction, or whether they used more hybrid practices, or were in fact inflexible in what they chose to cover, whether using the module, textbooks or their own notes. The categories used in my analysis are shown in Table 6.5.

In the more extreme form of learner-centred approaches, learners contribute to decision-making on not only what they would like to investigate, but also on other curricula matters. In Gauteng schools, learners did not make decisions on broader curriculum issues such as length of lessons, where they would work, etc. The number of periods spent on Natural Sciences per week and the length of these lessons were specified and adhered to. Only teachers who taught across two or more learning areas e.g. Jackie, could allow more (or less) time for Natural Sciences activities. Some teachers did however extend their discussions into breaks or after school, as mentioned elsewhere.

In order to find out whether the needs and interests of learners had been addressed, I attempted to assess whether the learners found the curriculum relevant and interesting. I looked at learner participation, enthusiasm, expressions of interest in the questions they asked, etc, or at signs of boredom revealed by reading other books in class, chatting about other topics, doing homework for other subjects, messing around. In addition I asked the teachers about their learners' level of interest.

Through my observations and teachers' comments during interviews, I assessed the extent of learner-centredness in this category as follows.

Table 6.5: Needs and interests of learners

Feature	**less ----------->more learner-centred**			
Needs and interests of learners determine the content of the curriculum especially Science content	*Teacher decides on content to be covered and stays focused in this content.* **Thobz**	*Hybrid approach: teacher follows their own plan, but pace and extent of coverage determined by learners i.e. a less learner-centred 'hybrid' approach.* **Sipho, Gogodi Samkele, Mphety Zama, Nsuku Rennie, Riana**	*Hybrid approach: the teacher has a general plan but the needs and interests of learners determine the direction in which the lessons go and the content covered, i.e. a more learner-centred hybrid approach.* **Jackie**	*The curriculum is dependent on and determined by the needs and interests of learners. The learners contribute to decisions on what they will investigate within the topic of human reproduction.*
Learners find curriculum relevant and interesting	*Students appear disinterested, engage in other activities, or simply listen but do not participate.*	*Learners fairly enthusiastic, pay attention to teacher, some questioning, some involvement in and completion of tasks.*	*Learners mostly enthusiastic, actively engaged in lesson, frequent questioning by learners, active involvement and completion of most tasks.* **Sipho, Mphety Zama, Thobz, Rennie**	*Learners enthusiastic, actively engaged in lesson, extensive questioning by learners, active involvement and completion of tasks.* **Jackie, Samkele, Gogodi, Nsuku, Riana**

Learners in all classes seemed to find the topic of human reproduction relevant and interesting. However the extent of their interest seemed to depend on a number of factors. These included the confidence and interest of the teacher, whether aspects of this topic had been covered in Life Orientation or by an external group e.g. FAMSA, the maturity of the learners (very young learners were sometimes not interested); and the information they were interested in.

Interest and enjoyment of the topic, according to the teachers, was evident in their learners' questions and enthusiastic participation in class; staying after school to talk to the teacher (Mphety); and their good performance in the class test (Jackie). Jackie claimed that

> They LOVED doing Science this term... they enjoyed it. They really did. (I - Jackie)

Thobz commented that

> They are excited all the time. They want us to go back and keep asking those silly questions. (I - Thobz)

Sipho claimed that:

> Every single period they would wish it's human reproduction. They are enjoying that a male is talking to them about the things their parents do not talk about. And they want to know. Their life is surrounded by sex. Everything. Their music... (I - Sipho)

Nsuku explained why her learners found the information relevant.

> It is very useful for learners because it is what's happening. It is not like teaching the locust. It is about them. It is about life. (I - Nsuku)

As mentioned previously, most of the pressing concerns that learners had related to their experiential knowledge i.e. understanding their changing bodies, addressing anxiety about their differences, as well making sense of the troubling stories they heard from friends, family or the media about menstruation, abortion, the birth of a baby, etc. The more academic content on structure and function was less emotionally engaging and fewer students seemed absorbed by learning about these aspects.

Occasional boredom was evident in some classes especially when there was a heavy emphasis on health and morals e.g. in Sipho's and Rennie's classes during presentations on ethical questions, and when Thobz read long extracts from some notes which emphasized moral behaviour. In some cases such as Rennie's, lack of interest at times may have been due to a repetition of aspects of a sex education programme by FAMSA earlier in the year in the school.

When I analysed the extent to which the needs and interest of learners determined the content of the curriculum, I found that all of the case study teachers fell within the hybrid categories of my classification. Jackie was perhaps the most learner-centred in pursuing the needs and interests of the learners (see Table 6.5). Jackie engaged in intensive questioning of her class, as mentioned previously, and they responded with many of their own questions which she turned into 'research questions' i.e. the learners had to go home and find answers to their own questions either by asking their parents or searching for information in books or on the internet.

> And the questions that they were asking are questions that they really wanted the answers to.
> (I said) "So how badly do you want to know? And if you really want to know, go and find out and come back with it and let's see if your information is accurate."
> So a lot of the work they did themselves. … They went and found answers to what they were interested in. That's learner-centred where you're going and finding your own information, these are questions they ask themselves and they really wanted to. That's truly, truly learner-centred, because it is important to them. (I - Jackie)

Jackie felt that her lessons demonstrated the spirit of OBE since the questions her learners asked determined the direction of her teaching. She claimed her teaching was responsive i.e. she would consider the information collected and presented by the learners and continue from there. She pointed out that this is what they wanted to focus on, and so any attempts to get them to understand more conceptual stuff, for example the menstrual cycle, were not met with the same level of interest. Jackie felt the message her learners were conveying was "I'm not really interested in what you think you want to teach me". Jackie's first few lessons followed this approach. Later however she began to use the worksheets supplied by the HOD which contained detailed content and activities. However Jackie felt she was not constrained since although she started with the concepts in the worksheets, where she took the discussion and the levels to which she took the discussion were her own or rather that of the class. She felt the direction and content of the discussion largely emerged from the class and the content was not pre-empted by her.

The remaining nine case study teachers followed the plan set out in the module or in their own worksheets or textbooks and were thus considered less learner-centred (Table 6.5). However the rate at which they moved through the material varied depending on the extent to which they spent time

answering the learners' questions and pursuing directions which interested the learners.

Some teachers stayed very focused. Riana typified this kind of teacher. She had a tightly organised programme and moved quickly and efficiently, allocating specific times for tasks. She did use extensive questioning to probe for her learners' concerns and interests and she responded to their questions, allowing time to explore some ideas. If however their questions related to topics that were planned for later lessons, she says that she postponed giving them an answer.

Gogodi, Mphety, Zama and Nsuku had similar approaches, responsive to questions and concerns but following a clear plan. Pregnancy and the birth of a baby were topics that were not included in the module but were of great interest to learners. These topics do appear in the RNCS, to be taught at some stage between Grade 7 and 9 (Department of Education, 2002a). This was a topic that most teachers made a detour into.

Rennie followed the worksheets closely and attempted to complete each topic within the time period he had decided on. However the discussions that took place in his class resulted in him being unable to keep to his own deadlines.

> When I go into class, I'd like to finish that topic within that period because we're pushed for time. But very often it doesn't happen that way and sometimes the discussion, depending on its strength, its importance at that point, might take longer than I will plan for. (I - Rennie)

Teachers pursuing the ideas of learners more extensively included Sipho and Samkele. Samkele saw her teaching as learner-centred because her learners were asking questions and the many questions determined how much time was spent and how much detail she went into. The content of her lessons was influenced by her learners' interests which were around pregnancy, testing for virgins, and a number of cultural issues.

Some teachers, while having a plan determined by their own programme or textbook or worksheets, spent more time exploring the questions of learners. They would appear to be more learner-centred in this regard. In responding to the questions (needs and interests of learners), they did sometimes explore their learners' concerns in much greater depth, and addressed misconceptions or cultural perspectives far more deeply, but they sometimes tended to return again and again to certain topics, repeating points and thus struggled to move forwards.

In responding to the needs and interests of learners, the argument against learner-centred approaches comes to the fore. Should one move in a clearly defined direction building concepts in a vertical direction as proposed by Bernstein (1999) or do the outcomes count most and the exploration of what most interests learners, even if in lateral or circular directions, is more likely to meet their needs and enable them to demonstrate a wider range of outcomes? I would suggest a balance is needed, particularly in a topic like human reproduction. Learners are surrounded by a confusing array of conceptions of human reproduction which are continually presented to them by family, friends, teachers, nurses, the media and other sources. Learners need to build their concepts of reproductive structure and function in a vertical fashion, assisted by their teachers and peers, and allow the 'two-

way traffic' between scientific and everyday discourses to continue so that, as Ivinson proposes, they can "confront common sense with scientific discourses" (Ivinson, 2007, p. 203) allowing cognitive conflict to occur, be resolved and new understandings to be constructed.

6.4.4 Different intelligences and learning styles accommodated

Gardner (1983) proposed that learners think in different ways which he calls intelligences, and learn best through certain approaches which make use of certain sensory stimuli (visual, auditory, kinaesthetic or tactile stimuli) as discussed in Chapter 3. My analysis makes use of only three of the seven intelligences identified by Gardner, and I examine which of the four learning styles are addressed through their related sensory stimuli.

- verbal-linguistic – auditory learners learn best through speaking, hearing, reading, writing.
- visual-spatial – visual learners learn best by seeing, i.e. through working with pictures and colours, visualising and drawing.
- bodily-kinaesthetic – the tactile learner learns best by touching while the kinaesthetic learner learns best by moving. In both cases they are processing knowledge through bodily sensations.

I have not included 'logico-mathematical' and 'musical-rhythmic' since there was little focus on developing these intelligences in this topic. The only opportunities for logico-mathematical skills to be developed was in the use of menstrual calendars by three teachers, and there was no attempt to develop musico-rhythmical skills.

Gardner also proposed that two further forms of intelligence needed to be developed i.e. the ability to learn by interacting with others and to learn by working alone, i.e.

- interpersonal – learn best through sharing, comparing, relating, interviewing, cooperating
- intrapersonal – learns best through working alone, self-paced projects, reflecting.

Intra- and interpersonal skills are both important skills that should be addressed in a balanced learner-centred approach. Interpersonal skills, the ability to work together and cooperate, were not taught specifically in the classes I observed but there were many opportunities for these to develop in most teachers' classes, resulting to some extent in the achievement of CO 2 i.e. working effectively as a team or group. This has been discussed at length in previous sections. Intrapersonal skills, the ability to work alone on a self-paced project can be linked to CO 3 i.e. the ability to organise and manage themselves and their activities responsibly and effectively. Only Jackie and Riana provided significant opportunities for the development of this skill.

A learner-centred approach would provide opportunities for learners to use all these multiple intelligences and learning styles thus catering for their strengths and working on their weaknesses. Goodnough (2001) suggests that Gardner's multiple intelligence theory provides a useful framework for teachers, allowing them to assess their teaching and ensure more balance in their activities. My analysis explores the extent to which some of these intelligences were developed and children's learning styles catered for during the observed lessons.

Table 6.6: Multiple intelligences and learning styles

Feature	**less ----------->more learner-centred**			
Caters for different intelligences and learning styles and encourages development of these intelligences				
	never	*sometimes*	*often*	*always*
Verbal/linguistic – reading, hearing, speaking, writing, discussion **(Auditory)** – (oral presentations, debates, discussions, question and answer) Learn by hearing				**all teachers**
Visual-spatial – working with pictures and colours, visualising & drawing **(Visual)** – (posters, charts, models, pictures) (Learn by seeing)		**Samkele Zama**	**Jackie, Sipho Gogodi, Mphety, Thobz Nsuku, Rennie, Riana**	
Bodily kinaesthetic – (Kinaesthetic) using body to solve problems, convey ideas and emotions, movement (games, role-play and activities encouraging movement – learn by doing - **Tactile** (touching) – handling and manipulating materials – learn by touching	**Sipho Jackie Samkele Zama**	**Gogodi Mphety Thobz Nsuku Rennie Riana**		

The most commonly developed intelligence was verbal/linguistic and in particular hearing and speaking thus catering for learners with an auditory learning style. This was evident in the dominance of teacher-talk in some classrooms (e.g. Samkele and Thobz) and of a mixture of teacher and learner-talk in other classrooms during explanations, question and answer sessions, discussions and debates. These lessons catered for the auditory learner.

The activities in the module provided learners with an opportunity to develop their visual-spatial skills and catered for the visual learner. Gogodi and Riana provided visual materials most frequently, but the remaining teachers all used some sort of visual stimulus in most lessons, and Zama and Samkele used them in some lessons. The visual stimuli used most often were the diagrams in the worksheets or in textbooks. As mentioned earlier (in the section on hard scaffolding), teachers also used large laminated colour charts of the human reproductive system (Riana, Rennie and Gogodi) and small black and white laminated charts (Samkele); overhead transparencies (Gogodi and Thobz); pictures from books and magazines (Sipho and Samkele); and pictures on the internet (Jackie). Teachers in one of the under-resourced township schools drew pictures on the board (Zama) or on flip charts (Mphety) which could be carried from class to class. The quality of these resources varied greatly and so too then did their usefulness in catering for the visual learner and in developing visual spatial skills. Learners need to visualise internal reproductive structures, and see where they fit together in the body in order to begin to understand how they function. Children need to develop a picture in their head of the internal organs, and the larger, the more colourful, and the better the quality of the representation, the more it would capture their attention and help them to remember these structures. The large

colourful charts from the Department of Health and Education and the pictures on the internet site that Jackie used, were considered most valuable in developing visual skills. These resources will be discussed in the next chapter.

The kinaesthetic learner was catered for in the module only in the role-plays on emotional changes and in the 'sugar baby' project and only half the teachers included these role-plays in their teaching. The only opportunity for catering for the tactile learner would have been examining contraceptives (but this was not observed), and in learning about the reproductive system through touching structures on a model. None of the schools had models of the reproductive system.

Thus the teaching of human reproduction catered for the visual and auditory learner and to a far lesser extent the tactile and kinaesthetic learner, and one assumes that other learning areas would pay greater attention to the development of other intelligences, and teachers' beliefs about these factors. I begin with factors that relate directly to the teacher and which I refer to as internal factors.

6.4.5 Personal differences in learners accommodated

A learner-centred approach takes into account the context of the learner. This includes cultural and religious beliefs and practices, the home background of the learners and the languages of the learners i.e. their home language and their competence in the language of instruction. Children in urban schools in Gauteng come from a wide range of different backgrounds. In addition, as adolescents approaching or going through puberty, they are at different physical, social and emotional levels of development. An analysis of these 'learner' factors is provided in Table 6.7. A detailed discussion of the findings in Table 6.7 can be found in Chapter 9, sections 9.2-9.4, which focuses on learners.

Table 6.7: Personal differences in learners accommodated

Feature	**less ----------->more learner-centred**			
Personal differences amongst learners accommodated				
Personal: learners' ideas and interests respected; their distinctiveness & uniqueness respected.		**Mphety Thobz**	**Sipho, Jackie Nsuku, Riana Rennie,**	**Gogodi, Samkele Zama**
Cultural & religious beliefs and practices		**Thobz**	**Jackie, Sipho Gogodi Rennie, Riana**	**Samkele, Mphety Zama, Nsuku**
Language: takes into account language difficulties in multilingual classrooms, provides assistance, allows code-switching		**Sipho, Jackie, Rennie, Riana**	**Gogodi Thobz**	**Samkele, Mphety Zama, Nsuku**
Takes into account developmental level of learners i.e. physical, intellectual, emotional and social.		**Mphety Thobz**	**Sipho, Jackie Samkele, Zama, Nsuku, Rennie**	**Gogodi Riana**

Teachers varied greatly in the extent to which they accommodated personal differences amongst learners. Rennie, for example, had English as his home language and taught in a school where most learners also had English as their home language. Code-switching was not observed there although it

might have been used occasionally between learners who had English as an additional language. For Mphety, as her lessons became more and more unmanageable, it became difficult to hear, let alone respond to individual learners' ideas and interests. In Chapter 9, I explore the personal differences amongst teachers and the extent to which these differences affect the teaching of human reproduction in learner-centred ways. I will then return to an analysis of Table 6.7 when I conclude with a discussion of the extent to which teachers accommodated these personal differences.

There is frequent reference in the National Curriculum documents to different rates of learning being catered for. Children learn at different rates and a feature of a learner-centred approach is the teacher's ability to provide opportunities for learners to learn at a rate that suits them, extending the gifted child and allowing the slow learner opportunities to catch up. In the more radical forms of learner-centred education, each learner would work at their own pace, resulting in learners throughout the classroom working on different tasks. This style of teaching was not evident in any classrooms I observed. Nor was I aware, in any lessons, of special tasks being given to gifted learners. I only observed one teacher, i.e. Gogodi, providing one class that was ahead of the other classes with group tasks. While this is an important feature of learner-centred approaches, I therefore did not include this aspect in the profile I developed of the learner-centred teacher.

6.5 Conclusion

In conclusion, if one examines each teacher's outcomes-based, learner-centred profile (appendix 6), one realises that it is difficult to categorise each teacher as teaching or not teaching towards the outcomes or being more teacher-centred or more learner-centred in their approach. An outcomes-based and learner-centred approach is multi-faceted and teachers display strengths in some areas and have not paid much attention to other areas. Sometimes, as in Jackie's case, a feature that was considered more learner-centred in one area such as her Socratic style of questioning resulted in a less learner-centred approach in another area such as less time being spent in learner interactions with one another. Some teachers tended to be more teacher-centred in their approach but this did not mean that their teaching was of no value. Samkele for example did not provide her learners with opportunities to achieve certain outcomes. However although only being able to provide her learners with poor physical conditions and extremely limited resources, she nevertheless was an enthusiastic teacher who provided a safe emotional environment within which her learners could ask a wide range of questions. In addition, her learners appeared to enjoy her animated lessons in which she used the type of rhetoric that Hattingh et al. (2005, p. 22) suggested was highly valued in Africa and well suited to large classes and inadequate resources. In the next chapter I discuss each case study teacher and will return to these profiles. The individual profiles provided in the appendix give a picture of each teacher whereas this chapter reveals trends amongst a group of teachers.

In the next three chapters I will explore factors affecting the teaching of reproduction in outcomes-based and learner-centred ways, and teachers' beliefs about these factors.

Chapter 7
Internal factors: The teacher

The topic of human reproduction is a sensitive topic for most teachers, particularly for primary school teachers. Grade 7 Natural Sciences teachers would not only be expected to teach this topic, but would need to use outcomes-based and learner-centred approaches to do so if their teaching was to be true to the RNCS. Grade 7 Natural Sciences teachers' beliefs about their ability to teach human reproduction to their learners in outcomes-based and learner-centred ways, can be influenced by professional and personal factors. These include their professional background, home background, personal characteristics and their value systems which might be influenced by their religious and cultural beliefs and personal values. This chapter examines the extent to which these factors impact on the way in which teachers teach human reproduction.

In this chapter, I draw on data from the survey, field notes, lesson transcripts and interview transcripts to begin to answer the 2nd-4th research questions. My first concern, and thus the first level at which I explore my data, is to identify factors that affect the teaching of human reproduction without considering whether the approach is outcomes-based or learner-centred. There may be professional and personal factors unique to a teacher that may help or hinder their willingness or ability to teach human reproduction to Grade 7s. Identifying these factors will help me to answer research question 2. There may also be professional and personal factors which affect the extent to which teachers use outcomes-based and learner-centred approaches to teach human reproduction. Identifying these factors will help to answer research question 3. Finally, at the heart of what causes teachers to teach in the way they do, may be their behavioural, normative and control beliefs i.e. their attitude to teaching in outcomes-based and learner-centred ways, their perception of whether these approaches are approved of by those they respect or are responsible to, and in particular whether they believe they can control what takes place in the classroom. Here I look at how their control beliefs are influenced by personal and professional factors and thus try to answer research question 4. My theoretical framework for my study can be found at the end of Chapter 3 and shows the relationship between the different aspects of my study. To summarise however, I have represented what I intend to investigate in this chapter in Figure 7.1 below.

I start this chapter by analysing and discussing the survey results which provide me with the professional and personal context of a group of Grade 7 Natural Sciences teachers from one Gauteng district before the teaching of human reproduction, and with their beliefs on how their context will affect the teaching of human reproduction in outcomes-based and learner-centred ways. I then provide a biography of each of the ten case study teachers and one additional teacher in order to provide a coherent picture of each teacher in their context, before focusing on the professional and personal factors that affect their beliefs about their teaching.

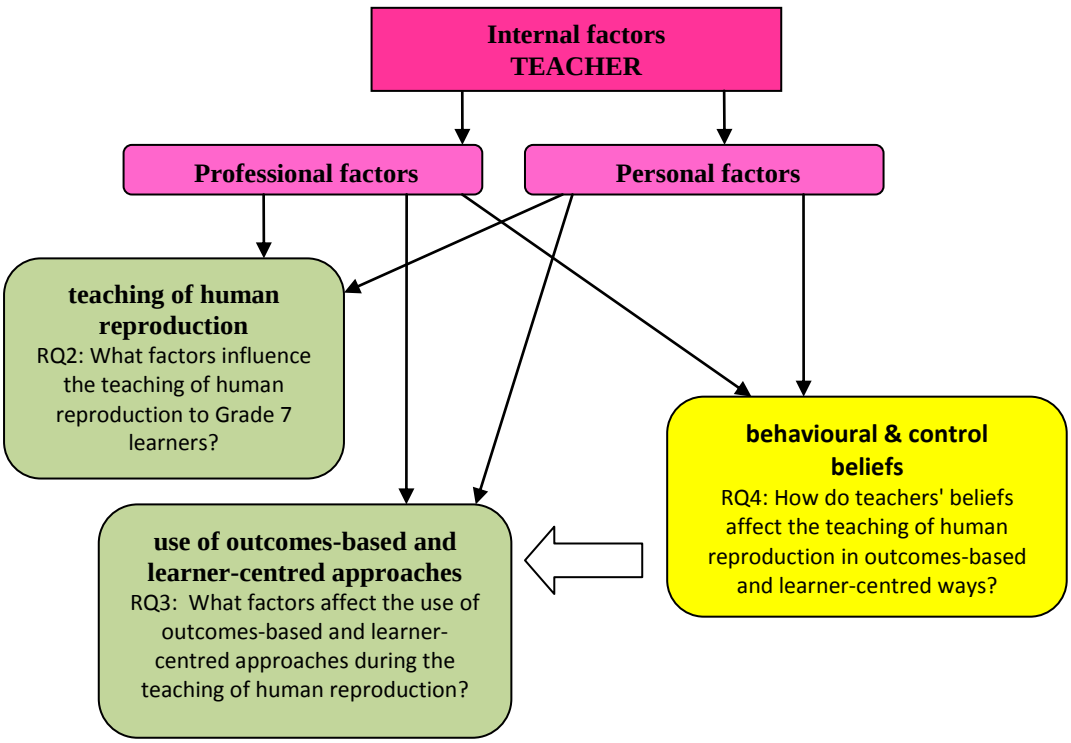


Figure 7.1: Teacher factors and my theoretical framework

7.1 Survey

In this section I provide an analysis of the biographical information provided by the survey teachers as well as their perceptions relating to professional and personal factors that could influence their teaching of human reproduction. In Chapter 5, sections 5.2.1.3 and 5.2.1.4, I discussed the sample that I used from my survey and how I collected the data. I will briefly review this in order to explain the numbering used in the tables and in my quotes. Fifty-four teachers attended the workshop and were given a number from 1to54. They used this number on their questionnaire and so when I refer to a particular teacher's response, I may say (T49) for the teacher who was numbered 49. The questionnaires of only 40 of those teachers could be used in my analysis for reasons explained in section 5.2.1.4. In my discussion I use quotes from the survey (S) and so if it is a quote from teacher (T) 49, I will use the index: S - T49. The data from the survey questionnaire of 40 Grade 7 Natural Sciences teachers (see Chapter 5, section 5.2.1) was analysed. As the survey teachers did not answer all the questions in the survey, I have indicated how many have answered each question.

7.1.1 Professional background

In the survey, teachers were asked to provide some biographical data. This is recorded in Table 4.3 in the appendix. Teachers' qualifications and, in particular, their qualifications in biology and the stage of their career are analysed and discussed.

7.1.1.1 Teachers' qualifications and possible subject content knowledge

Research shows that a teacher's level of education and training make a difference in their capacity to innovate (De Feiter, et al., 1995; Rogan & Grayson, 2003) and in their teaching of human sexuality (Anastácio, et al., 2004; Berger, et al., 2008). The teaching of human sexuality, as mentioned in Chapter 2, is similar to the teaching of human reproduction with regard to the promotion of appropriate knowledge, attitudes and values. The extent of teachers' subject content knowledge, in this case human reproduction, affects their confidence in teaching and as a result often their willingness to teach in new and innovative ways. I was therefore interested in finding out what academic and professional qualifications were held by the teachers in my survey, and whether these teachers had specialised in Natural Sciences/General Sciences and/or Biology/Life Sciences. I was then interested in whether their perceptions of how confident they were about teaching human reproduction before they started teaching could be linked to their level of education and training.

The teachers who participated in the survey all held some sort of professional and/or academic qualification. Table 4.3.1 in appendix 4.3 shows the wide range of diplomas, degrees and further qualifications amongst the survey teachers and the subjects these teachers specialised in. Of the 37 teachers that responded, 22 teachers had teaching diplomas, 12 teachers had degrees and a further three teachers said they had both degrees and diplomas. Nineteen of the 25 teachers (76%) who had completed teaching diplomas (including those who had both degrees and diplomas) had studied Natural Sciences (formerly General Sciences) or Life Sciences (formerly Biology) during their diploma; whereas only seven of the 15 teachers (47%) who claimed to have degrees had done so.

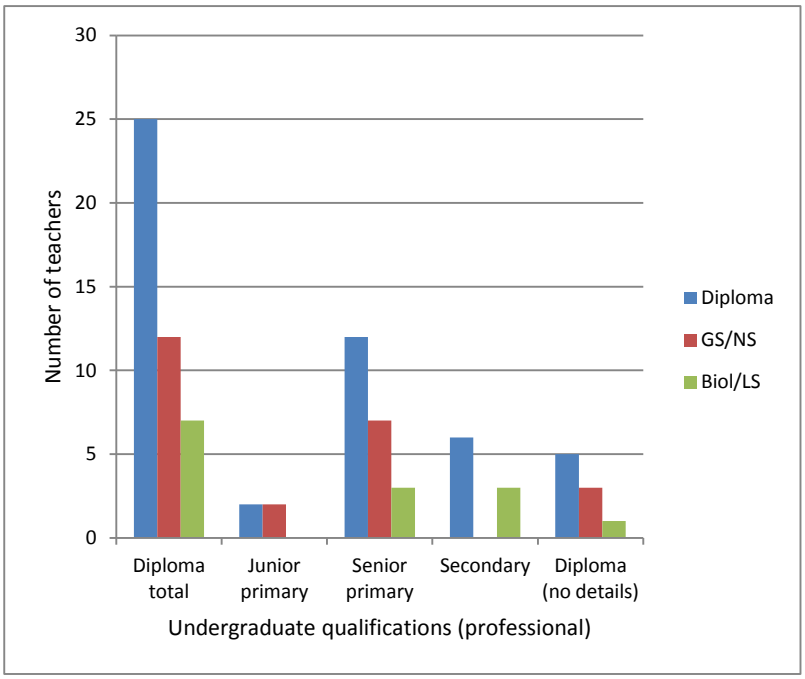


Figure 7.2: Number of teachers with professional undergraduate qualifications, and number specialising in General/Natural Sciences or Biology/Life Sciences subjects (n=22)

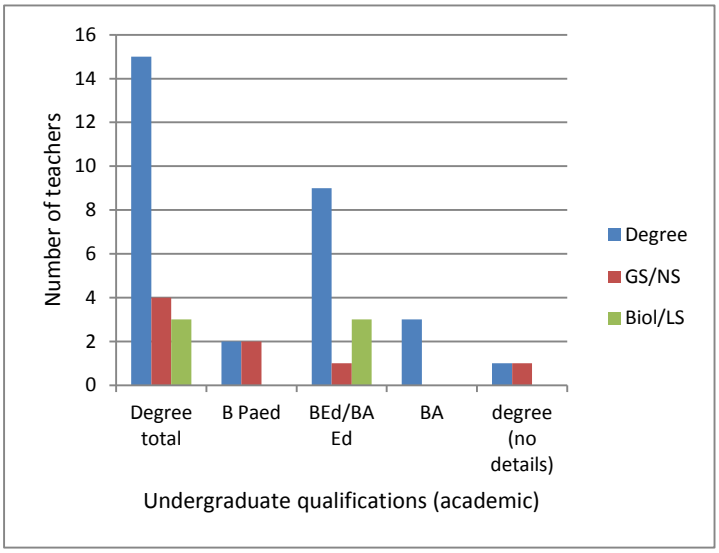


Figure 7.3: Number of teachers with academic undergraduate qualifications and number specialising in Life Science subjects in tertiary training (n=15)

[Key: BPaed (Prim) = Bachelor of Pedagogy in Primary Education; B Ed = Bachelor of Education; BA Ed = Bachelor of Arts in Education; BA = Bachelor of Arts]

Further qualifications were both professional (3 ACES specialising in Natural Sciences) and academic (4 BEd Hons, 1 BA Hons, 1 Honours, and 1 M Ed, none of which involved specialising in biological subjects).

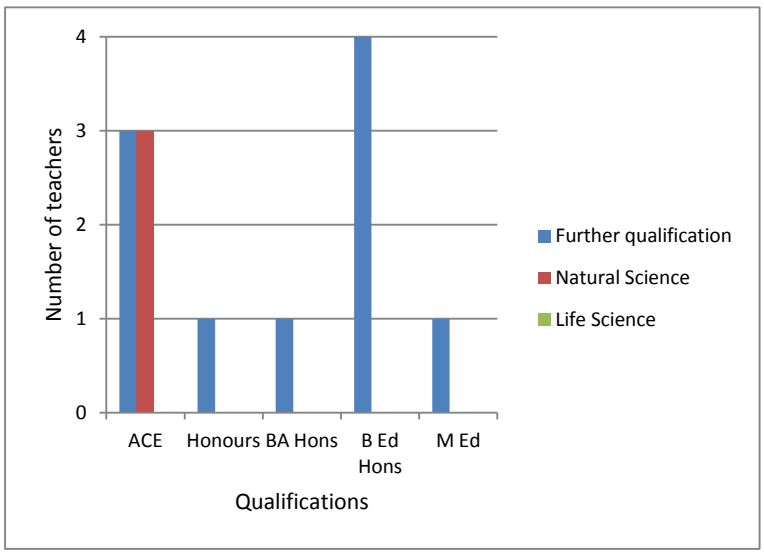


Figure 7.4: Number of teachers with further qualifications and specialising in Natural Sciences or Life Sciences (n=10)

[Key: ACE = Advanced Certificate of Education; BA Hons = Bachelor of Arts Honours; B Ed Hons = Bachelor of Education Honours; M Ed = Master of Education]

A much greater proportion of those primary school teachers who had chosen a diploma route had

studied natural or Life Sciences compared to those who had completed degrees. In addition three of these diploma teachers had upgraded their qualifications by completing an ACE specialising in Natural Sciences whereas none of the teachers who had completed postgraduate degrees had studied Life Sciences. Those teachers who had studied Natural or Life Sciences were likely to have studied human reproduction at some stage in their tertiary education and would thus have better subject content knowledge with regard to this topic.

It is a matter of concern that half the degree teachers and one quarter of the diploma teachers teaching Grade 7 Natural Sciences in this survey group have not qualified in the Natural or Life Sciences. They may, like the primary school teachers in the PEI studies, tend to avoid or limit the introduction of new ideas and concepts and they may frequently make errors with regard to the subject content due to their poor conceptual knowledge (Taylor & Vinjevold, 1999). Shulman (1986, 1987) has pointed out that what teachers know affects learning in the classroom. Several authors who have explored teachers' views on sexuality education (Anastácio, et al., 2004; Berger, et al., 2008) have found that teachers with higher academic qualifications and/or with specific training in sexuality education have a more positive attitude to teaching sexuality education, are more able to answer learners' questions and they encounter fewer difficulties while teaching this topic.

At the end of the survey, teachers were asked how confident they felt about teaching human reproduction in the following school term. Amongst the 31 teachers who did respond and provided appropriate responses, 12 teachers were very confident, 13 were confident, four were fairly confident, and two indicated they were not confident. These two teachers were well qualified (one with an M Ed and the other completing an M Ed) but did not have any Biology in their qualifications. There seems to be a trend towards a teacher feeling more confident before teaching human reproduction if they have biology in their background, as can be seen in Figure 9.4 below (Table 4.3.3 in appendix 4.3).

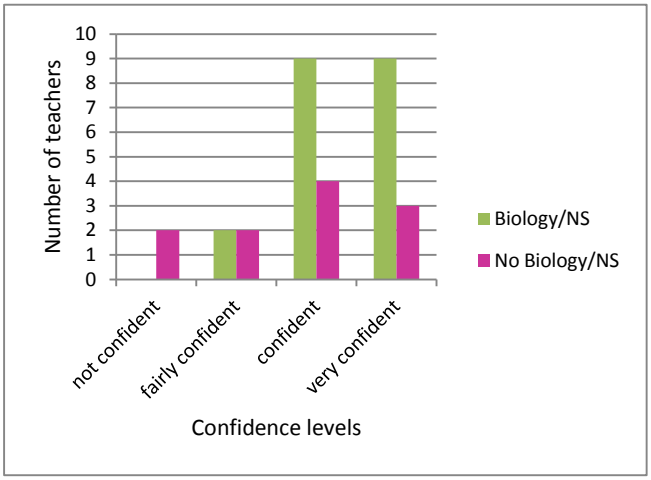


Figure 7.5: Confidence levels of teachers linked to Biology/Natural Sciences studied at a tertiary level (n=34)

Their study of Biology or Natural Sciences in their degree or diploma may have increased the confidence about teaching human reproduction amongst some teachers. However three of the nine teachers who claim to be very confident did not study Biology or Natural Sciences at a tertiary level. In addition, since the content of diplomas and degrees differ widely, one cannot really draw any firm conclusions here about the level of subject content gained during their tertiary education, and clearly many other factors contribute to teachers' confidence in addition to subject content knowledge. These will be discussed in the next section.

7.1.1.2 Professional experience

A first year teacher has many new challenges and may simply be attempting to survive that year. However, according to De Feiter et al. (1995), if that teacher feels that they have coped in that first year, they are more likely to try innovations.

I asked teachers how long they had been teaching for, and in particular how long they had been teaching Natural Sciences (Appendix 4.3, Table 4.3.2). As can be seen in Figure 7.6, most teachers had taught for between 6 and 30 years. Only three teachers were in their first year of teaching and four teachers had taught for up to five years. However a number of these teachers had begun to teach Natural Sciences after teaching other subjects e.g. an additional three teachers were teaching Natural Sciences for the first time and an additional twelve teachers had only been teaching Natural Sciences for 2-5 years. So the trend appears to be that some teachers start teaching Natural Sciences later in their career. This may be because they did not initially study the Natural Sciences in their diploma or degree and started teaching the subjects they were qualified in and later were asked to teach Natural Sciences. In addition in my study, three teachers had studied further e.g. by studying for an ACE specialising in Natural Sciences and this may be indicative of a change in what they were now teaching and the need to gain more pedagogical content knowledge through an ACE. Most teachers were mature and experienced teachers, but some had less experience in teaching the Natural Sciences. All these teachers had taught some or all of grades 4-7 (end of intermediate and senior phase). Twelve of these teachers had also taught in high schools.

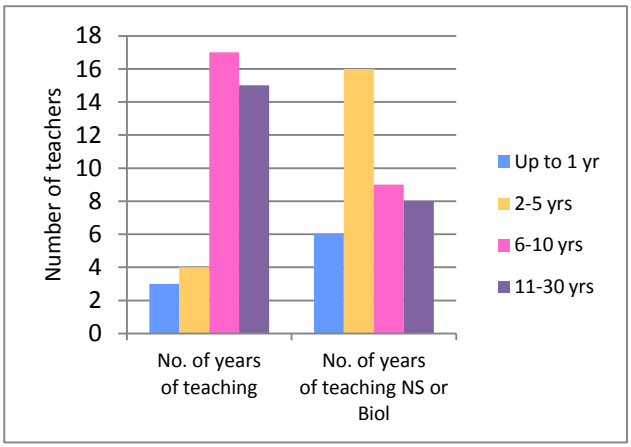


Figure 7.6 Teaching experience of survey teachers (n=38)

This therefore seems to be a mostly experienced cohort of teachers, although most were less experienced in teaching Natural Sciences. Three teachers had only started teaching that year but all three expressed their confidence concerning the teaching of human reproduction. The stage of a teacher's career did not seem to be a determining factor here in teachers' level of confidence before teaching human reproduction, since those who claimed to be very confident fell into the range of 2-30 years of teaching, and the three who did not show much confidence had taught for 8-12 years although two had not taught Natural Sciences before.

7.1.2 Personal factors

Many personal factors can influence the way a teacher teaches the topic 'human reproduction'. These include teachers' religious, cultural and personal values and their attitudes such as flexibility and open-mindedness, commitment and interest, self-efficacy, congruence and preferred teaching styles. I was interested in finding out teachers' perceptions of the influence of these personal factors on their teaching of human reproduction (RQ 2) in outcomes-based and learner-centred ways (RQ 3) and their perceptions of whether beliefs related to any of these factors would influence their teaching of human reproduction (RQ 4).

7.1.2.1 Religious and cultural values

Religious and cultural beliefs and practices can have a significant influence on teaching (Aikenhead & Jegede, 1999; Greathead, et al., 1998; Reiss, 1995; Rogan, 2000) and may limit the extent to which a teacher explores issues around sexuality, including the way they learn about the human body. I was interested in teachers' perceptions of the possible influence of their religion and culture on their teaching.

In the survey teachers provided more responses on the influence of religion than on the influence of culture (Appendix 4.3, Table 4.3.5). Teachers were first asked if they belonged to any particular religion. Five teachers did not respond. Five teachers (13%) said they did not belong to any religion, and one teacher said she simply had a universal belief in God. 63% of the teachers (n=25) said that they were Christian, whilst two teachers were Muslim, one teacher was Hindu and one belonged to a traditional African religion. When teachers were asked how their religious beliefs would influence the way they taught, a variety of responses were obtained. The Hindu teacher simply felt that his religion would help him to be more objective in his approach. The two Muslim teachers indicated that they held a very conservative position as did some of the Christian teachers. One Muslim and three Christian teachers indicated that they would encourage learners to abstain sexually. Another Christian teacher said she would encourage her learners to abstain until older. Both a Christian and a Muslim teacher referred to taboo topics e.g. pictures of the body (for the Muslim teacher) and sexual intercourse and contraceptives (for the Christian teacher). For the latter, these were topics to be discussed only in the context of marriage. Three Christian teachers said they would include moral behaviour in their lessons so that, according to one of them, "the learners must know the correct way of doing things" (S – T44). Another of these Christian teachers felt it was important to be open but

suggested that "we need to get a language of passing on the message" (S – T29).

Amongst the Christian teachers there were a range of other responses. Four teachers felt that their religion in no way hindered their teaching of human reproduction, and in fact supported discussion. However this discussion may well have been within a certain moral framework determined by the religious values of those people. One teacher thought that her religious beliefs would partly influence her teaching but said "I am a realist and believe that learners need to be taught this to be kept safe" (S - T36). Another teacher believed that teachers should focus on facts and should avoid imposing their religious beliefs on learners. Several teachers (n=5) felt that it was important to be open, helpful and professional in their approach and seemed to indicate that religious beliefs would not influence their teaching (see Appendix 4.3, Table 4.3.5). Thus there was no common response from a majority of teachers concerning the influence of their religion on the way in which they taught, although ten teachers (35%) felt that it would influence their teaching in some way. As can be seen from Table 4.3.5 in Appendix 4.3, there was rather a wide range of responses, with the largest group of responses (n=5) as that of being open, helpful and professional.

Culture, according to 23 teachers (58%), would not influence the way in which they taught human reproduction. However for eight teachers (20%), culture would influence their teaching. Two teachers felt that it would be difficult to talk about 'sex' since sex was seen as something sacred. Two teachers indicated that they would avoid certain topics e.g. circumcision and birth (see Appendix 4.3, Table 4.3.5). A fifth teacher expressed a moral response about when two people should have sex and this no doubt would emerge in her teaching.

Thus it seems that only some teachers believed that religious and cultural values would influence their approach to teaching human reproduction. Some teachers thought that they would focus on the factual aspects, whilst others thought that they would bring in a strong moral perspective.

7.1.2.2 Personal attributes

A person's flexibility and open attitude to change and their sense of the congruence of their ideas with those of the curriculum reform all contribute to their confidence and sense of efficacy as they attempt reform (Bandura, 1991; Davis, 2002; Fullan, 2001; Hargreaves, 1998a, 1998b).

Flexibility and openness to new approaches

The survey teachers were in the middle of curriculum change, and were continually being asked to implement new approaches. Some teachers, according to Fullan (2001), are flexible and enjoy attempting new approaches whilst others resist change and prefer to continue to use approaches that they have used successfully in the past. I was therefore interested in which approaches they felt were effective, and what their response to new approaches was.

The survey teachers were asked which approaches they felt were the most effective approaches for them and their learners when they taught the Life and Living component of the Natural Sciences (Question 5.6 and Appendix 4.3.7). The most effective approaches, according to twelve teachers, were

practical work involving investigations, observation and experimentation. The use of visual aids was considered important by five teachers, and a further five teachers felt that activities that allowed for interaction such as discussion and debate, brainstorming and reporting back were effective approaches.

When teachers were asked about their preference with regard to the adoption of new approaches (Question 5.7), 35 teachers responded. The majority of these teachers (63%; n=25) claimed to prefer trying out new methods. A further 23% (n=9) stated that they used both new approaches and methods that had always worked well for them. Only one teacher said he preferred to continue using methods that had always been effective in his teaching. New ideas for teaching human reproduction had been introduced during the workshop. It is not clear, at the end of the workshop, whether teachers were attempting to portray themselves as innovative to the researcher (even if this was not really their attitude to new approaches) or whether this truly represented their preferences. Their actual practice provides some indication of whether their claims were matched by practice.

Confidence and self-efficacy

People's sense of self-efficacy i.e. their confidence in their ability to perform a certain behaviour (Bandura, 1977, 1991) influences their perceptions of how easy or difficult it is to perform a behaviour and thus influences their willingness to carry out that behaviour (Ajzen, 1991). Thirty-one teachers responded to the question (5.10) in the survey questionnaire asking them how confident they felt about teaching human reproduction to Grade 7 learners. Their responses can be seen in Appendix 4.3, Table 4.3.6. As was mentioned in the previous section and illustrated in Figure 9.4, 63% of these teachers (n=25) reported that they felt confident or very confident about teaching human reproduction and so they had a strong sense of self-efficacy. Some of them elaborated on this point. One teacher exclaimed emphatically "I have NO problem teaching this subject" (S - T26). Four had a lower sense of self-efficacy (fairly confident), two were not very confident, three had inappropriate responses and six did not respond. The results thus indicated that most of the teachers who did respond were confident, willing and ready to teach human reproduction.

A teacher's confidence in teaching human reproduction is likely to have an impact on how they present the topic. Teachers' reasons for feeling confident related to their enjoyment of the topic and thus looking forward to teaching it (n=2), gaining confidence through the workshop (n=4), one teacher's experience as a mother (n=1), and their sense of responsibility to learners (n=2) e.g. "If I do not teach them, they might get the wrong information from their friends" (S - T17). With regard to their intended approach, one teacher (S - T48) expressed her confidence in terms of controlling the content i.e. "I teach facts to learners and do not allow vague comments", whilst another teacher (S - T29) felt that his openness with his learners contributed to his confidence. Two of the teachers expressed the need to deal with the topic sensitively and respectfully (Appendix 4.3, Table 4.3.6).

Four teachers indicated that they felt fairly confident, whilst two teachers were not confident. As mentioned earlier, both of the teachers who lacked confidence had not studied Natural or Life Sciences at a tertiary level. For one of these teachers, her lack of confidence was attributed to her

religious beliefs (Islamic). She did however see the value of "adjusting my thinking" (S – T12). When this teacher was approached one month later and asked to participate in case studies, she had moved into a more senior position in the school and had handed these classes over to a new teacher.

Confidence is a perception that is not necessarily related to a teacher's subject content knowledge or to their teaching ability. It can be linked to Bandura's notion of self-efficacy, a belief that one can perform a certain behaviour (Bandura, 1991) and that belief can make a difference when a teacher sets out to teach human reproduction.

7.2 Multiple Case Study

In this section I will look at the influence of professional and personal factors on the teaching of the ten case study teachers in my multiple case study. The data was extracted from the survey, the interviews with these teachers and my observations of the ten teachers. In order to provide a more complete picture of personal and professional factors influencing each teacher, I will provide a description of each teacher in individual vignettes before trying to draw conclusions on the influence of different factors affecting how these teachers teach human reproduction in outcomes-based and learner-centred ways.

The vignettes, while attempting to provide a more complete picture of each teacher, are of varying length since I explore some teachers' characteristics in greater detail than others. My description does not follow a particular order although I tend to start with a brief description of the teacher followed by professional and then personal characteristics. When I describe what the teacher is telling me, the data comes from the interviews (I) unless I specify that this is a response from the survey questionnaire (S). Any extracts from the field notes containing my observations and some of the class discussions are indicated by (F) and the date on which the lesson occurred. Five of the observed lessons for each teacher were transcribed and this provides me with a written record of the actual verbal interactions between teachers and learners. When these are quoted, I identify them with an LT (lesson transcript) and the date on which the lesson took place.

In my methods chapter, I mention that in a multiple case study, a researcher often increases the number of case studies to include interesting and sometimes different findings. In looking at religious influences, I was concerned that my case studies only portrayed teachers who were not influenced by religious beliefs or were Christian. One teacher who declined to be observed but was willing to be interviewed was Yaseen who was a devout Muslim. I have included a special vignette on Yaseen since I believe his story provides additional interesting information on the impact of religious beliefs on the teaching of human reproduction.

The case studies are followed in section 7.3 by an analysis of personal and professional factors affecting the teaching of human reproduction amongst the case study teachers and the one special case i.e. Yaseen.

7.2.1 Sipho

Sipho was a gentle, softly spoken, and clever young man and he couched much of what he said in dry humour. He was an experienced teacher, having taught for eight years. He was confident in his role as a teacher and so this may have contributed to his confidence in engaging learners in discussions. His lack of confidence was in the subject content since this was the first time he had taught this topic and his first year of teaching Natural Sciences.

Sipho grew up in a rural setting in KwaZulu Natal and only came to Johannesburg after finishing matric. The ethnic group to which he belongs is Zulu and he was immersed in the Zulu culture throughout his childhood. He would frequently refer to his childhood in his teaching. He felt that urban children had forgotten their culture and he wanted to remind them of their roots during his teaching. In his interview he spoke further about his background. He said he was raised amongst boys and never viewed girls as potential friends. A friendship would only be with a girl with whom one was in a sexual relationship. The separation of boys and girls, he felt, was a way of creating "a boundary for respect between boys and girls" (I). Talking about changes in the body and human reproduction was forbidden during his childhood.

He said that in his culture, a boy would not talk openly about his experiences as his body changed. He would rather quietly consult an elder.

> I remember even when I was still at home, ... you would hardly talk about whatever you have experienced. Instead you will talk to someone in confidence and someone who's far more matured than you, who will guide you through what to expect next, and what not to do and what to do. And what would be the consequences of doing that. For example, a wet dream. ...
> And you learn to say, ok, this is why this is protected, this is why this is put in a way that your dignity as an individual, your dignity as a young boy growing up should be maintained and be respected in that way. (I)

Growing up in the Zulu culture meant that Sipho did not go through the initiation ceremonies including circumcision that Xhosa and other boys were subject to. However there was clearly guidance from his elders as can be seen from the above quote. For Sipho, talking openly with boys and girls about the human body and particularly matters associated with human reproduction and human sexuality was therefore taboo in his culture. This created some conflict for him, exacerbated by the fact that he had had no tertiary training in the Life Sciences/Biology.

> ... I was right from the onset thrown in the deep end, because this is not my area of expertise as well, and I never felt that I would one day find myself talking explicitly about things which to me were things that are highly respected and highly confidential and only discussed when the time and the place is suitable for that. ... And to talk about female parts in the classroom it was scary but I had no choice. The only shield that I had was, I would say, it is policy, it is curriculum.
> It is kind of like I have ... breached a contract of the culture. However, today, these children are the ones who are now away from the rural areas where culture is the basis, where culture is the ground, and where culture is the blood form for everything to pass. And their parents are hardly taking these children back to their roots to go and learn and understand. (I)

Sipho's case was very interesting. It seems to me that having breached the contract of his culture, he simply did not know where to shift the boundaries to, and so at times seemed to almost abandon boundaries. For example, he asked his learners to bring in pictures showing changes in boys and girls during puberty. While the idea was good, the pictures of breasts, scrotum and other body parts taken from magazines were often very suggestive but he continued to use these instead of being selective about which pictures could be used in his class.

> I remember having all these kind of pictures, and I was so sceptical at the beginning as to say, I find myself digging out for pornography, however it is not pornography in a sense, it is teaching, and learners should understand what is it that's happening in their development, what is happening in their bodies, what is happening when they get to the stage of development, and what does it say about their body parts and the changes as well. (I)

In his apparent abandonment of boundaries, he created what I viewed as an unsafe emotional space for learners. In chapter 6, section 6.4.2.4, I discussed briefly ways in which I felt his teaching was both engaging and somewhat disturbing and will elaborate here. He drew learners into his confidence by telling the class about his boyhood experiences in rural areas and the lack of discussion about sex. He was a storyteller, acting out some of his stories from his childhood such as running to the river and hiding. The class responded well, enjoying his stories and comments, but were sometime horrified (and for some – delighted) by his openness. They were encouraged to be honest and open about their experiences and many felt free to talk openly. At this point, I (as a white, middle-aged female) felt he pushed the boundaries too far. He became too personal particularly in a mixed gender class. So for example when a learner asked what masturbation was, he found a volunteer to simulate masturbation, standing on a chair and using a glue stick in the position of the penis. He asked another boy to describe his wet dream to the class. With each topic, Sipho made it personal. For example, he asked the boys which of them had masturbated, how many of them had had an erection that day, what they had experienced with their scrotum that day (cold weather) and asked the girls which of them had started menstruating. When the children brought pornographic pictures to class, he showed them. He said "We can talk about this. Doesn't mean we have to go and have sex" (F - 31/7).

Most of the learners were fascinated by his stories, giggling at his accounts of wet dreams and other descriptions. However some at the back and front of the class were pensive and the girls greeted his query about menstruation with silence. The silence particularly from the girls indicated to me that he had invaded their privacy and they were putting up protective walls. Beyond this concern of mine, Sipho was an engaging and interesting teacher. He was provocative and stimulated a lot of really good discussion around decision-making about trust, commitment, peer pressure, and when to become sexually active. Most learners were ready to discuss extensively on the sort of issues that were raised on talk shows or in sitcoms. Some were not interested. Perhaps they had heard it all before or were protecting themselves against intrusive questions and information.

Religious influences were not evident in Sipho's teaching. He described his religion as traditional in the survey. However there was no mention of religion at any stage and he claimed that religion played no role in the way he taught.

Sipho was not qualified to teach Natural Sciences. He was however well qualified for teaching in his field, describing himself as an Economic and Management Sciences (EMS) specialist majoring in business studies, accounting and economics for which he had obtained a Higher Diploma in Education (HDE). He was completing his M Ed in Educational Leadership and Management. He had taught EMS for eight years and was accepted in an EMS post at his current school at the beginning of the year. To his great disappointment and frustration, he found himself teaching Natural Sciences (NS) and Maths, subjects he was neither qualified nor interested in. Thus in the survey, he made comments like

> This learning area (NS) was pushed down my throat. … I know nothing about Natural Sciences. I feel very sorry for the learner who (does) not get solid foundations due to poor curriculum planning at my school. (S)

In the interview and in comments to me between classes, Sipho continued to express his anger at the situation in which he found himself. He was one of the two teachers in the survey who indicated that he did not feel confident about teaching human reproduction. He said in his interview that his lack of confidence in teaching this topic pushed him to do his own learning. He realised that he had to get his facts straight and so he used the internet, books from the school media centre, and his fiancée's college biology books and he looked at the reproduction sections when they appeared in the weekly papers containing matric questions. He also told me that he reads widely about physiology because it interests him. In Sipho's case, his lack of subject content knowledge made him uneasy, but his reading up on the subject provided him with sufficient knowledge to teach the class the content specified in the curriculum.

> And with that it strengthened my backbone, confidence … in teaching Natural Sciences, and the kids could not even pick up in a single day that there are some places where I lack information. (I)

The learners may not have been able to pick up the gaps in his knowledge but these gaps were evident on a number of occasions when learners asked him questions. Sipho did not have an adequate conceptual structure by which to construct accurate explanations and to identify many of his own, his learners' and other people's misconceptions and alternative conceptions. At times he was honest and said he did not know the answer to a question. At other times, he perpetuated myths using scientific evidence such as blood typing and DNA evidence to support his story. Thus he reported that he had read in the media of intercourse between humans and animals that resulted in a half-human lamb and a half-human calf. (see section 9.1.1.2 in Chapter 9). Sometimes he was more careful about the myths but still ended up giving incorrect information, for example:

> Boy: They say when the mother's very old, Sir, the child is gonna be short.
> *(laughter from class)*
> Sipho: Very old as in? Just be specific. Very old?
> Boy: Like 45, 50, between there, Sir, and has a child, the child is gonna be very short.
> Sipho: It is an opinion, it is not a fact. In some cases even young people do give birth to people who are short.
> Boy: So what causes that?
> Sipho: What causes that is some of those tissues within our bodies *(the short person)* that are not fully developed. (LT- 14/8)

At times Sipho was quite lost in the content, and relied on the learning materials, for example:

Boy to Sipho privately: Can I ask? I know the egg comes up from here to here (pointing at a book diagram), but when people are like having sex, does the penis hit the egg?

Sipho: No. When the .. borrow me that book. You know it is called egg. You know it is called sperm, right! .. Like the kidneys, you cannot reach an egg as well.

Boy: What causes the flow (of sperm) from here to there (egg)?

Sipho: What causes the flow is menstruation and understand what causes the egg to move from where it started so that you'll be able to meet halfway. Then fertilisation takes place.

Boy: Sir, so why does the egg go up to the sperms?

Sipho: Go to the menstruation and read that section. That is why I said, use every source of information. (LT-24/8)

On the male system:

Sipho: Feel your penis when you go to urinate now, there are two tubes. The other one is the sperm duct, the other one is the ureter which carries the urine, ok. (LT-24/8)

Sipho was unable to clearly understand the child's confusion and at one point wisely referred him to the learning materials, and then gave the class incorrect information about the penis.

Even though Sipho intended to return to his own learning area, he admitted that he had enjoyed teaching this topic because he had learnt a lot. Nevertheless he continued to argue that if we wanted quality education in our schools, then primary school teachers needed to teach in the area of their specialization. His fairly confused explanations of some aspects of human reproduction indicated that he was quite correct in his position on this matter.

I have mentioned some aspects of Sipho's personality, his sharp mind, dry humour, soft manner and penetrating and personal questions. He used humour throughout the period that I observed him in order to explore aspects of human reproduction and to obtain a response from the learners. He described this as follows in his interview.

> I'm someone who…my style of teaching is always surrounded by fun. Because from where I come from, teaching was fun. And it had to always have that sense of humour in it, using things that are relevant to the kids to encapture that knowledge ... However, to keep it in a more fun way I had to use those convincing ways in which the learners can maintain humour and also not be scared to engage and talk about what they know, or what they have heard, which they want to understand whether, is it true or false? (I)

Sipho believed that he challenged the learners to value and respect themselves. In his interview, he said that he provided his learners with the following advice.

> Value who you are, value what you have, value what is precious to you because once it is damaged it is never going to be repaired again in time. ... It is like when you start engaging in sex at a very early stage, you become a victim and that person – especially the girl is the victim – the boy is the victor because he counts how many girls he has slept with.
>
> And by the time you get to the age where you have to officially engage sexually, you are already nothing, you are some kind of a reject. ... If you start engaging in sex right now the consequences are number 1: you're losing something that is golden to each and every woman around the world, virginity. (I)

It is interesting to note that for Sipho, the loss of virginity and thus value is experienced by the girl only. Perhaps this relates back to the value system of the Zulu culture with its virginity testing for girls only!

Sipho believed that he had an important role to play in guiding and nurturing the children. Sipho believed that for learners who have a single parent (mother) or a father who does not talk about sexual matters, he plays an important role in providing advice.

> This boy ..., he's got someone whom he opens up to about these things because I know for a fact his father is not someone who is kind of an open person. ... he would always come afterwards and ask me, sir, if this happens what does it mean? Sir, should there be a specific amount of time you spend when you're having sex? What does that mean in terms of your confidence and your performance? ...And obviously you cannot say, well I do not have to explain this to you. And asking the question of, are you having sex? You are scaring the person away, however that person came straight to me in confidence to ask because he has realised that this is the person I can open up to regardless of whether he or she is an adult, I can open up to this person, and he or she maybe advise me on a problem I have. (I)

So Sipho sees himself in a counselling role. He is in a curious position of being influenced in his attitudes by his culture, but at the same time going beyond that culture in removing the restrictions and talking very openly to his class about sexual matters. His self-acquired subject content knowledge has made a difference to his confidence in teaching the subject, and his personal confidence has meant that he is more at ease in the classroom and in control. He does enjoy debate and discussion and is very comfortable challenging learners' notions and inviting them to open up. There is however a lack of congruence between what he has been asked to teach and what he was brought up to believe was appropriate for public discussion. As a result, it seems that he has no sense of appropriate boundaries for Grade 7 Natural Sciences learners and so he goes beyond what seems appropriate for Grade 7s.

There is another possible explanation for Sipho's behaviour, mentioned in chapter 6. He is extremely unhappy in his role as a Natural Sciences teacher, teaching outside of his area of expertise, and he feels the school has been devious in appointing him to an EMS post and then giving him Maths and Natural Sciences classes. Perhaps the situation is not so much a matter of not knowing where to place the boundaries of his discussion for grade 7s, but rather an attempt to force the school to consider him unsuitable as a Natural Sciences teacher and to place him in the post to which he was appointed. This is simply conjecture.

My attempt to probe further on the matter of boundaries did not yield much information. Having asked Sipho in the interview if some of his questions were too personal, such as asking boys how many of them had had a wet dream since midnight (to which a couple of boys responded), he did not seem to grasp why I considered that sort of question to be problematic. He did not seem to have his own sense of what should be public and what should be private in the classroom, and simply engaged in a long explanation on why boys must know the difference between wetting their bed and having a wet dream. I was concerned that perhaps I was taking too conservative a position on the matter, and consulted several male teachers who did agree that his questions were too personal. While experts in

the field of sexuality education did address matters related to what sort of discussion was appropriate in the classroom, there is clearly need for more workshops to discuss this issue as it relates to the multicultural classroom where both teachers and learners have very different beliefs about what should be included when one teaches human reproduction.

As we can see from his profile, (Appendix 6.1), the critical outcomes that were most evident in his class were effective teamwork in groups (CO 2) and communication mostly through discussion (CO 5). The Natural Sciences learning outcome most evident was that of constructing knowledge (LO 2), in particular learners' ability to recall meaningful information and interpret that information. However there was also some mis-construction of knowledge.

Sipho demonstrated certain learner-centred characteristics. He provided a suitable social environment for group and class discussions, but counteracted this by (in my opinion) providing an unsafe emotional environment where learners were asked to provide personal information. The absence of a code of conduct drawn up by the class meant they had no recourse to rules by which they would operate. The learners did find his curriculum mostly interesting and relevant. Sipho often explored their everyday knowledge and scaffolded learning particularly through questioning and the learners often talked about and worked together on activities. He therefore encouraged the development of verbal-linguistic intelligence and to a lesser extent visual-spatial intelligence but bodily kinaesthetic intelligence was not developed during this topic. He took into account the developmental levels of learners, leaving the shy small boys out of his class discussions but responding to their individual questions when he moved to their group or after class.

Thus, from my observations, Sipho demonstrated some strengths as an outcomes-based and learner-centred teacher but he did not have the opportunity to or did not pay attention to other aspects in particular providing a safe emotional environment for all learners.

In conclusion, a number of teacher factors influenced the way in which Sipho taught human reproduction. Firstly, he was a compelling personality in the classroom, humorous and interesting, experienced and confident in his role as teacher, and able to easily engage in discussion with his learners and hold their attention. His ability to provoke discussion amongst most learners was an asset as he sought to use learner-centred approaches. He was however not qualified as a Natural Sciences teacher, and although he could hide his lack of knowledge most of the time, he sometimes could not provide accurate answers to his learners' unexpected questions. He would then make up an answer that made sense to him without having the necessary conceptual structure to assess the accuracy of what he was teaching his learners. He therefore helped the learners to not only build conceptions of human reproduction, but also misconceptions. He retained strong cultural links with his past and was clearly influenced by the value systems in place from his childhood in the Zulu rural cultures. However he had migrated to the city and had undergone the change into a young urban man confronted by new value systems in the urban culture. In my view, he seemed to have no sense of appropriate boundaries for his Grade 7 learners in the complex urban environment in which he now lived.

7.2.2 Jackie

Jackie, an Indian South African, was probably in her early-mid 30s at the time of the interview. She was open and 'chatty', appeared to be very confident, and was a strong personality. Her dress was informal e.g. jeans and denims. Her classroom was neat, colourful and well-ordered, seemingly a reflection of her personality (although she would not agree on being a 'well-ordered' person).

> Like I said, I wouldn't say I'm very ordered, but there must be order and structure when you're teaching. You can not teach in chaos. So discipline for me comes through. (I)

Jackie was an experienced teacher having taught Natural Sciences to Grades 3 to 7 for nine years and she had the respect of her learners and her colleagues. She completed a Bachelor of Pedagogics in Primary Education (B Paed Prim Educ), a four year degree majoring in science education. She said she did not study much biology content in her degree since the focus was on the pedagogy i.e. how to teach Natural Sciences using the new outcomes-based approaches of Curriculum 2005 that were being introduced into schools. While attending the workshop, she realised that she lacked certain content knowledge on human reproduction.

> I was not as confident about my facts, and especially after the workshop that you did and I was like, ok, I never knew that, and then you yourself realise how ignorant you are in terms of that. And then you have to teach them. So as I got more and more au fait with the content and the facts surrounding the stuff then the confidence grew and the ability to answer questions within reason, that definitely. (I)

Jackie was proactive in addressing her lack of content knowledge. She said that she used her free periods to look up information on the internet, and she became familiar with terminology as she used the worksheets prepared by her head of department. She felt that she and her learners were engaged in a team effort in terms of researching and sharing new information.

Jackie was, in Hargreaves' terms, a pioneer, embracing change (Hargreaves, 1998b). In her interview, she said that she usually jumped in when there were new challenges and enjoyed them because although they added stress, they also added excitement. She described her attitude to teaching as follows:

> I love doing new stuff. I'm not afraid to try something new. Yes, I'm enthusiastic. I love my job. It is nerve wracking and it is time consuming and it is stressful, but I love teaching. (I)

Hargreaves suggested that teachers who enjoy the challenge of change play an important role in promoting change. Jackie embraced the challenge of teaching a new topic i.e. human reproduction, and was prepared to teach in what she understood to be outcomes-based and learner-centred ways.

Jackie's notion of learner-centred approaches tended to involve a Socratic style of questioning i.e. extensive probing of her learners' understanding and expecting her learners to find the answer to their own questions through research (see discussion in section 6.3.2). Humour played an important role in Jackie's approach to teaching. She joked with her learners while questioning their ideas. For example, in the card game, one boy commented that the size of the penis doesn't matter (quoting the answer on

the card) and so she asked "so why do boys compare the size of their penises?" (L6; FN) which evoked a laugh from the class. She made the following comment in her interview:

> It is a Dr Jekyll and Mr Hyde kind of relationship *laughs* because, it is like I said to you, I use a lot of humour, I'm very sarcastic and I can be very hard on them, and I can also be very playful and very … like I said, the humour comes out. Humour, it is a coping mechanism to a large extent. And a learning tool, and a teaching tool. So humour is very, very important to me. Being able to laugh at myself, being able to laugh with them. (I)

Her mood could change rapidly and then, if work had not been done, she expressed her displeasure and rapidly asserted her authority.

> And I do scare my kids. I've got that hairy eyeball …. when I get quiet and I look, then it is, you're drawing near to the line now, stepping over the boundary. (I)

So, while Jackie would joke with her classes, she maintained a fairly strict discipline in her classes. Perhaps it was her Jekyll and Hyde relationship that made some of her learners a little wary. Her lessons were not entirely predictable, but she did engage with her learners.

In the lessons I observed, Jackie was very open with her class, probing for ideas, challenging them about their descriptions, and encouraging them to participate. Jackie talked openly about matters such as menstruation, traditional activities surrounding virginity, homosexuality, sexual intercourse and anal and oral sex, but limited the discussion.

> If a kid has to ask you about wet dreams, not everybody is going to be able to get that. But they know that with my personality, that I'm not afraid to talk about that, I'm not shy, and if a kid wants to know, how badly do they want to know? And I'm willing to step up to that. (I)

She challenged perceptions amongst her learners on what was acceptable sexual behaviour for boys and girls. For example, as discussed in the previous chapter (Section 6.3.1; CO 1), she asked boys who thought they would like to marry a virgin whether they themselves thought they would be virgins when they married. So she was prepared to raise issues with learners and question perceptions. She was however rarely personal (with the exception of asking them the extent of their kissing). She maintained a distance from the learners, and a sense of respect – of boundaries. After the one lesson, she expressed to me the difficulty of treading the fine line between what is appropriate and what should not be discussed.

> Boundaries. Very important for me. So even though I may talk to you *(referring to the learner)* like we're friends, or I would speak to you like, that's great, that's fine, and we can sit and have a discussion and a talk, but when it comes to my work and when it comes to me being Ms X (her surname), that's a line, and they know that line. (I)

Jackie was clearly guided by her own set of moral values when encouraging learners to develop appropriate attitudes and values for their own lives regarding sexuality. She said, in the survey, that she did not really belong to any religion but had a universal belief in God. Her teaching, she felt, was underpinned by values, critical thinking skills and choices. In her interview, she elaborated on this.

> You're talking to a very atypical Indian. I've not been brought up in a very religious household. Spiritual yes, where you believe in God and you pray and whatever, but not religious … not religious teachings so much as you live your life to be honest and to be fair. So my upbringing is very value

based. Not so much religion based…. So you could say my thinking is very logical and very … I wouldn't say scientific, … it is based on logic, so that comes through. (I)

Jackie's focus on values was evident in her teaching. She had taught Life Orientation for two years to the class I was observing so she had a long-term relationship with them and had discussed issues like values and self-esteem with them in previous years. She had challenged them to think carefully about the type of person they wanted to be. She pointed out, in her interview, that their perception of sexuality was linked to their self-esteem, and that their self-esteem should guide them in distinguishing right from wrong choices. She said that she also encouraged them to think of the consequences of any actions. She commented as follows on the influence of her value systems in her teaching.

I would say, when you teach your feelings come out. You can not help it. The way you feel about life and the way you feel about morality and values. Even though you do not want to preach to them and give them your values or try and stuff it down their throat or whatever, but they get a sense of the way you act and where you're coming from.

I try to be honest with them but not to influence too much because … they're teenagers, so everything is curiosity. … So they know that, and in terms of sexuality and self esteem, they already had an understanding of, listen, it is your choices.

A lot of the ah! questions were answered in this section. A lot of, "ah, now I understand why. Now I understand why sex at an early age is detrimental to you physically and emotionally and whatever." Even though they understood it, the science helped solidify it. (I)

When Jackie's outcomes-based and learner-centred profile is examined (Appendix 6.2), one can see that the critical and Natural Sciences learning outcomes she was most proficient at helping learners to develop were the ability to organise and manage themselves (CO 3), to conduct investigations (LO 1; CO 4) and to communicate effectively (CO 4). Her learners spent a lot of time recalling meaningful information from their Life Orientation classes and their everyday life and spent some time interpreting the information and linking their understanding of human reproduction to cultural contexts (LO 2 and 3).

The learning environment that Jackie provided was reasonably suitable even though it was a typical small classroom, resources were available and used, especially the media centre, and the emotional environment was a safe place for her learners with clear boundaries in place. Perhaps the weakness in terms of learner-centredness was that most of the interaction appeared to be between Jackie and her learners and comparatively little group work and so her learners were unable to spend significant time talking about and working together.

Jackie did respond to the needs and interests of the learners encouraging them to carry out research to find the answers to their own questions, and the learners found the curriculum very interesting. Jackie's strengths in terms of facilitating learning using constructivist approaches were her questioning skills and the activities she promoted, especially the research her learners carried out. She explored learners' prior knowledge, as mentioned above, and scaffolded learning in other ways in addition to her extensive questioning. The intelligences she promoted and the learning styles that she catered for were mostly intrapersonal intelligence (learners working on their own) and verbal/linguistic skills. She promoted appropriate values and attitudes to human reproduction, was

sensitive to the developmental level of different learners and to their cultural and religious beliefs and practices. She was less effective in developing interpersonal skills.

In conclusion, Jackie was a pioneer, enjoying the challenge of teaching this new topic of human reproduction. Her use of the Socratic style of questioning, continually probing learners for answers and requiring them to find the answers to their own questions was indicative of her understanding of outcomes-based and learner-centred approaches. While her subject content knowledge was initially weak, her own reading up on human reproduction provided her with sufficient content knowledge to be able to guide her learners through this topic. Her experience as a Natural Sciences teacher, and her personal confidence enabled her to teach this topic confidently, and to be open to asking questions and answering questions from learners whilst maintaining boundaries on what should be discussed at a Grade 7 level. She used humour to address sensitive aspects of this topic and to question learners' ideas. Jackie had a strong personal value system and this value system permeated much of her teaching. Her weakness was probably her tendency to dominate the direction of discussions, thus resulting in a less learner-centred approach.

7.2.3 Gogodi

Gogodi was an older woman and an experienced teacher. She had taught for approximately 30 years and had taught Natural Sciences to Grades 6 and 7 classes for about ten years. During her professional training, Gogodi had completed an NPDE (National Primary Diploma in Education) and had specialised in General (Natural) Science. She had studied human reproduction and maintained that her subject content knowledge on this topic was good. She said she did not struggle to answer the learners' questions about the reproduction content. My observations supported these assertions. She was most at ease talking about physical and emotional differences between learners and about staying healthy. Both the content knowledge that she gained 30 years ago, reinforced over the years by her experience as a mother and by her talks to Grade 7 girls on human sexuality at the beginning of each year, as well as her lengthy teaching experience gave her some confidence in teaching this topic. However she was reticent about talking about certain aspects of human reproduction.

Gogodi described herself as an introvert, quiet and sensitive. She had a dignified and gentle but firm manner in class and used humour to relate the topic of human reproduction to her learners' lives. Gogodi felt her relationship with her learners was a parent-child relationship and she said that she treated learners as if they were her 'kids'. (She had six children of her own.) She believed that discipline was important since she felt that it allowed learners to get their work done and helped them to progress.

Gogodi felt it was important to maintain a gap between herself and her learners so that they did not become too personal in their questions and comments. She found that the code of conduct helped the learners to recognise appropriate boundaries.

> There was that gap between myself and them. And the code of conduct also it helped a lot just for

them time and again to remember where to end and what to say and what not to say. (I)

She reinforced the rules in her learners' code of conduct such as "Do not talk about someone else, talk about yourself" and this helped to prevent inappropriate comments from learners about their classmates.

I asked Gogodi about the influence of religious beliefs in her teaching. In the survey she indicated that she did not belong to any particular religion. However in the interview she said she was a Christian and that this impacted on what she felt free to talk about. She said that she avoided talking about sexual intercourse and said it was for two reasons. Firstly it was not appropriate for them at their age; and secondly she was concerned that they would look at her and start to say – "She has kids – this is how it all happened!" She felt this would become too personal for her.

Gogodi said she did not follow the Tswana culture (except for certain 'necessary' situations), and did not feel that her Tswana culture influenced her teaching in any way. However when questioned about her reticence during her teaching, she said that she thought this was due to her upbringing. In her culture certain aspects of human reproduction were not talked about. The exception as a child was talking to her mother about menstruating.

> I felt very shy to name the body parts, more especially the private parts and all that has to do with human reproduction. That is how I grew up. And then it became difficult for me to teach the kids. Because for the past years then, I used worksheets and transparencies and explain here and there. ... I could not go into too much detail (about growth and changes during puberty). ... I'd stay very vague. (Gogodi, referring to her annual sexuality talks to Grade 7 girls). (I)

Several authors point out that talking about sexual activity and using the biological names of reproductive organs is forbidden amongst certain African ethnic groups including the Tswana (Helleve, et al., 2009; Mbananga, 2004), and Gogodi's reluctance initially to use the biological names for these parts seems to be linked to this cultural taboo.

Although Gogodi grew up being shy about talking about reproductive structures, and this continued in her teaching, she did make an effort to overcome this reticence in her teaching of this topic to the Grade 7s. She therefore did show the chart from the health department illustrating external physical changes during puberty from boy to man. When the little boys sniggered and grinned, she told them they could giggle for a while, it was only natural, but then they would have to stop. When she began to tabulate the names and functions of the male organs on the chalkboard, she came across to the desk where I was sitting to fetch a book and whispered "It is becoming difficult now"! However she insisted on the use of biological terminology when the children referred to the male structures, overcoming her own inhibitions. She seemed at ease, using humour to talk about differences in physical development. She laughed at their role-plays, and walked around quietly encouraging groups during class discussions. The class may not have been aware of how difficult she was finding this topic. This was not easy content for her to cover. She nevertheless helped the class to get started on their flow diagrams of the structures through which the sperm move from the testes till they reach and fertilise the egg. She walked around the class quietly checking on their work, commenting on their flow charts and answering their questions. She then brought learners to the front to help construct the

flow chart on the board so that the groups could check theirs was correct. Thus although she would not talk about the act of sexual intercourse, she could work on the more 'scientific' aspect of the movement of sperm from one place to another. I was therefore surprised when, in her interview she said that she did not feel free to talk about the sex organs, and the sperm moving from the testes through the organs to the Fallopian tubes (flow diagram activity).

> They wanted to know how does that happen? Then I could not budge on that. I did not. Because I just felt now … it is clear they can see that they're talking here about how a baby is developed. Now they want us now to go out of the topic and talk about things that entertain them. (I)

She however was prepared to address moral issues by giving the learners an activity in which they wrote about what they believed to be responsible behaviour. After feedback from some learners, she challenged them about the responsibility of both boy and girl in the case of pregnancy.

> Girl – you will be a mother; boy – you will be a father! (I)

There were certain aspects of Gogodi's teaching that were problematic such as the use of overhead transparencies with very small labels that were not visible to learners, unclear instructions for tasks and a two worksheets in a muddled sequence so that questions could not be answered. It seemed to me that she had not had time to carefully review the materials to identify problems. She did indicate in her interview that in her position as grade head she had a great deal of administrative work that she found affected her teaching (as discussed in 8.2.2).

The outcomes that Gogodi encouraged (Appendix 6.3) were working effectively with others in a group (CO 2), organising and managing themselves and their activities responsibly and effectively (CO 3), carrying out investigations (LO 1), constructing knowledge (LO 2), effective communication using language skills (CO 5). Learner-centred approaches were used such as asking learners to recall meaningful information to answer questions, especially in relation to their everyday knowledge, and to interpret information they were provided with. Gogodi provided a comfortable physical, intellectual, social and emotional environment. The enforcement of the class' code of conduct contributed to the safe emotional environment. The learners were very interested in the subject content. She scaffolded their learning to some extent, through questioning and other activities, and provided them with tasks which enabled them to work together and learn from one another.

Gogodi catered for different intelligences and learning styles by including activities that developed verbal/linguistic and visual skills. She encouraged learners to respect personal differences amongst their peers. However she paid much less attention to cultural and religious differences, and to language differences since English was widely spoken at this school.

My impression is that the Gogodi's home background, personality and age played a significant role in her fears about the discussions that could arise in class. Gogodi appears to have grown up in a conservative home with many restrictions around what could be spoken about in relation to the reproductive organs and sexuality. Forty years ago, when she was growing up, television was a new phenomenon in South Africa and magazines were not as explicit as they are now. As a result she was probably not exposed to all the information available now in the media. In addition her quiet and

sensitive nature meant that sexual matters were a very private matter and not for discussion even with her own children. She was anxious about personal questions. Teaching this topic in far greater detail than she had in the past was very difficult for her. However because it was part of the new curriculum, she used terms that she had avoided before (the names of the structures making up the reproductive organs) and she taught with dignity. She had a good sense of learner-centred approaches and allowed the groups to discuss and learn together (or perhaps she was relieved at that point to not have to participate in the discussion!). Her confidence in her subject content knowledge also made a difference.

7.2.4 Samkele

Samkele was a large Zulu woman, conservative in appearance, with a kind manner and a forceful personality. She completed a Primary Teacher's Diploma (PTD) specialising in Biology at a College of Education and then taught for six years, three of which were spent teaching Natural Sciences. In her interview, Samkele said her content knowledge about human reproduction was mostly gained at high school with very little added to it at college. The college at which she completed her teacher training was in a rural area and lecturers may have chosen to leave out human reproduction either because it was not part of the primary school curriculum at that time, or because it was considered culturally inappropriate. In order to have sufficient background knowledge to teach human reproduction to the Grade 7s, Samkele said that she used the internet and an old tertiary biology textbook, and got help from her colleagues. She was therefore proactive in acquiring content knowledge and as a result her knowledge of human reproduction was reasonably good at a Grade 7 level. She made some content errors, for example she responded to a question from a learner as follows:

> Why do they close the umbilical cord? That's a good question – the air can get inside. ... They do it to make sure no air gets inside. (LT-29/8)

When Samkele was unsure of her answer, she would go back to her references and check that the information was correct. If it was not correct, she would inform her learners. If she could not provide an answer, she would tell them so. Samkele, like Jackie, considered the teaching of human reproduction as an ongoing learning experience for both her learners and herself. In certain ways she too was a pioneer, embracing the teaching of a new topic. When I asked Samkele to describe her own personality, she described herself as a confident person who enjoyed new challenges.

> I have confidence in myself. There's one thing I know about me, I've got confidence. I go ahead, … I want to tackle it, … I want to see what's going to happen.
> I'm an outspoken person. I'm not shy. I speak openly. *Laughs* I can not describe myself. … but what I'm saying is ... I was not shy to tell them. The things that you could be afraid to tell them but I just told them and kept my face. (I)

So Samkele acknowledged that there were topics that a teacher may be afraid of discussing but she chose rather to speak about them boldly without feeling that she lost her sense of dignity (I ... kept my face). This is unlike Gogodi who was concerned about what her learners would begin to say when

certain topics were discussed. Both women appear to be conservative, but Samkele was a much younger person than Gogodi with a more forceful personality. Samkele was very open during her lessons and she tried to encourage appropriate behaviour during class and establish boundaries. When she started, she emphasised that this topic was about their bodies, not anybody else's.

> And I said to them, "there is nothing that needs you to be excited. Remember ... we will be talking about how do you grow, and we are talking about you, not anybody else. Nothing new. Except you. You are the one we are talking about. So do not be excited, do not lose yourself. Whenever I say 'a penis' to a boy, I'm speaking about boys. If I say 'vagina', I'm speaking about girls. Do not be excited." (I)

She tried to discouraging giggling and to 'normalise' the subject content.

> I told them, "It is about you. Is it a joke that your penis is getting bigger? Is it a joke that you're getting bigger breasts? No. Why do we have to laugh when we talk about these topics? We are talking about ourselves".
> ... That's how I made it easier for myself. ... Because it is quite a sensitive topic to be honest. To say, we are talking about our breasts. Before we never talked about these things so openly like this. (I)

By creating boundaries of behaviour, she created a space within which she could talk about topics that were previously not discussed openly in her culture.

Samkele considered it important to deal with values and attitudes towards sexual activity. She said she wanted to teach her learners responsibility, in particular that they were not yet ready for a child. She addressed issues directly. For example, when she asked the class to look at a picture of a sperm and egg cell and to describe them, she warned them:

> Girls - I do not want you to be ignorant – if you let a boy come inside of you, there will be trouble....
> And boys, do not say it is a mistake, she wanted a child. There's no girl who would want a child." (I)

Samkele had a strong moral code, particularly in relation to 'no sex before marriage'. She felt that she was influenced by both her religious and cultural beliefs.

> As a Zulu girl it affected me both sides. Religiously and culturally.
> Religiously as in abstaining. ... I grew up like that. I was born again up to now.
> Culturally as in, I was also as a girl when I was growing up, ... they used to check us if I was still a virgin. ... So when I was tackling that one I felt the joy came back to me to say, I remember all those days when we used to laugh, have those ceremonies when we were celebrating our virginity, that we are still virgins at this age. (I)

Samkele described the Zulu Reed Dance ceremony for girls to her class and added that she believed virginity was important.

> Because I told them. I believe in that. My belief system says, no sex before marriage. But I gave it to them as a hint to say, if I were you … I did not stress it to them. (I)

Samkele said she was careful not to impose her beliefs on the learners ('to push it down their throats'). She felt that would be wrong. She felt however quite emotional about the situation in which many of her learners found themselves.

> I felt like a parent, I wish I could help them, I wish I could save those who already have been abused, or I wish I could bring back their virginity, those who already lost it without knowing it, and I wish I could save those who have never done it. It was so tense. (I)

Samkele explained that she sometimes felt the need to set aside her lesson, take on a parental role and give some counselling.

> Yes. In most sections ... this lesson went with emotions most of the time. There were times when I felt like, remember you're a teacher, you just (need?) to be a teacher. But sometimes there were times when I felt personal. I felt I needed to be more of a parent than of a teacher. I needed to give more than the book gives, than the information gives. I needed to give more life experiences. (I)

She felt keenly the pain of others.

> One of them was asking, what is the cause of women not getting children. And in Zulu there's this name, eNyumba, when you are barren. It is so painful, they were insulting her mom like that. And then I had to shift from my lesson and attend to that, because you could see that it did hurt this child. She said it is her step-mum and she was just useless in the family, just being called 'barren, barren'. Remember in our culture a woman has to bear children. (I)

She said she realised that questions about abortions, barrenness, why miscarriages happen, and why children are born disabled emerged from learners' experiences in their families. Samkele herself had had an accident resulting in a miscarriage while teaching this module and so perhaps was particularly responsive to learners' concerns. She felt it was important to address their questions and assure them that these things did not happen because they were not good. She also wanted to encourage both boys and girls to be responsible and to remind them that they were not yet ready to bring up a child.

Samkele's style of teaching tended to be very teacher-centred. She was an orator or storyteller with a deep and powerful voice. She walked up and down, acting out her message (e.g. imitating the movement of sperm), using her hands and body and a change in the volume and tone of her voice, and humour and earnestness to tell her story, and to convey her message. Learners were mostly absorbed in her story as she taught in this very traditional manner. They felt comfortable about asking questions and Samkele took care to try to answer all their questions in as frank a manner as possible.

Samkele's strengths, as an outcomes-based and learner-centred teacher (see Appendix 6.4), lay in helping learners to recall meaningful information (LO 2), particularly what they had learnt at home, in the media and from one another. She did encourage some understanding of different cultural contexts and traditions within these contexts (LO 3). Samkele was sensitive to the personal differences amongst learners, their different developmental levels and their different abilities with language and she allowed learners to talk about their different cultural beliefs and practices. Even though she had a rather dismal physical environment, very few resources and did not spend much time allowing interactions between groups, she did provide a safe emotional learning environment through her kindness and her willingness to engage with the learners and answer their questions. The boundaries she put in place ensured that the learners treated one another and the subject with respect. Her willingness to explore the stories that learners had heard, made the subject relevant and interesting for the learners.

In conclusion, Samkele was an engaging storyteller and used this approach to hold the attention of her class and to convey information about human reproduction. She was a pioneer, ready to breach cultural boundaries which would not allow her to talk about some of the topics. She spoke candidly and openly as she answered her learners' questions about human reproduction. Her concern for her

learners' well-being and her belief that they needed to understand their own bodies so they could protect themselves from abuse, drove her to overcome any inhibitions in speaking about human reproduction. She felt keenly her 'parental role' in counselling and guiding her learners and in addressing their concerns directly. She was fairly teacher-centred in certain aspects of her approach, doing a lot of the talking and remaining in control of the class. In other ways her responsiveness to the personal needs, interests and differences amongst learners and her provision of a safe emotional environment were indicative of ways in which her teaching was learner-centred.

7.2.5 Mphety

Mphety was a 'modern' woman in her 30s, with long braids and dressed in informal clothing e.g. denim jeans, running shoes and sweater. She was an enthusiastic teacher, willingly taking on the challenge of teaching human reproduction. Mphety had qualified with a Senior Primary Teachers Diploma (SPTD) specialising in Biology, and an Advanced Certificate of Education in Maths and Science. She had studied human reproduction during her SPTD and felt confident that she had sufficient content knowledge on human reproduction due to her tertiary studies and having taught Life Orientation (which includes sexuality education) for a few years. During my observations, she seemed to have good subject content knowledge and I was not aware of her introducing misconceptions or failing to correct misconceptions from her learners. Mphety had taught for eleven years, starting as a Grade 1 teacher and spending four years teaching Natural Sciences. This was her first year of teaching in the school I observed her in. She pointed out that, in her previous school, she had only taught girls and had 'talked girl stuff'. She said that she had not found it easy to teach classes in which boys and girls were mixed together.

Mphety was in some ways similar to Samkele. She was very expressive and very dramatic, using her hands a lot, rolling her eyes and moving her body. When illustrating changes during puberty, she acted out the changes by making her shoulders get broader and deepening her voice. She said she developed this way of using her body in her teaching in her first few years as a Grade 1 teacher. She was a bit of an actor, gazing fiercely at the learners, eyes flashing, and opening her mouth in astonishment at something someone had said. She varied the volume of her voice from loud to a whisper, and her manner was enthusiastic as she moved from group to group, getting involved in their discussions.

However unlike Samkele, Mphety was a gentle soul, unwilling to confront learners. She described herself as approachable and cooperative and as a person who doesn't get angry easily. Some of her learners responded by being uncooperative and the older boys were insolent. Mphety struggled to manage her Grade 7 classes. She talked above the class noise and pleaded with the learners to quieten down. Her classes took advantage of her gentle manner and this, amongst other factors, made it difficult for her to teach in outcomes-based and learner-centred ways. While boundaries were initially established when her learners drew up a code of conduct, these boundaries began to break down when

discipline deteriorated. Then a few learners began to verbally insult one another, to the amusement of the rest of the class.

Mphety told me that all the Grade 7s, during their Grade 6 year, had been taught together in one large room in a local facility while their old dilapidated school was being torn down and a new one was being built. As a result, they had not had sufficient attention and many were now struggling with their school work and so were frustrated and disruptive. In addition the lack of desks for learners to work on made classroom management more difficult.

Mphety did have a deep concern for her learners, aware of the extent to which they were struggling with the language, and so she began to use more simply written learning materials as described in Chapter 9 (section 9.3.2), and allowed her learners to switch to their home language during discussions. She stayed after school and learners came to her to ask questions about what had been covered in class. During group work, she circulated amongst the groups, asking them questions and checking their understanding of the questions and the content. She did her best to assist her learners in difficult circumstances, moving a flip chart with notes and diagrams from room to room and using the chalkboard to show them how to carry out tasks.

Mphety had strong moral values. She was a Sotho woman whose religion was Christian but she was adamant that her teaching was not affected by either religious or cultural beliefs. She made clear her position on appropriate sexual behaviour and in particular on abstaining from sex. In her classroom, there was a box for anonymous questions. One question she received was "When must we start having sex?" and she responded as follows:

> Yes, I told them it is best to abstain. That's the only solution. (I)

Mphety has two daughters and her position on abstention may have been influenced by her role as a mother and also by her personal belief and concern that learners would get involved sexually at an early age and might contract sexually transmitted diseases (STDs).

> …remember I told them about the STDs. So I even said, somebody who is having a disease, is it written on their face? Nobody has written it. So they'd better abstain. (I)

She discussed contraceptives warning them against using the pill or the injection at the early age of 12 and that condoms were not 100% safe. She therefore addressed values and attitudes but in a fairly teacher-centred way i.e. advising and telling them about appropriate sexual behaviour.

Mphety was, according to my analysis, one of the least outcomes-based and learner-centred of my case study teachers. However some outcomes were demonstrated amongst two thirds of the learners who cooperated. These learners did work together as members of a group (CO2), an activity which they had not had great experience of in the past according to Mphety. She did attempt to promote effective communication by encouraging learners to talk in groups, thus encouraging the development of verbal/linguistic skills (CO 5). Her approach was also learner-centred in some ways. For example, she addressed the personal needs of learners attempting to assist them where they struggled, was responsive to learners' ideas and attempted to address poor English language skills by allowing code-switching and by addressing learners in their language. I did not see evidence of any investigations

(LO 1), and there was limited recall of prior knowledge except in the section on puberty and construction of new knowledge (LO 2).

Mphety, in conclusion, was an enthusiastic and committed teacher, who was prepared to try new approaches such as group work activities and willingly carried a flip chart with her notes and diagrams from classroom to classroom. However many of her good efforts did not bear much fruit because a number of learners were deliberately disruptive. Mphety was too anxious to please the learners and too gentle with them to insist that they get on with their work. Thus boundaries of behaviour were not established and maintained and this had a significant effect on her ability to teach in outcomes-based and learner-centred ways.

7.2.6 Zama

Zama was a young, serious, gentle and quiet man in his first year of teaching. He described himself as a shy person who loved kids, sports and watching TV. He said he liked learning and enjoyed helping others and explaining things. He described how, even at school, he used to help older learners with their maths.

> Yes, I think it is the love of the children. I'm shy but I love children, so my shyness, I put it on one side when I have to deal with the kids. (I)

Zama had studied human reproduction in Biology for matric. He then completed a secondary teachers' diploma (STD) specialising in geography. He said that he studied some biology in his diploma and this included some content related to human reproduction. He would have liked to have specialised in biology but the biology class was full. Zama said that he enjoyed teaching human reproduction. His interest in biology meant that he did read up on the topic in the school textbook and a biology textbook that he had at home. He also used to read his cousin's (medical) books when working in his surgery. As a result his content knowledge on human reproduction was reasonably good for teaching at a Grade 7 level. He was however not always sure of his content particularly at the start of his teaching of this topic and in the section on the structure and function of the female reproductive system and menstrual cycle. He frequently checked his notes and the Grade 7 Natural Sciences textbook. As a first year teacher he was also initially a bit nervous of me and kept asking me whether his notes on the board were correct. He became more confident as he proceeded through the module, but found himself unable to answer certain questions on the functioning of the female reproductive system and menopause. Unlike Sipho, he openly admitted that he did not know the answer when his learners asked him a question that he could not answer. I did not find that he was introducing misconceptions about human reproduction.

Zama was a Xhosa from the Eastern Cape and used to help his cousin, a doctor, with circumcising boys in the surgery. Perhaps because he had gone through the Xhosa initiation ceremonies and had assisted when his cousin circumcised boys, this provided him with a certain authority and confidence in the classroom.

> Because of the experience that I know, it helped me especially circumcision. It did influence me a lot because I'm from there, I know what is going on, and it was not a problem for me.
> It did influence me about talking about their bodies ... knowing what is going on in the males, and what is happening outside there, it was quite easy for me to go through and explain further whatever questions they may ask me I would answer it in a positive way. (I)

As a result, being an 'insider' to the secret ceremonies of initiation, Zama was treated with much greater respect than Mphety, a woman who, according to some South African cultures, should not be discussing this topic.

In the survey, Zama indicated that he did not belong to any religion and in his interview he asserted that he was not influenced by any religious beliefs. He also claimed, in the survey, that his teaching was not influenced by cultural beliefs. My field notes and transcripts of lessons supported this claim. Zama tended to keep to the scientific content of the topic and to health issues. I may have missed quite a bit because he kept switching to isiXhosa and the learners were responding in their home languages, mainly in isiZulu in one class and Setswana in another class. However in the one lesson that was translated because it was predominantly in these home languages, there was no evidence that Zama was presenting a cultural perspective on human reproduction. In all these lessons, I did not pick up much description of cultural beliefs. There were rather the typical questions about what the learners had heard or read – i.e. the strange stories from the media. There was however a class discussion on circumcision in different South African cultures which I missed and that Zama described to me. In the discussion, the Zulu boys claimed that circumcision did not make you a man, whereas other boys felt it was an important transition to manhood. Girls said that circumcision involved checking for virginity and a mark on their legs to say they are a virgin. Zama did not divulge more than this.

Zama code-switched throughout his lessons and at times spent a substantial portion of the time speaking in isiXhosa particularly in the final lesson. The transcription for this lesson was a translation to English. Zama was most comfortable speaking in his own language and often used this language when instructing, reprimanding, elaborating and responding to questions about what learners had read or seen on TV during class discussions and individual interactions with groups or individuals. These discussions tended to be about health issues such as regularly changing pads and tampons during menstruation to prevent infections and getting rid of the pads or tampons hygienically, how abortions are carried out and safe abortions in a clinic rather than backstreet abortions, adoption of a child by two male partners, and sex changes from male to female. Zama tended to speak in English when formally teaching the science content such as in the activities on the male and female reproductive organs, and the notes he wrote on the chalkboard were in English. He said that many of the learners did not understand English and this was why he spoke in isiXhosa. However he also struggled to express himself clearly in English and was most at ease when speaking in his own language.

The Grade 7s in the school in which Zama and Mphety taught were particularly difficult (as mentioned in Mphety's vignette). As with Mphety's classes, the learners were restless and while they were initially cooperative, they became noisier and noisier and disruptive particularly in the lessons on male responses, i.e. the card game. Zama's quiet admonishment was not immediately effective.

However once Zama shared some of his experiences of circumcision and answered their questions thoughtfully, thereby gaining their respect, they began to settle down and began to question him extensively and share their ideas about human reproduction.

Zama did address the issue of responsibility, raising the question for the girls of how they would cope at home if they for example had to look after a disabled father and their baby.

> Like I tried by all means to show them that it is not nice at their age to even think about having sex. So they were worried, they said "No, at this stage I can't do it because I just imagine myself doing grade 7 and I have a baby, ... how are the other kids going to look at me as a young mother". So it was quite something. So that's why I said, it did help me a lot at some stage, and them also. (I)

It was interesting that he did not raise the matter of the boy's responsibility although he was responding to girls' questions at this point. However both in his notion that the stronger sperm resulted in a boy and that girls should not think of having sex, he seemed to portray a slightly sexist perspective.

Zama created boundaries so that his learners did not intrude on his personal life. He felt he had a good relationship with most of his learners since they felt free to come and ask him questions, but he did not allow familiarity. When learners asked him about whether he had a child, he described his and his partner's decision to have a child, and their checking on their HIV status first. When they probed further, he pointed out that their questions were personal. In his interview, he said that he was prepared to be open with them but not about his personal life.

As described in previous chapters, Zama tended to be teacher-centred, spending a lot of time explaining concepts and putting notes on the board. However he did provide opportunities for group activities and walked around the classroom, listening to learners' questions, and responding to them. He tended to become deeply involved in lengthy responses to individual learners, leaving the rest of the class on their own to work or play. Nevertheless he seemed to have the respect of the class.

His more teacher-centred approach, as a new teacher teaching a subject he had not studied extensively at a tertiary level, may have been safer than a more open learner-centred approach. In addition his shy and quiet personality may have resulted in his wanting to keep control of the subject content. So he did not willingly embrace all the ideas proposed in the module, and when he did e.g. the card game, he conducted the activity in a rather muddled and repetitive way. He lacked the confidence at this stage to work with some of the innovations. His greatest strengths in terms of being a learner-centred teacher, were his accommodation, in his gentle and quiet way, of learners' personal, cultural, religious and language differences. He provided a non-threatening emotional space for his learners and so they felt comfortable talking to him during and after class. He allowed his learners to talk about their prior knowledge about human reproduction and he found ways to scaffold their learning particularly through questioning.

Certain outcomes were demonstrated, such as learners communicating effectively using language skills (CO 5), constructing their knowledge about human reproduction (LO 2) and understanding the

cultural context of ideas about human reproduction and respecting the beliefs and practices of other cultural groups (LO 3). Zama however admitted that he did not know what it meant to teach in an outcomes-based way.

In summing up Zama's characteristics, I would describe Zama as a quiet young man who took on the task of teaching human reproduction in a committed way. He gained the respect of his learners both due to his serious consideration of their questions and his openness in answering them within acceptable boundaries. His diploma provided him with only a small amount of content knowledge on human reproduction but he tried to make up for his lack of subject content knowledge by reading up on human reproduction, and his subject content knowledge was fair. He tended to teach in a more teacher-centred manner but did allow for a fair amount of class and group discussion. My impression was that Zama, even though he came from a rural background (like Sipho), did not seem to be strongly influenced by cultural beliefs. He also did not spend a great deal of time exploring issues of behaviour and responsibility. Rather his focus was on communicating accurately the scientific content and helping learners construct their content knowledge about human reproduction, and in addressing learners' concerns and misconceptions about human reproduction.

7.2.7 Thobz

Thobz was a softly spoken and kind person with a quiet smile. She was elegantly dressed, modern, with long braids and conservative in her manner. Thobz described herself as an extrovert, and perhaps she was, in a quiet way, since she enjoyed teasing her learners in her gentle manner. In her interview, she said that she preferred a quiet classroom. She hated making a noise but admitted that the learners "can drive you to making a noise". She felt that she was open and very direct with her learners and preferred the same from her learners.

> I'm one person who prefers to be to the point. I do not want to play hide and seek. ... Then if I'm teaching, I'm expecting learners to be as I am. … I prefer learners to be free because I'm open. (I)

During her lessons, she therefore did encourage openness amongst her learners about their feelings and pointed out that they needed guidance on how to deal with feelings. She also appreciated having a chance to counsel learners.

> And I enjoy it when a learner shows that he has that confidence in me when he has a problem maybe at home or in a lesson, just come freely to me. I enjoy that. I enjoy working with learners. That's how I am. (I)

Thobz had a BAEd degree majoring in Geography. She had not studied Life Sciences at a tertiary level but had taught Natural Sciences in a high school to Grade 8s for three years, although this had not involved teaching human reproduction. This was the first time she was teaching this topic. Thobz was now a Grade 6 Natural Sciences teacher in her sixth year of teaching. She was interested in teaching human reproduction and so attended the workshop. The two Grade 7 Natural Sciences teachers were reluctant to teach the topic and had asked Thobz if she would teach human reproduction to their Grade 7 classes for three weeks while they took her Grade 6 classes. Her belief that it was

important to address issues associated with the teaching of human reproduction meant that she was willing to do the swop. In the interview, I asked Thobz how she felt about teaching this topic to the Grade 7s. She said that before teaching this topic, she was concerned about both classroom control and the subject content.

> I was worried about our learners because I know that they will be too excited and it will be hard for me to control them. …
> And eish, I did not know how to approach other parts of this. Like when you go deeper to showing the penis, the vagina on the board, but I just prayed the Lord would help me do it. (I)

Once she started teaching the topic, she said that she felt her confidence grow.

Thobz quickly established boundaries in her classroom by getting groups to draw up a code of conduct in their first lesson, and then to agree to a common code of conduct. She frequently reminded them of their agreed upon rules, particularly when they 'got out of hand'. She warned the girls not to tease the boys when they learnt about the male system since the boys would tease them in turn later when the class studied the female reproductive system. When learners started making crude suggestions on matters brought up in the card game such as masturbation, she quietly reprimanded them.

> This opportunity to share in our classroom, it doesn't mean we are going to disrespect people – that we are going to talk anyhow about their private parts. So we must remember all the time we respect each other and their privacy and their dignity, ne! (I)

So Thobz reinforced the need for privacy, dignity and respect.

In her lessons, Thobz tended to focus on values and attitudes rather than subject content knowledge, probably because this was what she believed was important. As a guide to her teaching, she used Life Orientation materials that she felt comfortable with because, as she pointed out, they were based on Christian principles. She felt that the focus in these materials on handling feelings was an important starting point to this topic. Using these materials, she provided notes on learning to deal with feelings during puberty/adolescence, and encouraged her learners to understand their feelings and view them as a gift, but to not allow feelings to control them. She wanted her learners to understand that their behaviour during adolescence was normal but they must learn to control their behaviour. She encouraged them to be mature, to respect their culture, and to remember that, for a Christian, sex is for marriage. When she found a picture displaying pornography in the classroom, she addressed this issue, encouraging her learners to avoid these pictures and to change TV channels when they portrayed pornographic activity. Once again she focused on the issue of respect. Thobz felt that the school had a responsibility to teach their learners good moral values to prepare them for high school where there were many behavioural problems and pressure to get involved sexually. Her school draws learners from very impoverished communities, mainly informal settlements, and Thobz felt that many of the learners did not develop suitable value systems at home.

> Because in our environment they are not encouraged in their homes to concentrate on their studies. Instead what they see is it is drugs, alcohol. So what's motivating them on their education? There's nothing. If you do not do it as a school, they won't be motivated. They'll end up, if they decide at grade 8 to leave the school, you can do it. And no one can force him or her to go back to school, because there's no educational background in the family. (I)

Thobz did teach biological concepts related to human reproduction, using the module to guide her. However she seemed to skim fairly rapidly through these concepts and I wondered if she was avoiding discussion because her subject content knowledge was weak. The lack of biology in her tertiary studies meant that Thobz lacked sufficient knowledge of the anatomy and physiology of the human reproductive system to be able to provide answers to learners' questions or to distinguish between learners' correct conceptions and their misconceptions. Thobz was very aware of her lack of content knowledge and concerned about it. However she said that she did not have time to go to the library to find more information since her school was running a special programme in the afternoons designed to make up for lost time during the lengthy teacher boycott in the previous term. She therefore relied on the materials immediately available to her, i.e. the Life Orientation materials and the workshop module as her source of information. To teach the content, she made overhead transparencies of the annotated diagrams (male and female reproductive system, menstrual cycle and mammary glands) in the module and used these as a visual aid. Then she read the annotations to the class and elaborated on them, a fairly typical approach observed amongst some of the case study teachers who recognised the language difficulties of their learners and/or needed the support of the annotations for their explanations. She asked questions rhetorically and learners would respond with a "yes" or would repeat a key word such as 'adult life' often in chorus. Thobz had a fairly utopian view of the impact of knowledge on behaviour. She told her learners:

> So once you understand all the changes (in your body), you will have a healthy sexual life. You won't be confused. (LT- 28/8)

Cultural influences were not evident in Thobz's teaching except perhaps her initial nervousness about showing pictures of the reproductive system. However this could equally be attributed to her conservative Christian upbringing. Thobz, who is a Sotho woman, asserted that she and her family did not observe any cultural rituals associated with the Basotho. She said her family were 'too much on Christianity' and were Pentecostal Christians. She was in charge of a Christian group in her school attended by many of the learners and she would teach them from the Bible. She said that her religious beliefs did influence her teaching. She however indicated that she would respect other beliefs of her learners.

> I know that government doesn't allow us to add our religion on this. Because we have to respect their religions as well. So hence I used to ask before that, who doesn't believe in the Bible? So that I may respect them as well. They do not believe in this, they believe in that. (I)

Thobz did encourage the achievement of certain outcomes (see Appendix 6.7). For example, she did provide learners with opportunities to work effectively with others as a group (CO 2) when they shared their ideas on changes during puberty, during the card game and in their research project, and she promoted learners' language skills (CO 5) through class and group discussions. Her learners were given a research task (LO 1) which was completed by at least one group during my observation period. She also provided some opportunities for the construction of knowledge about human reproduction (LO 2). Her lessons also showed some learner-centred features. For example she provided a suitable social and emotional learning environment for her learners. While there was limited recall of prior knowledge, she did ask questions in order to scaffold the learning and provided

opportunities for her learners to talk and work together. She therefore showed some strengths in terms of being an outcomes-based and learner-centred teacher but tended towards more teacher-centred approaches. She tended to dominate the conversation and limit learners' responses so that learners reverted from time to time to chorus answers.

A number of factors seemed to affect Thobz's teaching. Firstly she had strong value systems in place and these were influenced by her religious beliefs. She felt she had a 'mission' with these learners who were not, according to her, having moral values instilled at home. She was therefore prepared to move from her own Grade 6 classes and to take the Grade 7 classes for three weeks in order to teach the learners about human reproduction, in particular how to control their feelings as they went through puberty and became interested in the opposite sex. She was interested and committed and so enjoyed teaching this topic. She was a reasonably experienced teacher but this was the first time she had taught human reproduction. Her lack of subject content knowledge as well as her beliefs on what was important thus seemed to affect her choice of content for her lessons. Thobz's lack of tertiary level content knowledge on human reproduction, her conservative approach to talking about the reproductive structures of the body and her religious beliefs resulted in her focussing on values and attitudes to a greater extent than on the biological aspects of human reproduction.

7.2.8 Nsuku

Nsuku was a modern young teacher who dressed informally and engaged with her learners in a relaxed manner. She seemed, during my observations, to be a serious and committed teacher. She, was quite expressive in class, used humour in her teaching and had a big smile. She said she was not a shy person and described herself as honest, truthful and objective. She said she made sure the learners respected her and she respected them. This was evident during my observations. She treated learners' questions thoughtfully and tried to answer them, often providing very good answers. When learners presented their role-plays, she was involved, listened carefully, picked up on their ideas and elaborated, encouraging them. She was animated, involved and supportive.

Nsuku completed a Secondary Teachers Diploma (STD) specialising in Biology, an Advanced Certificate of Education (ACE) specialising in Natural Sciences, and a B Ed Hons specialising in Curriculum. She was an experienced teacher having taught for nine years but even though she had specialised in the Sciences, this was only her first year of teaching Natural Sciences. At times she appeared a little insecure in her teaching, perhaps because this was her first year of teaching Natural Sciences and her first attempt to teach human reproduction. A long time had elapsed since she studied this content during her tertiary studies and she needed to revise the content. Her content knowledge was generally good but she did make some surprising statements such as:

> Everyday millions of sperm are made and stored in the testes ... That is why if you are not responsible enough, you can have a million children. Then you need to be very careful, you need to be responsible. (LT – 5/9)

Perhaps she was trying to shock her learners by this extravagant claim but they did not respond.

Nsuku used the module materials extensively but these were in short supply (see Section 8.1.3) and each group of eight learners shared one module which sometimes had missing pages. This impacted on the effectiveness of teaching and learning as learners struggled to read the text and see the pictures. Nsuku nevertheless persisted. Her style of teaching changed during the module. When she was dealing with physical and emotional changes and the card game on male responses, she allowed them to work through the activities in groups, answering questions and then giving feedback to the class or performing role-plays. Learners were drawing on their everyday knowledge. When however she started with basic concepts on the anatomy and physiology of the reproductive systems, and was using the annotated diagrams, her style changed and she became more teacher-centred. Like Mphety, she read through the annotations and elaborated on them, only occasionally introducing misconceptions as seen in the quote above. Reading the relevant text seemed to provide some sort of scaffolding for her teaching and allowed her then to expand on the topic. During her reading and elaboration, she continually repeated her statements, pausing before the end so that learners could provide the last word in chorus. For example:

Nsuku: Everyday millions of sperm are made and stored in the testes. Everyday millions of sperm are?
Class: made.
Nsuku: And are stored in the?
Class: testes. (LT-5/9)

and....

Nsuku: ... it does not depend on the size of the breasts, whether they have breast milk or not doesn't depend on that, it depends on the fact that there's a breast and it has ...
Class: milk.
Nsuku: It has what?
Class: Milk
Nsuku: The breast has what?
Class: Milk
Nsuku: Because of what?
Class: Glands
Nsuku: Milk glands. Because of?
Class: Milk glands (LT-3/10)

This seems to be a habit rather than a carefully thought out strategy since the words that learners repeat are not necessarily important new biological terms that they need to remember (e.g. 'made' and 'milk'). She thus reverted to a traditional manner of teaching with the more complex conceptual content so that her learners could memorise the information. In Chapter 9, I discuss further her use of repetition and chorus answers (section 9.3.1).

Nsuku belonged to the Tsonga ethnic group. When asked if her Tsonga culture influenced her teaching in any way, she said it probably did. I did not see evidence of this beyond her being able to tell the learners a little bit about circumcision. She indicated her initial concern about using biological terminology, an unacceptable practice in many African ethnic groups and thus possibly amongst her learners, but realising the importance of using these terms, she continued to emphasise them so that learners became accustomed to using them.

Nsuku also identified herself as a Christian but she said she did not allow her Christian beliefs to influence her teaching. She pointed out that this was because she had to accommodate all her learners and some of them did not practice Christianity but rather their traditional religions. Instead Nsuku conveyed a moral message about being responsible which she felt was appropriate to all her learners.

> Make sure that they abstain … what I emphasised on is, I just say abstain. Do not get into things at a younger age. Just do your things when you are responsible enough. At the age of 21. It is what I was emphasising. (I)

When she advised the class to abstain until 21 and then they could make decisions about relationships, one of the girls asked why 'our culture' says 21 when the President had said when you are 18, you can do anything. Nsuku addressed this issue by exploring what was meant by the Constitution, i.e. they were now legally regarded as adults and could go to bars, buy cigarettes and vote. She pointed out that that did not mean they could do 'anything'.

Nsuku emphasised self-control, respect and responsibility during her teaching of human reproduction. She said that she could see the change in learners at this age such as their feelings, their admiration for certain people, and writing letters to them. She said that she tried to convey to her learners that even though they were experiencing these physical and emotional changes, they needed to control their emotions and be responsible so that they did not end up contracting STDs or having children at a young age resulting in a situation leading to or continuing in poverty.

Nsuku used humour to convey ideas and handled well questions such as " If you want to sleep with a girl but not to make her pregnant, how do you do it without using a condom?" and comments such as "They say when you sleep with a girl, your penis will grow" (LT – 5/9). She said she did find their comments and apparent knowledge a bit intimidating and whispered to me during this lesson "They are very informed, more than me!" (LT – 5/9). The class were at ease with her, and felt free to ask her questions.

Nsuku was initially worried about how learners would behave and so, like most other teachers, had created a code of conduct with her learners. This provided a safe emotional space within which she and her learners could hold discussions and she maintained the boundaries created by this 'code' in a fairly relaxed manner. In her interview she said that she also recognised that "boys tend to be naughtier than girls" and so started by looking at the male organs. She claimed that "once you start to expose them, they go to order" (I) and it was then easier when looking at the girls organs. An important message that she conveyed throughout the teaching of different aspects of human reproduction was that everyone was different and that learners should not be alarmed if they had different sized organs or started puberty at different ages. Throughout she said she emphasised respect.

In Chapter 9 section 9.3.3, I will speak about how Nsuku used extensive code-switching, probably partly for her own comfort, but also to assist learners. Her English language skills were reasonably good but in my field notes I did note that she struggled to read some of the text in the annotations.

Nsuku worked in extremely overcrowded classrooms but did not allow this to detract from her teaching. She attempted to move amongst the learners during group work, squeezing between the chairs, and talking to them. She engaged quietly with them, and they were immediately interested and involved. Her very large classes sat packed together in long rows facing each other. This enabled her to create groups of four to six learners (and eight when materials were scarce). So she provided a social environment in which groups could interact and begin to demonstrate some of the outcomes such as working together (CO 2), communicating effectively (CO 5) with one another and with her using both English and their own home languages. In their discussions, learners did recall meaningful information about human reproduction from their everyday knowledge, and could interpret the information in some of the activities (LO 2) and did listen to and respect one another's beliefs and practices (LO 3). However Nsuku faced a major resource problem, learners had virtually no resources available and so the intellectual environment was very limited. Nsuku's teaching was less outcomes-based with regard to encouraging problem-solving (CO 1), and analysis of information (CO 4, LO 1). So Nsuku, working in a very difficult context in terms of overcrowding and lack of resources, managed to demonstrate that to some extent she had promoted the development of certain critical and learning outcomes and had used some learner-centred approaches. (See Appendix 6.8 for profile.)

Nsuku's value systems differed from some of the other teachers in that she did not push abstaining until marriage. However like the other teachers, she promoted responsibility and not becoming involved sexually at an early age. She appeared to be committed to and interested in her teaching. However she displayed some traditional styles of teaching e.g. chorus answers, indicating there was not clear congruency with the new approaches.

In conclusion, Nsuku was a committed young teacher, willing to take on the challenge of teaching human reproduction for the first time amongst very large classes. She was adequately qualified to teach human reproduction but since she had not taught human reproduction during her nine years of teaching, she seemed to have forgotten some content. She therefore needed to gain more content knowledge in order to feel more confident when answering questions. Nevertheless she did well, creating a comfortable environment in which learners felt free to ask her a wide range of questions on issues that were puzzling them about their bodies and the process of human reproduction. Her style of teaching was more learner-centred when dealing with prior everyday knowledge and concerns, and more teacher-centred when exploring new concepts related to how the human reproductive system worked. Nsuku had gone some way towards being an outcomes-based and learner-centred teacher.

7.2.9 Rennie

Rennie was a middle-aged Indian South African, a gentle, quiet and kind man. Rennie completed a Senior Primary Education Diploma (SPED) specialising in Elementary Maths and a BA Honours in Music Education. He had taught for 26 years but had only taught Natural Sciences to Grade 7s for three years. He studied Physical Science for matric but not Biology and so was less familiar with the Life and Living part of the Natural Sciences curriculum. He said he had to read up and learn about the biology topics before teaching them, but that human reproduction, particularly as it related to males, was more familiar to him. To ensure that he could answer learners' questions, he read up on human reproduction on the internet. He would then go through the next topic in the teacher's guide and learner's module and plan how he would approach it. He said that as he relaxed in the evenings he tried to anticipate which questions the learners would ask him and planned possible answers. He wanted to be 'forearmed'.

Rennie's content knowledge, as a result of his preparation, was reasonably good but his lack of a solid foundation in biology meant that he did not pick up on some of the learners' misconceptions. For example, he did not correct the following:

Rennie: What else makes differences between boys and girls?
Girl: Um, girls have breasts and boys have chests.
Rennie: Yes, perfect. (LT– 2/9)

On fertilisation, he did not notice the incorrect identification of where the egg is fertilised and the ambiguous explanation of sperm being killed.

Boy: The penis enters the vagina, okay, then there's an egg by the vagina and then the penis lets off sperm and if one of them enters the egg, that will kill off the other sperm ... and after nine months the baby will grow. (LT- 9/10)

He also held the misconception that I frequently encountered amongst learners and teachers in which the exit of the unfertilised egg from the body was linked to the onset of menstruation. However these were amongst only a few instances in an otherwise confident presentation of biological content.

Rennie felt that he did have limitations on how much he would tell his class. He said that when learners asked him certain questions, he would try to answer but would not provide too much detail. He also created personal boundaries that learners were not allowed to intrude upon.

> Once or twice the kids did approach hoping to get like a personal experience out of me now. And then I had to tell them, "look this is not about me, this is about you and how much you need to learn". And you've got to keep that distinction. ... One cannot relate one's own experiences to the children. The kids look at us in a certain manner of respect. I think that might interfere with it. You can't bring yourself to the level of the children. (I)

Like other teachers, Rennie also asked his class to construct a code of conduct for their interactions with one another. However it took him a while to enforce their rules resulting in some slinging of personal insults amongst learners before he reminded them about showing respect to one another.
He insisted on the use of biological terminology. For example, when a boy asked what would happen

"if my williewonker is smaller", he asked the boy to use the term penis (LT – 12/9).

Rennie said that he was conservative in his thinking as are, in his opinion, most Indian men. He did not however feel that being conservative held him back from responding to most of the questions learners posed, and from providing them with the information they needed. Rennie's conservative nature was evident in certain ways. For example, he had separate boy and girl groups. During the card games on male responses, he gave the cards only to the boys while the girls caught up on other work. When one girl objected, he told her that they were 'boy cards'. The girls could only comment when the boys gave their feedback to the whole class.

He had a fairly 'matter of fact' attitude to the content, asking learners questions and responding to their questions. The biological diagrams and most of the content were not a source of embarrassment for him. However, I noticed that he did go through the female reproductive system very quickly. He also, having read through the text for most of the module, avoided reading the section on sanitary pads and tampons. When one of the boys reminded him to read this section, he told the class they were supposed to read it themselves. However he had no difficulty having an extended discussion on responses to the Dr Naidoo activity (beliefs associated with menstruation).

Rennie was non-confrontational in his approach, a pacifist at heart. He said that he tried to be more informal and relaxed while teaching this topic, and avoided disciplining them too much so that they did not close up. Learners seem to respond to his quiet and unthreatening approach. While some learners chose not to participate but rather fool around, most of them engaged freely in discussions such as beliefs about menstruation. While they enthusiastically shared their ideas during class discussions, Rennie never judged their ideas but simply probed their reasoning until they arrived at more satisfactory answers. Rennie thought it might have helped if he was more outgoing. Nevertheless he felt he achieved what he intended to.

> But I think that I did a fairly good job with these kids. Although I'm not that kind of outspoken person but in the class I think I responded well enough for them to have got whatever was important in the lesson. (I)

Although Rennie adhered to the Hindu religion, he did not feel that his religious beliefs played any role in what he discussed in the classroom. He attributed this to mixed influences from his parents.

> The religious aspect did not influence at all ... Well, it is probably because of my upbringing also you see, because my mom is a Christian and my dad is a Hindu, so I have a little of both worlds, let's put it that way. So I suppose that creates that balance in me now as to how far I should go or whatever it is. (I)

He did not feel culture played any role either beyond contributing to his conservative nature.

Rennie did provide opportunities for learners to demonstrate certain outcomes such as the development of teamwork skills (CO 2), communication skills through language (CO 5), and construction of knowledge (LO 2). He was learner-centred in his approach, in encouraging learners to recall meaningful information whether from school, the media or other sources and to some extent he scaffolded their learning. He provided a safe unthreatening environment for his learners. So he did

demonstrate that to some extent he promoted outcomes-based and learner-centred approaches while teaching this module, but he said he preferred teaching in more traditional ways.

In conclusion, Rennie's personality, his quiet and accepting nature, his acceptance of a wide range of ideas and his skill at probing the learners resulted in rich discussions of some aspects of human reproduction amongst those learners who wished to participate. He created boundaries for what could be discussed. His content knowledge was not strong but mostly sufficient and in places where he was unsure of his content, such as the structure and function of the female reproductive system, he reverted to a more teacher-centred approach. He achieved his goal of helping learners construct their knowledge as seen in the way in which learners absorbed concepts and used them to interpret various reproduction-related conditions, answer their own questions and resolve their personal concerns.

7.2.10 Riana

Riana was Afrikaans ('White' Afrikaans-speaking) and an experienced Natural Sciences teacher. She qualified with a Higher Education Diploma Junior Primary (HOD JP - Hoër Onderwys Diploma Junior Primêr), specialising in Natural Sciences, Life Sciences, Afrikaans and Art. She then taught Life Orientation for eleven years and Natural Sciences to Grades 6 to 9 for seven years. Human reproduction formed part of the old Grade 9 curriculum which Riana would have used. This was her first year of teaching in this primary school. She taught the topic of human reproduction with confidence and flair and had good subject content knowledge.

Riana described herself as a 'drama queen' and she certainly was. In her long dresses, shawls and beads, she moved from group to group, crouching beside a group and talking softly, intently and warmly, and then would turn to the class and exclaim loudly, questioning learners about something she had heard somewhere. She was an actor pulling her audience, her class, into her stories, spinning her tales, and using her voice, eyes and arm movements to convey her meaning. Her stories ranged from a personal story of her teenage son slamming his bedroom door in anger (effect of hormonal changes on behaviour) and her response (removal of the bedroom door for use as a picnic table!), the anguish for parents with a brain damaged child, the dilemma of a pregnant girl at school and circumcision in girls. She said in her interview that her intention was not to entertain the children but to keep her lessons as interesting, as versatile and as challenging as possible. She wanted them to enjoy Science so that they would continue with it in high school. She felt it was important to keep some measure of suspense in her class so the learners never really knew what was going to happen next.

> And you need to teach like that. You need to keep them on their toes constantly. Yes. They cannot relax. They must be constantly (thinking) "What's cooking now? What is she planning now?"
> And ... you must be completely different every time. One day (you) must make a huge scene, throw a big drama piece there and next day you've got to have all this stuff in your class that they can taste and smell and stuff like that. You need to keep them ... *(claps her hands past one another signifying keeping them sharp and on their toes)* ... constantly.

> The whole frigging booklet was a drama piece if you think about it. (*laughter)* That was one big drama. I should get an Oscar for this. (I)

Riana emphasised that she loves the subject and she loves teaching – and that was clearly evident.

The learners in Riana's class produced a code of conduct which remained on the board throughout her teaching of the subject. She only referred to it a few times but did reprimand learners occasionally including an exasperated "Stop giggling like a hyaena, I can't stand it" to her class at the start of one lesson (FN-1/10). Learners were aware of her value system and respected her and did not make crude comments during class discussions. During their recorded group discussions, while she was not with them, they did become more personal. Riana herself had personal boundaries which were evident to the learners so that although she told a few funny stories of events in her family that related to emotional changes, no learner ever asked her a personal question about her sexual life. Her boundaries were clearly in place for both herself and her learners.

Riana did not feel that Afrikaans cultural beliefs played any role in her teaching. Rather, like Thobz, her Christian beliefs seemed to influence her approach and in particular her concerns about the learners' moral values. Riana however emphasised that her focus was on learners having a strong value system rather than on her trying to push a Christian value system. She believed a strong value system was essential in learners.

> It is not about my position, it is about a strong value system. And it is a safe value system if you think about diseases, AIDS and stuff like that. You need to have that value system to guide the kids, to show them what's the safe value system. And for me the only value system. (I)

The theme of values permeated all her teaching and this was the focus of her teaching. Although she did cover the biological content, and her learners did complete the activities, this was done quickly. Then time was spent presenting her perspective on values and allowing learners to give their opinions and argue their point. Riana was very aware of the fact that she had to take into account different value systems

> … you do have to have an open mind and an ear for the other type of value systems. … Because (I have) all types of religions in my class. You can not tell them that this is right, this is wrong. That's not my place to do. (I)

However she could not also contravene her own value system and so while she listened to her learners' views, she did establish her own position.

> You do not have to agree … You can't tell them, you know it is fine, … you can have sex at 17, 18, it is fine. I would never do that. But, it did come through. In all my lessons. (I)

Riana was deeply concerned about the lack of values in the lives of young people today. She said they did not develop a value system through their religion, pointing out that 80% of children never go to church or are given the opportunity to believe in something, and their parents were not taking the time to develop values in their children.

> I do not think there's time to communicate. When do the parents communicate? When the mom is making food and dad is in front of the TV maybe? I picked up, if you look at in general children how they behave, respect for one another, respect for one another's pencils and stuff, how they talk to one another, I think the value system is definitely going down. And unfortunately it is our job. It is

not really fair. It is not really our job. But you can't say, sorry, ... it is not my job so I'm not doing it. You'll do it. (I)

I asked Riana if being a parent herself influenced her teaching of values and she thought it possibly did. She said she felt very sorry for her learners because she thought that without a strong value system, they would become very confused as adults. She expressed her concern for these learners:

And it is not really fair, it is not his fault. We can't judge a child of something he does not know. You must tell him something. And I think being a mother does help. Being a Christian really helps a lot, but it is also I feel I have to teach this child. Now our job is not just about teaching, it is about caring, it is about empathy. You need to feel a child, know his heart and his soul. (I)

Riana was driven by her Christian principles and her strong sense of children's need for a value system to guide them. She was probably also influenced by her many years of teaching Life Orientation. Although she did cover the biological content, like Thobz, her concern was thus not simply getting biological concepts across but life principles.

Riana was a very powerful personality in the class, a strong mother figure as well as teacher and counsellor and the class, particularly the girls, wanted to talk to her, to tell her their stories and get her advice. She was deeply involved with her learners, as a mother figure, drawing them into her stories and challenging them as she attempted to convey a moral message based on her Christian beliefs. For example, she talked about the wonder of a baby developing in the mother's womb, a gift from God and a huge responsibility since each child is special. She told the children in her class that, having learnt about human reproduction, they had no excuse now (for causing a pregnancy).

In one of her final lessons, she did however cause some dissent. She referred to the Bible and the values placed on women, and spoke of the importance of waiting until ready, about the need for men to value women and treat them as special. She talked about choices and peer pressure and commented: "And do not think girls, if you sleep with a few boys, that you are not going to be called a slut!" (T - 8/10). Her learners challenged her. One girl said her mother was not married but had two children. This girl asked why one should complicate things by getting married, rather live together (her mother's voice!). Another girl told the class her aunt had been engaged for eleven years, had two children and was only now getting married. More stories followed and there was a good discussion about moral issues and when a sexual relationship was appropriate. In this situation, Riana needed to be more sensitive and not forget the very varied circumstances in which these children were being raised. She may have caused offense or embarrassment.

Riana showed many outcomes-based and learner-centred characteristics. She provided opportunities for group work and individual work in which learners managed their groups responsibly thus allowing for the demonstration of CO 2 and CO 3. In groups, learners' discussions enabled effective communication to take place through talking to one another and completing written tasks (CO 5). During group work, she continually circulated and interacted with the groups, ensuring that they understood and were doing the required work. She did well at helping learners to recall meaningful information and interpret new information (LO 2). In this way she helped learners to construct new

knowledge, scaffolding their learning and giving them group tasks in which through verbal interactions, they could help one move through their zone of proximal development and acquire new conceptual knowledge. This was done perhaps too hastily and more could have been achieved here. Learners had an opportunity to demonstrate LO 1 through their STD project that I was told about but did not observe.

In conclusion, Riana was an interesting and competent teacher, a storyteller who provided a safe learning environment for her learners. Here they could comfortably discuss their perspectives, consider new ideas and learn about human reproduction. Her stories, presented dramatically, enthralled the learners and challenged them to consider why it was important to behave responsibly. Her lessons, like that of another storyteller (Samkele), captured the attention of the learners and challenged their thinking on their values and attitudes. They spent less time constructing their knowledge about the biological aspects of human reproduction.

7.3 A special case: Yaseen

At the end of the survey, I asked teachers to indicate whether they would be prepared to participate in the case studies which included observations and interviews or whether they would be prepared to just be interviewed. In selecting teachers for the case studies, I tried to get a spread of people from different population and ethnic groups in order to see the influence of culture on their teaching. I also tried to include people from different religions to see the effect of religious influences. However I was not always successful. For example, neither of the two Muslim teachers was willing to be observed. However one of them, Yaseen, was prepared to be interviewed after teaching human reproduction. I have included a short biography of Yaseen because it adds to the richness of the data collected. Yaseen was a very devout Muslim and so his experiences provide an Islamic perspective on the teaching of human reproduction to Grade 7s. It is, of course, Yaseen's unique experience and I would not infer that this would be the response of other Muslims. However it does reveal some of Yaseen's struggle as a Muslim.

Yaseen

Yaseen taught at an affluent and formerly 'White' English-speaking suburban school. When Yaseen attended the workshop, he participated in many of the activities in the module. In the survey, he indicated that he would not be able to use the analysis of the diagrams (showing the changes from boy to man and from girl to woman, and internal reproductive organs) in his teaching for religious reasons. He felt the diagrams bordered on the pornographic. He added that because of his religious beliefs, he would encourage no sex before marriage. He added that cultural influences would also play

a part in his response.

> Being Indian, we are conservative and sex is not something easily spoken about. (I)

Yaseen was interviewed after he finished teaching this topic. He now began to see his survey answer in a different light and attributed his response more to his upbringing which no doubt was influenced by culture and religion.

> The answer that I gave at the training was purely based on my upbringing that I had and the fact that I…because my parents were very, very strict and very, very conservative, and they never had this discussion. We were three brothers. They never at one stage put us aside and said, look, this is what happens. So my answer's based on purely my strict upbringing I had from my parents. (I)

Before starting to teach his learners about human reproduction, Yaseen was concerned about what he would be teaching and so he asked for advice from his religious elders.

> I did speak to some religious elders on a Friday night and Saturday night when I went to the mosque. (I told them) "As I'm reading, this is what I'm finding, and it would be easier for the kids to physically see as I'm explaining 'this is the Fallopian tube, this is where the egg goes into'." (I)

Yaseen asked the elders what restrictions the Islamic faith imposed on what could be taught.Their response focussed on whether the subject matter was educational, and the teacher's motive was 'pure'.

> And the answer that sort of stood out was: as long as it is from educational perspective and your intentions are very clean and very clear, there should not be a problem. (I)

Yaseen found this distinction helpful. He could teach this material with a clean conscience because his intention was educational:

> Spiritually I had to look at myself and say, what is my intentions? God is asking me to do this. Why am I doing this? Am I doing it because I'm going to use this as a means to introduce the kids to pornography? Or am I going to use this as a means for education? Because Islam teaches about knowledge from the cradle to the grave. And I said, my intentions are clear, my intentions are purely based on knowledge, so that the kids become aware so that they understand what is happening with their bodies. And that sort of eased me. (I)

Yaseen had gone on a personal journey as he grappled with teaching human reproduction to his learners. He said that before he taught the subject, he read articles on the internet from Kid's Health and Teens' Health and he looked at the flip chart from the Health Department. As he began to learn about the functions of the organs, he no longer saw the pictures as pornographic. He started to view the organs differently.

> I saw the value that it was not pornographic. That if I did it in this manner, I did not just simply put up a picture and say there's the female reproductive system, flip the chart, there's the male reproductive system. There was a reason behind it. What is the ovary? What does it do? What is the Fallopian tube? There's an educational reason behind it. (I)

During his teaching, Yaseen did give his position on moral issues when responding to learners' questions. The learners, for example, asked Yaseen why he believed in no sex before marriage. He gave his reasons, but he says that he made it clear to them that this was his perspective and that, on the 'sex' issue, it was their personal choice. He encouraged them to make sure their choice was guided by

their parents, by their religious beliefs (if they had religious beliefs), and by their cultural beliefs. He pointed out to the learners:

> I can stand here and say, do not have sex until you are married, but it is your decision. You need to be guided by your parents, by your religion, and by your cultural beliefs. ... ultimately it is your choice. I can stand here and preach a whole sermon as to why you should not have it until you get married. But at that moment I'm not going to be there. It is your upbringing that is going to be there, it is your religious beliefs that you're going to hold, it is your cultural beliefs that is going to hold you, and that is what you need to take cognisance of. (I)

Yaseen describes himself as a very conservative person. He says that when he started to teach the physical changes from boy to man and from girl to woman, he just wanted to get it over and done with as quickly as possible. However to his surprise, his learners had a very positive attitude to this section and this helped him to relax and talk a bit more freely about this topic.

> But the kids' responses, the kids' attitude towards the whole section, ... just sort of eased me out of my shell a little bit in terms of so that I could also be as free. Because I realised, if this is the attitude that they are having, the openness to it, and if I'm going to be conservative, these kids that have these questions are also then going to close up and these questions are not going to come out and these kids are not going to learn and I'm going to lose my objective of what I want. So based on their openness and on their enthusiasm I came out slowly. ... My religious beliefs, upbringing is still with me, was still at my background, because I did not open up fully. There's still some information that I would not give that I feel is for parents to instil into their kids. So I focused purely on the biological perspectives and ... explaining it to them was much easier. But they played a big part. (I)

When Yaseen could not find a logical answer, he provided a spiritual explanation, attributing it to being God's way. In the interview he gave the following examples:

> They asked the question: why is the females' on the inside? Why is the boys' on the outside? So I had to find an answer for that one, and I said, it is God's way, we have the penis and that on the outside and the female's everything is on the inside. I then had to go and do research and find out and eventually the answer that came up was, it is just God's way. (I)

> Another question that I got asked was, when we did the section after the female reproduction was, the circumcision. Sir, why did God give us the foreskin? And I said, think of it this way, why do you have cartilage in your ear? Why do you have skin on your ear? ... The best answer I can give you is that it is natural phenomena from God that we have to accept. People choose to have circumcision, other people choose not to have circumcision.
> "Yes, but Sir, why? Why the skin? Why us?"
> I said, that's God's way, that's natural. That is the answer that I gave. (I)

He did not invite his learners to investigate further to suggest a structure-function relationship but closed the discussion with a religious response.

Yaseen said that when he gave advice, he made it very clear that it was based on religion.

> I said straight, the advice that I give you is based on religion and I say abstain until you are married. ... The less partners you have, the less risk of getting HIV. But if you sleep with an infected person, the chances of you getting it are very, very strong. ... So abstain until you are married. That is my advice that I give you. (I)

In the interview, Yaseen expressed how excited he was about what he had learnt and in particular what the children now understood about what was happening to their bodies.

> (Regarding menstruation) The girls got an understanding of why blood is released and why sometimes lumps are released. A lot of the girls said, Sir, we did not know that, we did not actually know why this happens. So this whole activity, this thing on sex education or human reproduction gave the learners an understanding of how their bodies function and why it is functioning. What are causing the changes. And I asked for feedback on how were the lessons, what have you learned? These were the two things that stood out from all the responses: thank you, you've given us understanding. We know what sexual intercourse is, but the biggest understanding is, we know now how and why our bodies are going through this and how and why our bodies work in this way. So they understood the different parts. (I)

Yaseen's perspective, as a devout Muslem and conservative person, had changed during his teaching of human reproduction. He firstly consulted with his religious elders who advised him and helped him to see that it is how one views the reproductive system and its functions that either helps learners to understand how the body functions or turns it into a 'pornographic' activity. One's attitude during teaching is very important. He then started to discover explanations for himself on the internet as he prepared for his lessons. Then as his learners expressed a natural interest and enthusiasm for understanding the changes that they were experiencing or had heard about, he began to relax and enjoyed helping them gain this understanding. Yaseen still withheld certain information that he felt only parents should communicate to their children. However his whole perspective on the teaching of human reproduction changed without him compromising who he was and what he believed in.

7.4 Personal and professional factors affecting the case study teachers

A number of professional and personal factors can influence a teacher's willingness and ability to teach a sensitive topic such as human reproduction and to teach it in an innovative way, in this case in outcomes-based and learner-centred ways. In this section I will consider the possible effect of some of these factors and will indicate how other factors may affect the impact of each factor described here.

7.4.1 Professional background

A teacher's qualifications and professional experience can have a significant impact on their confidence and competence when teaching human reproduction.

7.4.1.1 Teachers' qualifications, content knowledge and levels of confidence and competence

The teachers in both the survey and case studies had a wide range of qualifications (Appendix 4.3; Tables 4.3.1 and 4.3.2 respectively) and these qualifications were not always in biology, particularly for the teachers with degrees (Figures 7.1 and 7.2). In the survey there seemed to be a trend towards teachers feeling more confident about teaching human reproduction if they had biology in their qualifications (Figure 7.4). All the case study teachers, whether qualified or not, with the exception of Rennie and Sipho indicated in their survey questionnaire that they felt confident about teaching

human reproduction. The reasons for their confidence varied from a desire to "iron out preknowledge" (Thobz – I), to assist learners to understand puberty, STDs and teenage pregnancy (Nsuku – I); to respond to childrens' interest because "the children want to know and have great insight themselves" (Jackie – I); because he had sufficient knowledge and would be helped by others (Zama – I); and in Mphety's case, because she believed her experience as a mother of two girls would make a difference (Mphety – I). Rennie who specialised in Maths and music felt fairly confident, and Sipho who specialised in Economics and Management Sciences (EMS) felt negative about the prospect. Thus both those who had studied biology in their degree or diploma and those who had not, indicated that they were ready and willing to teach human reproduction with the exception of Sipho.

In practice, teachers' confidence and competence varied with regard to their content knowledge, their ease in answering questions and talking about human reproduction, and their use of outcomes-based and learner-centred approaches.

Teachers' subject content knowledge of human reproduction contributes to their ability to conceptualise this topic and answer questions thoughtfully and meaningfully. As mentioned earlier, research has shown that in sexuality education, academic qualifications and/or specific training in sexuality education have a positive impact on teachers' competence in teaching human sexuality to learners (Anastácio, et al., 2004; Berger, et al., 2008). The same is probably true of teaching human reproduction in the Natural Sciences. The problem is that one cannot simply look at a South African qualification that has Biology or Natural Sciences listed as one of the courses and assume that human reproduction has been taught and learned adequately. Thus Riana had a Junior Primary Teaching Diploma (HOD JP) and the biology content knowledge would have been considerably less than for example a secondary teachers' diploma (STD). Jackie had completed a B Paed Prim Ed (Bachelor of Pedagogics in Primary Education) specialising in Science Education but this degree focussed on the pedagogy and there was comparatively little subject content knowledge in her course. Samkele reported that there was very little on human reproduction in her PTD (Primary Teachers Diploma) biology course. Gogodi and Mphety had primary diplomas and Nsuku a secondary teachers' diploma (STD), and in all three cases they took tertiary level biology courses which seemed to include human reproduction. Sipho, Zama, Thobz and Rennie did not have biology in their tertiary level courses.

Most of the case study teachers felt they could teach human reproduction at a Grade 7 level, not only because they may have studied human reproduction at a tertiary level but also because of other contributing factors. Riana had taught human reproduction to Grade 9s previously and so was familiar with the content and would have explored the topic in greater depth. In addition Riana, Jackie and Mphety would have briefly covered some biological aspects when teaching Life Orientation e.g. puberty, menstruation and sexual intercourse, as would have Gogodi in her special course. Samkele, Zama, Jackie, Sipho and Rennie all spoke about reading up about human reproduction on the internet, in old tertiary level textbooks and in the materials provided so that they had sufficient content knowledge to be able to answer learners' questions confidently. Only Thobz said she did not have time to read because of afternoon classes but planned to prepare the content thoroughly the following year. Prior experience, reading up on the topic and content gained through their PRESET all

contributed to teachers' confidence and competence. Teachers were reasonably competent with regard to teaching biological content.

Some teachers considered the teaching of values such as responsibility and respect for others, and making well-informed and thoughtful decisions on one's life and future with regard to sexual activity, to be the most important component of their teaching of human reproduction e.g. Riana and Thobz, and this was where they spent the majority of their time. All the teachers paid attention to values and attitudes but Zama and Rennie spent the least time on this aspect of teaching human reproduction, preferring to focus on subject content and health matters, answering all those questions that 'worried' the boys and girls in their classes.

What did seem to emerge was that teachers with more content knowledge taught the biological concepts more thoroughly whereas those with less content knowledge tended to focus on puberty and values and attitudes and seemed reluctant to move on into the anatomical aspects. Riana, who focussed on values and attitudes, was an exception here, moving quickly and decisively from topic to topic.

Teaching human reproduction in outcomes-based and learner-centred ways provided another challenge, but teachers were helped by the workshop materials and other materials that were designed to use learner-centred methods to achieve the specified outcomes. Teachers tended to use these approaches when teaching everyday topics such as physical, emotional and behavioural changes during puberty, circumcision, and beliefs about menstruation. Some teachers reverted to more teacher-centred approaches with the more conceptual biological material, such as reading and elaborating on the annotations of biological diagrams, expecting chorus responses thus encouraging rote learning of content.

The only specific training the case study teachers received with regard to teaching human reproduction was the workshop they attended that has been reported on in Chapter 4 (Section 4.5). The workshop did not specifically cover content except within the context of the activities completed. The focus was on how to teach human reproduction in outcomes-based and learner-centred ways and how to handle awkward questions in the classroom. No other relevant INSET was provided before they embarked on this topic, unless teachers attended life orientation workshops, but none reported having done so.

There was no clear distinction between teachers who were well qualified in biology and those who were poorly qualified and the extent to which they taught this subject effectively in outcomes-based and learner-centred ways. A number of researchers have argued that a teachers' level of education and training affects their capacity to innovate (Beeby, 1966; De Feiter, et al., 1995; Rogan & Grayson, 2003). Rogan and Aldous (2005) however found that other factors such as a teachers' willingness to change played a greater role than their qualifications and thus subject content knowledge in the extent to which they implemented outcomes-based teaching. This is in line with the findings of this study.

7.4.1.2 Professional experience

Some research (De Feiter, et al., 1995) indicates that a teacher's capacity to innovate is affected by the length of period for which they have been teaching, with first year teachers being less likely to attempt innovations. The teacher's capacity to innovate is also affected by their positive or negative experiences of teaching before attempting the innovation. I only looked at the stage of the teacher's career to find out how experienced they were. First year teachers, according to De Feiter et al. (1995), had so many new situations that they had to learn how to deal with, that implementing an innovation would be more difficult than for teachers who were more settled in the daily requirements of teaching and could spend time trying out the innovation. Amongst my case study teachers, only Zama was a first year teacher and he did struggle with learner-centred activities, preferring to be in control and either talking, questioning or writing on the board. He did try out group activities, allowing learners to work together on three activities. He was also fairly limited in his subject content knowledge. He was not the only one. Human reproduction was a new topic for Grade 7. In the previous curriculum, it had first been taught in the Natural Sciences in high school in Grade 9. Thus Riana had sufficient subject content knowledge because she had taught human reproduction previously to Grade 9s. Jackie and Thobz had taught human reproduction as part of Life Orientation where the focus was more on values and behaviour. Their teaching reflected this influence. Gogodi had taught human reproduction to girls for one day once a year in a Grade 7 programme on human sexuality and had also covered human reproduction in very limited ways. The remaining teachers were all teaching human reproduction for the first time. They did not have to learn how to manage learners or organise their teaching for the first time, as would a first year teacher, but they did have to learn how to teach human reproduction for the first time. Another first time experience for Sipho, Mphety, Zama and Riana was that this was their first year of teaching in the school I observed them in. However they had been teaching for six months and so this factor should not have played a significant role in how ready they were to innovate.

The graph in Figure 7.7 provides a profile of the years of teaching for each case study teacher. Gogodi and Rennie were the most experienced teachers and they were comfortable with their learners and reasonably competent in certain aspects of using outcomes-based and learner-centred teaching. However Rennie, who had been teaching Natural Sciences for a relatively short time, said he preferred a more teacher-centred approach. In terms of length of period teaching Natural Sciences or Biology, Jackie and Riana were almost as experienced as Gogodi and were comfortable in their teaching of human reproduction and in attempting a variety of outcomes-based and learner-centred approaches. While there is some indication in the case studies that more experienced teachers, in particular those who have been teaching Biology or Natural Sciences for longer, are more comfortable with and knowledgeable about their subject and more able to attempt innovations, the findings of both the case studies and the survey do not provide convincing evidence for more effective teaching with more experience, because so many factors play a role. I now turn to personal factors in order to see how they impact on the teaching of human reproduction in outcomes-based and learner-centred ways.

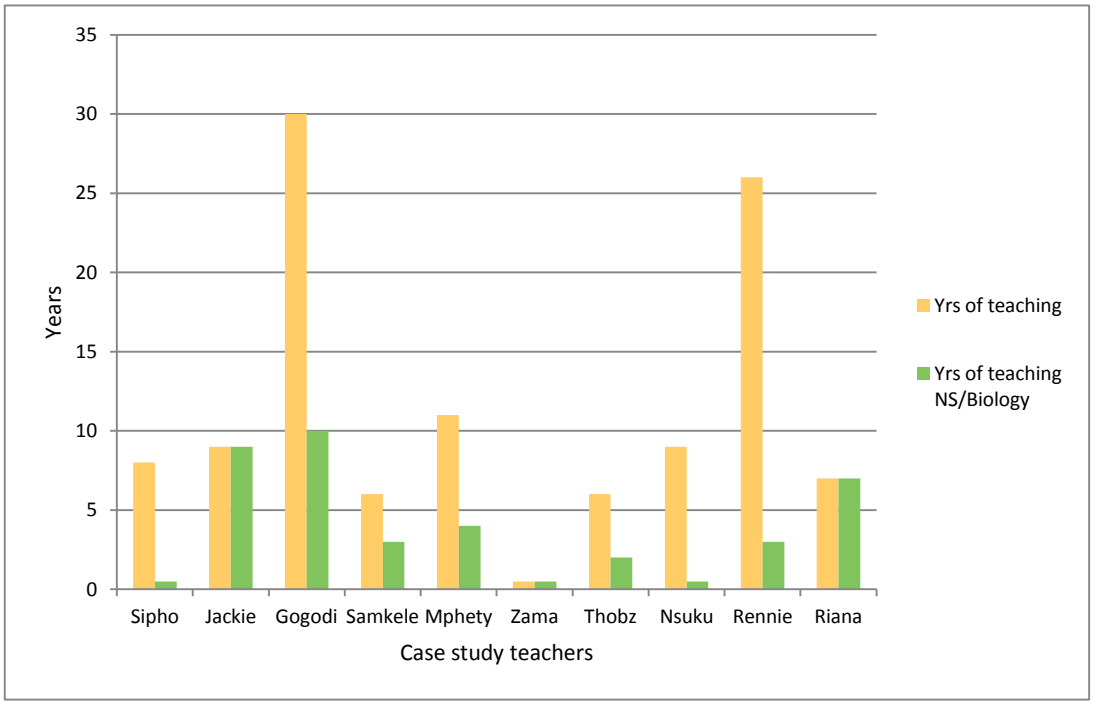


Figure 7.7: Teaching experience of case study teachers

7.4.2 Personal factors

A number of personal factors influence what innovations teachers are prepared to embark on. These include teachers' personal beliefs about and attitudes towards the innovation and thus their commitment to, and interest in, implementing the innovation; their flexibility and open-mindedness regarding the innovation; their congruence with the innovation and their sense of self-efficacy in carrying out the innovation. Their personal, religious and cultural values also play a role especially when teaching human reproduction. The next aspect of the discussion explores the influence of these personal factors.

7.4.2.1 Behavioural beliefs

Beliefs about a behaviour, according to Ajzen (1991), influence attitude towards the behaviour which helps to determine the intention to perform the behaviour and the performance of that behaviour. Using Ajzen's theory of planned behaviour, one could thus expect that Natural Sciences teachers' beliefs about teaching human reproduction and teaching it in outcomes-based and learner-centred ways (the behaviour in Ajzen and Madden's model) would have an effect on their attitude to teaching human reproduction in ways which would influence their intentions and actual behaviour.

In the workshop held at the end of 2006 by the Natural Sciences subject advisor in the district in which the survey and cases studies were situated, almost all teachers supported the teaching of human reproduction to Grade 7s for the reasons discussed in chapter 4 (Section 4.3). In the survey, some of the teachers expressed their anticipation of and excitement about teaching human reproduction to Grade 7s at a time when learners were preparing to enter high school. The case study teachers

likewise believed in the value of teaching human reproduction to their Grade 7 learners and so had positive attitudes and engaged enthusiastically in the behaviour of teaching human reproduction to learners. The views of the case study teachers can be summarised as follows:

- These children were entering or have entered puberty and needed to understand what was happening to their bodies (all teachers).
- Parents were not talking to their children about the changes taking place in their body (Sipho, Rennie, Riana).
- Learners were collecting information from peers and the media and this information was often incorrect or contained half truths. Natural Sciences teachers could provide learners with more accurate scientific information (Samkele and Sipho).
- Teachers had a moral role to guide the learners (Thobz, Riana, Jackie, Samkele).

However the case study teachers had certain concerns or fears about teaching human reproduction. These included the following:

- *Lack of subject content knowledge, something new.* Sipho was concerned that this topic was outside of his area of expertise. Zama and Rennie expressed the concern that they had never taught the topic before. Rennie was excited by the challenge although a bit apprehensive about questions the learners might ask that he could not answer.
- *Different value systems.* Riana was concerned that since this was the first time she had taught human reproduction to this age of learners, she was not familiar with their parents' position on human sexuality matters and thus the children's value systems.
- *A private and taboo subject.* Several teachers felt that human reproduction was a private matter and were concerned about discussing it for personal reasons (Gogodi), religious reasons (Thobz) and cultural reasons (Sipho). Nsuku and Sipho were also concerned about how learners from different cultural backgrounds would respond.
- *Learners' remarks and behaviour.* Four teachers from township schools were concerned about remarks passed and the possible behaviour of the students. Thobz was worried that her learners would be too excited about the topic and thus hard to control. Gogodi was concerned that her learners would 'use these names on me later' or would write comments on the walls. This sort of behaviour did take place in a very unpleasant way in the school of another case study teacher. In this school, a learner drew pictures on the walls of the boys' toilets showing, in a very crude manner, two staff members engaged in sexual intercourse. Elsewhere there were reports of boys touching girls in the playground. Although there were only a few incidents, it did indicate that for some learners discussing human reproduction was like opening a can of worms, and the results could be unpredictable if not handled with great sensitivity and good sense. Many learners came from homes where, according to the case study teachers, they were already exposed to sexual activity either from being abused, watching family members or being sexually active themselves or from watching pornography through the media (see Chapter 9, section 9.1.1.2). Teachers needed to be taught how to handle such situations. In the workshop held before the start of teaching human reproduction, a presenter from Family Life advised the teachers on many of the situations they would face and how to handle them. There would need to be ongoing workshops

for teachers to share their experiences and what they felt would be the most appropriate action in such instances.

- *Anxiety about encouraging sexual activity.* Some teachers such as Samkele were concerned that discussing human reproduction would encourage their learners to become sexually active.

  > In the beginning I was a little bit nervous, ... maybe I will be the one who's leading them to being sexually active, because it involves a lot of things, naked as they are, there is nothing hidden there, so I felt nervous. Maybe I'm wrong. (Samkele - I)

Nsuku said that the parents in her school were also concerned that teaching their children about human reproduction would encourage them to become sexually active and reluctantly gave their permission because they hoped that it would encourage responsibility. Research in many countries shows that talking about human reproduction in an education context e.g. a human sexuality programme does not encourage but rather inhibits sexual activity (Bhana, et al., 2011; Somers & Surman, 2005) and so this may be an unwarranted fear in the case of these teachers and parents.

Teachers' beliefs that it was important to teach aspects of human reproduction to Grade 7s resulted in positive attitudes to teaching human reproduction and so the case study teachers did all teach this topic with some measure of enthusiasm and interest. However their teaching was affected by their anxieties about teaching this topic and this affected the extent to which they would explore this topic with their learners. Teachers' behavioural beliefs thus did impact on their teaching of human reproduction in outcomes-based ways (RQ 4).

7.4.2.2 Personal attributes

There are a number of personal attributes that contribute to a teachers' likelihood of innovating.

Commitment and interest

Commitment and interest, according to Rogan and Aldous (2005), is one of these attributes. The teachers who attended the workshop and completed the survey had either chosen to go to the workshop or been sent by their Principal. Those who chose to attend the workshop were probably interested in learning how to teach human reproduction in outcomes-based and learner-centred ways. In the survey, all the case study teachers, except for Sipho, expressed interest and appeared to be looking forward to teaching human reproduction. Jackie expressed this as follows:

> I was actually looking very forward to doing it. I was excited about it, but it is about time … it is relevant, so I was looking forward to it. (I - Jackie)

Her positive attitude contributed to her willingness to engage in this topic.

All the case study teachers, including Sipho, became increasingly committed to and interested in teaching human reproduction as they proceeded through teaching the topic and noted the learners' very positive response. The children's interest in the topic created lively discussions especially in classes where teachers had a greater sense of self-efficacy and thus allowed the discussions.

Confidence and self-efficacy

The case study teachers had varying levels of self-efficacy before teaching human reproduction (survey data). Amongst the case study teachers who had no biology or Natural Sciences in their qualifications, Sipho was not confident, Rennie was fairly confident and Thobz and Zama were confident before embarking on teaching human reproduction. The remaining teachers who all had biology or Natural Sciences in their degrees or diplomas, all claimed to be confident or very confident. Gogodi's reason for her confidence was interesting. She maintained that "I feel confident as I teach facts to learners and I do not allow vague comments" (I). This seems to indicate a fairly rigid stance and was indicative of the fact that if the discussion moved away from her 'facts', she would lose confidence. She was in fact very nervous of the conversation straying over to personal discussions.

In the classroom, Riana and Jackie appeared most confident in the handling of the subject material and responding to questions but Sipho, Samkele, Nsuku and Rennie also displayed confidence in responding to a wide range of questions. Thobz was confident, but tended to control content and conversation and restrict her learners to the moral perspective she was conveying. Zama, while saying he was confident before teaching, was nervous in the classroom. He was a first year teacher and this probably contributed to his being less confident. He did however engage in long discussions with learners, challenging their ideas and answering their questions. Mphety was initially confident since she had a good grasp of the subject content and was sure her experience as a mother would help her to answer questions, as mentioned previously. However she struggled with discipline and this eroded her confidence.

Open-mindedness and boundaries

Helleve and colleagues identified another attribute for the successful teaching of sexuality education and thus relevant here i.e. that of being free and open-minded when teaching human reproduction (Helleve, et al., 2011). A number of the case study teachers could be considered free and open-minded, willing to listen to learners' perspectives and to engage in a discussion or answer a question. These included Sipho (who I considered to be too open), Jackie, Samkele, Zama and to a slightly lesser extent, Rennie, Riana and Nsuku. This openness allowed for more extensive discussion and gave the learners the confidence to share their ideas, whether conceptions or misconceptions which teachers could then address.

All teachers except for Sipho and Jackie introduced codes of conduct, usually drawn up by the learners, which would define the boundaries of conversations in the classrooms. The emphasis in these codes was on not being personal and on respect, dignity, listening to one another and respecting one another's cultures. By placing boundaries on what could be discussed, teachers safeguarded both their and their learners' privacy. This was extremely important in creating a safe emotional environment in which appropriate discussion could take place. Some teachers were very strict about those boundaries such as Thobz, whereas others were more lax such as Rennie. Some teachers struggled to maintain the boundaries when discipline broke down such as Mphety, whereas the teachers' personal moral system meant that learners did not often try to cross the boundaries such as

with Gogodi and Riana. All teachers respected the boundaries of personal privacy except for Sipho and on a couple of occasions Samkele and Jackie. In my opinion, Sipho (who had not used a code of conduct) either did not know how to create appropriate boundaries or chose not to. The result was an emotional learning environment that was exciting but not particularly safe.

Age and gender

Amongst the case study teachers, no conclusions could be drawn about the effect of age on the ease with which teachers taught human reproduction. Unlike findings from Portugal that teachers under 30 had fewer difficulties teaching sexuality education (Anastácio, et al., 2004), age did not seem to be a determining factor in the teaching of human reproduction amongst this small sample of Grade 7 teachers. Gogodi who had taught for 30 years initially found it awkward to teach this topic whereas Rennie who had taught for 26 years did not experience the same difficulties. Zama was the youngest teacher and was open with his learners within the boundaries he had set, but Thobz, another young teacher, was more reticent due to her upbringing.

I also could not see any real gender differences in the ease and openness with which teachers discussed human reproduction, unlike Anastácio's findings where females found it more difficult than males to teach about body growth and expressions of sexuality.

In conclusion, the case studies show that certain personal attributes or characteristics allowed for a deeper engagement with learners when teaching human reproduction such as openness within clearly defined boundaries, a sense of self-efficacy that contributed to the teachers' confidence in the classroom, and interest in the topic and a belief that it was important to teach the topic and thus a commitment to the teaching of human reproduction in a way that was appropriate for Grade 7s.

7.4.2.3 Value systems: Religious and cultural values and personal values

Several studies have shown that a teacher's religious and cultural beliefs and their value systems have an impact on their teaching of sexuality and sex education (Anastácio, et al., 2004; Berger, et al., 2008). I was interested in the extent to which these influences were evident amongst the teachers in the survey and case studies.

Religion and culture can have a strong influence on the teaching of human reproduction. Berger and colleagues found that the more religious, or rather the stronger a person's belief in God, the more likely they were to talk about abstinence rather than safer sex. Samkele, Thobz and Riana (Christians with a strong belief in God) and Yaseen (a Muslim with a strong belief in God) all strongly advocated abstinence. Other teachers advised responsible behaviour such as Nsuku, also a Christian, who advised abstinence until a child was adult and responsible, and other teachers who proposed responsible behaviour from an early age.

Teachers in both the survey and case studies were very aware that they were not allowed to impose their religious and cultural beliefs on the learners and they were supportive of this position.

Nevertheless most of the teachers challenged the learners to be responsible and to think of the consequences of early sexual activity. They challenged perceptions such as the need for boys to get sexual experience to become men and perceptions of the harmful consequences of not having sex! Thus even if they were not driven by strong religious beliefs, teachers such as Jackie tried to communicate a moral message.

Most teachers claimed that neither religion nor culture were particularly influential in their teaching. However as indicated above, religion did influence the position a teacher took on issues like abstinence, or what topics could or could not be discussed as in Yaseen's case.

Yaseen's vignette was included because it provides an interesting example of the sort of dilemmas a very conservative and religious person may face. His conservative upbringing in which sex was never mentioned, reinforced by strong religious beliefs, shaped his thinking. As a result, he believed that showing learners any pictures of naked human beings or sexual organs was close to exposing them to pornography. Interestingly it was both his religious elders, who helped him focus on the motive for teaching human reproduction, and his learners who were deeply interested in the topic, who helped him to review his thinking on the matter and to see the value of understanding how one's body functions. However his thinking remained deeply embedded in his religious perspective, so that when learners asked him the "Why" question, he reverted to a religious response of "it is just God's way" instead of helping learners to see that structure is closely related to function (whether or not one believes this is God's way). Thobz was the most similar to Yaseen in her conservative religious upbringing but was more able to give a biological perspective in response to questions.

Cultural influences were evident in several case studies. For example, Sipho constantly referred to his Zulu culture but broke away from the restrictions of his culture in the type of discussion held in class. Cultural influences were evident in Samkele's teaching in her interpretation of learners' stories where she sometimes reinforced 'myths' and sometimes recognised their origins and refuted them; and in her strong stand on abstinence which was perhaps more driven by the beliefs of her Zulu culture and her own belief in the value of virginity testing than by her religious beliefs.

7.5 Conclusions

Both personal and professional factors affect the way in which teachers teach human reproduction, how effective they are in communicating biological concepts and appropriate attitudes and values, and the extent to which they are able to teach human reproduction in learner-centred ways, thus enabling learners to demonstrate the critical and learning outcomes specified for Grade 7s (RQ 2 & 3). Subject content knowledge contributes to confidence but can be gained through tertiary studies, extensive reading of the subject and/or teaching of the subject, as in Riana's case. Teachers' personalities may be outgoing, portraying some level of confidence, and evoking enthusiastic responses from learners, but the quiet and gentle teachers such as Rennie and Gogodi were as effective as those who were bold and outgoing. Each teacher is unique, and there are many different influences on their teaching, and as

such, it would be difficult to come up with a formula for what conditions result in an excellent outcomes-based and learner-centred teacher. However my suggestion is that a teacher well grounded in subject content knowledge, with clear boundaries in place in the classroom, and with a deep concern for their learners and a desire that they should understand how their bodies work, and who understands how to teach in learner-centred ways, will be an effective outcomes-based teacher when teaching human reproduction.

This chapter has explored what I refer to as internal factors, i.e. factors internal to the teacher (personal and professional) that affect their teaching of human reproduction in outcomes-based ways. In my next chapter I look at some of the factors that are external to the teacher that also impact on their teaching of human reproduction.

Chapter 8
External factors:
the learning environment and support structures

The environment in which learning takes place, as well as educational and community support structures, may have a significant impact on the teaching and learning of human reproduction in outcomes-based and learner-centred ways. In this chapter I explore the effect of these factors that are external to the teacher, in order to partly answer research questions 2-4. I am interested in the extent to which these factors directly influence the teaching of human reproduction (RQ 2), and whether they influence the ability of teachers to use outcomes-based and learner-centred approaches to teach human reproduction (RQ 3). In addition, I will investigate teachers' normative beliefs, i.e. their beliefs about whether other people whose opinions they value approve of their teaching of human reproduction to the Grade 7s; and their control beliefs, i.e. their beliefs about the extent to which whether there are resources and opportunities for or obstacles to the teaching of human reproduction in outcomes-based and learner-centred ways (Ajzen, 1991) and whether the learning environment and support structures influence those beliefs (RQ 4). I am therefore exploring only one part of my theoretical framework (represented in Figure 3.1 in Chapter 3), and I have elaborated on this as can be seen in Figure 8.1.

In this chapter I discuss teachers' expectations of the influence of the learning environment and support structures on their teaching of human reproduction, as recorded in the survey questionnaire by the survey teachers before teaching human reproduction, as well as the case study teachers' perceptions of how these factors influenced their teaching as recorded in their interviews after having taught human reproduction. In addition I discuss my perceptions of the influence of these factors, based on my observations recorded in my field notes and based on my interpretation of the lesson transcripts. I recognise that the picture I am presenting is an 'intersubjective reality' built on the co-construction of that reality between myself as researcher and the teachers as research participants (Cohen, et al., 2007; Hatch, 2002).

I will first look at the learning environment.

8.1 Learning environment

The environment in which learning takes place impacts on both the teachers' beliefs about what they can do and directly on teaching and learning. Schiro (2008) describes a suitable physical and intellectual environment for learner-centred approaches as one in which different resources are set up at different centres or work-stations around the classroom. Learners can pursue their interests and work at their own pace at these centres, and the classroom allows for easy movement to and from resources and people. In this section the aspects of the learning environment that I explore include the physical environment, size of the class, and resources available to the teacher and thus learners.

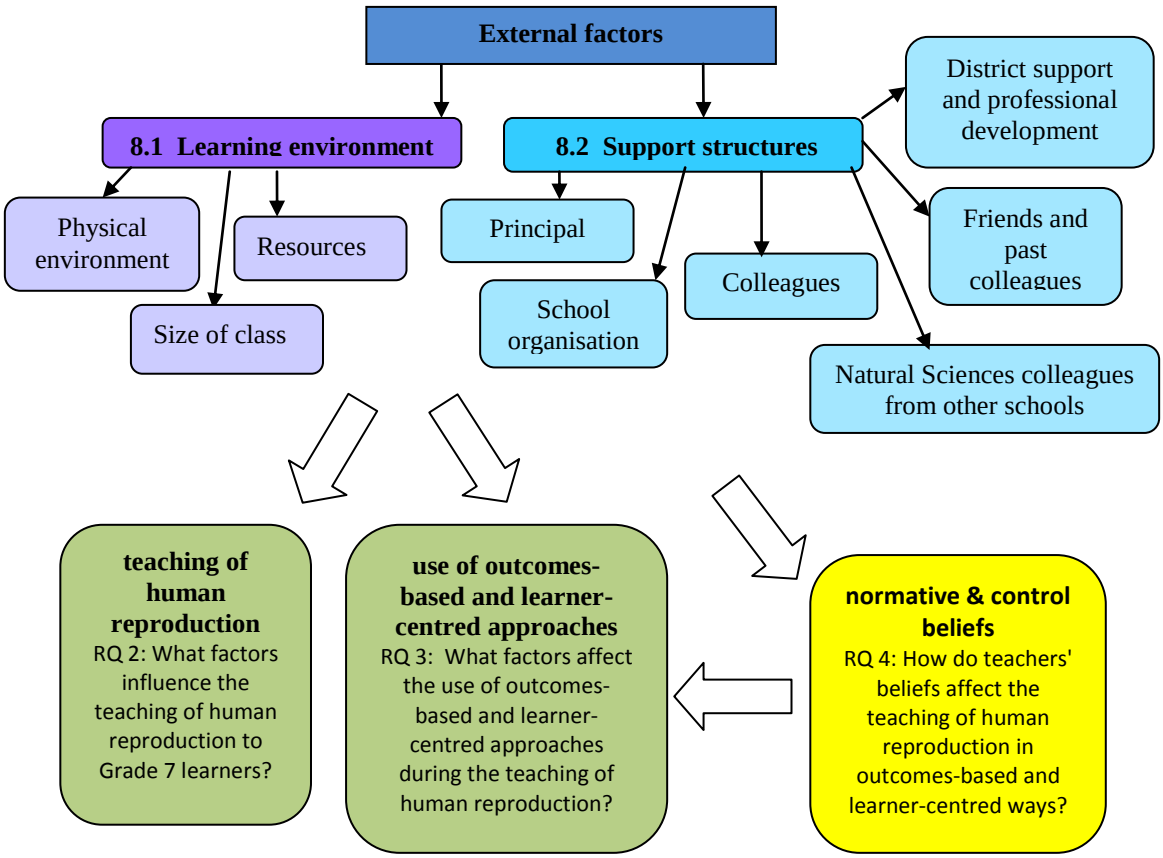


Figure 8.1: Learning Environment and Support Structures and my theoretical framework

8.1.1 Physical environment

In the survey, teachers were asked whether the physical conditions of their classrooms would help or hinder effective teaching of human reproduction. Nineteen teachers (48%) reported that the physical conditions in their classrooms were favourable for teaching (Appendix 4.2, Table 4.2.1). The conditions that teachers felt supported effective teaching all related to having sufficient space for various types of group work. Thus some of these teachers mentioned being able to use a science laboratory, or having large and spacious classrooms or simply having classrooms that were large enough for learners to sit and work in groups and to move around or 'play-act' activities.

Those who felt their physical conditions hindered their effective teaching (n=9) referred to overcrowding due to large learner numbers and thus lack of space and inability to move around. Further problems that individual teachers reported on included the lack of learners' desks in the classroom, carrying materials from class to class, and being unable to keep materials on the walls since classrooms could not be locked and thus theft took place (Appendix 4.2, Table 4.2.1). One

teacher however claimed that she could teach human reproduction under any conditions ("under the tree or wherever" T23).

The conditions reported on in the survey were evident in the case studies. The classrooms in which human reproduction was taught to Grade 7s were far less suited to learner-centred approaches in the township schools than in the city or suburban schools (See Chapter 6, Table 6.4).

Mphety and Zama were in a newly built school in one of the townships. The school had moved from dilapidated prefabricated classrooms to a new double-story brick building. The classrooms were small but similar in size to classrooms in other schools. There was a chalkboard and flip charts in the Grade 7 classrooms. The Grade 7 learners did not however have desks to work at and so learners sat on plastic chairs with their books on their laps or on other chairs. (According to the Principal, they had run out of money and would only be able to purchase desks for Grade 7s the following year when supplied with a new budget.) In the survey, Mphety wrote that she expected that the lack of desks would hinder effective teaching of human reproduction and I agree with her. The lack of desks or tables meant that even if teachers did have resources, they could not set up these resources at different work-stations around the classroom, a feature of many learner-centred classrooms. It was also a great deal more difficult for groups to work on an activity which required more than just talking to one another.



Figure 8.2: Zama's classroom



Figure 8.3: Samkele's classroom

Samkele's classroom was a medium-sized poorly lit room which was separated from another classroom by a large torn vinyl sheet which hung from the ceiling. The two classrooms could be converted into a small hall when the vinyl sheet was removed. This arrangement meant that it was easy for learners to be distracted by the learners and teacher in the adjacent classroom since there was no sound-proofing. In addition, the room was crowded and learners could not move around. Each group consisted of six to ten learners seated at desks that had been pushed together. The only other furniture in the classroom (as was

typical of most classrooms) was a teacher's desk and two cupboards. In these three teachers' classrooms, the physical conditions were not conducive to learner-centred activities, as indicated in Table 6.4 (Chapter 6, section 6.4.2).

The classrooms in which Nsuku and Thobz taught were an improvement on those of the previous three teachers. They were well lit classrooms with desks. Thobz taught in a 'container' school (containers welded together, with windows and doors, to form classrooms), while Nsuku taught in a newly-built school. The desks faced each other in three rows in Thobz's classrooms and four rows in Nsuku's classrooms, so that 40+ and 60+ learners respectively could be seated facing each other. The arrangement of desks allowed the teacher to quickly organise the learners into groups of varying size. However particularly in Nsuku's school, it was very difficult to facilitate any group work since the desks were so closely packed together that it was almost impossible to reach the learners. Thus once again, it would have been physically impossible for individual work-stations to be set up where learners could pursue their interests, and there was certainly no space for teachers and learners to move around and reach each other or to move to any resources that may have been available.



Figure 8.4: Nsuku's classroom

Sipho, Jackie and Gogodi taught in 'city' schools. They had their own classrooms and these classrooms were larger than the township schools and seated approximately 40 learners. Four to six learners were arranged around two or three desks so that learners were always seated in groups facing one another and could thus easily engage in group work. The clusters of desks were scattered around the classrooms in different arrangements and there was space for teachers to move between the desks. It might have been possible to set up work-stations with different activities at each cluster of desks but space was still far too limited for such an approach to be easily used.



Figure 8.5: Gogodi's classroom

Riana and Rennie had much smaller classes and taught in a large spacious laboratory with lab benches along the walls and so there was the potential for learners to move around and pursue their own interests. However while teaching human reproduction, both Riana and Rennie, like the other teachers, chose to seat their learners around tables in groups and the groups worked together on the

same activities in the module.



Figure 8.6: Rennie and Riana's laboratory

One of the factors that must impact on the sort of physical environment that teachers can create is the matter of who 'owns' the classroom. Samkele, Rennie, Riana, Gogodi, Jackie and Sipho were allocated their own rooms. Riana and Rennie shared the laboratory when necessary and used it while teaching this module. Rennie did however have his own classroom. When a teacher 'owned' a classroom, and learners moved from classroom to classroom for different learning areas, then the teacher had the opportunity to create their own pleasant learning environment, and, if there was space, to setup learning centres with resources in different parts of the room or even simply to have all their resources available in a cupboard in the classroom. However when classes 'owned' the classroom and teachers moved from class to class, as in Mphety, Zama, Thobz, and Nsuku's case, the teachers could not make decisions about the classroom environment for their Natural Sciences classes, and could not place resources in strategic positions. Rather, the teacher had to carry their resources from class to class. This would have been difficult i.e. carrying the resources from class to class and continually setting them up and packing them up. However this was not a significant issue in any township schools since resources were very limited. Learners helped with carrying text books, overhead projectors, and flipcharts from class to class where these were available.

I considered Mphety, Zama and Samkele's physical environments the least conducive to learner-centred approaches, whereas Nsuku's and Thobz's classrooms were viewed as slightly more conducive simply because learners could at least work at desks in a reasonably well-lit environment (Table 6.4). However their rooms were so overcrowded, especially the classrooms in which Nsuku taught, that any sort of movement around the classroom was difficult. The rooms used by the three city teachers, Gogodi, Sipho and Jackie, and the laboratory used by the two suburban teachers, Rennie and Riana, were potentially more useful due to more space for movement around the classroom. While Riana and Rennie had plenty of space to set up work-stations in the laboratory, they used the module which did not require learners to move from one set of resources to the next. Jackie's use of the computer lab provided another physical environment in which learners could access the internet and thus a variety of web-based resources. In all classes, learners worked together at the pace set by the teachers.

The very restricted space in some classrooms and the lack of large desktops on which to work had a debilitating effect on the ability of learners to move around, examine different resources, talk to one another and plan. The situation was further exacerbated by the size of some of the classes and the limited resources available.

8.1.2 Size of class (number of learners)

In the survey teachers were asked approximately how many learners they had in their Grade 7 Natural Sciences classes, and whether they thought the size of their class would affect their teaching of human reproduction. There was a wide range in number of learners in classes. Eighteen teachers came from city schools, 11 from township schools and 11 from suburban schools. The graph below shows responses from 33 of these teachers, indicating the average number of learners in their class.

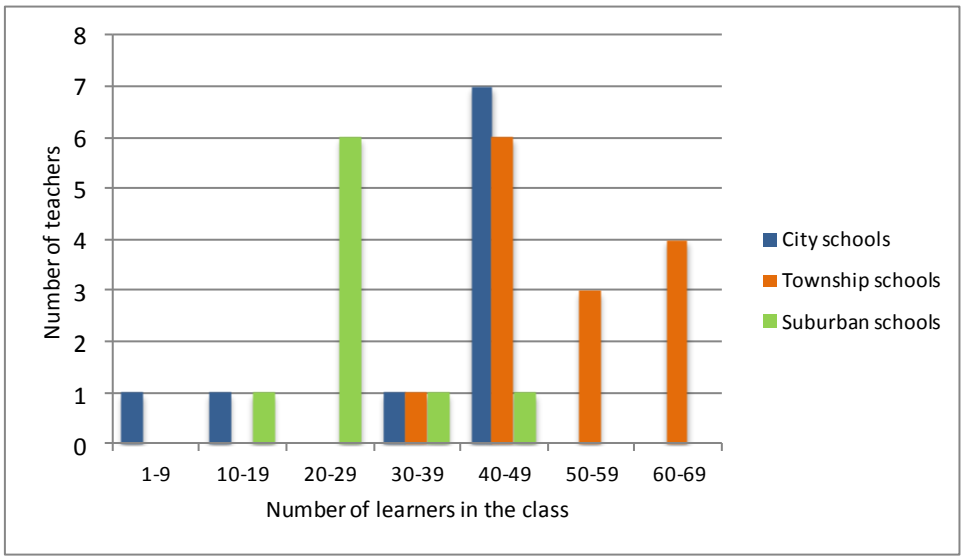


Figure 8.7: Number of teachers with Grade 7 Natural Sciences class sizes in the range indicated (n=33)

The teacher-learner ratio specified by the government at the time of my study was 1:35 learners. As can be seen from the graph, the class sizes in suburban schools were mostly below that ratio, usually due to governing body teaching posts paid for by the school; whereas the class sizes in most city and township schools was above the 1:35 ratio with the most common class size being 40-49 learners. Of the two city schools with low numbers, one was a special needs school and one a private school.

Only five teachers, four of whom had classes ranging from 55 to 69 learners, anticipated that class size would impact on their teaching (Appendix 4.2, Table 4.2.1). One of these teachers with an average class size of 64 learners had concerns about lack of space in the classroom, poor attention given to learners and learners being out of control. Another teacher felt she would not be able to give individual attention to learners. Amongst those who were not concerned about their large class sizes, one teacher with 44 learners said "We have learnt to cope with these numbers" (T26). Another teacher with classes of 60 stoically stated that she would do her best regardless of big classes.

It seems that teachers have become inured to the impact of class size or are reluctant to admit this could be a problem. Class size was very problematic in some of the schools observed in the case

studies for reasons both observed by myself and identified by teachers during the interviews. Some of these reasons include the following:

Classroom management

Mphety pointed out that classes of 40-44 are now seen as the norm but she suggests that these are in fact too many learners and they become difficult to control.

> I think the control, although you are used to it, you survive as if there is no problem. *(she laughs)* There is! (I - Mphety)

Rennie, who had only 23 learners in his class, felt that he had control, said that the group discussions did not get too noisy, and the children could focus on the lesson.

Samkele however was very aware of the noise level of her 40-60 learners.

> The physical environment, yes, it is the class (room), it is too small. Because sometimes ... you wanted to divide into groups ... to say brainstorm this. When they were brainstorming, ... in that little class [room], it is so noisy. And it irritates to be honest. You feel like saying, stop it, it is so noisy. … They need to talk, but there are too many. And it ends up being noise instead of working. That is the hindrance. (I - Samkele)

Samkele knew that outcomes-based education encouraged interactions during group work but she seemed restrained by both the presence of another teacher on the other side of the vinyl sheet who might find it difficult to continue to teach her class with the increasing noise levels, but also possibly by her more traditional upbringing where children are silent. As a result she tended to focus on discipline instead of encouraging group interactions:

> I've tried that before but it becomes very noisy. And it goes to when you no longer enjoy it and you have to discipline, and instead of encouraging going around in groups, you end up going to groups and disciplining them. Instead of saying, what have you done, how far have you gone? But now you come to say, hey, what are you still doing? (I - Samkele)

Tracking individual learners' progress

For Zama, Thobz and Nsuku, classes of over 40 prevented them from really being aware of an individual's understanding and progress. Zama maintains that he would have picked up problems before tests if the numbers were smaller.

> It is a problem, because you may not know each and every learner's problem. Up until you give them something to do and then it is only then that you see that this one is having a problem. Like now I was saying with the class work and homework, group work, they were doing very good. But now as I was marking their question papers, I could see that they can not cope reading the questions and writing the answers. (I - Zama)

Nsuku found it difficult to even reach learners, and so she could not check on what they are doing.

> Learners are around 60-65 in each classroom, the grade 7s. ... they're sitting in four rows, in groups ... Just to check, to move around ... you need them to shift which takes a lot of time. Then it is not easy to move. ... when you have given them something to discuss, because it is restricting you to reach there, you're not sure what they're talking about. And you have to listen, make sure that

they're doing what you've told them to do.

Yes, you can't reach all learners. You'll be shouting in the front. But for you to reach there, it is going to take a lot of time … the 1st row, the 2nd row, the 3rd you are tired.

Yes, even to mark their work is not easy, because it is almost four classes in one. But we do in terms of marking their … if I see that I cannot mark them I just say, ok, can you swop your books for marking for yourself. Then they do and do the remedial work. (I - Nsuku)

Gogodi had a very pleasant classroom, airy and light and, in my opinion, quite a big classroom compared to other schools. However she felt that with 43 children, it was very small. She had seven tables for six children each so one child always had to circulate and find a space. When the children pushed their chairs backwards to sit comfortably, she could not move easily amongst them to get to the groups.

Riana had a large laboratory and small class but believes class size is not important.

Because it is not the class size that counts. It is what you're teaching that counts and how you teach it. That's the most important. The kids do not even realise at the end of the day, if they listen to you and it is interesting information, they can learn something where they are. (I - Riana)

Riana is of course correct. A very good teacher would probably achieve more with a large class than a poor teacher with a small class. Many factors play a role in how a teacher manages to introduce new content and approaches. Nevertheless large classes clearly have an impact on teacher-learner interactions. As Riana concedes, with large classes "There's no ways you can get to every child every day. It is not possible. But, you've got to try. That's the challenge!" (I).

Several researchers have pointed out that large class sizes are counterproductive if one is attempting to use learner-centred and activity-based approaches (Clark & Linder, 2006; Onwu & Stoffels, 2005). As these authors point out, there is a disjuncture here between curriculum policy and practice if teachers are expected to be responsive to the needs and interests of more than 30 learners. Most of these teachers only teach Natural Sciences, and so it may be difficult enough to get to know the names of learners in each class let alone their needs and interests, a point also made by Clark and Linder. To scaffold learning for individual learners in an attempt to help them move through their unique ZPD seems an impossible demand. To have sufficient resources for so many learners, and to have sufficient room for learners to move around to work with these resources, seems like another unrealistic expectation, as is the expectation that the teacher will even be aware of the personal differences of individual learners, let alone accommodate these differences during teaching and learning. Some researchers (Hattingh, 2008; Rogan, 2004) have suggested that the traditional African oral style of teaching in which rhetoric is highly valued may be a more appropriate way of teaching large classes. I agree that there is a place for such an approach but I would also like to suggest that encouraging learners to work in groups, a style decried by so many researchers, has actually helped to address the problem of large numbers. However learners engaged in group work need to be working towards achieving the outcomes of critical and creative problem-solving and construction of new knowledge.

8.1.3 Resources

In the survey teachers were asked what resources they had, and whether resources or lack of resources would affect their ability to teach human reproduction effectively. The resources that 38 of the 40 teachers indicated were available for their use (Appendix 4.2, Table 4.2.1), are illustrated in Figure 8.8 below.

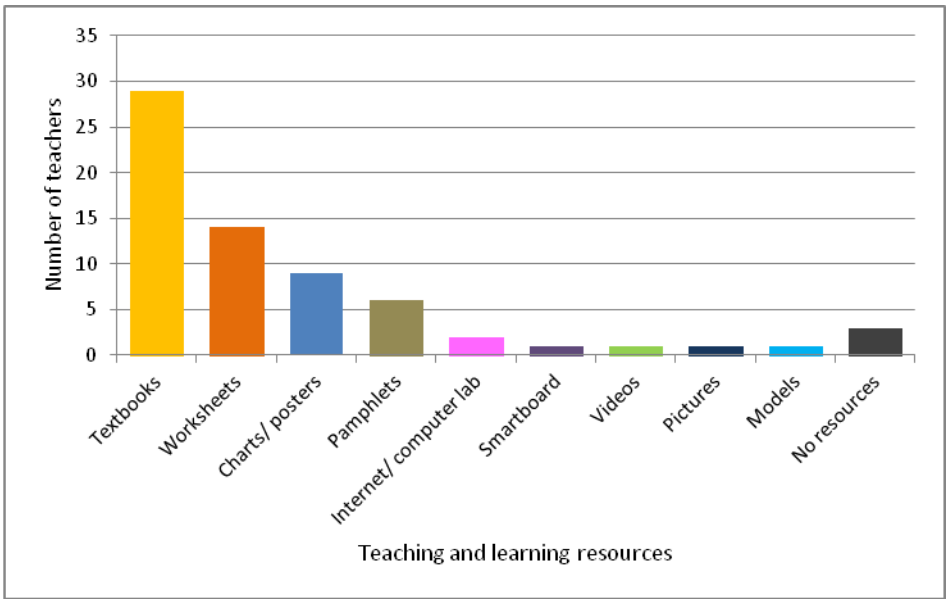


Figure 8.8: Teaching and learning resources available to Grade 7 Natural Sciences teachers (n=38)

Textbooks

The most common resource available to the survey teachers was school textbooks. However these textbooks were probably only available as classroom sets for use during class. None of the schools in which the case studies took place provided learners with their own textbooks. Samkele kept a set of textbooks in her classroom cupboard for use during her lessons and she occasionally lent these to learners. Mphety and Zama shared 25 textbooks (*Science Today*) amongst three classes, and Gogodi had one set of the *'Science Today'* textbooks in her classroom. Nsuku reported that in her school, each teacher was supplied with one textbook and one teacher's guide. Learners did not have textbooks.

There was still the notion, carried over from Curriculum 2005, that teachers and learners should not be tied down to one textbook. The Department of Education portrayed the 'textbook method', i.e. teaching directly from one textbook, as 'bad' and this view was strongly held by the Natural Sciences subject advisor for the district in which my research took place. Teachers were expected to rather draw from a number of sources to provide suitably contextualised teaching and learning materials and in a learner-centred classroom, learners should construct their own knowledge using a variety of resources. This was an admirable notion, an ideal situation, and suited to resource-rich schools. The problem of course was that in resource-poor schools, a variety of resources were not available. Nevertheless teachers had bought into the concept that they should not be textbook-bound.

> Sometimes you do not follow the textbook, you use what you have in the work schedule. For homework purposes, textbooks help, will guide you. But not to say you are going to use a textbook

> in everything. A policy document has the content/core knowledge. One textbook doesn't contain all the content so many textbooks have to be used. ... We do not use a textbook anymore, the textbook method. You're following the work schedule, then if your work schedule directs you to get something from the textbook, then you go and look for that. Because they said we can use different resources, not only a textbook. (I - Mphety)

The very worrying result of this way of thinking in resource-poor schools was that, as in Mphety's school, there were simply no resources available to learners besides the notes they wrote down from the chalkboard or from Mphety's flip-chart, or from the occasional worksheet that they could afford to photostat. While textbooks may be far from perfect, at least they are a resource that children could take home and use to complete activities and learn from.

When the survey teachers were asked about what effect the presence or absence of resources might have on their teaching of human reproduction, they gave a variety of answers (Appendix 4.2, Table 4.2.1). Without resources such as textbooks, individual teachers said that learners might not know what was going on, teaching would be difficult and lessons would be less effective. However textbooks were of limited value according to two teachers, one of whom claimed that the information in the textbook needed to be supplemented, whilst another pointed out that textbooks did not provide for all learning styles, only for the linguistic and visual learner. It seems therefore that for some teachers in both resource-poor and resource-rich schools, textbooks were no longer a valued resource. Teachers instead often turned to worksheets as an alternative learning support material. In my case studies for example, two of the resource-rich schools chose not to supply Natural Sciences textbooks to each learner. Rennie explained that normally each NS teacher in a particular grade prepared a different section of the curriculum and developed worksheets for that section. Then all the NS teachers in that grade would teach that section using the prepared worksheets. However for this topic they decided to rather use the module because, according to Riana, it was well designed, with good information and activities that were 'well thought through', and she felt that the teacher's guide provided excellent guidelines. All learners in Rennie and Riana's school were supplied with the complete module. In addition, they had access to, and were encouraged to use reference books in the laboratory and in the school library. Both Sipho and Jackie encouraged their learners to bring books and encyclopaedias from home, and Jackie made use of the computer lab. Jackie felt that these resources were more useful and could be updated.

> No. We don't have textbooks. …with the internet and with the resources available and information becomes obsolete or you need to get a new text book. (I - Jackie)

Worksheets developed by the Head of Department became the main source of information for the learners in Sipho and Jackie's classrooms.

Worksheets

Fourteen of the survey teachers (35%) claimed that they used worksheets during their teaching (Appendix 4.2, Table 4.2.1). All the teachers at the workshop requested copies of the module from which workshop activities had been drawn. After the workshop (as mentioned in Chapter 4, Section 4.5.4), when corrections and additions had been made, a single copy of the module on human reproduction, containing information and activities as well as the teacher's guide (Appendix 8.1-8.3)

was supplied to these teachers. Eight of the case study teachers used these worksheets all or some of the time. The other two teachers (Sipho and Jackie) used worksheets supplied by their Head of Department.

In schools that could afford to do so, all learners were supplied with a copy of the worksheets and these were cut and pasted into their notebooks where learners could then add their answers to questions in the activities, complete tasks and write up research projects. Thus in the city and suburban schools, all the worksheets were copied for learners so that they had a full record of the work stuck in their notebooks. The township schools (Samkele, Thobz, Mphety and Zama) allowed the printing of some worksheets for each learner as well as some textbook pages containing diagrams (Samkele's school). Alternatively the modules, like the textbooks, were considered as classroom resources and only ten copies of the full module were available in Mphety's and Zama's classes, to be shared amongst groups, and thirty copies in Nsuku's school to be shared amongst five classes taught by three different teachers. In Nsuku's school, the process of trying to get photocopies of worksheets was a long and tedious bureaucratic process with approval needed from first the HOD, then the Vice-Principal and then the Principal according to Nsuku. She said that as a result, teachers usually did not bother to try to get worksheets printed.

Worksheets, if used, need to be available for each learner if they are to take the place of textbooks or of notes copied from the chalkboard or overhead transparency, a time-consuming process. There were several problems associated with the supply of worksheets. Firstly it is an expensive process. Thus at schools with limited resources, such as Nsuku, Mphety and Zama's schools, a classroom pack of worksheets were run off and shared between classes. If classes ran in parallel, there might only be one worksheet per group, sometimes with pages missing. Thus when learners attempted to complete an activity at home or study for a test or exam, they only had the answers to their questions in their notebooks to study from and some notes from a flip-chart or overhead transparency. They never learnt how to read and work with text or to study from it. In addition, photostatting machines were overused and frequently broke down so worksheets were not always available when needed. In an educational system that aimed to promote equity, there was no evidence of equity in the supply of teaching and learning materials. Children in the township schools remained at a distinct disadvantage.

Both textbooks and worksheets, if well designed, can promote outcomes-based and learner-centred approaches. They can both provide essential content and instructions for activities in which learners can work together or alone to construct new knowledge, and develop skills, values and attitudes. For some teachers and schools, worksheets represent what they feel is important, and do allow teachers to put their own personal stamp on the materials and incorporate activities which use the range of resources in their schools. If the worksheets are well designed, learners do find them easier to work with. They can underline, colour in, add notes etc. The worksheets become their own material. However if worksheets are poorly designed, these benefits are limited. I found, for example, the worksheets developed by the HOD in Sipho and Jackie's school very dense, with language and content far beyond that needed by Grade 7s. Sipho agreed with this point but Jackie did not. Mphety likewise found the language level of the module I developed 'too high' whilst other teachers felt it was

'just right'. The language in the answers provided in the card game did use very formal language that learners found difficult to follow (Appendix 3.3).

One of the reasons teachers abandoned textbooks was that they said learners could not read them (Vinjevold, 1999b). However if textbooks are simply replaced with worksheets which are equally difficult, then the language issue is unresolved. There is a need to provide teaching and learning materials that are at a language level appropriate to the learners in a school, so that the language used does not hinder the development of concepts. The danger however is that teachers may develop materials with such limited use of English that learners do not develop their ability to read and engage with text. As far as Jackie was concerned, it was important that learners engaged with the level of language used in her worksheets, and that while the language level may have been challenging for some of her learners, the majority of her learners were able to understand and work with the text. Research has shown that suitable learning materials such as textbooks and worksheets that are a source of science knowledge, teaching ideas and challenging activities, are essential for improving the quality of science learning (Malcolm & Alant, 2007; Vinjevold, 1999b) but teachers need to be shown how to use these resources effectively.

Other visual aids

Amongst the survey teachers, nine teachers said that they had charts or posters that they could use as a visual aid, and six had pamphlets as a resource. Beyond that, there was no reporting of any other resources except in single cases in a school e.g. a video, a model, a smart-board, and the internet. One teacher thoughtfully added that both she and the children were resources.

All classrooms that I visited had a chalkboard and teachers used their boards for illustrating structures and processes. Gogodi, Riana and Rennie used large colourful charts on human reproduction produced by Gauteng's Department of Health and Education. These excellent charts, which covered all aspects of human reproduction taught to Grade 7s and were kept in a folder that could be carried from classroom to classroom and used in flip-chart fashion, were however found only in the city and suburban school of these three teachers. Where they were needed most, in the township schools which were devoid of other visual aids, there was no sign of them. They had, according to the Department of Health and Education, been supplied to schools about five years previously but were no longer in print. Overhead transparencies were used in only two schools, Gogodi's and Thobz's schools. Gogodi had an overhead projector permanently in her room whereas Thobz had to take an overhead projector from a storeroom and run an extension cord from the offices which had electricity to her classroom. According to Nsuku, there were two to three overhead projectors in her school, but only certain senior staff were allowed to use them. Flip-charts were used by Mphety and taken from class to class to save time. Zama did not have any teaching aids other than the chalkboard and shared textbooks and worksheets for illustrating visual images to learners. Once again, the township schools had the least resources, and in Nsuku's school, some of these resources were only available to certain members of staff.

When the survey teachers were asked about the impact of resources or lack of resources on their

teaching of human reproduction, a number of them responded. Eight teachers who claimed not to have any charts or posters, pointed out that these resources were important in helping learners to visualise structures. According to these teachers, these visual representations contributed to learners' insight and understanding (learners would "see what I'm talking about"), thus making the teaching of human reproduction more effective (Appendix 4.2, Table 4.2.1). One teacher added that colourful pictures would attract learners and they would pay more attention thus promoting learning. In Chapter 3, I discussed briefly the theories around learning styles and multiple intelligences. According to Gardner (1983), many learners have visual-spatial intelligence, i.e. they learn best by 'seeing' - working with pictures and colours. Natural Sciences teachers are (or should be!) very aware of the value of visual material such as large colourful charts that everyone can see, colour diagrams or photographs of biological structures, You-tube videos, models, etc, all portraying structures and processes in ways that capture the attention of the learners and help them to make sense of biological concepts. A learner-centred Natural Sciences teacher would therefore use visual material extensively. In my analysis of the case study teachers, I observed that most teachers (except Samkele and Zama) used visual materials often. However the quality of these materials and thus their usefulness varied greatly from diagrams on worksheets, to drawings on the chalkboard or on flipcharts, black and white or colour charts, overhead transparencies and internet images.

Sometimes Natural Sciences teachers were provided with inappropriate advice (from a biological, if not cultural) point of view. For example, Mphety asked fellow staff members if any of them had colour charts of human reproductive structures or knew where these were kept in the school. She explained to them that if the chart was in colour, it was 'real' for learners. However they responded that colour pictures of reproductive structures would be 'too real' and that parents wouldn't like them. So unfortunately she took their advice and showed her learners pictures with black outlines of reproductive structures which her colleagues felt would not 'scare anyone' but were also dull and too small to be useful!

Gogodi was very aware of the value of having one easily visible image that all learners focussed on and which she could use for explanations, thus scaffolding the interpretation of diagrams and the learning of more difficult new concepts such as female internal organs.

> The overhead projector, I used it when I was introducing a female sex organ, for them to see because the sex organs are inside the body, then they must have a picture of how do female sex organs look like. So that when we go on with our work it should not be difficult for them to imagine what I said. If I say the ovaries, the Fallopian tube, then if they do not know, they really do not have an idea of what a Fallopian tube is, so I just felt that overhead transparencies will be much better than having to draw the illustrations straight on the board. I just find it that they will also remember because the overhead transparency is right there in front, and I am explaining, so when they have the worksheets then they are able to remember what I've taught them. So it becomes easier for them, they do not forget. (I - Gogodi)

Internet access

Jackie was the only case study teacher who used the computer lab in her school during her teaching of human reproduction. She found one of the programmes particularly useful.

> There's a wonderful website called Webquest – the human machine. And in there you've got tasks and stuff that they can do based on any number of topics ... like the human reproductive system. So we went in there and we started saying, do you understand that a girl is not a boy, who's using the urethra for ejaculation and urination, but a girl isn't. And even up till the very last rounding off when we're doing the STDs, a couple of kids still did not get that, still did not see that there's no contact in terms of the uterus and urination. So for once and for all, things like that got clarified. And that's what we used the last two weeks of, to just clarify things. (I - Jackie)

The availability of resources in schools clearly varied widely, some schools being well resourced, thus contributing to the sort of intellectual environment that is needed for learner-centred practices. In these schools, teachers could send their learners to the library (as Riana did) or the computer lab (as Jackie did) to collect data during an investigation, thus providing opportunities for learners to achieve outcomes associated with scientific investigations (LO 1) and the collection and processing of information (CO 4). However as Adler, Reed, Lelliott and Setati point out, more resources do not necessarily lead to better practice (Adler, et al., 2002). Thus for example, during the observation period Rennie did not mention using the library in his school and while Mphety said her school had a good library, neither she nor Zama seemed to use it. Sipho did not report using the computer centre that was available in his school. This is not to say that these teachers did not use these resources at other times. Sometimes teachers in poorly resourced schools found ways to address resource problems using outside resources. Teachers made use of books from home (Zama), pamphlets from clinics (Mphety and Samkele), nursing staff in clinics (Thobz) and supermarkets (Thobz) as sources of information for investigations. So teachers do differ in the way they choose to acquire and use resources. As Adler and colleagues suggest when new practices are adopted, "teachers' changing resourcefulness is partial and uneven" (p. 58). Nevertheless, it was evident in my case studies that the lack of adequate resources created a poor intellectual environment in most of the schools, where learners did not have easy access to information they were seeking during lessons, and this limited their ability to construct new knowledge (LO 2) on the topic human reproduction.

8.2 Educational support structures

I was interested in finding out what support structures in terms of human personnel were available to teachers. I therefore looked at the type and level of support provided in the school by the principal of the school, the Natural Sciences HOD, colleagues who were also Natural Sciences teachers, Life Orientation teachers and others, as well as the administrative staff. Rogan and Aldous considered that school ethos and management as well as the support provided by the school for curriculum change to be the most significant factor affecting a teacher's uptake of outcomes-based approaches in Mpumalanga schools (Rogan & Aldous, 2005). I therefore examined the way in which the school was organised and managed. I was also interested in whether teachers were supported by their district, by teachers at other schools or by any other groups. Then I looked at possible support structures outside of education such as parents or religious leaders. My findings would help me to conclude on whether, like Rogan and Aldous' schools, school management and support of the teachers by various role-players would affect the teaching of human reproduction (RQ 2) in outcomes-based ways using

learner-centred approaches (RQ 3) and if normative and control beliefs played any role here (RQ 4). This section reports back on the findings from both the survey and case studies on each of the above. The details of the survey data can be found in Appendix 10.2, Table 4.2.2.

8.2.1 School Principal

In the survey, teachers (N=40) were asked whether or not their school principal supported new teaching and learning activities. They were asked in what way he/she supported them and whether this support made a difference to their learning. The majority of teachers (87.5%) found their principals supportive of new teaching and learning activities. Their school principals' support took different forms, as indicated in Figure 8.9 below.

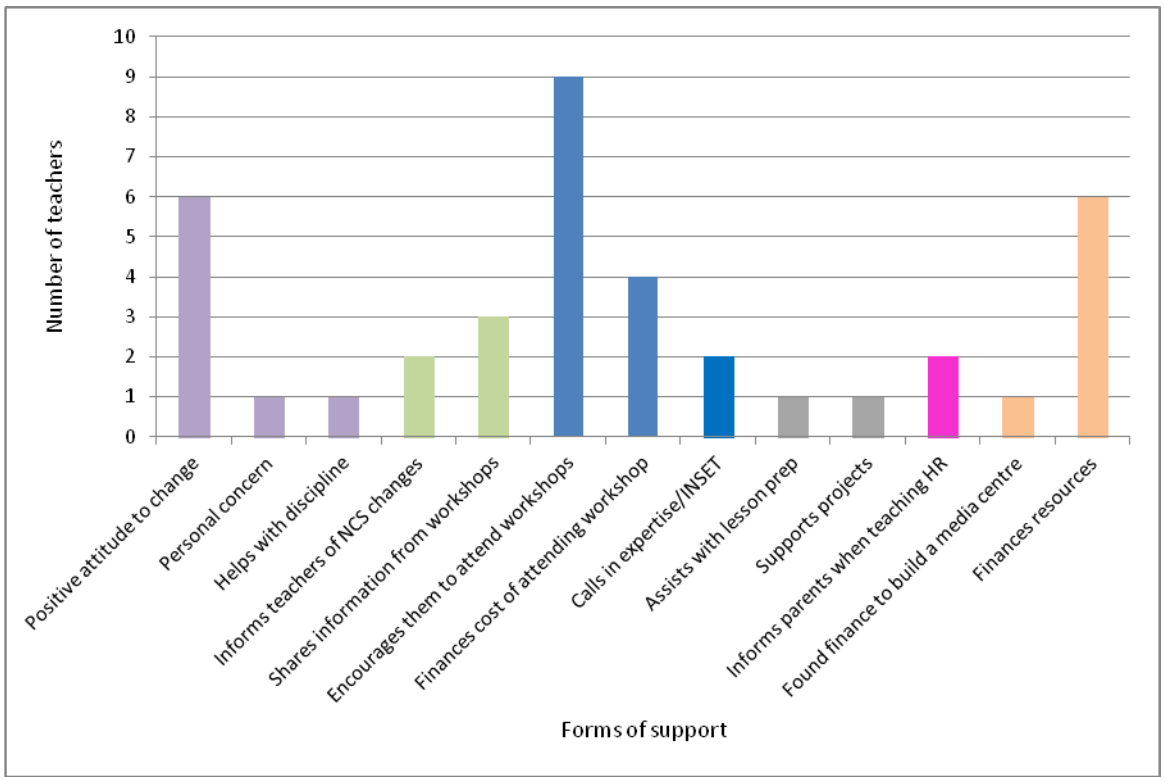


Figure 8.9: Forms of support provided by Principals; as reported by survey teachers (N=40) (HR – Human Reproduction)

Attitude to change

Some principals' positive attitude to change was encouraging for six teachers. Their principals at city, township and suburban schools were described by teachers as innovative and progressive, not resistant to change but open to new ideas and concepts, giving teachers the freedom to, and encouraging them to, implement new ideas and to proceed with "anything that benefits learners" (S – T28). One teacher said his principal was very knowledgeable and led by example. He described this city principal as "a light and leader of the school" (S – T50). This principal participated in the workshop because he wanted to know about new developments in his district, to see how useful they would be for his school.

Personal support

The principal's interest in and personal support of individual teachers was also valued. One first year teacher (Zama) said this gave her/him confidence as a teacher.

> Yes. Every time she (principal) keeps on asking me, are you coping? What is the problem? If you have a problem, feel free to come to my office and ask for help or ask someone else. She is very supportive. (I - Zama)

A survey teacher found her principal showing concern with how she coped with her learners "everyday" (S – T11).

In the interviews, four of the case study teachers (Samkele, Jackie, Thobz, and Riana) valued the interest displayed by their principal and HOD in their teaching of human reproduction. In addition, several teachers felt support simply because their principal trusted them with this very sensitive subject and did not continually check up on them. Gogodi, for example, said that her principal did not worry about what she was teaching in class and she concluded:

> Really, truly speaking, I do not want to tell lies, I had a nice principal. (I - Gogodi)

Gogodi's principal was frequently seen walking around the school, checking that children were in class and that all was in order. He appeared pleasant, organised and supportive of both his staff and learners. Gogodi was an experienced teacher having taught for 30 years and having taught Natural Sciences for 10 years. The trust may have been due to her gentle nature, conservative manner and the fact that she was an older woman and experienced teacher. The same level of trust seemed to occur between Samkele, Rennie, Riana and Jackie and their principals. Some principals were however nervous of their teachers teaching human reproduction. Thobz's Principal checked up on what was being discussed in class particularly after graffiti appeared in the boys' toilets portraying members of staff involved in sexual acts. As mentioned earlier, one male teacher who agreed to be involved in the case studies was not allowed to teach this topic, and the Principal chose to teach it. So, trust between the Principal and the Natural Sciences teacher was an important issue in some schools. It is in fact a critical issue, since inappropriate behaviour from teachers could have a damaging effect on learners. The Principal needs to be able to trust their Natural Sciences teachers to handle the teaching and learning of human reproduction with great sensitivity and respect for their learners.

Principals demonstrated their support in other ways. Thobz for example said, in her interview, that her principal and deputy were "really supportive", making a real effort to help. Sometimes they went out of their way to help, for example when she needed overhead transparencies, her deputy principal rushed to the neighbouring school to make them since their machine was not working. It is not clear whether this extra effort was made because I was coming to observe the lesson or whether he would take this action for all teachers under normal circumstances. However Thobz was encouraged by this level of support.

Professional support

Professional support was provided by principals in several ways as indicated in Figure 8.9. The most frequently mentioned forms of professional support provided related to their being encouraged to attend workshops, as well as the principal providing financial support for workshops and resources. These teachers were thus supported in their own professional development, at the school's cost, and were provided with the resources to teach more effectively. Samkele pointed out, in her interview, that her principal sent her, the HOD and the Grade 6 Natural Sciences teacher to the workshop, and added that her principal likes to accommodate all educators in case they can "grab some information that can help them". In addition, two of the survey teachers reported that professional development of teachers was promoted in their city schools through calling in expertise and arranged for in-service training in the school to assist the teachers with implementing the RNCS. Only one teacher mentioned help specifically with discipline.

The school's financing of the printing of worksheets was valued even if the school could only afford to print one set of worksheets, as in Mphety's school. The refusal to allow the printing of adequate worksheets was the cause of some dissatisfaction in Nsuku's school, particularly when those in charge could afford other printing as seemed to be the case in this school. Thus teachers understood the financial constraints on their school, and were prepared to consider this, but when they felt that resources that were available were withheld, this resulted in discontent. With regard to the provision of worksheets, support was seen as being allowed to make copies of worksheets, sometimes one per child, and at other times one per group. Nsuku felt the lack of sufficient worksheets was the one area in which she did not feel supported by her principal.

Support of teachers' programmes by the principal before parents and learners was also valued. Nsuku and Samkele for example indicated in the survey that they felt supported when their principals informed parents that they were teaching human reproduction and invited them to a parents' meeting, and another teacher valued support for long term projects like the sugar baby project. This teacher said "It makes the difference because I know I am not alone" (S – T17).

In the survey, only three teachers felt they were not supported by their principals. Another teacher was unsure and one did not respond to the question. Thus most principals, according to the survey teachers, provided some form of support with regard to new teaching and learning activities and this was clearly valued by the teachers.

Sipho was the one teacher who felt he was not supported by the Principal or HOD. In the survey and interview as well as during discussions, he explained that he was an EMS specialist, currently finishing his Masters degree in this field and had applied for and had been appointed to an EMS post. On his arrival he found himself teaching Science and Maths which was not his area of expertise. In fact he felt he knew nothing about these learning areas. He expressed some anger at not being allowed to teach the area that he was qualified in and knowledgeable about. He had moved to this school at the beginning of the year after teaching for eight years at other schools. For Sipho, support would have

been evident in being allocated to subjects in which he was highly qualified so that he could draw on his expertise in these areas. This did not happen.

> I do not have support at all, because number one, I would say … I would always say, I've been thrown in the deep end by false promises, having the post advertised for EMS and then at the end of the day I'm teaching things that I do not know at all … (I - Sipho)

Leadership and support by the Principal for any innovation was considered by Fullan (2001) and Rogan and Grayson (2003) as crucial to any innovation. Leadership was evident when principals embraced change themselves and encouraged teachers to try out new ideas. The principals of six of the case study schools supported the teaching of human reproduction to their learners. The only exception was Thobz's principal who was more tentative about whether the topic should be taught to Grade 7s, especially after the unpleasant incident mentioned above where sexually explicit graffiti had been displayed in the boys' toilets. This had never occurred before. She was very concerned about the possible negative impact of teaching this topic on her learners.

As can be seen from the above discussion, teachers valued different forms of support, whether it was some form of personal support or professional support in the form of resources, workshops and in interactions with parents. By providing suitable personal and professional support for teachers, and a well managed teaching and learning environment, the principal can and some do make a significant difference to the quality of teaching and learning that takes place in their schools. Their personal and professional support for teachers during the teaching of human reproduction did seem, for the case study teachers, to make a positive difference to their teaching of human reproduction (RQ 2) in outcomes-based ways (RQ 3).

8.2.2 School organisation

In the survey, only approximately half the teachers responded to my question on school management and organisation in meaningful ways, probably due to the complex wording of my question (see Chapter 5, section 5.2.1 for a discussion of this problem). Twenty-one teachers responded and almost all of these teachers (n=18) claimed that organisation within their school would not in any way hinder but rather be supportive of new teaching and learning activities. Three teachers however felt that certain aspects of school organisation hindered implementation. The survey and case study teachers' views on the impact of school organisation on their teaching can be placed in three categories, i.e. administrative demands, teaching allocations, and discipline and classroom management.

Administrative demands

One of the biggest hindrances to implementing new activities, according to one of the survey teachers (T5), was the excessive administration which resulted in less time for teaching. She referred to both departmental (Gauteng Department of Education) and school pressures, with teachers being "snowed under with admin" due to the constantly changing demands from the Department, extra-mural activities, fund-raising, marking, assessment, reports etc. This may have been particularly difficult for her in her position as a Grade 7 Natural Sciences teacher and deputy principal in Rennie and Riana's extremely well-run suburban school. Rennie and Riana did not express the same concerns. Gogodi

also reported, in her interview, that as grade head she had to spend time compiling information for the principal in order to complete departmental paper work. She found that it disturbed her teaching "a lot". Thus two teachers in senior positions in their school found that the administrative demands on their time impacted negatively on their teaching of human reproduction to their Grade 7 classes.

Teaching did not seem to have been interrupted in any significant way by departmental demands for nine of the case study teachers (excluding Gogodi). Rennie remembered only once completing a pupil survey for the Gauteng Department of Education (GDE) during teaching time and Riana stated that GDE forms were always filled in after school and this was part of her job. Likewise the other case study teachers indicated that classes were not disrupted by workshops since these were held in the afternoon (although Zama would leave the school at 1.00 to get to workshops by 2.00), or only once or twice during the year by urgent requests for information by the GDE. This is in contrast to the complaints by teachers to the RNCS task team about the onerous administrative demands from the Department of Education which left them with less time to teach (Dada, et al., 2009)

Teaching allocations

Allocation of teaching (and thus preparation time) also seemed to be a problem for two teachers who completed the survey, both from the same school. One was teaching four learning areas, and another claimed that she was constantly being moved from one grade to another. Sipho, in both the survey and his interview, expressed his great dissatisfaction in being required to teach a learning area that he was not qualified for and was not the post to which he was appointed.

Classroom management

Classroom management is an ongoing problem in many South African schools. Clark and Linder, referring to a teacher's comments during their study in the Western Cape, suggest that with the abolition of corporal punishment in schools and students' assertion of their rights, there has been a realignment in student-teacher relationships (Clark & Linder, 2006, p. 25). Several students that they interviewed described their classroom situation now as "a free world". The attitude of "it's a free world" (p. 26) seemed to be held by many of the learners in Mphety and Zama's school. Mphety at one stage had to call in her HOD and refused to continue teaching. Zama, a new teacher, found the lack of discipline at times discouraging:

> Sometimes I feel it is good to teach the subject, sometimes you feel that you can't do it anymore, because after disturbances sometimes from the kids, ... sometimes when you talk, one of the boys will make something that will make you think otherwise.
>
> Sometimes because we're not using corporal punishment anymore so it is difficult sometimes to punish these kids because if you chase them away from the class and then it is against the law, and the government. Like one day I asked these 2 other boys, when I came to class they were not there, they were sitting in a dustbin outside. So I asked them to stay outside of my class. So my HOD came and said, it is against the law because they are supposed to be in class so you have to take them back.
>
> Discipline is a problem here. This is a new school but it is already the windows are broken, the doors are broken. It is a problem. (I - Zama)

In conclusion, most teachers did not feel their teaching was affected in any significant way by administrative demands from their Principal or from the Gauteng Department of Education, nor did they indicate that they had frequent interruptions due to sporting events (complaints in the past). Teaching allocations were indicated as a problem for only two teachers, one because she was constantly moved from grade to grade, and another because he was not teaching the learning areas he was appointed for and qualified in. The only real concern expressed by two teachers concerning school organisation and management was the lack of discipline amongst learners in the school. This contributed to a poor social and emotional learning environment that had a significant impact on the effectiveness of learning in that school, and thus on the achievement of most critical and learning outcomes. In Mphety's case, disruptive learners simply brought learning to a halt for a short period; while Zama felt hamstrung by "The Law"! The rights of the disruptive learners took precedence over the rights of those who wished to engage in learning. Thus appropriate management and organisation of the school is vital, and the Principal plays a key role in this, but there are many contextual factors that affect management and organisation of a school.

8.2.3 Colleagues – other teachers

I was interested in the extent to which teachers received support from their colleagues in a functioning 'community of practice' and whether they believed this made a difference to their teaching of human reproduction. I explored these support structures in general terms in the survey before the teachers taught this topic, and then interviewed the case study teachers for their perceptions of support from colleagues in relation to human reproduction after they had taught.

According to McLaughlin (1998) and Hargreaves (2002), the most significant communities of practice are the teachers' school or department within the school. If this community is weak, McLaughlin and Hargreaves suggest that teachers will not have that shared sense of practice and will become professionally isolated. I was therefore interested in the amount of support and interaction that these Natural Sciences teachers received within their school community and in particular from their Natural Sciences colleagues.

8.2.3.1 Natural Sciences colleagues

In the survey before teaching human reproduction, most teachers (70%; n=28) felt that their Natural Sciences colleagues acted as a supportive community of practice (Appendix 4.2, Table 4.2.2). Various forms of support from their colleagues were clearly valued by the survey teachers. The number of teachers reporting on each form of support is indicated in the graph below (Figure 8.10).

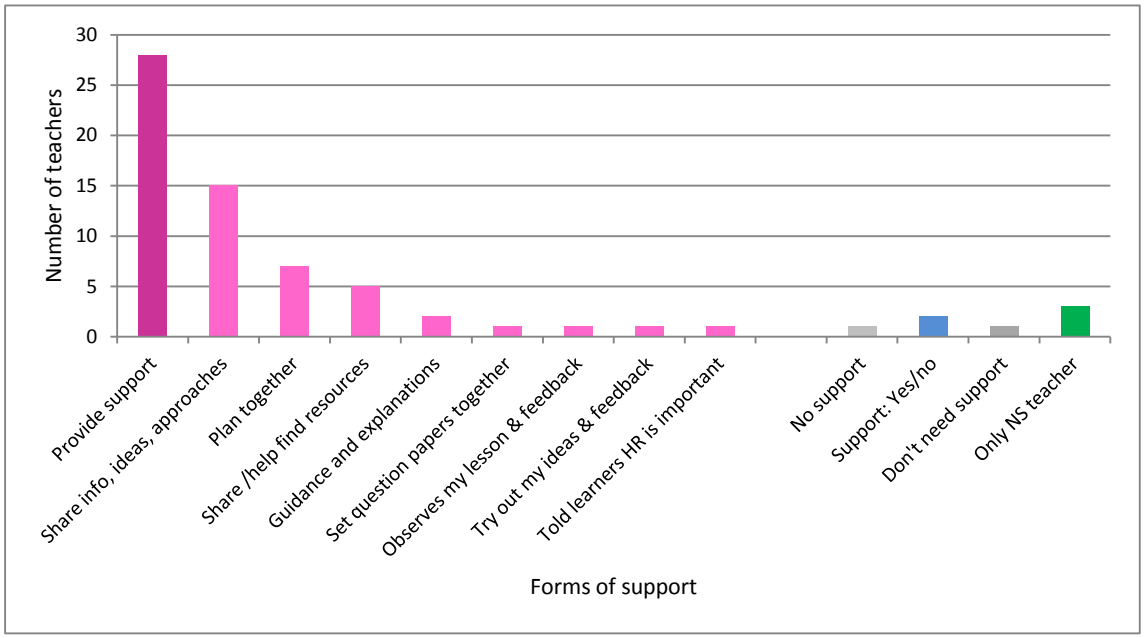


Figure 8.10: Forms of support provided by Natural Sciences colleagues of survey teachers (n=35)

The most commonly valued form of support amongst the survey teachers was sharing of information, new ideas and new teaching and learning approaches (n=15). Some teachers also felt supported when their Natural Sciences colleagues shared resources or helped them find resources such as worksheets, charts, assessment sheets or materials in newspapers and magazines (n=5) and when they planned their teaching together (n=6). When teachers were asked in what ways the support made a difference to their teaching and learning, three teachers said that planning together and sharing ideas and resources gave them confidence to teach the Natural Sciences learning area and to try new ideas. This sort of collegiality had a positive influence on the way in which they taught.

Only one survey teacher said that she did not get support from her Natural Sciences colleagues. She felt that it was difficult to discuss some matters with her colleagues. Another survey teacher clearly did not want support "As an educator, you must be self-motivated" (T8). It seems unlikely that this teacher would offer support to his Natural Sciences colleagues.

The results of the survey thus indicate that most teachers valued and benefitted from interactions with their Natural Sciences colleagues. I was therefore interested in a clearer picture of the extent to which case study teachers felt supported by their Natural Sciences colleagues when teaching human reproduction, and the ways in which this support was expressed. Their views were expressed during interviews after they had completed teaching human reproduction.

Three of my case study teachers were the only Grade 7 Natural Sciences teachers and so they already experienced some professional isolation. The remaining seven teachers taught together with one or more other teachers. The extent and type of planning amongst Natural Sciences colleagues, and the extent to which they supported one another, sharing ideas and materials, varied amongst the case study teachers.

In some cases, the Natural Sciences teachers worked together in the planning phase but then worked independently. This was the case with Mphety and Zama who were both new to their school. Mphety worked with Zama on the work schedule and then wrote it up. They both agreed to follow the guidelines in the module on human reproduction, but planned their lessons separately. Mphety and Zama did not report much interaction and sharing of experiences during teaching, although Zama said they did talk about some of the topics and he would ask her questions when he did not know something. These two teachers seemed to operate independently most of the time and so did not benefit from the support experienced when sharing difficulties and successes of teaching human reproduction.

Nsuku and her two Natural Sciences colleagues did not plan together. This may have been because they were using the module on human reproduction. Nsuku however, like Zama and Mphety, did interact with her male Natural Sciences colleague on a more informal basis in the room where they sat and ate. She said she talked a lot with him and shared ideas on how to do the activities. However she said she did not really talk to the other female teacher. Thus interaction was fostered by good relationships.

In Rennie and Riana's school, there were three Grade 7 NS teachers. Good relationships and a great deal of interaction were evident between Rennie and Riana, but the third Natural Sciences teacher (Janet) who was also the deputy principal was not a part of these discussions. Because of the nature of the topic, Rennie and Riana talked to one another about their teaching of human reproduction.

> Riana and I had a lot of … like we would sit outside and we would talk about it. And I would tell her, look, I was going to do this and this was how I was going to do it. Well, Janet because she's in admin now, we do not have much of a chance to have a chat with her. But Riana and I have spoken a lot about all the issues related to the topic. (I - Rennie)

> We talked about it every day. Especially Rennie and I. ... In the beginning we came together and then worked it out and talked about it, and then checked that the one is comfortable with what you're doing, do you understand, do you know? Every day we talked about how this is every day. Where are you now? Is it ok? What did you do? Did you do something different? ... What would you use? (I - Riana)

They talked to one another when they weren't sure of content.

> Yes. Even … on the day that we spoke about flow diagrams and so on. What happened was she had not read the manual, and she thought now this flow diagram is actually going to be drawing the organ itself. So fortunately she asked me, and I told her, no, do not worry about drawing the organ, just concentrate on using blocks and names of the organ rather than drawing the organ. (I - Rennie)

Rennie felt that they each had something to contribute as male and female teachers.

> Because I had the side of man's perspective of things, and she had the woman's perspective, and then she needed to have some info from me as well. So it did get us to communicate a lot more with each other.
>
> Yes, it helps, also because Riana is female and you get the female perspective, and of course she did say that in some of her classes the boys were acting a bit silly and asking questions that they probably knew the answers, but because she's a woman they like to hear her say it. That sort of

> thing she would tell me. And that helped me because it also prepared me for in the event of responses coming like that to me, then I know how to handle it also. (I - Rennie)

I asked Rennie if they were able to provide emotional support for one another and he responded emphatically "Oh yes!".

> We did (have a few laughs together). In fact she's quite a jovial person. And we'd sit and talk about it and sometimes we did laugh at certain things. But we did support each other a lot along this programme. (I - Rennie)

As with Nsuku and her male colleague, an easy and comfortable friendship between Riana and Rennie, and desire to help one another provided a strong support structure. However when that relaxed and easy relationship did not exist, such as between Nsuku and her female colleague, and Riana and Rennie and their HOD, then sharing would probably only occur in a formal setting such as a planning meeting.

A different sort of relationship existed between Sipho, Jackie and their HOD. Jackie seemed to have a good relationship with the HOD, unlike Sipho. The HOD who had attended the workshop with Sipho and Jackie but was not teaching Natural Sciences to Grade 7s, decided that he would prepare worksheets for human reproduction. Sipho felt that worksheet materials were simply thrust on him and there was no development of ideas together, nor was there any discussion of how his lessons were going. For him, there was no community of practice.

> - we wouldn't sit in a round table and say, right we're doing the preparations, what are the things that we should put together? No. This is the work, you do it… (I - Sipho)

Jackie agreed that there was very little interaction, she did not feel that she needed it and she felt that it would be a form of interference. She was self-sufficient, confident, and as she pointed out in her interview, very independent.

> My teaching rarely impacts my colleagues in that there is not a lot of interference ... from others in my teaching. (I - Jackie)

Jackie's comments revealed the lack of collegiality amongst the two Natural Sciences teachers. Hers was the dominant role, the position of the more expert teacher who did not seek advice from him but was prepared to provide help.

> Yes, I went in to ask him (Sipho) how it is going, how is he handling it and stuff like that but not so much for information, in terms of the content. Just to see how is he going, and if he needs help or whatever and how is he handling it. But we worked very independently of each other in this component. Very, very independently. (I - Jackie)

The result was that Sipho was disgruntled and excluded and clearly did not have an easy relationship with both Jackie and the HOD. Jackie on the other hand was highly regarded in her school and very happy there.

> It is a comfortable environment to work in. It is supportive. Where you're getting job satisfaction and you're getting the support from the staff, the HODs, it is amazing, anything you want to try, you can go for it. They'll be behind you 100%. (I - Jackie)

Relationships are always complex with so much affecting whether or not two people can work together. I did not attempt, during interviews, to explore the relationships observed but it does seem from both the interviews and the survey, that relationships between teachers are most congenial and supportive when colleagues are willing to help one another, share their successes and failures, and laugh together over some of the stories that emerge during teaching or some of the awkward situations they have to handle. When they saw themselves in the same boat together learning and growing as teachers, their support network was strong. When individuals were 'lone rangers', their colleagues felt isolated.

Teachers who taught alone mostly did not have the opportunity for the type of friendship support structures evident between Nsuku and her male colleague and Riana and Rennie that came from sharing their experiences of teaching the same topic. Gogodi, Samkele and Thobz were the only teachers in their school teaching human reproduction. Samkele turned to her HOD for help when she could not answer certain questions e.g. when learners asked about the cause of pimples and if eating peanuts resulted in more sperm being produced. Samkele's HOD had participated in the workshop on teaching human reproduction and was very supportive of Samkele and interested in how her teaching was going. Thobz had the support of her principal and HOD but she was a Grade 6 Natural Sciences teacher who took over the teaching of this topic from the two male NS Grade 7 teachers for reasons discussed in her vignette in Chapter 7. Here there was no 'community of practice' but rather a handover of responsibility for what was perhaps a very uncomfortable topic for these male teachers to teach.

Fullan (2001) argued that the extent to which teachers interact with and support one another in the implementation of an innovation is a strong indicator of how successful it will be. Hargreaves (1997, 2002) likewise pointed out that research in Britain increasingly shows that 'cultures of collaboration' have a significant impact on teachers' sense of efficacy, their willingness to take risks and in their implementation of new practices. Those 'cultures of collaboration' were most evident between Riana and Rennie. In fact Riana liked to network, in informal ways as will be seen later, and she was one of the most effective outcomes-based and learner-centred teachers (see her profile).

McLaughlin (1998) found that the most significant communities of practice were the teachers' closest professional community i.e. the school or department. He spoke of the professional isolation that teachers experienced if the community was weak. He suggested that teachers in these circumstances carry on as they see fit and understand, but deep and sustained change is very difficult. My impression, in the short period that I was in each school, was that teachers did not have strong communities of practice but some formed individual alliances based on good relationships already in place (e.g. Riana and Rennie) and these alliances allowed them to share their successes and failures, provide emotional support, advise one another and attempt new practices. Where teachers became isolated in their struggle to survive, e.g. Mphety and Zama, they may well have abandoned their attempts at new practices at the end of the module and reverted to their teacher-centred practices.

8.2.3.2 Colleagues from other learning areas in their school

The amount and types of support Natural Sciences teachers experienced from colleagues in other learning areas would give me some indication of the extent to which communities of practice operated within their schools. In the survey, 58% of the teachers (n=23) indicated that they had support from colleagues in other learning areas in their school. Once again the type of support most frequently mentioned by these teachers included sharing ideas, information and materials with their colleagues (n=7). Only two NS teachers mention that they were assisted by the LO teachers. Four teachers stated that they had little or no support from colleagues in other learning areas. 42% of the teachers (n=17) either did not answer the question or gave responses that did not relate to the question.

Unlike the sharing reported in the survey, there did not seem to be a great deal of sharing of information and ideas between the case study teachers and teachers in other learning areas in their schools. One would expect Natural Sciences and Life Orientation teachers in particular to share their ideas since there is an overlap between NS and LO curricula regarding values and attitudes related to sexuality, and valuing different cultural perspectives on human reproduction (LO 3, AS 1). This did not occur. Rennie, who had taught LO before, said that in Natural Sciences one approaches the topic of human reproduction from a more scientific point of view while the Life Orientation teacher looks more on the danger of diseases and moral issues. In Samkele's school, the Grade 7 LO teacher told her that they focussed on safe and unsafe relationships in Life Orientation. These teachers did not see the value of some sort of sharing of ideas or integration. Jackie, who was also the Life Orientation teacher, tended to integrate her teaching of human reproduction in the NS and LO learning areas.

Although there was very little sharing of information with other teachers, there did seem to be an affirming type of support for their teaching for many of the case study teachers. Thus Samkele said that all the staff were interested and would offer help where possible e.g. the offer of a book with information. Both Zama and Riana pointed out that in their schools their colleagues were always willing to help and give advice.

Jackie reported that there were no objections to her teaching human reproduction, and some measure of admiration. There were comments like "Ooh, that's a touchy subject and ..... I do not know if I could do that".

> They were very interested in what the kids were saying and how they were handling that discussion. If a kid has to ask you about wet dreams, not everybody is going to be able to get that. But they know that with my personality, that I'm not afraid to talk about that, ... But there was never, how could you be teaching that? … I never had a feeling of it, I never had a comment about it. Nothing.
>
> (I - Jackie)

Gogodi seemed, like Jackie, to have good relationships with other staff members. She described how, at times, she would tell other staff members about some funny classroom incidents and they would joke about it.

> When we started with the sugar baby project, I told them in the staff room that I'm starting with this project with the grade 7s, if they see them carrying babies and old blankets and whatever, they

should not be surprised. So they said, there you go again with ... (*laughs)* But they allowed that. They were not funny. (I - Gogodi)

Thus the emotional support provided by colleagues was of great value to teachers and contributed to teachers' confidence in teaching human reproduction and in using outcomes-based and learner-centred approaches to do so. Sipho may have alienated himself from receiving this sort of emotional support from some of his colleagues because of his anger that kept emerging about not teaching in the post to which he was appointed.

Colleagues, whether teaching or support staff, were not always supportive of change, especially if associated with some deep suspicion of what that change involves, i.e. the teaching of human reproduction to Grade 7s by a young male. I have therefore selected a short vignette of the experiences of a survey teacher who was then later interviewed. I extended my multiple case study to include Thabo who, like Yaseen, provided new and insightful information.

Special case: Resistance from colleagues and support staff

Thabo was a young male Natural Sciences teacher in a formerly white city school. The boys and girls in the Grade 7 classes of Thabo's school were kept separate as the girls were considered to be more developmentally advanced as compared to the boys at that age. Thabo was teaching these classes, and this made the staff, and in particular the support staff, very nervous. The trouble started when Thabo handed in the module for printing. The older African women who made up the office staff were shocked and incensed by the pictures of naked boys and girls and men and women (Appendix 3.1, p. 4) and lodged a complaint with the Principal. They also deliberately delayed some printing e.g. the card game so that Thabo could not use it. Some of the HOD's, other Grade 7 teachers and support staff complained that the Grade 7 boys were now out of control, and whereas formerly they had been quiet, now they were difficult, restless and suggestive and talking about a teacher who was "horny" (not Thabo). I visited the school to interview Thabo and was summoned to the deputy principal's office and informed of all these concerns and complaints. She said the staff had complained that Thabo was going "too deep" as evidenced by the module that they were being asked to print. They felt this was inappropriate for Grade 7 learners. I felt that Thabo had simply lifted the lid on a can of worms that they had effectively suppressed, i.e. sexual talk and sexual activity in primary schools. I felt that I was viewed as the supplier of pornographic material and when I tried to interview Thabo in the staffroom, the cleaner constantly circled us with her vacuum cleaner, moving chairs noisily around us. We retreated to the equally noisy but less hostile playground for the remainder of the interview. Thabo was bewildered by these accusations and his HOD was angry about them, expressing the view that Thabo had not behaved inappropriately in his teaching. However it seems that Thabo was faced with a cultural/religious conflict here, to which I will refer in the next chapter. He was a young Black male new generation teacher, and his opponents were older conservative Black African women who, according to Thabo, were very religious. Thabo felt that the furore was "all about their religion" and their response was probably a combined religious-cultural response. In traditional African cultures, visual representations of sexual organs and the naming of these organs was taboo, and so to present this material to primary school children was highly offensive to these women, and probably indicative

to them of the collapse of moral standards in schools. Thabo's female Afrikaans Natural Sciences HOD clearly did not feel the same way and was strongly supportive of Thabo. Thabo thus experienced the opposite of a supportive community of practice, i.e. a lack of trust in his intentions while teaching human reproduction, deliberate attempts to prevent him using materials and a level of hostility from certain staff members that must have been very discouraging. He nevertheless did have the full support of his HOD. There was no evidence that he had behaved inappropriately.

Thabo's teaching of human reproduction to Grade 7s was affected negatively by the subjective norms of a group of support and a few teaching staff who considered a visual representation of a naked body, even as a simple sketch, as offensive and pornographic. They felt that Grade 7s should not be learning these sorts of details. The hostility of this group, and their protest to the Principal and vice-Principal, and the ensuing investigation, acted as an obstacle to Thabo's teaching. Their beliefs had a negative effect on his control beliefs, i.e. his beliefs about his ability to teach relevant aspects of human reproduction in outcomes-based and learner-centred ways. The case study teachers in other schools, by contrast, were admired by their colleagues for their efforts at teaching a sensitive but relevant subject. The subjective norm or social pressure from colleagues and support staff in their schools was in favour of teaching human reproduction, and so the case study teachers held positive normative beliefs i.e. that what they were doing was approved of by the Principal, HOD and colleagues. They had the cooperation of others and in some cases their help, and this had a positive effect on their control beliefs, boosting their confidence in their ability to teach human reproduction in outcomes-based and learner-centred ways.

8.2.4 Natural Sciences colleagues from other schools

Natural Sciences teachers in other schools, although playing a less significant role as a community of practice, nevertheless could be an important source of help to Natural Sciences teachers. I therefore collected information on how regularly they met. Approximately half the survey teachers said that they did meet at cluster meetings or workshops (n=19; 48%). An almost equal number (n=18) said they did not meet with Natural Sciences educators from other schools, and three teachers did not respond. It seems then that only about half the survey teachers recognised the value of meeting with and learning from other Natural Sciences teachers.

In their interviews, the case study teachers were asked if they met and planned with Natural Sciences teachers in their district. Six of the teachers (Sipho, Gogodi, Thobz, Rennie, Jackie and Zama) said they did not. Rennie said that the only contact was at departmental workshops maybe once a year. He said that they used to have cluster meetings but these were not happening much any longer.

There were unplanned meetings. For example Samkele met Mphety at the workshop before teaching human reproduction and they discussed their fears and how they anticipated the children would respond. However she made no attempt to contact teachers from other schools while she was teaching the topic.

> No. I won't lie to you. There's no time for that. To be honest. And it only happens when you meet once in meetings, maybe in a workshop or maybe in a certain meeting, that's when you start

> chatting. And it is not too long, because the time is limited. You are in a meeting, you are not here to talk about that. (I - Samkele)

Mphety said that she had only talked in passing to one other teacher (Samkele) and had shared ideas at the May workshop and an assessment workshop. She expressed an interest in meeting with people in her cluster. She suggested that in order for her or other teachers to succeed, they had to sit down and share ideas.

> I think it would be a good idea. ... Hopefully it will happen in a cluster one day. ... It would be helpful in our planning if we can do that. Maybe different schools, all the primary schools meet maybe from 2-3, do plannings together. Maybe after 2 weeks again we meet to review. It will be helpful because we do not know each other for now. Maybe they know each other. Myself and Zama are new.
>
> (I - Mphety)

Nsuku did attempt to make contact with the Natural Sciences teachers at two other schools. However the one teacher said their school would not be teaching human reproduction since they had already completed the strand 'Life and Living' and the other school had not yet started.

One of the values of teachers meeting together with other teachers in the same field is that it breaks down the isolation of the classroom. By slowly building a community of practice amongst like-minded teachers, they create their own subjective norms and begin to support one another and learn from one another. However it appears that teachers in this district only met in cluster meetings or workshops and did not keep contact with one another after these workshops and meetings.

8.2.5 Friends and past colleagues

For Riana, her discussions with Rennie were significant but more important were her circle of friends. Riana said she does not meet formally with Natural Sciences teachers, but has lots of teacher friends from other schools including private schools. She says they get together every weekend, have braais, watch rugby and they talk. They share a lot about their teaching.

> You get good ideas, you really do. ...Especially grade 7. Because I told them I'm teaching this and they said, we're busy with that, and the other one said, we did it at the beginning of the year. I said, ok, give me a few hints now. What's the easy way to do it? And did you feel uncomfortable to do it? And we talked a lot about it. (I - Riana)

Riana said that definitely it was helpful.

> Because that's every weekend we chat. To know what's cooking, what you are doing, where can I maybe better this and do this the other way. The teachers are actually eager to … listen, I tried this now. I'm teaching this and I do not know how to teach it, and I said, try this or do this. It really works well. I've got a strong huge teacher support group. (I - Riana)

When I asked her who they were, she said they were friends from when she studied and from where she has taught "from all over the show" (I). This 'friendship group' of Natural Sciences educators provided her with a strong support group.

Sipho, who could not seem to get on with Jackie or his HOD, also had a friend in a former colleague. He said he interacted most with his colleague from the previous primary school he had taught at. They lived in the same building and he would go and get help from her. She had taught Natural Sciences for 22 years. According to Sipho, she guided him in how to approach this section on human reproduction, answered his questions and helped him a lot.

These relationships were amongst friends and spontaneous, easy to maintain in a familiar informal setting and not requiring yet another formal school meeting. They provided valuable support for these groups of friends, and were the result of an eagerness to share experiences with each other and probably to have some good laughs together. In the process, they developed their own set of norms for teaching influencing one another's normative beliefs and contributing to any changes they were willing to try out in the classroom (RQ 4).

8.2.6 District support and professional development

Support from the district in which a school is situated is one of the 'outside influences' affecting implementation, according to Rogan and Grayson (2003). The majority of survey teachers (85%; n=34) completing the survey felt that they had at least some support from their district, whether through personal contact, supply of teaching and learning materials, or workshop and cluster meetings.

The Natural Sciences subject advisor for the district, according to one teacher, provided support in the form of school visits, meetings and phone calls. For some teachers, this personal contact was reassuring as their NS subject advisor helped them to understand policy from the DoE, provided some form of guidance regarding subject content and checked they were 'on the right track'. One teacher commented that

> We are fortunate in having good support. X *(NS subject advisor)* is very knowledgeable and passionate about what she does and will always help out or clarify issues. (S - T5)

For one survey teacher, the personal contact with her NS subject advisor made her feel less isolated and more valued. She said that she felt:

> … recognised and attended to … because somebody ("district") is concerned on how I cope in a classroom everyday with my learners. (S – T11)

For two other survey teachers, they felt heard. They felt it was refreshing to find that issues were discussed amongst the teachers and the NS subject advisor listened to their opinions, and acted on their suggestions if considered useful. The NS subject advisor, according to these teachers, played the type of supportive role recommended by the NCS task team after receiving complaints that subject advisors were simply ticking boxes and performing bureaucratic roles (Dada, et al., 2009).

District support was also provided, according to nine survey teachers, in the form of teaching and learning materials, but a further three teachers complained about insufficient materials being provided or a lack of these materials in their schools.

Workshops and cluster meetings were attended with varying frequency (e.g. once, twice or several times per year) by 48% of the survey teachers (n = 19), and were considered helpful for professional development by most of the participating teachers. These formal gatherings were valuable, according to sixteen teachers, because they learnt from one another and from their facilitator and workshop presenters, gaining new knowledge, sharing ideas and experiences, and learning about new approaches and how to teach more effectively. One teacher said the sharing of information during meetings helped her to understand what core knowledge she needed to teach, and another teacher felt that she became aware of learners' needs. Subjective norms were being established and normative beliefs developed. The teachers, by sharing their experiences with one another, felt they were providing support to and receiving support from their colleagues. In addition, one teacher suggested that the workshops helped them keep in touch with current trends in education.

Five teachers had a mixed response to the workshops. Their concerns included the workshops were not frequent enough, there was no follow-up and the district did not train the teachers to cope with difficulties during assessment. One of these teachers complained about a lack of consultation about changes. Teachers were asked whether the meetings make any difference to their teaching and learning of new topics like human reproduction. One teacher said

> "Some meetings are really beneficial. Others are just a waste of our precious time." (S – T5)

Another said:

> "No - there hasn't been any "worthwhile" meetings that have taught me anything! (except now). (S - T28)

There was therefore a range of opinion on how valuable support from the district was. While most teachers found the interaction amongst teachers at workshops and cluster meetings valuable, some did not. In the review of the RNCS, the general complaint from teachers and organisations around South Africa to the task team was that the district meetings dealt with bureaucratic matters and did not help teachers to cope with the assessment (Dada, et al., 2009), a point also raised by some survey teachers. Only 48% of the survey teachers participated in cluster meetings and workshops but almost all these teachers found the interaction with Natural Sciences colleagues from other schools helpful and the information provided by the district useful.

As suggested by Hargreaves (2002) and McLaughlin (1998), communities of practice within a school can play a significant role in supporting innovation. In the survey schools, 73% of the survey teachers felt supported by their Natural Sciences colleagues and 58% by other colleagues within the school. The positive response would influence Natural Sciences teachers' normative beliefs i.e. that teaching human reproduction was worthwhile and acceptable in the community of teachers within their workplace. This would possibly have a positive impact on their introduction of new approaches when teaching human reproduction. As Aldous and Rogan found in their work with teachers in Mpumalanga, collaboration between teachers is a powerful influence for change when implementing a new curriculum (Aldous & Rogan, 2009).

8.3 Community support structures

Parents and religious leaders may be significant outside influences either supporting or objecting to the teaching of human reproduction in schools. I will look at teachers' expectations of support from these two groups.

8.3.1 Parents

In the survey, teachers were asked whether they expected any response, either support or opposition, to their teaching of human reproduction. Seven teachers said that they did not expect a response for various reasons such as a perception that parents expected that learners would learn about human reproduction at school and so would not interfere, or that parents were simply not interested as evidenced by the fact that they ignored requests to come to the school to see their children's teachers. Five teachers expressed the hope that parents would respond by providing them with feedback on their views about sexuality education in general and in particular the human reproduction being taught to their children. They also hoped parents would help them to understand and thus respect their particular culture and religion. Seven teachers expected a response from parents and four of these teachers felt parents would be supportive due to the positive relations and trust that had already been established between the school and parents; one teacher expected a mixed response from parents; and eight teachers felt there might be some opposition from parents. Opposition might be to specific topics e.g. sexual intercourse and might be due to religious or cultural beliefs. Thus teachers' expectations about the influence of parents was fairly mixed.

During the workshop, teachers were advised to get permission from the parents for their children to participate in this module. All the schools involved in the case studies informed the parents that human reproduction was a topic in the new Grade 7 Natural Sciences curriculum and would be taught to their children. They did so at a parents' meeting at the beginning of the third term (except in Gogodi's school) and in four schools (Gogodi, Thobz, Sipho & Jackie, Rennie & Riana) through letters informing the parents that they would be teaching human reproduction to Grade 7s and requiring their signed consent for their children to attend these classes.

At the parents' meetings, which were only attended by a small proportion of the parents in most schools, there were a variety of responses. Questions were raised by a few parents at Zama and Mphety's school about how wise it was to teach this topic to their children. However when one of the other teachers explained to the parents that it was a good age to start making learners aware and responsible because children started getting pregnant at this age, almost all the parents agreed with the teacher. In Nsuku's school, the few parents that came to the parents' meeting expressed the concern that teaching learners about human reproduction may make their children want to experiment. However they seemed relieved that the school was taking responsibility for talking to them about the changes taking place in their bodies and other aspects of human reproduction. Teachers at other schools also had the impression that most parents were relieved. Riana commented that:

> We did not have one complaint or one problem whatsoever. I think maybe they're just very relieved somebody else is doing it. (I - Riana)

At Thobz's school, the parents were 'very happy', and there were no complaints. Thobz thought this was because these parents found it difficult to talk about these things, and they thought their children would obtain more accurate information from the school than from their friends.

What was interesting was the general level of trust in the government or curriculum developers by the parents i.e. if it was in the new curriculum, then the content must be appropriate.

Almost all parents consented to their children attending the lessons on human reproduction in the case study schools. There were a few exceptions at Gogodi's school. The children of these parents were given other work to complete on a different topic and they soon requested permission to rejoin the class and promised to get their parents' consent. Gogodi said she tried to keep parental anxiety (and her own) in check by keeping the information in the learners' workbooks at a minimum so that parents did not think she was teaching their children about sexual intercourse. Parents checked these workbooks and she was concerned that parents from different religions and beliefs would be surprised by what was in the workbooks and by what their children would say at home. Gogodi's own conservative nature and her concerns about parents' reactions were evident.

During the teaching of the module, there were various levels of support. As reported in Chapter 6, section 6.3.2, LO 1, some teachers asked their learners to go home and collect information from their parents about, for example, physical changes in puberty, menstruation and circumcision. Some learners reported that they could not ask their parents such questions. Some felt confident to do so and their parents were willing to talk to them, and some parents referred them to someone else e.g. to the husband or wife or uncle. Talking about human reproduction was clearly an uncomfortable subject for some parents, as seen by their relief that the schools would be handling awkward questions. Other parents were confident enough to talk to their children about reproductive matters, thus providing support from home in terms of information provided.

Rennie said the children in his classes showed their workbooks to the parents but there were never any objections, nor, he said, was there feedback on whether the teachers were doing a great job with this topic. Many of the parents in his school, he pointed out, were quite wealthy but uninvolved with their children, leaving them to find out things for themselves. Riana's comment about many of the wealthy children from the same school was that they came home to an au pair or a nanny or they stayed after school and did their homework, and then went onto their computers and play-stations at home, ate and went to bed i.e. they had very little communication with their parents.

There was at times a lack of financial support for projects due to the parents' circumstances. Thus when parents were asked to buy bags of sugar for their children for the 'sugar baby' projects in Nsuku's school, some parents simply did not have the money to do so, and the project had to be abandoned.

8.3.2 Religious leaders

In the survey there was a very limited response to the idea that religious leaders might influence the way in which teachers teach human reproduction. The lack of involvement of religious leaders in the running of these government schools meant that for most teachers, their influence would be minimal or non-existent. In the case studies, there was no evidence of involvement of religious leaders. The only exception was the special case of Yaseen whose Muslim religious leaders played an important role in helping him to view the teaching of human reproduction as acceptable as long as his motives were pure and his purpose for teaching the topic was educational.

8.4 Conclusions

In this chapter I have looked at the influence of certain external factors on teachers' capacity to implement outcomes-based and learner-centred approaches when teaching human reproduction as reported by the survey teachers before teaching human reproduction and by the case study teachers after they had completed teaching this material as well as through my observations as recorded in my field notes and transcribed lessons. Three aspects of the learning environment, i.e. the physical environment, size of class and resources were investigated.

The appearance of the rooms in which learners were taught varied greatly, from dull impersonal rooms to colourful, brightly lit and more 'welcoming' classrooms. The appearance of the classrooms was partly but not entirely dependent on whether teachers had ownership of the rooms or not. Jackie and Gogodi had made their own classrooms their 'home' for their learning area/s and had possibly the most pleasant learning environments. Nsuku moved from room to room and one of the rooms that Nsuku taught in also had learners' work attractively displayed along the back wall. The most disadvantageous situation was Mphety and Zama's school where the Grade 7 learners did not have desks to work on.

None of the classrooms except for the lab were large enough for a truly learner-centred approach where learners could move around alone or in teams to work-stations to investigate some aspect of the Natural Sciences such as human reproduction in their own time. In addition, the large number of learners packed into each classroom, particularly in the township schools, meant there was very little, if any, room for movement. Nsuku was the most affected by the space issue, with her excessively large classes packed tightly into a small classroom.

Resources in the classroom for learners' use were limited to worksheets and/or textbooks so even when a large lab was used, learners did not move around in search of other resources. The consequence was that in the classroom, opportunities were not presented for these learners to achieve CO 4 and LO 1 in which they had to collect information before organising and analysing it. The intellectual environment of the classrooms, in terms of resources available for learners to use, was

extremely limited. Only Jackie took her learners out of the classroom to a computer lab where they could conduct their own research.

The learning environments for the case study teachers were therefore not really supportive of learner-centred activities in which learners' needs and interests could be addressed, and learners could work at their own pace. The large number of learners in most classrooms meant that catering for personal differences amongst learners was almost impossible. This will be discussed in the next chapter. However teachers, to differing extents, were able to cater for different intelligences and thus learning styles. The use of large colour charts and the internet by a few teachers did mean these teachers could cater for the visual-spatial learners; the arrangement of desks so that learners could sit in groups and the provision of activities that required group discussion in many lessons suited the verbal-linguistic learner, while space at the front of the classroom meant that learners could carry out their role-plays, catering for the bodily-kinaesthetic learner. Critical outcome 5, communications skills, could thus be achieved within the very limited context of a three week module on human reproduction.

The district, principals, heads of the Natural Sciences departments (HODs) and colleagues provided the Natural Sciences teachers with emotional support in most schools, and some intellectual support in a few schools. In addition, occasional cluster meetings and workshops provided teachers with some support. However many teachers did not attend these or only attended once or twice a year. This resulted in these teachers working in isolation, a situation which according to Fullan (2001) hindered teachers' adoption and continued implementation of new teaching and learning practices.

In the next chapter, I explore the impact of learner factors on the use of learner-centred practices and achievement of critical and learning outcomes.

The beliefs of teachers as stated through the survey and interviews have been compared to my observations and I have attempted to identify whether their control beliefs have impacted on their perceptions of their control of the behaviour and thus their intention to perform a behaviour resulting in the use of outcomes-based and learner-centred approaches when teaching human reproduction (See Figure 3.3 – theoretical framework for this study). I have not always found that their stated beliefs match their practice because their vision for what is possible is sometimes rather limited.

Chapter 9

External factors: Learners

In this chapter I focus on the learners and how they impact on the teaching of human reproduction in outcomes-based and learner-centred ways. Learners are considered one of the factors external to the teacher and their preconceptions about human reproduction obtained from the media and their home environment (parents, relatives and friends) as well as their religious and/or cultural views could influence the way in which teachers teach human reproduction. Learners' competence in English, the language of learning and teaching, their developmental levels and other personal differences all require that teachers change their approaches to accommodate these differences. In this chapter I will be exploring the extent to which learners' prior knowledge, their cultural and religious beliefs and traditions, their use of English or home languages and other personal factors impact on how the teaching and learning of human reproduction takes place. This will contribute to answering research questions 2 and 3. In addition, I will investigate teachers' control beliefs, i.e. their beliefs about the extent to which learners are seen as a resource or threat when they are attempting to teach human reproduction in outcomes-based and learner-centred ways. These control beliefs about learners will in turn affect their ability to control what takes place in the classroom (RQ 4). I will be drawing my conclusions from the survey and from my field notes, transcriptions of lessons and interviews with the ten case study teachers. Figure 9.1 represents the part of my theoretical framework that I will be addressing in this chapter.

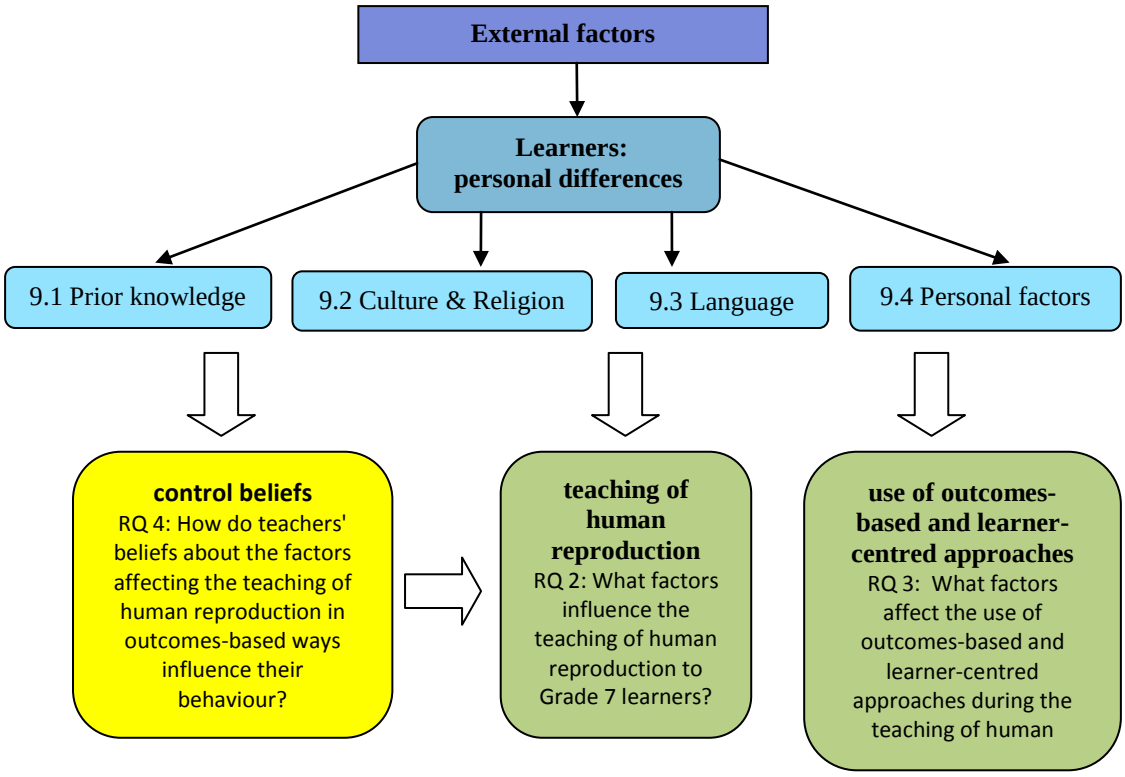


Figure 9.1: Learner factors and my theoretical framework

9.1 Prior knowledge

In constructivist approaches to teaching, learners' prior knowledge is considered important as the starting point for the construction of new knowledge (Bennett, 2003; Brooks & Brooks, 1999) and as Chisholm and Leyendecker (2008) point out, prior knowledge and experiences are determined by culture and social context.

What were teachers' beliefs about learners' prior knowledge before being taught human reproduction and did they think this would affect their teaching? I attempted to find this out in the survey in order to partly answer RQ 4. I then explored the type of prior knowledge that emerged during the teaching of human reproduction in the case studies, the extent of this prior knowledge, its source (RQ 2) and teachers' views on the influence of prior knowledge (RQ 4).

When teachers were asked in the survey what impact learners' prior knowledge could have on their implementation of the topic 'human reproduction' (Appendix. 4.1, Question 4.1), they interpreted this question in several ways. Most of their answers fell into one or more of the following categories i.e. the source and extent of learners' prior knowledge and how they would respond and address knowledge, attitudes and values (Appendix 4.2, Table 4.2.3).

9.1.1 Source of prior knowledge

Prior knowledge about human reproduction for Grade 7 learners would have come from school knowledge or from their everyday world. It might consist of factually accurate information or stories, beliefs and myths passed on from their community or from the media. Eight survey teachers identified what they thought were the source/s of learners' prior knowledge about human reproduction (Appendix 4.2, Table 4.2.3). Their responses can be seen in Figure 9.1 below. An example given of 'own observations' was a woman getting pregnant and giving birth, and personal experience referred to some 'practical' knowledge about sex through being sexually active.

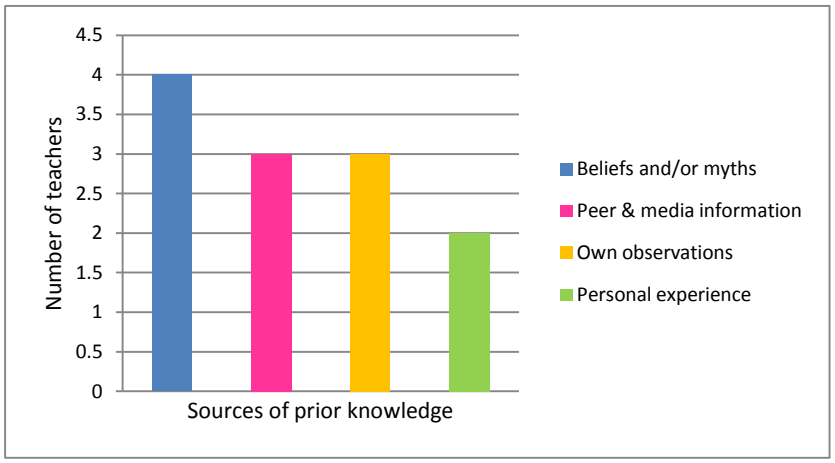


Figure 9.2: Number of survey teachers identifying each source of information about human reproduction (n=8)

In the multiple case study, all these sources of prior knowledge were evident, that is, peers, the media, and their personal knowledge gained through their own observations and experience. In addition, family members and some parents were a source of prior knowledge at home while certain school programmes were a source of prior knowledge at school. The discussion below looks at how these sources of prior knowledge influence the teaching of human reproduction in outcomes-based and learner-centred ways.

9.1.1.1 School programmes

All children in primary schools are taught Life Orientation. Some of the outcomes for this learning area are the promotion of health, and social and personal development (Department of Education, 2002c). From Grade 4, the Life Orientation document notes that learners are becoming increasingly aware of their own sexuality and this should be dealt with sensitively, developing life skills that enable them to deal with peer pressure and making them aware of risks (p. 25). In Grade 5, learners are expected to understand body changes, in Grade 6 to learn how to respond to peer pressure and explain the causes of communicable diseases such as HIV/AIDS and in Grade 7 to discuss personal feelings, community norms, values and social pressures associated with sexuality. Jackie confirmed that when the Grade 7 Natural Sciences learners that I was observing were in Grades 5 and 6, she had discussed sexuality, values, self-esteem and HIV/AIDS during Life Orientation. The Life Orientation programme was thus a source of prior knowledge particularly for the initial topics in the module, such as physical and emotional changes during puberty, and responsible behaviour. Teachers and learners easily engaged in discussions of these topics because they were familiar topics. The Life Orientation programme thus provided an easy entry point into the discussion of the more biological aspects of human reproduction, and so was an important factor aiding the teaching of human reproduction. The problem arose, as mentioned in previous chapters, when some teachers struggled to move beyond this familiar territory to address new concepts.

There were other programmes in schools that also acted as a source of learners' prior knowledge. In Gogodi's school, sexuality education was presented to separate groups of boys and girls by a male Life Orientation teacher and by Gogodi respectively in the semester before human reproduction was taught. This special day, it seemed, was an annual event. Some schools went a step further, and invited outside organisations to their schools to run programmes associated with puberty or sexuality education. So the 'Johnson and Johnson Sisters' (from the commercial organisation Johnson and Johnson) gave a talk about menstruation to the girls in Gogodi's school. FAMSA (Family and Marriage Association of South Africa) ran a one day course at Riana and Rennie's school at the beginning of the year on various aspects of puberty including menstruation and sexuality. As a result Rennie found that his learners had prior knowledge, but said the focus was on 'sexual education' rather than human reproduction. He distinguished between the two in the following way:

> Human reproduction distinguishes because it is more biology. Whereas sexual education is trying to get the kids to understand the dangers of being engaged in sexual activity too early in life. (I - Rennie)

Once again these programmes ensured that learners felt comfortable with familiar material and so had a positive influence on the teaching of human reproduction (RQ 2). However in Rennie's classes, learners also became bored with the repetition especially about responsible behaviour.

9.1.1.2 Media

Seven of the case study teachers considered the media as the main source of information about sexual activity. For the urban child, as Sipho commented, their life is surrounded by sex.

Several teachers (Rennie, Riana, Jackie, Zama) talked about the impact of TV soap operas and movies on learners' perceptions of sexual activity. In particular they mentioned one of the South African TV channels, i.e. e-TV that showed late night pornographic movies. Jackie described how some of her learners said that they crept downstairs after the parents were asleep to watch these movies.

> e-TV, it is a major problem. ... Quite a few of them said to me they watch it to learn what to do. So that's their concept of sexual intercourse. And depending on the type of porn they're watching it is damaging and it is very dangerous for a 13yr old to get into his head that this is what sexual intercourse is all about. And it is an impressionable age. You have grade 1s simulating sexual activities on the playfield. .... So it's still a problem. And I can't understand why it is still out there.
>
> (I - Jackie)

Zama was also concerned about the effect of these programmes.

> Most of them they know a lot because they watch TV and these programmes that are playing on Saturday on e-TV, they just watch them as it is ... the act of sex! (I - Zama)

Thus TV programmes often presented distorted perspectives of sexual activity which children then could take as the norm.

Magazines were an important source of information according to most of the case study teachers. Some of the magazines purchased by parents and found in learners' homes were considered extremely explicit about sexual activity or pornographic.

> Because they read magazines. And some of the magazines they read, ey, they say different things.
>
> (I - Samkele)
>
> Most of it is coming from peers and the magazines. These magazines are so freely available now. And parents are keeping them in houses, and they do not even keep it in safe enough places. So kids are getting this literature, like pornographic stuff into their hands now. And it often portrays a wrong image of sex and human reproduction and so on. (I - Rennie)

Rennie was possibly not referring to all parents, but to parents in a few instances he encountered, and was simply make a sweeping statement for emphasis.

Magazines, or learners' interpretation of what magazines were saying, were often a source of misinformation. One learner claimed that her uncle was born after a 13 month pregnancy, but when questioned further, said that she read this in 'Living and Loving'. It is more likely that these magazines were reporting on people's stories but learners would tend to pick up the lurid stories and believe that they contained factual information. For example, in Samkele's class, one learner said that she read in a magazine that:

> A child was born with its hands closed. When it was opened – there was a sign 'Jesus is coming'.
>
> (LT – 29/8)

The class responded with laughter and Samkele assured the girl it was just a story. However it is a little worrying if the teacher promotes certain media stories as Sipho, for example, did.

> Boy: If a female has sex with an animal, what happens, ... does the baby get born with four legs?

Sipho: I have never seen it ... but through what I have seen from the media, when it was 1996 or 97..on the media in the Northern Cape, a sheep gave birth to a little one which they could not associate with the sheep or any other animal. And it was shown on TV that the features, some of the features are of a human baby.

Class: Yo!

Sipho: and they took some blood samples of that sheep for testing ... and they discovered that a human being had sexual intercourse with that sheep. (LT – 14/8)

Sipho continued spinning a second similar story. In the first story the evidence was a blood test and in the next story, the evidence was a DNA test (a calf that was half human!). Did Sipho, a self-proclaimed very traditional rural but recently urbanised young man, believe these stories or was he being provocative (making a statement that would be recorded) since this was not a subject he wished to teach? Later statements indicated his tendency to believe stories that have no scientific base. Unlike Samkele, he does not help the learners to distinguish fact from fiction, perhaps because with no academic background in Natural Sciences, he cannot separate the two.

By contrast, teachers thought that some TV programmes and magazines were informative. Zama, for example, reported that his learners obtained valuable information from medical talk shows and investigative TV programmes such as "Special Assignment" e.g. on the issue of abortion. Gogodi and Samkele both felt that certain magazines that explained menstruation and other aspects of human reproduction well were also helpful. Learners brought these magazines to school to show their teachers and, according to Gogodi, to check that what the magazines were saying was the same as what they were being taught.

9.1.1.3 Peers: Friends and family members

Friends, older siblings and cousins are an important source of information about menstruation, sex and other aspects of human reproduction according to several teachers (Gogodi, Samkele, Jackie, Riana and Sipho). In Jackie's class, one of the boys identified his sister as the source of his knowledge.

Boy: My sister ... she's the one who tells me everything.

Jackie: She tells you everything?

Boy: Yes Ma'am, she's not afraid, she tells me. (LT – 31/7)

In Samkele's class, boys said they had heard that by eating peanuts, a boy could produce more sperm. This was a recurring idea, circulated amongst boys, and expressed in this way by a boy in Sipho's class.

Boy: Sir, I know with boys when you eat a lot of peanuts like they say your sperms develop, more sperms develop when you eat peanuts. (LT – 3/8)

Thobz expressed the value of her Grade 7 learners studying human reproduction as follows:

They are so blessed, these learners, to get this information because they get the information from their friends. And they do not get the right thing! (I - Thobz)

During the observed lessons, learners would discuss at length what they had heard from their friends, other young people, their sisters, brothers and cousins or seen in magazine and on TV and they tended

to believe this information. Misconceptions circulated amongst peers in this way. Prior knowledge about human reproduction, whether misconceptions, alternative conceptions or scientifically accurate conceptions, seem to come mostly from the media and peers (sisters, brothers, cousins and friends) in the Gauteng urban environment according to the case study teachers, whereas in the past it may have come from the adults in the communities in which learners lived and they may have learnt about some aspects of reproduction at circumcision school.

These findings are in line with several Southern African studies. Clacherty and colleagues' survey of 11-12 year old children from a wide range of South African backgrounds revealed that most children learned about sex from watching television, reading about it in magazines and from talking to their peers about it (Clacherty, et al., 1998). Rivers and Aggleton (1999) agree, saying that the shift in young people obtaining sex education from their communities to the media and peers has been due to the disruption of these rural communities as a result of migration and rapid urbanisation. In Bhana's study of learners aged 12 to 18 years in Zambia and South Africa, school and peers were found to be the main sources of information on sexuality and reproductive health in this age group (Bhana, et al., 2011). Given that learners are continually receiving 'everyday' knowledge about human reproduction from a variety of sources and it is often inaccurate, school can play a valuable role in providing more scientifically accurate information about human reproduction to learners.

9.1.1.4 Parents

The parents, from a wide range of backgrounds and cultures, could be described as very 'traditional' to 'modern'. In Chapter 8, section 8.3.1, I discussed parents' support for the teaching of human reproduction to their children. Here I explore the extent to which these parents contribute to learner's prior knowledge by talking to them about changes in their body and sexual matters.

Most teachers felt there was very little or no discussion taking place at home. Thobz's learners were mostly living in informal settlements, their parents having migrated to Gauteng from rural areas in search of work. She described these families as very traditional. Her learners told her that their parents did not talk to them even when they started menstruating. Sipho and Jackie whose city school drew learners from a variety of backgrounds both in the townships and surrounding city, and Rennie and Riana who taught mostly suburban middle class children, like Thobz, thought that there was very little parental involvement prior to the teaching of this topic. The topic of menstruation seems to be the exception. Zama, Samkele and Rennie found that some mothers talked to their daughters possibly when they started menstruating or because they anticipated their daughters would start menstruating. Sipho claimed that parents hide the realities of human reproduction from their children, seeing the school as responsible for imparting this sort of knowledge. The lack of parental involvement was also evident in Bhana's study where only 12% of the parents and guardians of 12-18 year old children in Zambia and South Africa had discussed sex and HIV and AIDS with their children (Bhana, et al., 2011) and in Lesotho where only 20% of adolescent females and 10% of adolescent males talked to their parents about sex (Mturi, 2003).

There were a number of reasons put forward for parents not talking to their children about sexual matters and their bodies. Firstly talking about menstruation, the reproductive organs and the act of sex are personal and intimate matters for most parents and, as Turnbull, van Wersch and Schaik (2008) and Mturi (2003) point out, parents often feel embarrassed and uncomfortable about doing so. When Jackie sent her learners home to find out the answers to questions they had asked her in her first lesson, for example questions about how big the eggs are, what happens to them if a woman does not get pregnant, whether ladies get sexually aroused, and questions about menstruation, abortion and circumcision, most learners reported back that they could not talk to their parents. If learners did talk to their parents, it was usually to their mothers. Sometimes their mothers would avoid the topic, ask them to talk to someone else or become suspicious, as in the following responses to their children's questions on abortion.

Girl 1: My mom said "I'm tired"
Girl 2: My mother changed the subject. She said; "What? Oh, I think someone's knocking", and she left.
Girl 3: Mother did not want to talk about abortion. She asked me to talk to my father but I could not.
Girl 4: I asked my mum what is abortion, and she said "Ai, I do not know. It is none of your business, its older people's stuff. If you get pregnant, you must get out of the house." (LT – 31/7)

Parents' lack of knowledge may be a second reason for the lack of communication as seen in the mother's response to Girl 4, and as seen in other countries (Mturi, 2003; Walker & Milton, 2006). This was the impression of one of the girls in Jackie's class concerning her parents.

Girl 1: My parents know nothing about medical stuff, you know. My father knows nothing. (LT– 31/7)

At a parents' meeting in my exploratory case study, after presenting the module to the parents and grandmothers, they laughingly said that they also needed to know this stuff, and asked if I could run a course for them on human reproduction! Most of them had probably never studied human reproduction and now they were being placed in the difficult position of being expected to help their children and answer their questions.

A third factor may be that in many traditional African societies, particularly in more rural areas, it is taboo for parents to talk to their children about sexually related matters. This is the responsibility of adult relatives e.g. aunts, uncles, elder sisters or grandparents (Mturi, 2003). Thobz felt this was the reason for the lack of communication between parents and children in her school, which drew learners from a migrant and rural population.

I think it is our culture. We as black parents. You rather ask your sister to talk to your girl, rather than approaching … I think it is our culture. (I - Thobz)

A fourth reason may be the common fear amongst parents that their discussion will influence their children to become sexually active (Malambo, 2002; Mturi, 2003; Walker & Milton, 2006). Several teachers believed that many parents in Gauteng had this reservation. Sipho suggested that parents tend to believe that talking about sexually related matters meant that they were giving their children permission or even encouraging them to have sex.

> (The parents might think) 'I'm teaching my boy to go out and have sex. I'm teaching my girl to go out and sleep around.' ... The parents were so happy that there is someone who is going to talk on their behalf to their children about things that they are scared of. (I - Sipho)

Samkele reflected on this issue as follows.

> As parents, it is not an easy chat with your child. ... Some of the parents find it difficult. Some of the parents do not see it as necessary. Some of the parents have the fear I had before I started the lesson. What do I mean when I tell my child this is sex? It means I'm saying to my child, start doing this. (Samkele - I)

At the start of this topic, parents were informed that their children would be studying human reproduction (if permission was granted) as this was now part of their Grade 7 Natural Sciences curriculum. They were also told that their children would be asking them questions about reproduction. Jackie found that as they progressed through the topic, more learners started to engage in discussions with their mothers. One girl who said she had been very shy, claimed that "Now I like talk to her any time" (T – 28/8). When Zama sent his learners home to find out about menstruation, he found their parents were willing to help their children "know more" (I). Like Jackie, he thought that this was because teachers explained to the parents at the parents meeting why they were teaching certain topics in human reproduction and the parents had agreed to it. Creating a formal 'forum' (the school curriculum) for discussing this topic gave parents the confidence and right to talk to their children about some of these topics. Jackie also pointed out that the new generation of children are more open and prepared to ask their parents about things, but she added that a lot of her learners still do not feel comfortable talking to their parents.

Fathers do not seem to play any significant role in educating their children about human reproduction. I found no reference in my research to input from fathers. Rennie, whose boys came from the White, Asian and other communities observed that boys do not seem to go to their fathers. He suggests that fathers just expect their sons to find the desired information for themselves. Turnbull and colleagues (Turnbull, et al., 2008), in their research on parental involvement in sex education amongst British families, found that mothers were the main source of information particularly with their daughters, while boys turned to their peers, the media, and the internet for answers to their questions. Bhana et al. (2011) refer to the 'invisibility' of fathers in the lives of South African and Zambian children and thus their low level of involvement in the sexual and reproductive health of their children. They also found that confusing messages were given by the 'male custodians' of children, i.e. 'boys need to experiment; girls need to be protected'. These 'cultural' messages came not only from parents but also through initiation ceremonies thus exacerbating the problem of mixed messages to children.

9.1.1.5 Personal knowledge

The conditions in which children live can influence their prior knowledge. If learners are living in very crowded conditions, they are more likely to be aware of and perhaps observe sexual activity. Nsuku, Thobz, Gogodi and Sipho all speak of the crowded conditions in which some or most of their learners live. According to Thobz, 90% of her learners live in one room shacks with their families. Some of Gogodi's and Sipho's learners also live with their family in one room in city apartments, or their families share a room with one or more other families. In these situations, learners would be

aware of any sexual activity amongst parents, 'visitors' to their shacks ('uncles'), as well as siblings and their partners and would form their own impression of the act of sex.

9.1.1.6 Community

Some of learners' ideas about human reproduction are cultural beliefs passed down from generation to generation. They circulate in a community and may be widespread 'common-sense' ideas or beliefs particular to a culture. However some so-called traditional beliefs are not beliefs held by adults but recognised as stories told to warn children off particular activities such as "If you masturbate, you will go blind".

The module attempted to address some alternative conceptions or misconceptions that had emerged in previous studies. It did so through the card game on male responses and the letters to Dr Naidoo with statements such as: "I've heard that if you do not have sex and get rid of the sperm, your testes will burst"; "My granny told me that I mustn't bath or swim when I'm menstruating. She said it is very bad for you". These activities (Appendix 3.1 and 3.3) gave learners the opportunity to examine how valid these claims are from a biological perspective.

Learners raised questions about alternative conceptions that they had heard. The most common alternative conception related to eating eggs. Samkele's learners told her that if you eat a lot of eggs, you will menstruate at an early age. They said they had seen it in a documentary in which 'cultural women' responsible for young girls growing up in rural areas had made this claim. Jackie's learners had also heard that females must not eat eggs but could not give her a reason for this belief. One of them had read about it in a magazine called "About you" and another had heard it from her mother (no eggs, milk or cheese). Sipho's learners thought it related to sexual activity.

> Boy: I want to know if it is true that if a girl eats too much eggs and stuff, I do not know, they get to like boys or something.
> Sipho: ... you are not alone there because I do not know whether it's fact or an opinion.
> Girl: It's a fact.
> Sipho: Some cultures or nations believe that if girls are exposed to most of these things, they quickly become sexually active ... eggs, milk, sour milk cause them to become sexually active at a very, very early stage ... people today still believe it is like that, right?
> My mother, until she passed away last year, she did not know what an egg tastes like. Margarine, sour milk – they were not allowed to eat that even if they can get married.
>
> (LT – 3/8)

This traditional belief that eggs should not be eaten by children, pregnant woman and during menstruation is held by many communities in South Africa and other African countries (Mengo, 2012; Osci, 1998). Mengo and Osci both point out that this belief has had a negative impact, resulting in malnutrition in Kenyan and South African communities respectively.

A further source of prior knowledge for some Grade 7 learners may have been initiation schools, attended by young boys and girls in some South African ethnic groups. These schools take on the role of educating boys and girls about matters related to human reproduction. I could not gauge how much prior knowledge had been gained in this way since these children were bound to a pledge of secrecy

and would divulge very little of what they knew to their peers or the teacher. This was respected and so little could be done to elicit this prior knowledge and use it to help these learners construct new knowledge.

9.1.2 Extent and type of prior knowledge

Teachers participating in the survey expected to find a wide range of prior knowledge, as expressed by one teacher:

> Some learners know absolutely nothing whereas others are already engaged in sexual activities with older people. (T1)

Twelve survey teachers gave their views on the extent of learners' prior knowledge (Appendix 4.2, Table 4.2.3). Seven of these teachers believed that learners' prior knowledge about human reproduction was either lacking or limited, or based on incorrect or "misunderstood" knowledge or "clear misconceptions". Two teachers however suggested that the learners know something, and a further two that learners might know a lot, some of which could even be "relevant and true". One survey teacher pointed out that teaching human reproduction to Grade 7s might be "an eye opener" concerning learners' prior knowledge.

In the case studies, learners' prior knowledge of human reproduction, as expected, varied from almost no knowledge to fairly knowledgeable about certain aspects of human reproduction. This depended on their age, their interest and their background experiences. Younger learners tended to keep quiet during discussions which either indicated they did not know much about human reproduction, or they were not interested in the topic (yet!) or they were too embarrassed to talk about it. The impact of developmental level on learners will be discussed later. Learners who were going through puberty were mostly aware of physical and emotional changes during puberty as shown by these responses in Jackie's class: "you grow breasts", "hair under the arms", "you start to have feelings for someone in your class", "very emotional", "hormones are affecting your rage"! (T - 30/7) During my observations of lessons presented by the ten case study teachers, I could see that most boys had some understanding of the cause of male responses such as wet dreams (dreams), and girls who were menstruating had a limited understanding of menstruation (bleeding, every 28 days, pain, if bleeding stops - you could be pregnant).

Learners had some sort of idea of what sex is, at a very basic level i.e. a male placing his penis inside a female's vagina so that his sperm travels to her egg to fertilise it. Most of the learners had some idea of how to use a condom to prevent fertilisation and to prevent transmission of sexually transmitted diseases. They had probably covered these aspects in Life Orientation and/or in special sex education programmes. They would also have heard this information in Love Life programmes and in other media promoting healthy sexual behaviour. Further ideas about sexual activity varied widely and in some classes learners expounded on them. Thus during a lesson about the function of the male organs during which boys asked questions, one boy offered advice on how they could have sex without making a girl fall pregnant, i.e. by masturbation thus controlling the sperm.

Sipho and Jackie also commented that the children in their classes seemed very informed about sexual activity and what was going on in society. However their understanding of the biological aspects of human reproduction was mostly very limited. Thus Jackie said:

> It is amazing what they have an idea about. They have their ideas about what it is and what it is about, but they do not have, like you say, the scientific knowledge, or even a basic understanding of what's happening in their own body. ... but they know a lot of stuff, it may not be factual and it is definitely not true, most of it, but they know a lot of things. (I - Jackie)

The following excerpt of a lesson illustrates this.

Boy: When do periods develop?
Jackie: What do you mean by 'periods develop'?
Boy: When do they start?
Jackie: Ladies? Who wants to tell him the process of how you develop?
Girl 1: I think when an egg, one egg falls ... and then it touches another part and then you start bleeding. The egg breaks.
Jackie: The egg breaks?
Girl 1: Yes Ma'am. You start to menstruate (LT – 30/7)

Jackie continues to probe their ideas and the talk turns to menstrual blood.

Girl 2: Ma'am, I'm not sure but if dirty blood from your body comes out through your vagina...
Jackie: Dirty blood from your body? How does that happen? And what happens to the boys' dirty blood?
Class: *[laughs]* (LT – 30/7)

Jackie is incredulous about the notion of menstrual blood being dirty and uses sarcasm to get them to think through what they mean. She then asks them what menstruation is, and asks them to find out for homework. In the classroom next door, the learners are receiving a very different message from Sipho, who trained as an EMS teacher and has no tertiary background in the Natural Sciences.

> Sipho: And boys, do not engage with a girl who is menstruating sexually because you also get infected, because then whatever they are releasing is not clean, it is dirty. That's an infection to you as well. You do get infected. Alright? So in other words, we've got many different ways of releasing dirt within our bodies. And within the menstruation cycle I always say, tell myself that ok, the woman's sexual organ is cleaning itself, ... (LT – 14/8)

Not only the learners but at least one of the teachers have misconceptions (or alternative conceptions) such as the notion of menstrual blood being dirty blood. This is an old idea evident in cultures throughout history but has no biological basis. Once menstrual blood is released however, the blood forms a rich environment for the culture of bacteria in tampons, sanitary pads and cloths and if these are not regularly replaced, infections can set in. This is possibly the origin of the 'dirty blood' notion.

Gogodi and Samkele agreed with Jackie that learners have many incorrect ideas about reproduction. Gogodi said that "most of the time they had wrong ideas" (I) and Samkele that very few had correct information. Riana felt that her learners were well informed about some aspects of human reproduction but not the actual functioning of the reproductive organs.

> The kids are more knowledgeable than we were in Grade 7, let's be honest. I did not know anything about anything in Grade 7. But they started early to menstruate and are getting earlier to be sexually active and stuff like that, so they do have knowledge but it is nice for me to teach them all this in a scientific way, teaching the right words and the right things to do and I think that's more important. ... Ok, the kids know about sex in general. They know about pills in general, they know about the breasts and the monthly pains, but they do not know what the penis really look like in a scientific way. How does the sperm get out? They know how the sperm gets into the woman, that's general knowledge, but how do their ovaries work? All that scientific stuff, the general knowledge, how does it actually all come together, that was nice. I really enjoyed that. (I - Riana)

The topic of human reproduction stimulated a great deal of discussion in most classes and all sorts of questions were asked and ideas argued. I was interested in finding out how learners' prior knowledge would influence the way in which teachers taught human reproduction.

9.1.3 Teachers' prediction of their use of learners' prior knowledge to address misconceptions and explore values

In the survey, eleven teachers felt that by finding out learners' prior knowledge, they would then be able to correct their wrong ideas. Their responses included that they would undo 'bad' knowledge, give the learner the "correct scientific version" rather than peer information (by implication – incorrect information), and would clarify confusing aspects. They hoped to arouse learners' curiosity on issues they were not sure of. They would provide scientific answers to questions that were based on myths that learners had heard, beliefs held by learners and learners' own experiences. They would help learners to "separate facts from fiction" so learners would "know the truth". Providing learners with facts, one teacher believed, would empower the learners.

Four survey teachers felt their role was a moral one, to provide guidance. This included helping learners to cope with their own development and with new relationships and to make informed choices, and challenging or instilling norms and values. One teacher hoped that her teaching would lead learners "to do things correctly". Another teacher hoped that by giving her learners "the truth", they would learn to trust her and be open to her since they could not share with their parents (Appendix 4.2, Table 4.2.3).

During the case studies, the case study teachers did attempt to address misconceptions and explore learners' value systems with regard to the topic of human reproduction. The way in which they did so is discussed in Chapter 7 and in this chapter.

9.1.4 Eliciting prior knowledge: a step towards achieving NS learning outcome 2 using a learner-centred approach

The teacher's role in a learner-centred classroom is to establish the starting point for each learner when embarking on the task of facilitating their construction of new knowledge which, in this study is about human reproduction. The first assessment standard (recalling meaningful information when

needed) for Natural Sciences learning outcome 2 (constructing science knowledge) would thus be achieved. In section 6.3.2 of Chapter 6, I have discussed the extent to which teachers provide opportunities for learners to recall prior knowledge. I considered that all teachers did so, Mphety and Thobz sometimes, Jackie, Gogodi and Riana frequently, and the rest of the teachers regularly. In section 9.1 I have looked at how much prior knowledge teachers think learners have on this topic, the sort of prior knowledge learners share in class and the origin/s of this prior knowledge. We have seen in the multiple case study that learners contribute a great deal of information in class, especially when probed for this information and when given the freedom to contribute as in Gogodi, Riana and in particular in Jackie's class. In so doing, learners act as an important resource for teachers, providing teachers with an understanding of the starting point for the construction of new knowledge amongst different learners in their classes. Learners shared their ideas (e.g. eggs breaking and menstruation) during class and group discussions, questioned one another and frequently asked the teacher "Is it true". The ideas ranged from those that were biologically correct (scientific conceptions) to those that had cultural origins such as those about eggs (alternative conceptions), to ideas whose origins were unclear to me and may have originated from the need to justify excessive sexual behaviour (misconceptions e.g. the need to sleep with a girl to get rid of pimples). In group or class discussions, teachers frequently provided the forum for learners to interrogate these ideas, and used probing, exclamations and incredulous looks to encourage the learners to reconsider how valid the ideas were. Thus there was the opportunity for the type of cognitive conflict that Piaget advocated in order to accommodate new ideas, or the type of scaffolding provided by both peers and the teacher that would assist learners to move a small distance through their zone of proximal development (ZPD) in order to develop new conceptual understandings (Vygotsky, 1978).

The sources of learners' ideas were varied with the media being perhaps most influential in providing both accurate ideas and lurid stories which some learners interpreted as presenting true facts. Friends shared the media stories and other beliefs so spreading both accurate and questionable information. Parents mostly contributed little to their children's understanding of human reproduction but did provide advice and warnings. Everyday knowledge in the community circulated but cultural ideas had much less impact than ideas and stories presented through the media for most learners, possibly because, in an urban environment, the media represents what is modern and believable in the very multicultural environments in which learners live. All teachers except Sipho did well to encourage learners to interrogate these stories and learn how to separate fact from fiction. Sipho did not have sufficient biological background to be able to do so himself. As the learners proceeded through the module, some teachers were able to use new knowledge to draw into question some of the strange ideas that surfaced and could have blocked learning about human reproduction.

9.2 Culture and religion

Culture and religion are intertwined concepts in many countries and this is particularly the case on the African continent. Within a broad African worldview, culture and religion are inseparable (Mbiti, 1989, 1991) and many teachers use these terms interchangeably. I was interested in the extent to

which the culture and religion of the learners influenced the teaching of reproduction. During the survey, thinking as a person from an English White background, I used these concepts separately when asking teachers what they anticipated the impact of their learners' religious beliefs/traditions (Appendix 4.1, Q4.2) and then of their cultural beliefs/traditions (Appendix 4.1, Q4.3) would be on their teaching of human reproduction. This puzzled some teachers who then provided the same answers for both questions. As a result I chose to analyse responsiveness to learners' cultural and religious beliefs under the same heading.

Twenty-six teachers provided responses in the survey, five of which were not relevant to the question in any way. The remaining answers were placed in different categories (Appendix 4.2, Table 4.2.3), some of which consisted of advice to teachers, and some of which related to problems teachers might encounter in the classroom due to learners' religious and/or cultural beliefs.

Eight teachers anticipated that teaching human reproduction would be against the religious or cultural beliefs of some learners. Three of these teachers indicated that some religions do not encourage or allow children to be taught human reproduction at school, and five of them pointed out that certain cultures did not allow this. In these cultures, parents did not talk to their 'young ones' about these matters, this topic was for adults and not learners, and reproduction could not be discussed in public. Nsuku, in her interview said:

> Then I was worried about their cultural background, how they are going to respond. ... Yes, there is an impact on their culture because when you talk about human reproduction, some they're not free to talk about it. They think that according to their religion or culture you are not supposed to talk about it. Then you're not respecting. (Nsuku – I)

One survey teacher thought learners might want to be removed from the classroom. In section 8.3.1 of the previous chapter, I looked at survey teachers' expectations of parents' responses to the teaching of this topic and parents' actual responses during the case studies. Some parents did express concern but there was a general sense of acceptance and appreciation that since their children were surrounded by messages about sex all the time, the school would take responsibility for addressing this topic with their children. Some of the survey teachers then advised that teachers should treat all religious and cultural beliefs and traditions with the same respect and dignity and that this attitude should be imparted to their learners. Group work and class discussions would provide learners (and teachers) with opportunities to learn about different cultures, beliefs and traditions from one another.

The extent to which culture and/or religion had an impact on the teaching of human reproduction can be seen in the interactions in the classrooms of the ten case study teachers. The schools in which these teachers taught, drew learners from a number of different population and ethnic groups, as can be seen in Table 9.1 below. The learners in the district in which my research took place represented a wide range of ethnic groups, mostly South African, but also from other countries. The challenge for the teacher in this very multicultural society would be to be sensitive to and responsive to the unique cultural/ethnic context of each learner. In my analysis I looked for this.

Table 9.1: Population and ethnic groups, and languages spoken in case studies

School area	Teacher	Population or Ethnic group of teacher	Population group of learners	African Ethnic groups of learners	Languages spoken in class (in addition to English)
City	**Sipho Jackie**	Zulu Indian	African Coloured Indian	a mix of ethnic groups from South Africa and other African countries	various (mixed with English)
	Gogodi	Tswana	African Coloured Indian	a mix of ethnic groups from South Africa and other African countries	various (mixed with English)
Town-ship	**Samkele**	Zulu	African	Sotho, Tsonga, Xhosa, Venda	Sesotho, isiZulu
	Mphety Zama	Sotho Xhosa	African	Pedi, Tswana, Xhosa, Zulu	Sepedi, Setswana, isiXhosa, isiZulu
	Thobz	Sotho	African	Pedi, Zulu	isiZulu Sepedi
	Nsuku	Tsonga	African	Pedi, Tsonga, Venda, Xhosa, Zulu	Sepedi, Xitsonga TshiVenda, isiXhosa isiZulu
Suburb-an	**Rennie Riana**	Indian Afrikaans	African, Coloured, White (English), Indian, Asian	not known – a few African learners	not known (English for almost all learners)

9.2.1 Religious influences

The religious beliefs and traditions of the major recognised religions in South Africa such as Christianity, Islam and Hinduism, were not seen, in any of the case studies, to have overtly affected the way in which teachers taught human reproduction. Learners' beliefs were respected and their views on appropriate sexual behaviour were brought up in class discussion only occasionally by learners. For example, Riana reported on a discussion on beliefs and values in one of her classes:

> One little girl, she was very adamant, she will not have sex before marriage. That's how her mom and dad are bringing her up and she was very adamant about it … And the other girl next to her, ... she's not a believer of any kind, so she said, no, if she's big enough and she's ready for sex she'll have it. Finished! Over and done! She will not marry, it is not a big issue for her in her life. ... there's a lot of kids that's not exposed to any religion. Let's be honest. (I - Riana)

Gogodi said that less than 10% of her learners made statements such as they would not have sex before marriage because it was not allowed in their religion. Likewise the majority of Mphety's learners did not refer to their church's (or their parents') position about when they could or should become sexually active. Some of the girls in Mphety's class however referred to the law as giving them permission to start having sex at the age of 12. This was because the legal age at which girls could have abortions without parental consent had been lowered to the age of 12.

Occasionally learners brought in their beliefs in other ways. Jackie reported on some of the conversations in class for example:

> I have kids who told me, especially like D who says "Ma'am it is amazing. The body is so amazing." And it opened them up to the wonder of what the body is. And then the concept of God came up

> from them. It is like, if your body can do all of these things and it is such an amazing thing, you do not have to tell it, it is just doing it, there must be a God. There has to be a God who created that ... We had a huge discussion just based on spiritual beliefs. (I - Jackie)

Religious beliefs and values, while generating discussion in at least one classroom, did not therefore seem to be the guiding force for most children, except for those adhering to African traditional religions where religious and cultural beliefs and values merged. There did however seem to be some cultural taboos.

9.2.2 Using the biological terms

Human reproduction is a sensitive subject amongst adults and children everywhere because the reproductive anatomy evokes far more emotion than any other part of the body for most people. Thus people everywhere have found alternative terms to describe reproductive structures which are less scientific, more accessible, and gentler (or sometimes more aggressively graphic). In my study, learners frequently referred to their 'private parts', but only on a few occasions to terms such as "boobs", "balls", "willie wonker", "bush" (pubic hair), "being horny" and having a "hard-on". The case study teachers insisted on the use of biological terms so that learners could come to see these structures as part of the normal working of the body. However in some cultures, it is not culturally appropriate to use these terms (Mbananga, 2004) and so this could signal a clash between what is allowed in the culture of a particular ethnic group and what is being taught in the classroom. Nsuku was one of the teachers who was apprehensive about whether her learners would use the biological terms.

> But I was worried how are they going to respond because in their cultural background since we do have five cultural groups like Pedi, Venda, Tsonga, Zulu, Xhosa, into there. Because in my culture we are not supposed to talk this language. You cannot say penis, ... you're not supposed to say that. Then you had to show some respect. ... When you respect you're not supposed to say things like, vagina, penis in their culture. (I - Nsuku)

When she first used the term 'testes', there were shrieks of horror and laughter and some girls put their hands to their mouth (an expression of perhaps shock or amazement). Nsuku was therefore surprised when her learners did not object to the use of the biological terms.

In Gogodi's school, a one day programme for Grade 7s involving sexuality education was held earlier in the year. Gogodi taught the girls and a male Life Orientation colleague taught the boys. He avoided using biological terminology for sexual structures, using rather the names of highways for male structures. His action reinforced the notion that biological terms should not be used and Gogodi had to address this issue.

> but it was a problem when it comes to the boy's section, because the terms were not used. *(Like penis?*) Yes, penis and the sperm duct. ... he gave them names for that. *[Laughs]* ... I even talked to him yesterday that he said to the kids that this is an N1 tube, this is the M3…he gave my kids the wrong information! ... So they were shocked when I used the scientific terms. Some of them still when we did the activities, maybe for them to label the organs, they will use those words (N1 and M3) until I gave them notes in their books. (I - Gogodi)

Gogodi had to 'normalise' the use of biological terms for these learners.

Learners in all classes used the biological terms. Unlike the Transkei teachers in Mbananga's study, but similar to the learners in that study and to learners in Limpopo and Western Cape schools in Helleve and colleagues' study (2009), the case study teachers found that learners were prepared to use the English biological terminology, even if initially reticent about doing so.

9.2.3 Menstruation

Menstruation is an embarrassing topic for many young girls as well as boys. Gogodi had a delegation of girls beseeching her not to talk about menstruation to their mixed class. Samkele said her girls were very embarrassed and they also did not want the boys to hear about menstruation. When she started teaching the topic, there were cries from the girls of "do not listen in" and "close your ears boys" and protestations like "Ah but maam, ..haai they will know about us" (Samkele – I). Samkele pointed out that girls often considered menstruation as something they owned, their own unique experience and did not want to talk about it. Sipho pointed to learners, especially the boys, who sit in class with their hands over their face pretending to be sleeping. He says this is difficult embarrassing stuff for them. They have been told by their mothers that their fathers will never talk to them about woman's stuff like menstruation. According to Sipho, men do not talk about these things. This is private.

The case study teachers however felt that it was important for boys to begin to understand girls' experiences with menstruation and thus start to respect the difficulties they experienced. Rennie and Riana's learners were in separate groups, and so any group discussion on menstruation was kept separate but the groups nevertheless reported back to the class. Gogodi, having initially thought she would only talk to the girls about menstruation and give the boys other work to do, changed her mind when she realised the girls had looked at male responses in the card game. She decided to rearrange the groups and ensure that she had mixed gender groups. She whispered to me that she would see how it went and if the lesson became 'destructive', she would not go into detail but invite the girls to see her later. The remainder of the teachers maintained their groups whether single gender or mixed gender for discussions about menstruation and for completing the tasks.

The mixing of the groups in Gogodi's classes generated a lot of discussion. According to Gogodi, the girls were able to explain to the boys what menstruation is and the groups worked well on the follow-up letter writing activity (Task 9, p. 14 of learner's module). There were however a few learners that did not want to take part in the menstruation activities. Gogodi did allow learners to withdraw from these activities and gave them other worksheets to complete and Natural Sciences textbooks to read. As pointed out earlier, menstruation is a private issue amongst some people/cultures and she respected this without bringing learners' position into question. Thus Gogodi demonstrated that she was sensitive here to learners' personal needs, and accommodated personal differences, an important feature of a learner-centred approach.

9.2.4 Initiation and Circumcision

Perhaps the most taboo topic for some learners was circumcision[18]. In most African ethnic groups, as amongst Jewish and Muslim people, circumcision is an important spiritual and cultural ritual. Although talking about circumcision practices is prohibited for those who participate in the practice, initiation and circumcision is a subject of national debate in newspapers, on television and on the streets when every year male initiates die due to the harsh treatment they are subjected to in order to turn them into 'men' and due to infections caused by unhygienic circumcision procedures. It was therefore considered important to raise the matter, but only at a superficial level, to touch on a national concern but also for learners to realise that circumcision is a widespread ritual in many ethnic and religious groups in South Africa which fulfils different purposes. This would then enable learners to demonstrate learning outcome 3, assessment standard 1, i.e. understanding different cultural contexts. In the module (Appendix 3.1, pp. 8-9), learners were given a brief description of what circumcision is, i.e. the cutting of the foreskin, and some pictures of parents from different ethnic or religious groups explaining their reasons for either having their child circumcised or not circumcised and learners were then invited to share some information on the circumcision ceremonies in their ethnic groups if they were allowed to do so.

This topic generated a wide range of responses. In the suburban school, the topic was discussed in Rennie's classes with great interest, in a respectful manner, but with some emotional detachment. Traditional ties seemed to have weakened. However the girls in particular were shocked to hear about the various forms of female genital mutilation in Africa. In the city and township schools, there was emotional engagement in the topic and learners' responses differed widely from great interest and heated debate to anger or silence.

In most schools, there were some boys who would not participate in class discussions on initiation and circumcision. Some sat impassively and simply listened to the class or group discussion. Others participated only in group discussions amongst other boys. In her interview, Gogodi reported that:

> Some did not want to talk about initiation because they were not allowed at their homes. So the kids in their groups would say, "this is what in our culture we do".... Yes. They talk about the initiation in different groups. But the one who knows the story exactly, wouldn't say … they are not allowed to talk about that. (Gogodi - I)

The boys in Thobz' class were more actively resistant and demanded that their culture and the secrecy of initiation be respected.

> ... with circumcision it never worked at all. Because it is like those who went for circumcision school they should not tell anybody about it. So they felt that no, no, now we need to be respected, we can not say anything about circumcision. ... So it never worked. (Thobz - I)

Thobz's learners lived in the surrounding informal settlement and may have recently moved there from rural areas. If so, they were possibly more strongly influenced by their traditional beliefs and

[18] Any reference of mine to circumcision is a reference to the ritual which results in cutting the foreskin of males or to cutting or stretching the labia in females. Circumcision is one part of the process of initiation as described in chapter 2, section 2.3.3.1.

practices than learners who had grown up in urban environments. This group of boys exerted sufficient pressure on Thobz to ensure that the group work activity on circumcision was discarded.

In some classes the response from individual learners was anger. For example, when Mphety asked the groups to discuss circumcision in different cultures, one girl angrily replied that it was not right for girls to talk about this. She added "My father doesn't want girls to talk about this" (F - 22/8). In Nsuku's class, when one of the girls spoke about the rituals involved in making circumcision safe, e.g. slaughtering a goat, one of the boys stood up and angrily asked her how she knew this. He was very upset about this disclosure. Circumcision as a secret ritual is a very sensitive subject.

The case study teachers and their learners all respected the right of individuals to not divulge any information about their traditional rituals of circumcision. The teachers also made clear to their classes that if any of them did not wish to participate, they did not need to do so.

The initiation rites of each ethnic group are such a well-guarded secret that teachers and learners who had not participated seemed to know comparatively little about these rites. This can be seen amongst the teachers when Samkele, as a traditional Zulu woman, could talk extensively about the annual reed ceremony for Zulu girls but knew little about Xhosa circumcision rites. Likewise Nsuku, a Tsonga woman, confessed in her interview that she learned about the initiation practices of the Xhosa from the children in her class. Zama, as a male Xhosa man, was able to talk about circumcision of boys but was unaware of any circumcision of girls in South Africa, such as the stretching of the labia amongst some Sotho women. Teachers however shared what they did know, using the expression 'going up to the mountain' when discussing the initiation practices during which Xhosa, Sotho and other boys went through the transition from boyhood to being recognised as an adult in their ethnic groups. Samkele researched the topic on the internet and then, as storyteller, re-enacted what she had read about, drawing the class into the drama of the boys' experiences during initiation. The class was absorbed in her story, but a Xhosa boy who refused to talk about circumcision simply grinned and made comments to his friend. When Samkele moved onto the topic of female circumcision, the boys who had been silent about male circumcision were keen to find out about female circumcision.

Children who were not involved in particular initiation practices were often eager to talk about what they had heard or seen on TV or read about in a magazine. Where no vow had been made to keep a practice secret, children could talk about the topic freely. Zama found that boys were curious about why some cultures and religions had circumcision whilst others did not, and why Jewish and Muslim boys were circumcised at an early age. The girls wanted more details about why boys were circumcised, how long they spent in the mountains, which part of the penis was cut. When Zama asked his learners to find out about circumcision in their cultures from their families, some learners refused to do so, whilst others did talk to their families and then shared their findings with the class. Both teachers and learners provided some information about who was circumcised. Thobz said that her school drew learners from the Pedi environment and Pedis went to circumcision school from eight years upwards. The Basotho however went at puberty from the age of 14 upwards. Nsuku's learners

told her that the Tsonga and Venda and some Pedi go at an earlier age while the Xhosa go at around the age of 18.

Most schools catered for learners from a number of different ethnic groups, some of whom were extremely secretive about their circumcision practices e.g. the Xhosa people and some that did not engage in circumcision practices e.g. Zulu males. The challenge for the teachers was to allow learners to talk about different practices where they were allowed to do so and to encourage them to respect the silence of those who did not wish to talk about their practices. All teachers showed some sensitivity to the cultural and religious beliefs and practices of their learners. They all had an understanding that they needed to respect these beliefs and practices and this was frequently mentioned to me during discussions. Some teachers like Samkele, Mphety, Zama and Nsuku paid particular attention to the cultures of their learners and were considered most learner-centred in this regard (See Table 6.7 in chapter 6). Their learners came from different ethnic groups and were often only vaguely aware of some of the customs of other ethnic groups. These teachers felt that the group discussions enabled learners to inform one another of different customs. Jackie, Sipho, and Gogodi were careful about allowing learners who did not wish to participate in discussions about circumcision to remain silent and so were also considered learner-centred in their handling of cultural taboos amongst learners. Gogodi did not spend much time exploring learners' beliefs and practices and Sipho tended to spend time talking about the practices of his own ethnic Zulu group. Rennie and Riana were respectful of both religious and cultural beliefs. I viewed Thobz as the least learner-centred in this respect since, while allowing learners to express their views, quietly pushed a Christian perspective.

In conclusion, the case study teachers promoted cultural sensitivity amongst the learners regarding the beliefs and practices of other cultures, thus helping learners to demonstrate developmental outcome 3. In addition, teachers demonstrated the learner-centred characteristic of being sensitive to the cultural and religious beliefs and practices of learners. In comparing the cultural practices of different ethnic and religious groups, learners were learning about and comparing different interpretations of events. The case study teachers therefore did provide learners with the opportunity of achieving assessment standard 1 of learning outcome 3 for Grade 7, i.e.

> AS 1 Understanding science as a human endeavour in cultural contexts: learner compares different interpretations of events. (Department of Education, 2002a, p. 21)

Thus the case study teachers, by promoting cultural sensitivity, did demonstrate that in this regard they used learner-centred and outcomes-based approaches.

9.3 Language

I was interested in finding out in what way and to what extent teachers took into account learners' varying ability to communicate in English, the language of learning and teaching (LOLT). This would be an indication of the extent to which they were learner-centred with regard to accommodating personal differences amongst learners.

The schools represented in my survey all used English as the language of instruction. However only 13% of the survey teachers (n=5) said that English was the home (or first) language of most or all of their learners. English was an additional (second) language for most or all of the learners in the classrooms of 87% of the survey teachers (n=35). In Figure 9.2, one can see the distribution of survey teachers and their learners who had English as a home or additional language in township, city and suburban schools.

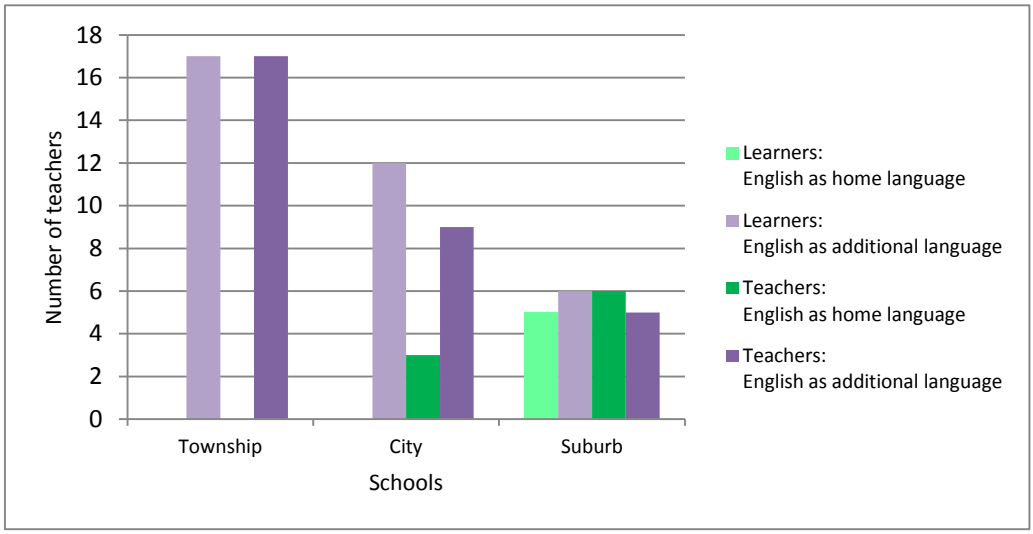


Figure 9.3: Number of survey teachers with English as a home or additional language and who had learners with English as a home or additional language (N = 40)

One can see from the graph the changing pattern of use of English as an additional or home language from townships to suburbs.

The survey teachers and their learners in the township schools all had English as an additional language. Setati and colleagues view English as an additional language if the language can be heard in the immediate environment of the teachers and learners and they have opportunities to acquire English informally through television, newspapers and magazines as well as by interacting with English speakers in their community and elsewhere (Setati, et al., 2002). The survey teachers' fluency in English as well as that of their learners would have varied depending on the extent to which they immersed themselves in English through reading, watching television and using English in their daily lives. In my multiple case study, four of these teachers i.e. Samkele, Mphety, Thobz and Nsuku appeared to be reasonably fluent in English whereas Zama felt less comfortable speaking in English and quickly reverted to isiXhosa in the classroom. Amongst these five teachers, their learners' ability to communicate in English also varied widely and the situation of some of the learners, particularly those from informal settlements, seemed more like the learners in Setati's rural schools where learners do not encounter much English in their immediate environment and only use English in the formal school context. Setati suggests that for these learners, English is a foreign language.

In the city and some suburban schools of the survey teachers, English was an additional language for learners and most teachers (including Sipho and Gogodi). Only three of these city teachers (including Jackie) and two of these suburban teachers had English as their home language. In these schools, there would have been a greater immersion in English than in the township schools with much more English spoken in their immediate environment.

Five teachers taught at predominantly English-speaking suburban schools; four of these teachers (including Rennie) had English as their home language, and one had English as her additional language (Riana).

In the seven schools in which case studies were conducted, one could clearly see the pattern described in the survey. The learners in the suburban school (Riana and Rennie's school) almost all had English as their home language, no matter which ethnic or population group they belonged to. In the city schools, only a few learners had English as their home language whilst most had the home language of their ethnic group, whether South African or from elsewhere in Africa. The two city schools (Gogodi and Sipho and Jackie's schools), which were formerly 'white' English or Afrikaans schools, had encouraged learners to speak in English from an early age and most of their learners were reasonably fluent in English. The greatest difficulty was experienced by the township children many of whom struggled to understand English, and for some, English was more like a foreign language than a second language. The schools in the district in which this research took place show a clear pattern of diminishing fluency in the LOLT, i.e. English, from suburb to township.

Fleisch, in his review of research linking language to achievement, concluded that learners' competence in the language of instruction affects their performance at school. He found that learners with English as a home language consistently perform better than learners with English as an additional language, and the less that additional language learners are immersed in English, the poorer their performance (Fleisch, 2008). Learners with English as a home language are, in the language of the situated cognition theorists, being inducted into only one new social practice, the practice of science (Lave & Wenger, 1991; Lemke, 1997), whereas learners who have English as an additional language are being inducted into both Science and English as a social practice. They have a double challenge and face a bigger struggle to understand and acquire new concepts. Lack of fluency in English, the LOLT, thus slows down the learning process (Fleisch, 2008). The dilemma for teachers is whether to promote the understanding and use of English during Natural Sciences classes since it is the LOLT or conceptual development through learners' home language.

Teachers in multilingual classrooms often use their learners' home languages to help them understand the concepts (Setati, et al., 2002). In the survey, teachers were asked what other languages they used to help their learners understand the concepts they were teaching if they had second language learners. Their responses, illustrated in Figure 9.4 below, reflected the wide range of languages spoken in the schools of one Gauteng district.

The most frequently used home language in the classrooms where English was an additional language was IsiZulu, followed by Sesotho and then Sepedi. Seven teachers did not identify the language/s they

were using beyond stating that it was the learners' mother tongue. The range of languages used in the multilingual classrooms of the case study teachers can be seen in Table 9.1.

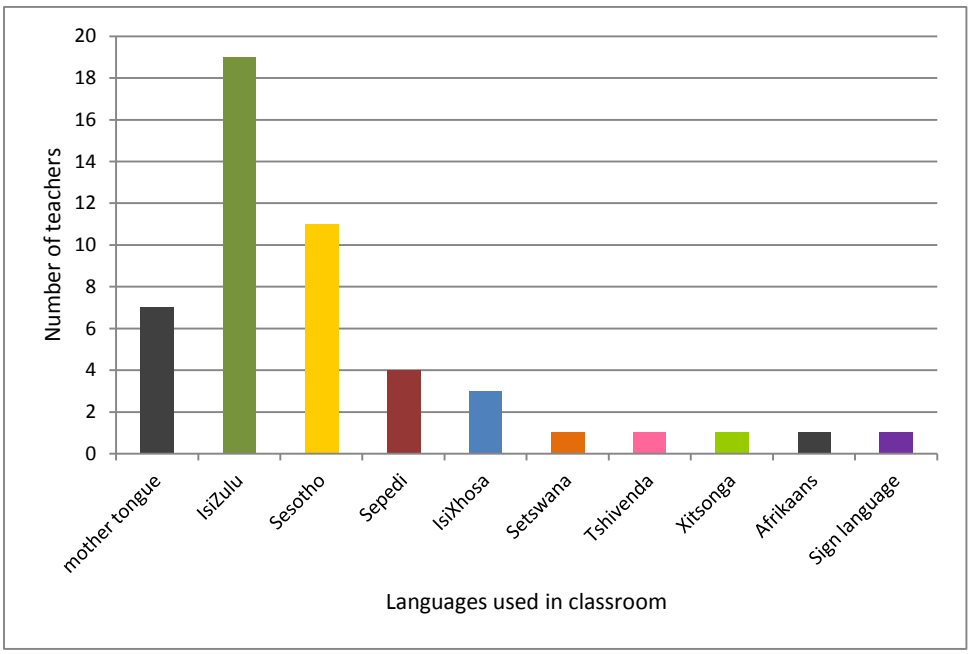


Figure 9.4: Languages used by survey teachers, in addition to English, when teaching Natural Sciences concepts (N = 40)

Gauteng is very cosmopolitan in nature and attracts people from all over South Africa and neighbouring countries. People growing up in multilingual communities are frequently multilingual themselves and so these teachers may have been able to switch from one language to another. One survey teacher claimed that she used five African languages in her Natural Sciences classes (T14), another claimed she used three African languages (T11) whilst a further twelve said that they used two African languages in their classroom in addition to English.

When the survey teachers were asked how they used learners' home languages, two teachers indicated that they only switched to the learners' home language as a last resort when the child was struggling, seven teachers claimed they translated from English to home languages, and ten teachers said that they engaged in code-switching between English and their home languages. Teachers said that they used code-switching in order to explain, interpret and clarify difficult concepts when they could see that learners could not understand. Thus one teacher said:

> If I am explaining something and I see that my learners are lost, I always use other languages. (T23)

Those survey teachers who saw their use of other languages as translations, said that they would explain new or difficult English terms in other languages in order to help the learners better understand the concepts that they were teaching. One teacher used mother tongue 'for emphasis'. Three teachers with English as their home language (T12, 28 and 50) said that they allowed the use of mother tongue in their classroom through peer teaching or they asked other educators to assist them with translations.

In my multiple case study I was able to observe the language practices of the ten case study teachers. They, like the survey teachers, addressed language difficulties in a number of ways which will be discussed below.

9.3.1 Learning biological terminology

Most learners found it fairly easy to deal with everyday discourse related to the topic of reproduction. They could give brief answers in English about changes during puberty such as hair under the armpits and in the private parts, breasts getting bigger, and the voice changing. However when it came to the biological terminology that forms part of the scientific discourse around human reproductive anatomy, they all struggled to some extent with learning new biological terms such as uterus, Fallopian tube, urethra and scrotum and remembering and using the terms. In Jackie and Sipho's classes, learners were expected to use their dictionaries extensively to help them learn new terminology and Jackie reported that although the children found the biological terms a bit difficult to learn, once they started working with these terms, they stopped using 'layman's language' and adopted the new terms in their written and spoken explanations. In other schools where English was an additional language, teachers had to rely on translating the terms into the home language of learners. Some teachers such as Nsuku resorted to repetition and chorus answers, for example:

Nsuku: The male hormone is called what?
Class: Testosterone
Nsuku: Testosterone
Class: Testosterone
Nsuku: Testosterone. Testosterone is a male hormone. (LT – 5/9)

Djite (2008) describes repetition and chorus teaching as well as code-switching as ineffective pedagogical practices, the consequence of making learners learn in a language that is not their home language. I do agree that chorus answers and repetition may do little more than help learners become familiar with and pronounce words in English rather than develop learners conceptually. However perhaps it is a start and helps learners to recall and use terms.

9.3.2 Understanding the worksheets

Some learners struggled to understand their worksheets. This was discussed briefly in the previous chapter (section 8.1.3.2) but I would like to extend the discussion. Mphety and Zama's school was one of the township schools where learners spoke very little English and experienced great difficulty in reading and understanding English. Mphety felt that the language in the module was a barrier to learning. She had to explain instructions and the questions and so their pace was slow.

> I noticed that the material, the pamphlet that you gave us, the language level is very high and I noticed that it is too long, because their pace is very slow. Sometimes we have to explain even the question. You read the question to them, you read the instructions, because if you want to carry on, you cannot just leave them without understanding because at the same time they have to answer those questions if you assess them.... I went to the Soul City book, the grade 7 one, then I found the simple one, so that they can cope because at the end of the day I cannot say they did not achieve, I

have to see that the level is suitable for them or the level it is too high. And the pace was very slow. (I - Mphety)

One of the problems that Fleisch (2008) identified, where learners had poor English language skills, was that the learning process became very slow if learners were using learning support materials written in English. Mphety tried to solve the problem by using the Soul City book with a language level far more suited to her learners. For her, it was important that they could grasp some of the concepts and thus demonstrate learning of Natural Sciences concepts. Jackie however took a different view with her learners who were much more fluent in English than Mphety's learners. She considered it important for the language of her worksheets to be challenging, and did not feel this hindered learning of Natural Sciences.

I think I'd rather set higher than lower. And let me tell you, when it came to actually now labelling a diagram, they used the proper terms ... oviduct and vas deferens or the endometrium. So they're using those terms. My big problem was, did they understand when they're talking about ... e.g. endometrium - ... could they visualise? ... So I found that most of them could do that. They did fairly well for their assessments. (I - Jackie)

Both teachers were addressing the learners' language needs in different ways, depending on what they felt the learners were capable of.

All learners cross borders when moving from their everyday knowledge to a more scientific understanding (Aikenhead & Jegede, 1999). In my study learners needed to cross borders from their everyday knowledge of human reproduction to a basic knowledge of reproductive anatomy and the functions of reproductive structures However border crossing is made much more difficult when there are language barriers. Mphety, in her classes, had to go through the painstaking process of helping her learners understand the English language and the biology concepts. This took a long time and so she wisely selected much simpler material (in terms of language and concepts) so that her learners could at least make some progress.

9.3.3 Code-switching and teaching in learners' home languages

Code-switching between English and learners' home languages was commonly used by both teachers and learners in order to help learners understand the concepts. The extent of the code-switching depended on teachers' perceptions of how much English their learners understood.

In classes where learners had very poor English language skills, teachers made more extensive use of their home language to help their learners understand the concepts being taught, rather than continually switching back and forth between home languages and English. Zama for example sometimes used English particularly when explaining notes that he had written in English on the chalkboard. However, he chose to conduct most of his lessons in his own language i.e. isiXhosa and felt the predominantly isiZulu speaking class would understand him. From their responses, it was clear that the class did mostly understand him, probably because they were multilingual or spoke an amalgam of languages. He gave his reason for using isiXhosa as follows.

> Similarly they can't read. They can't understand the questions as well. Some of them. ... So that's why sometimes I had to explain to them in the language that will be easy for them to understand. ... At home I believe they just speak their own languages. Some do not understand English. (I - Zama)

Mphety, who taught in the same school as Zama, used more English in her class but also provided explanations in learners' home languages particularly when she moved around to groups.

> I usually say to the person, what is your name? The person says "I am 12 years old". You can see that there's something wrong. That means the person can't read there or do not understand the question. So you want at least for them to achieve something if you must move around the group... Yes, because if you do not do that (*making sure they understand the task)*, if they submit their books, there are no answers.... So that's why sometimes I had to explain to them in the language that will be easy for them to understand. But now when they translate it to English it is very difficult for them. ... they just speak their own languages at home. (I - Mphety)

Learners in Mphety's classes struggled not only in reading but also in writing and simply understanding the English she spoke:

> ...at the end of the day I, as an educator, have to explain and translate if possible. But the language it is a barrier. ... Because it is not their home language. I try to explain using their mother tongue. ... It is very important to explain using their language. Learners are not in the same level. (I - Mphety)

Mphety was very aware of different levels of competence in English, the LOLT, amongst learners, and that many learners in her class could barely speak English. Her learners came from informal settlements, backyard shacks and over-crowded homes in the poor communities around the school and their contact with English was often fairly limited. She chose to provide explanations in the learners' mother tongue, possibly in an amalgam of African languages. She also allowed learners to speak and explore concepts in their home languages during group work.

> Yes, because when they talk in groups, they just talk in mother tongue. .... at least the knowledge is there when they are busy talking because this one says this and this one says, "No, it is like this" when they express themselves in their mother tongue. ...I thought the group work is the best. (I - Mphety)

When learners held discussions in their groups in the language they were most comfortable in, they seemed to engage far more vigorously with one another's ideas, challenging one another and helping one another move through their zone of proximal development as they worked out answers to questions in the activities.

Samkele spoke mostly in English but switched to Sesotho and/or isiZulu (Table 9.1) to translate what she had said or to elaborate, tell jokes, or sometimes tell a story. She explained why she did so.

> I spoke in English but there were times I switched to Sotho and Zulu because they are mixed classes. They spoke back to me in Sotho, Zulu, or in English. We've got only two home languages in our school.
>
> *(I: When did you switch to their language?)*
>
> When I wanted to stress something too. When I wanted to make sure that they understand properly. I would use English and interpret it in their home language to make sure that they understand this. ... With their home language to make sure that they get a clear picture of this. Remember in language there are words you can speak in English, but you want to stress them in your home language and they do not sound the same. (I - Samkele)

Nsuku code-switched continually, translating between English and Sepedi. For example

Nsuku: There is a special fluid that helps the sperm move in a long swim to the egg cell... Do you know what's a fluid?
Class: No
Nsuku: Ga le tsebe ke eng? *(Fluid, do not you know what it is?)*
Class: Rea tseba! *(We know it!)*
Nsuku: Ke eng ngwanaka? *(What is it my child?)* What is a fluid?
Girl: Something like water.
Nsuku: Something that is like water? Akere! *(Right!)* Fluid?
Class: Yes (LT – 5/9)

Nsuku: You see the scrotum down there?
Class: Yes
Nsuku: It covers the testes. Ke tsona tse di akaretsang di testes, akere. *(It covers the testes, right!)* A kind of muscle Ke tsona tse di akaretsang marete *(These are the ones covering the balls)*. And ... ke tsona tse di akaretsang mo *(And it's what they are covering)*
Class: *(chuckles)*
Nsuku: Ke di eng? *(What are they?)*
Boy: Balls
Nsuku: Haai ... scrotum. (LT – 5/9)

Code-switching by the teacher was evident in all classrooms where English was not the home language of both the teacher and learners, but was most frequently used in the township schools where learners struggled to understand both spoken and written English.

Learners tried to express ideas in English, but quickly switched to their own languages when communicating with one another or their teacher, when they felt they were not making themselves understood. Samkele expressed the learners' position as follows.

I can't put this in a foreign language. Yes, I know English, I want to put it in English, but I can't stress it the way I want to in my home language. (I - Samkele)

In conclusion, learners with English as an additional language often used English when using more formal scientific discourses for example when giving a biological name or using a phrase to describe a process (egg moves along the oviduct) but tended to switch to their home languages for everyday discourses when engaged in explanations, elaborations and particularly when a subject was getting on to sensitive issues like abortion or circumcision. We see here that teachers code-switched in very different ways, but in ways that both suited them and that they felt matched the language levels of their learners.

9.3.4 Concluding remarks: Using learner-centred approaches and achieving outcomes with regard to language

In Chapter 6, section 6.4.5, I briefly looked at one of the characteristics of a learner-centred teacher, i.e. whether teachers accommodated personal differences amongst learners. Table 6.7 shows the extent to which I felt teachers were learner-centred in their approach with regard to addressing

language differences in the multilingual classroom. I considered Samkele, Mphety, Zama and Nsuku as the most learner-centred of my case study teachers in this regard because they paid attention to personal language differences and in particular the needs of those who were struggling with the English language. They did so, as discussed in 9.3.3, by conducting most of the lesson in a home language understood by the learners (Zama), by code-switching continually (Nsuku) or by code-switching during activities or when clearer explanations were needed (Samkele and Mphety).

Sipho was a fluent English speaker and chose not to code-switch, because like Gogodi's learners, his were mostly fairly fluent in English. When learners' questions or comments were in their home languages, he responded in English. Jackie and Rennie had English as their home language, whilst Riana had Afrikaans as her home language but was fluent in English. Jackie spent time helping learners to grasp scientific terms by providing definitions for concepts within their notes and by encouraging them to use their dictionaries to find the meaning of words. I did not observe Jackie, Rennie and Riana at any stage speaking an African language. Jackie had mostly African learners in her class and Rennie and Riana had only a few African learners. Presumably like many Whites in South Africa, including myself, they could not speak an African language sufficiently well to use it in their teaching. Nor could they address learners in any of the other languages in the class except in Afrikaans. Thus the one Taiwanese boy simply listened and smiled throughout his lesson, while the rest of the group tried to help him make sense of the lesson. However this is perhaps an unfair way of deciding on whether these teachers were attentive to their learners' language needs since in Rennie and Riana's classes almost all the learners were fluent in English and thus the teachers were responding to their particular language ability by only using English. As has been mentioned previously, the use of either English or learners' home language to discuss biological concepts was evident in all classrooms amongst most learners and thus critical outcome 5, communicating effectively using language skills was achieved at a Grade 7 level amongst most of the learners in the case studies.

Perhaps most importantly the question of whether the language used in the classroom allowed learners to talk about the biology concepts, to argue, question and explain to one another is pertinent. Could learners' discussions in whatever language they used help them to resolve cognitive conflict and allow them to accommodate new biological concepts? Did the teacher scaffold the development of new concepts in a language that learners could understand, thus assisting learners to progress through their zone of proximal development with regard to acquiring new understandings of human reproduction? The learners in township schools were truly at a disadvantage since their Grade 7 exams and tests would be in English, as was all the teaching and learning material. The dilemma remains – to focus on English as the language of power and to hinder conceptual development or to promote conceptual development and leave learners unable to communicate in what is increasingly a global language (Setati, et al., 2009). The case study teachers took what action they felt was most effective to address this dilemma.

9.4 Personal factors

A final aspect that I considered here was the extent to which teachers considered, respected and accommodated the personal side of each learner's life e.g. their ideas and interests and their distinctiveness and uniqueness. This would provide evidence of one aspect of learner-centred teaching. In this section I therefore look at how teachers addressed learners' personal needs, interests and concerns, their different developmental levels and rates of learning, learners' embarrassed responses to the discussion of certain topics in the presence of members of the opposite sex, and how they addressed the personal anguish of children who were being molested.

9.4.1 Personal needs and interests of learners

Learners came from a wide variety of socioeconomic backgrounds and their home backgrounds, while they might be similar in some cases, would always be unique to a learner. In addition, each learner was distinctive and unique. I was therefore interested in how these personal differences were allowed for and used to enrich feedback in class from learners. Gogodi, a mature and experienced teacher, and Zama, a young and inexperienced teacher, were both quiet and dignified in their manner, and listened carefully to their learners. Both Gogodi and Samkele used humour in relating situations to the range of circumstances in people's lives, emphasising that it was okay to be different physically or to have different financial circumstances, and discussing how one copes in these circumstances. Zama listened carefully to learners' ideas, stories and concerns and they spoke to him personally after lessons. These three teachers showed a particular respect for, and interest in, learners' ideas, interests and concerns. There seemed to be a deeper connection or empathy in the way in which they treated questions. The remainder of the teachers seemed slightly less learner-centred in this regard, with Mphety and Thobz being considered the least learner-centred amongst the case study teachers in addressing the personal needs of learners (See table 6.6 in chapter 6). Their focus was on controlling the class (Mphety) and conveying a moral message (Thobz).

9.4.2 Rates of learning

There is frequent reference in the National Curriculum documents to different rates of learning being catered for. Children learn at different rates and a feature of a learner-centred approach is the teachers' ability to provide opportunities for learners to learn at a rate that suits them, extending the gifted child and allowing the slow learner opportunities to catch up. In the more radical forms of learner-centred education, each learner would work at their own pace, resulting in learners throughout the classroom working on different tasks. This style of teaching was not evident in any classrooms I observed. Nor was I aware, in any lessons, of special tasks being given to gifted learners. I only observed one case study teacher, Gogodi, providing one class with special group tasks because they were ahead of her other classes. The large sizes of the classes meant that it was very difficult for teachers to address different rates of learning with differentiated tasks.

9.4.3 Developmental levels

The national Department of Education (Department of Education, 1996a) proposed that while promoting knowledge, skills, attitudes and values, the teacher should be also be taking into account the developmental stages of the learners. In the learner-centred approach there is the assumption that individuals progress at different rates through stages of physical, intellectual, emotional and social development, the rate being determined by genetic and environmental factors, and that people's thoughts are different at different developmental stages (McCombs & Whisler, 1997; Schiro, 2008). Teachers would need to cater for these individual differences. The difficulty, at a grade 7 level, is that learners reach puberty at different ages so even if their physical age is the same, their emotional age in relation to the topic differs. In particular, girls generally enter puberty before boys and therefore develop physically and emotionally at an earlier age. In addition there is still a fairly big age range in some of the classes, although most learners are between the ages of 12 and 14. Most of the case study teachers were sensitive to differences amongst learners.

The most evident differences were the young boys in the class, mentioned in previous chapters, who did not yet seem to have entered puberty. These boys, often still small, appeared to find the subject matter embarrassing, and tended to cluster together in some classes, lower their heads or cover their eyes and remain silent. At the end of one of his classes, I asked Sipho about what appeared to me to be a huge difference in maturity in his classes. I was particularly interested in some very little boys who appeared to withdraw from the class. Sipho asked if I had noticed that they appeared to be sleeping. He said that it is not that they were not listening but they were immature and so tried not to be noticed. He said they were being exposed to things they knew nothing of and so remained quiet, but outside of class discussions they asked him some very perceptive questions. Both Jackie and Riana also talked about these young boys. In Jackie's class they remained very quiet and shy and would not volunteer any opinion even if asked. Like Sipho, she thought they were curious but not willing to participate. They were not quite ready for this topic. The case study teachers were responsive to this situation, allowing them to remain in a group they felt comfortable with and not pushing them to participate in class discussions. In Riana's multicultural classroom, she reported that:

> There was this one group, three little Black boys, they never talked loud, always sort of whispering, that's their way of dealing with their sexual awareness, and I did not want to put them into the other groups, because I know them. If I put them into the other groups, the other groups are going to completely take over their way of thinking. That's why I did not put them all together. (I - Riana)

While some young learners remained silent during classroom discussions, teachers reported that many who were just entering puberty or anticipated doing so, had questions;

> And to the young ones there were many exciting questions because they were still looking forward to this. So their questions were sort of, I'm excited to know this, I'm anxious to know this. And the others you could understand their questions were at different levels. Others were asking out of experience, others were asking out of anxiety, I'm anxious to know this. Others asking, this is happening to me. Can I know about this? (I - Samkele)

Rennie felt that class and one-on-one discussions between him and his learners was particularly beneficial for the younger boys since it enabled them to ask questions if something was bothering them and find out information from him rather than just their peers.

> But the ones that are really less informed are the ones that will ask, and it is generally the more immature kids that will ask. And then you get those kids now that hear things and they want to find out whether it is true. And that also comes from the younger ones, the less mature kids. They would like to find out now for example, they've not gone through that phase of having wet dreams yet and so they are wondering now, what is this wet dream people are talking about? So they will ask. But the guy that is having wet dreams now he knows it, he's not going to ask. His concern will be, is it healthy or not healthy? (I - Rennie)

Learners who had gone through puberty tended to sit back a little, and only answer some questions. Samkele noticed that these more mature learners were sometimes surprised at the questions of those still entering puberty, having forgotten there was a time when they too had those questions. Rennie noticed that the more mature children would ask fewer questions but would happily answer questions from their classmates.

Girls were, typically, more mature than the boys in the Grade 7 classes observed. Rennie noted how this affected the types of questions asked.

> So the kind of questions they (the girls) asked were more mature questions, questions that related to their bodies, and questions that would relate to problems like when you have sex or have children at an early age. Whereas boys, no, they wouldn't ask that kind of questions. Their questions are mostly about what happens if you have a wet dream or if your penis is not too big. Those are the concerns of boys. But girls are more mature in their approach and they will ask things that are more life orientated. (I - Rennie)

Riana picked up another difference in her class, i.e. the 'Black' boys in her class were more open about, and tended to know more about, sex and sexual diseases, than the 'White' boys of the same age. She wondered if they were more exposed to all this information. She did not see any difference amongst the girls.

9.4.4 Children who have been molested

The rate of child molestation in South Africa is very high across all socioeconomic groups. This means that the topic of human reproduction may create a great deal of stress for such children. Gogodi, for example, thought she had several children who had been molested.

> Yes. Although it is very difficult to identify them, some you'll notice those who withdraw, maybe at first the child is always asking questions or responds positively, then later on the child starts withdrawing. … now the child has changed their attitude, … the child does things that are very strange to you. (I - Gogodi)

Gogodi addressed the issue by talking to her classes about rape and responsibility, how children could get help and how they could prevent it.

Samkele likewise encountered this issue when talking about virginity.

> And one lesson that made me feel bad was the one they were asking about virginity. I realised ... there are girls who are being sexually abused, and the one girl asked me … I was explaining to them about virginity that virginity is only once. And she just raised her hand and said, ma'am is it possible to regain your virginity? I said, no. It was tense in the class. ... So that day I felt bad. I felt like a parent, I wish I could help them, I wish I could save those who already have been abused, or I wish I could bring back their virginity, those who already lost it without knowing it, and I wish I could save those who have never done it. It was so tense. (I - Samkele)

Teaching this topic raises painful emotional issues which can deeply affect a teacher, as it did Samkele. The challenge for the Natural Sciences teacher is to deal gently with such learners, and to provide them with space, respect and understanding without indicating that they in any way differ from other learners. In doing so, they provide a safe emotional environment for these learners while addressing their personal needs, all evidence of their use of important aspects of learner-centred approaches.

9.4.5 Girls and boys – embarrassing moments

Sipho, Jackie, Samkele, Thobz and Nsuku had mixed groups in their classes; Mphety and Zama had some mixed and some single sex groups, and Gogodi, Rennie and Riana had separate boy and girl groups.

At each stage of studying the body there was some level of embarrassment. The children giggled, shuffled their chairs, passed comments or turned away when, for example, viewing pictures of the change from naked boys and girls to mature men and women. The code of conduct drawn up by most classes was very helpful in that learners together had made decisions on what would be appropriate behaviour in a potentially awkward topic and either the learners or the teacher enforced these rules.

When the topic moved from external physical changes in both men and woman to the structure and function of the male sex organs, the boys felt particularly awkward. Samkele reported on her and her class's response to this topic:

> And then we moved on to talk about the male reproductive system. That's when they saw a penis, the scrotum. That was the day when I saw that, eish, I've put my children in a corner. Really they wanted to continue with the lesson, but they felt … it's like this teacher is selling us now … why us? This is us. It is quite sensitive. ... Ma'am can we have the female one? ... why does it have to be us. (I - Samkele)

Gogodi also found that the older boys in her class objected to her starting with the male sex organs.

When the topic moved to the female sex organs some of the girls in both Gogodi's and Samkele's classes also objected to an open discussion of menstruation, as discussed earlier, and this needed to be addressed with these learners before the class could continue. Riana found that boys and girls enjoyed learning about one another. She said that while they had heard of or had a basic knowledge of menstruation for example, she thought it was "quite an eye opener" for the boys and the girls to learn more e.g. about menstrual pains, the development of breasts, and wet dreams. She said that they did not know these things. Riana felt that the open discussion in boy and girl groups about issues like

menstrual pain, wet dreams, and differing rates of development as well as differing sizes of breasts and penises, helped her learners to realise they had similar concerns and as a result they felt less alienated.

> And I think when they talk to one another and actually realise - listen, she's also having menstrual pains or she's also feeling bad about her breasts not being as big as the rest, and then I do not feel as alienated if they know. Ok, I'm not being singled out, we all feel the same. And especially the boys. The boys they do not talk … they talk about the girls, but they don't talk about their own sexual development and stuff like that. They're a strange species, they really are. Ok, and if they know you're having wet dreams and I'm having them, at least they feel part of a group and they don't feel singled out. (I - Riana)

Most of the case study teachers reported that as learners became more familiar with the topic of human reproduction, they began to treat the names and functions of reproductive organs as the norm rather than a taboo topic. They became less excitable or less reticent, and more mature in their responses as they proceeded through the module. Teachers found that by carefully addressing aspects of human reproduction that learners initially found embarrassing, they were able to gradually 'normalise' the discussion of male and female structure and function. They used learner-centred approaches to do so by providing a safe social and emotional environment for discussions, and addressing the needs and interests of learners (RQ 1). Thus a factor that could have blocked the teaching and learning of human reproduction, i.e. learners' embarrassment about, and unwillingness to explore important aspects of male and female functioning, was addressed by teachers in ways that advanced their teaching of human reproduction (RQ 2).

9.5 Conclusions

Every learner is unique and they have unique life experiences which help to shape their identity. However when one looks at what teachers had to say and what was observed in the case study schools, certain trends and differences emerged.

Learners differed in their prior knowledge and this was influenced by their level of maturity, their life experiences, their closeness to or distance from their traditional roots, and the influence of initiation schools, programmes on sexuality in schools, the media, their peers and their extended families. The media and peers seemed, according to my observations and the comments of the survey and case study teachers, to be the source of most of learners' everyday ideas about human reproduction. My observations indicated that members of the family such as siblings and cousins were also important sources of information since learners often referred to them ("my cousin said.."; "my sister told me..."). Mothers talked to their daughters about menstruation while fathers contributed little to any discussion of this topic. The case study teachers did not seem at any stage to consider learners' ideas a threat, although some of them, like Gogodi, were nervous about what would emerge in discussions before they started teaching the topic. A further source of learners' prior knowledge about physical and emotional changes was the learning area Life Orientation, but learners did not grasp the biological basis for these changes, according to Riana, until they studied it in Natural Sciences. Teachers were

mostly effective in helping learners to think critically about their prior knowledge, and then to start to construct new knowledge (LO 2). However, as has been mentioned, teachers who perhaps did not have sufficient biological knowledge struggled to move on and build new concepts adequately so LO 2 was only partially achieved by their learners. Teachers' use of learners' prior knowledge therefore contributed positively to engaging in the topic of human reproduction (RQ 2) and doing so in ways that allowed the achievement of some outcomes in learner-centred ways (RQ 3).

Teachers were very sensitive to cultural differences and encouraged learners to find out more about one another's cultural beliefs and to respect different cultural views, thus providing learners opportunities for demonstrating their achievement of LO 3 (RQ 3). Eight survey teachers did express concern about the discussion of certain cultural practices such as circumcision, and the case study teachers in township and city schools found that topics such as menstruation and circumcision evoked a wide range of responses from hostility, anger, passive resistance and silence (from those affected) to enthusiastic interest from those who would not be affected e.g. from boys about menstruation and from girls and boys who did not plan to be circumcised, about initiation practices. Teachers had to wisely address learners' sensitivities and did so, once again demonstrating they were responsive to learners personal needs, another learner-centred characteristic.

Learners only occasionally made use of a religious perspective, for example abstaining from sex before marriage, and so this was not an important learner factor affecting what could or could not be discussed in class.

The use of English as the language of teaching and learning was an important factor in slowing down the rate of learning in some classes where learners struggled to communicate in English. Teachers used various strategies for assisting their learners to understand the English e.g. translations and code-switching. The survey teachers believed that the use of English in schools where it was not the home language, and in particular in township schools, would affect their teaching of human reproduction and this was evident in classes in the townships where case study teachers were trying to teach both concepts and language – a double task. These teachers had to make decisions about when to code-switch or teach in a home language and they took whatever decisions they felt were most appropriate, Each decision had its pros and cons, but my perception was that for an important topic like reproduction, learners needed to feel comfortable talking about it, and if their English speaking skills were poor, then teaching and learning in their home language would be more responsive to their personal needs.

Teachers were considerate of other personal factors such as learners' developmental levels and topics they did not wish to talk about. They were mostly quite reflective about what was needed and what should be done in order to assist their learners to learn about human reproduction in outcomes-based and learner-centred ways.

In my final chapter, I will reflect on my findings and discuss the implications of these findings for practice.

Chapter 10
Discussion and Implications

My study took place at a time of curriculum change in South Africa. The Revised National Curriculum Statement had, in the previous year, replaced Curriculum 2005 at the Grade 7 level, and content had been specified within phases and strands of the Natural Sciences curriculum but had not been specified at grade level. Human reproduction had been introduced to the Life and Living strand of the Senior Phase (Grades 7-9) level. In one district in Gauteng in 2006, the Natural Sciences Grade 7 teachers indicated that they believed it was important to teach some aspects of human reproduction to Grade 7s. They agreed, with the support of their Natural Sciences subject advisor, to teach certain topics in human reproduction relevant to the Grade 7 age group in 2007.

These teachers were expected to teach their science topics using learner-centred approaches in ways that would allow learners to demonstrate the critical and Natural Sciences learning outcomes at a level appropriate for Grade 7s. I was interested in whether Natural Sciences teachers could do so when teaching human reproduction. Human reproduction is potentially a very sensitive subject for teachers, learners and their parents or guardians. In addition, teaching towards outcomes using learner-centred approaches is a complex and multifaceted skill and the ability to teach in this way depends on both teachers' beliefs and more directly on personal (internal) and other (external) factors that influence what a teacher is able to do, or believes she/he is able to do in the classroom. I therefore set out to investigate the following questions:

1. To what extent do Grade 7 Natural Sciences teachers use approaches that are learner-centred and outcomes-based during the teaching of human reproduction?
2. What factors influence the teaching of human reproduction to Grade 7 learners?
3. What factors affect the use of outcomes-based and learner-centred approaches during the teaching of human reproduction?
4. How do teachers' behavioural, normative and control beliefs affect the teaching of human reproduction in outcomes-based and learner-centred ways?

In this final chapter, I draw together the various strands of my study in order to conclude on my research questions and outline implications for other similar studies and for teachers teaching human reproduction to Grade 7s.

10.1 The use of outcomes-based and learner-centred approaches to teach human reproduction (RQ 1)

The first question I asked in my research was whether teachers were using approaches that were learner-centred and led to the achievement of the critical and Natural Sciences learning outcomes, i.e.

were outcomes-based. I explored my findings in this regard in Chapter 6. I did not expect learners to be demonstrating their achievement of all the outcomes within the short period over which they were learning about human reproduction, and expected more focus to be placed on some outcomes that could be more easily achieved while teaching human reproduction.

Firstly, I found that the case study teachers did not have any clear concept of what an 'outcomes-based approach' is. The idea that it referred to teaching and learning that was driven by the outcomes was not mentioned by any teachers. Teachers' lack of clarity on what it means to teach towards outcomes was a common problem throughout South Africa according to the task team appointed by the Department of Education to review the National Curriculum and its implementation (Dada, et al., 2009; Fleisch, 2008). In the review, the task team reported that teachers found the curriculum documents vague with regard to the sort of input that would lead to the outcomes and requested more explicit direction on how to teach and what to teach. In my study, some of the case study teachers did realise that the 'how' of teaching towards outcomes involved learner-centred approaches. Their notions of learner-centred approaches included the children doing the work themselves, carrying out investigations and having discussions. Two teachers who could not explain an outcomes-based approach were not concerned, they believed that following the teaching and learning materials provided (i.e. the module or textbooks) would ensure that they were teaching towards outcomes. Like Stoffels' teachers (2008), they relied on the expertise of the providers of learning support materials (LSMs) to ensure they were teaching towards the outcomes using learner-centred approaches.

I investigated whether teachers, through using learner-centred approaches, did provide opportunities for their learners to achieve the five critical outcomes and three Natural Sciences outcomes that I investigated. I found that the results were variable, both for the achievement of each outcome by the ten case study teachers taking part in this multiple case study, and for the achievement of the outcomes by each teacher, as seen in the teachers' profiles (Appendix 6).

The extent to which teachers enabled learners to demonstrate the critical and learning outcomes partly depended on the focus in the LSMs they were using. Thus, for example, there was more evidence of effective group work (CO 2) by the learners in most case studies since these teachers used the activities in the module which were designed to promote interaction amongst group members. There was less evidence of problem-solving and decision-making using critical and creative thinking (CO 1) since the activities on human reproduction were not as clearly directed towards this outcome, and teachers did not, in most cases, give additional tasks that would address this outcome.

Then when one looked at individual teachers' profiles, one could see that some teachers were strongly outcomes-based with regard to certain outcomes and not with regard to others. I will use Jackie as an example of this. Jackie's approach focussed on encouraging learners to recall meaningful knowledge (LO 2, AS 1), collect further information through investigations (LO 1), organise and manage themselves (CO 3) and the information they collected (CO 4), construct new knowledge from what they knew and what they found out (LO 2, AS 2), and communicate their findings verbally to the class and in written work (CO 5). There was however little effective team work in most of her lessons

(CO 2), until her learners carried out their research project on STDs. There was also not much evidence of problem-solving leading to decision-making (CO 1), although Jackie did encourage learners to make responsible decisions concerning sexual activity in their own lives. With regard to learner-centred approaches, her strengths were her scaffolding from prior to new knowledge through extensive questioning and challenging of learners' ideas, her encouraging learners to collect information from human, material and electronic resources, and her development of learners' verbal/linguistic intelligence. This was where she placed her emphasis in this module. She did not cater for the kinaesthetic and tactile learner, for those with bodily-kinaesthetic intelligence, and she paid more attention to intrapersonal than interpersonal intelligence, developing the latter only in the research project. She paid attention to and accommodated learners' personal differences but was unable to participate in any code-switching to accommodate any learners with a poorer grasp of English. Using Jackie, one of the most outcomes-based and learner-centred of my case study teachers, as my example, one could therefore only say that teachers were outcomes-based with regard to certain outcomes, and learner-centred within some but not necessarily all categories when teaching human reproduction. I did not find, nor did I expect to find, any teacher who was 'perfectly' learner-centred or outcomes-based on my scale of assessment. It is important to remember that this assessment of teachers relates only to the context of teaching human reproduction. The same teachers may change their approach with another topic, for example they may cater for the tactile learner if they were using models during a lesson on the Earth's orbit around the Sun.

My findings were therefore that some of my case study teachers were more outcomes-based and learner-centred than others when looking at their overall position on the profile; and that they showed different strengths as learner-centred and outcomes-based teachers. Their profile was not an indication of 'good' or 'bad' teaching, but rather an indication of their ability and willingness to use approaches that were currently in favour in the national curriculum. Teachers' ability to teach human reproduction effectively was affected by a number of factors. I have discussed these factors in some detail in Chapters 7-9 and will review what I consider to be some of the most pertinent factors below and will consider their implications for teaching.

10.2 Factors affecting the teaching of human reproduction (RQ 2)

In my research I examined two groups of factors, those 'internal' or personal to the teacher, and those external to the teacher, i.e. the learning environment in which the teacher worked, support structures available to the teacher and the learners themselves. I will look at only some of these factors, i.e. personal and professional factors, the use of prior and everyday knowledge, and the language dilemma, in the discussion below.

10.2.1 Personal and professional factors (teachers)

Several factors that I have labelled as 'personal' affect the teaching of human reproduction. One of the factors mentioned in the literature that affects a person's ability to carry out a particular action is their self-efficacy i.e. their belief and thus confidence in their ability to perform a particular behaviour

(Bandura, 1991). Teachers who had a greater sense of self-efficacy i.e. a greater confidence in their ability to teach human reproduction, such as Riana, Samkele and Jackie, enjoyed the challenge of teaching this topic and readily engaged in doing so. They displayed greater confidence in the classroom, engaged more fully in teaching this topic and taught this topic in their own unique ways with greater enthusiasm and confidence. However external factors intruded which affected some teachers' sense of self-efficacy, as in the case of Mphety whose initial confidence was crushed by the poor physical environment (no desks), limited resources, lack of discipline, and other factors that contributed to teaching and learning being very difficult in her classroom.

One of the internal factors that contributed to the case study teachers' sense of self-efficacy was their content knowledge. Knowledge about human reproduction, whether gained through their tertiary studies, through teaching human reproduction in other grades and learning areas, or through their reading up on the topic on the internet and in books, seemed to contribute to their confidence when responding to learners' questions and their notion that they had control (their control beliefs) over interactions during the teaching of human reproduction. While Anástacio and Berger found that teachers who had higher academic qualifications and/or training in sexuality education had less difficulty in teaching sexuality education (Anastácio, et al., 2004; Berger, et al., 2008), one could not easily draw such conclusions in my study. The survey and case study teachers had a wide range of qualifications with very different curricula. However most of the survey teachers who had biology in their degree or diploma, including six of the case study teachers, indicated that they felt confident about teaching human reproduction. A further two case study teachers (Zama and Thobz) who did not have biology in their tertiary qualification also indicated in the survey that they felt confident about teaching human reproduction. However Zama was constantly anxious about the correctness of his content, and Thobz tended to avoid teaching biological content. Only Rennie and Sipho indicated that they were not confident as they anticipated teaching this new topic.

There did therefore seem to be a problem for teachers with less content knowledge on human reproduction. While many teachers had read up on the subject for their own interest, or because they were now teaching the topic, a more rigorous exploration of the anatomy and physiology of the human reproductive system was needed. The less background teachers had, the less they were able to provide coherent and accurate responses, as seen in some of Sipho's assertions which were incorrect. Without a fairly comprehensive and accurate conceptual structure, teachers like Sipho were unable to construct logical responses to some of their learners' questions, and to identify misconceptions.

While a teacher's subject expertise in South African primary schools has been shown to only have a small positive impact on teaching and learning (van der Berg, et al., 2011), it appears that teaching Human Reproduction at a Grade 7 level, the start of the senior phase of the GET, requires that teachers have more comprehensive subject content knowledge than would be required at lower grades. Anastácio, Carvalho and Clément's findings concerning more qualified Portuguese primary teachers (through tertiary studies and/or sexuality education training) having fewer difficulties when teaching sexuality education are relevant here. It seems that subject content is something that INSET and PRESET trainers need to pay attention to. At the end of my workshop, some teachers came to me

and expressed regret that we had not spent time looking in depth at the anatomy and physiology of the reproductive system. They wanted to know more so they could answer their learners' questions. INSET workshops in which teachers explore the biological aspects of the reproductive system, and in which they can share the sort of questions learners put to them and the responses they think are appropriate, are needed. The strengthening of teachers' content knowledge as well as acquiring ideas on how to teach human reproduction through such workshops would make a difference in developing their confidence with regard to their teaching of human reproduction. In addition, attention needs to be paid to a thorough exploration of content during PRESET in order to ensure that new teachers enter schools with a stronger sense of self-efficacy regarding the teaching of human reproduction.

The influence of cultural beliefs on a teacher's practice was another point of interest. The teachers in my study came from a wide range of cultural backgrounds but were also influenced to differing extents by the type of urban culture in which they grew up or to which they came at some stage of their life. Sipho, Zama and Samkele for example indicated that they had grown up in rural areas and moved to Gauteng as adults. In the survey, most of the teachers who responded did not feel that culture would influence their teaching of human reproduction but four teachers did refer to the difficulty of talking about sex and topics they would avoid. In the case studies, it was not evident that culture played any significant role. While teachers like Gogodi were nervous of addressing some topics that were not discussed openly in their culture, their behavioural belief that it was important to teach human reproduction to the current generation of Grade 7s usually overrode these cultural influences. Gogodi, for example, found it difficult to use the biological terms for the reproductive parts, a taboo in her own and many other African cultures (Helleve, et al., 2009; Mbananga, 2004). However she chose to overcome these cultural influences, using these terms in her teaching and insisting on the children using the biological terms in English. Her belief in the value of teaching human reproduction to these children took precedence over cultural inhibitions. Samkele's position on abstinence, which she encouraged in class, was influenced by both her cultural and religious beliefs on the importance of virginity for a girl.

Religion seemed to play a greater role in some teachers' approaches. Yaseen, for example, a deeply committed Muslim who had great misgivings about whether it was religiously acceptable to teach this topic, needed advice from his religious elders before he felt comfortable enough to teach this topic. As with teachers elsewhere (Berger, et al., 2008), both Yaseen and teachers with strong Christian beliefs such as Samkele, Thobz and Riana, promoted sexual abstinence before marriage, whilst others like Nsuku advised learners to wait until they were adults. All teachers were careful not to promote their particular religious beliefs but they made their positions clear. In addition, for Thobz and Riana, the focus of their teaching throughout, motivated by their beliefs, was on developing appropriate attitudes and values regarding sexuality. The same was true of Jackie who although not belonging to any mainstream religion, had her own strong belief systems.

A teacher's value system, whether emerging from a religious background or not, influenced some teachers' approaches. In the survey, some teachers thought their beliefs would influence their approaches whilst other teachers claimed they would just teach facts. This was evident in the case

study where some teachers focussed on the biological information and others promoted the moral perspective. Since particular religious beliefs were not promoted and teachers were careful to point out that this was simply their perspective and their advice on the matter, and since the exploration and promotion of values and attitudes is required in the RNCS, it seems to me that teachers were acting appropriately within the confines of the RNCS.

10.2.2 Exploring prior school and everyday knowledge

In any constructivist approach to learning, the teacher starts exploring a topic by finding out the ideas the learners hold about that topic (Bennett, 2003). This is a notion that concerns some educators, for example Taylor (2001), who would like to ensure social equity in schools by having a common starting point. Their concern is that by starting with everyday knowledge, middle class children will have an advantage over working class children with regard to school-linked knowledge gained at home (a Bernsteinian notion). However with the topic of human reproduction, that advantage is not evident. Firstly 'sex' is a topic that is widely talked about, read about and seen on TV and perhaps even at home in the Gauteng urban environment. What might not be spoken about in a particular ethnic group is openly discussed in the media. Gauteng learners live in cultures in transition and how much information they receive and how much they are shielded from, and the nature of that information, varies widely within a grade and across different schools in different areas. For teachers it is essential to try to gauge their learners' prior knowledge gained at school through Life Orientation and other school programmes, but more importantly their everyday knowledge gained from the world in which they live.

Amongst the Grade 7s as might be expected, age and developmental level, particularly with regard to the onset of puberty, was a useful indicator of the extent of a learner's everyday knowledge. Some of the learners, particularly the boys who had not yet reached puberty, did not seem particularly interested in the topic and had relatively little to contribute concerning everyday knowledge. Those who had begun to enter puberty were intensely interested in this topic and eagerly contributed to class and group discussions, and older learners offered advice. Learners' everyday knowledge of human reproduction was strongly influenced by the media, and the information from the media circulated amongst peers as stories. This information was available to most learners who had access to TV, the internet and magazines. Riana commented that her learners knew a lot about human reproduction but a great deal of what they knew was not true. This too was the experience of the other case study teachers and some of the survey teachers who likewise commented on the inaccuracy of learners' conceptions about human reproduction. Ivinson's argument for an ongoing two-way traffic between common sense and scientific discourses in sexuality education (2007) seems to me to be the most appropriate way to help learners to construct knowledge about human reproduction in the Grade 7 Natural Sciences classroom. Ivinson points out that learners communicate with their peers through common sense discourses about sexual matters and often fail to see the value of the scientific discourse provided in the classroom. The advantage of engaging in both discourses in the classroom is that while the common sense discourse maintains their interest, the scientific discourse on the structure and function of the reproductive system can provide them with a means of examining the accuracy of their common sense discourses, i.e. their beliefs and ideas on a range of matters related to

human reproduction. Thus learners' everyday knowledge needs to be not simply the starting point of the discussion about human reproduction but part of the ongoing conversation about what learners have heard, believed or experienced, and scientific knowledge. The two-way traffic also keeps the attention of the learners, and the topic remains relevant to them, an important feature of learner-centred approaches.

The problem occurs when the relationship between the two discourses becomes unbalanced, and teachers who are insecure about their content knowledge are reluctant to engage in the scientific discourse, and take much longer than necessary exploring everyday knowledge, as with Zama and Mphety. Alternatively the focus may shift elsewhere, for example onto the exploration of values. This was seen with Thobz, Samkele and to a lesser extent Riana. While the discussion of values is an important aspect of teaching human reproduction, it should not be at the expense of learning about the biological aspects of human reproduction.

The implications here are that learners' common sense discourses form a valuable part of the ongoing process of constructing knowledge about human reproduction alongside the scientific discourse, and that teachers should provide opportunities for learners to assess their everyday knowledge and beliefs against scientific knowledge throughout the teaching of this topic. For the teacher, the difficult task is to attend to the very variable levels of prior knowledge, and from these different levels or starting points, to scaffold learning.

10.2.3 Language (teachers and learners)

The language debate in South Africa and elsewhere is very relevant to the district in which my multiple case study took place. Learners' fluency in English, as the literature suggests, was most likely determined by their degree of immersion in English at school, at home and in their surrounding community (Fleisch, 2008). English was the LOLT in all ten case studies, and was the home language for almost all children in the suburban school, and for some children in the two city schools. Learners with English as a home language were at a distinct advantage, since they only had to learn about human reproduction and did not have to overcome an additional obstacle, i.e. a language that they could not speak fluently.

English was an additional language for most of the children in the city schools and all the children in the township schools. In the city schools, English had been the LOLT since Grade 1 and learners were immersed in English to a much greater extent than in the township schools. They had teaching and learning materials in English, a computer centre, some teachers with English as their home language and they probably had far greater access to English media since most of them came from wealthier homes than the township learners. Most of the city school children were fairly fluent in spoken English and could hold discussions with their teacher and with other learners in English. In groupwork they switched between English and their home languages, dealing with the more formal biological information in English and sharing their everyday knowledge in both English and their home languages or in their particular amalgam of languages. These learners were gradually acquiring greater competence in English. Allowing this type of code-switching seemed to me an excellent

strategy. Learners were talking in English some or most of the time and writing in English, and their written English was reasonably lucid. However being able to speak in their home languages allowed the conversation about human reproduction to continue, allowing for greater conceptual development (Setati, et al., 2009). As Setati and colleagues point out, the learners' home language allows learners to participate in lessons and develop conceptually, while they are at the same time becoming more proficient in English.

In the township schools, the use of English as the LOLT was a barrier to the meaningful exploration of biological concepts for most learners. As in the city schools, the level of immersion in English outside the school impacted on their fluency in English and some were more competent in English than others. For many of Zama, Mphety and Thobz's learners, English was not so much an additional language as a foreign language, a language seldom encountered outside of the school (Setati, et al., 2002). Fleisch points out that the less additional language learners are immersed in English, the poorer their academic performance at school. From Lave and Wenger's (1991) and Lemke's (1997) perspective, they have more to contend with, i.e. two new social practices (English and human reproduction) rather than simply one i.e. human reproduction. In the poorer township schools, learners were faced with an even greater problem, i.e. the lack of their own learning support materials so that learners rarely had the opportunity of reading English text at home. In these schools, teachers used code-switching and their home language to teach biological concepts. Zama was the only teacher that used his home language over a protracted period, and learners whose conversation had been stilted when trying to respond to questions in English began to engage in extensive discussions with Zama in their home languages.

There are a number of dilemmas here. Firstly we are aware that conceptual development takes place through language (Djite, 2008; Vygotsky, 1978) and for most learners English is not a home language. The first issue to raise is which is more important, learning about human reproduction in English in a stilted and awkward manner or encouraging learners to speak about their anxieties and concerns, and ask their questions in the comfort of their own language? My proposal here is that human reproduction should be taught in the language in which children are most comfortable so that they feel free to talk about their conceptions and misconceptions, their anxieties and their concerns. I am not suggesting that this is necessarily the best route for all topics, but certainly for a subject like human reproduction. Here conceptual development and resolving many of the concerns of learners is more important than learning to speak English, the language of global access. From this arises two further dilemmas.

Firstly, if learners only converse about human reproduction in their home languages because their English language skills are poor, then these learners will struggle to understand the teaching and learning materials that may be available in their schools as these are all in English.

There is then a second dilemma, i.e. the choice of language spoken in the classroom. It seems that many of the township schools draw learners from predominantly one or two ethnic groups but may have up to six different ethnic groups. Many learners are multilingual and may be speaking an 'amalgam' of languages (Fleisch, 2002). The problem for the teacher is which language to converse in

(and the choice will then exclude some learners) or whether to converse in the mix of the languages used in their school if they are able to do so. The language problem is indeed a difficult one to solve and therefore needs further research.

There was another 'language issue' that I looked at, i.e. the use of the biological terms for the reproductive organs, a taboo amongst some traditional African ethnic groups particularly if used in their home languages (Helleve, et al., 2009; Mbananga, 2004). Learners quickly overcame their awkwardness with the use of the biological terms and were soon using them with relative ease when speaking and writing in English. I was not aware of whether they used these terms in their home languages where the taboo is more typically enforced. With regard to the teachers' use of biological terms in home languages, I am only aware of Nsuku using the term 'testes' (see lesson excerpt in Chapter 9, section 9.3.3). The use of biological terms instead of slang did create a formality in the discussion and this in some ways contributed to placing boundaries around what may be spoken about with regard to human reproduction. I would therefore support the continued use of the English biological terms although would favour common biological terms such as 'sperm duct' rather than the more scientific 'vas deferens' for Grade 7 learners.

In the NCS review, teachers' lack of competence in English was identified as a major factor affecting the quality of teaching in South African schools (Dada, et al., 2009). This was not evident in my study. Nine of the ten case study teachers were either fluent or reasonably fluent in English with the exception of Zama who was more comfortable speaking isiXhosa. Zama had recently arrived from a rural area where isiXhosa would have been predominant. The remaining teachers were typical of middle class urban teachers, having conducted their tertiary studies in English and possibly reasonably well immersed in English whether they lived in the townships, city or suburbs. I was not aware that learners were disadvantaged in any way because of teachers' lack of competency in English.

10.3 Factors affecting the teaching of human reproduction in outcomes-based and learner-centred ways and associated control beliefs (RQ 3 and 4)

The factors mentioned in section 10.2 above could also be placed in this section. Language for example affects the teaching of human reproduction directly whether using teacher- or learner-centred approaches. However the use of a language appropriate for the particular learners who are found in the case study teachers' classrooms is a learner-centred characteristic, and a critical outcome relates to learners being able to communicate effectively. I will however focus in this section on the provision of suitable learning environments, the use of group work as a teaching approach, and ways in which teachers accommodated for personal differences, all of which are learner-centred characteristics that contribute to the achievement of outcomes. I will then comment on the support structures available to teachers and how this affected the ability of teachers to teach in outcomes-based ways.

10.3.1 Learning environment

A number of factors associated with the learning environment affected the teaching and learning of

human reproduction in outcomes-based and learner-centred ways. Unsuitable physical environments impacted on the use of learner-centred approaches. For example, teaching in a hall with a torn partition sheet between two classes meant that Samkele was reluctant to allow group work in case noise levels rose too much. The lack of tables in Zama's and Mphety's room meant that the learners had no suitable working surfaces. The very large numbers of learners packed closely together in Nsuku's classroom meant that she could not reach individuals or groups to find out what their ideas were, or what the quality of their written work was. Responding to the needs and interests of these learners was simply not possible with such large numbers of learners. Onwu and Stoffels (2005) have pointed out that large class sizes are counterproductive in attempting to use learner-centred approaches and this was evident in my research.

The lack of resources in township schools placed these learners at a considerable disadvantage. Visual materials such as large colourful charts, overhead transparencies, and projected pictures were unavailable, and so the visual learner was not catered for except through the teachers' sketches on the chalkboard, and diagrams in textbooks and on worksheets. Teachers were unable to use a common stimulating visual resource to help learners understand structures. Riana, Rennie and Gogodi were able to use colourful flip-charts, Gogodi also used overhead transparencies, while Jackie's learners went to the computer centre to find visual representations that helped her learners to understand the structure of the reproductive systems. Thobz was the only township teacher who was able to use an overhead projector to illustrate reproductive structures and processes.

Another important resource was the provision of learning support materials that the learners could use in class and at home to study from. The suburban teachers (Riana and Rennie) and city teachers (Gogodi, Sipho and Jackie) were able to supply the learners with copies of the module or with their own worksheets, so that although learners did not have textbooks, these resources served as their LSMs, and they could read these at home, study the diagrams and complete the activities, and could learn from these materials. In the township schools, learners made notes from the board and were given some worksheets but mostly had to share materials and return these to the teachers. Again the teachers were unable to provide the township learners with sufficient resources to study from and use to complete activities. This was a significant disadvantage for these learners and the provision of LSMs needs to be addressed by the relevant education authorities.

In my research, I wanted to know to what extent teachers used approaches that are outcomes-based and learner-centred. However I did supply them with teaching and learning materials in the form of the module on human reproduction and the activities in the module did influence what took place in the classrooms of those teachers who used these materials. The same point applies to the two teachers who used their own school's worksheets or the school in which the textbook was mostly used. Teachers said they did not know what outcomes-based approaches were, but relied on the materials they were using to teach in outcomes-based and learner-centred ways. Mphety was surprised to find that learners could engage in group work and persisted in spite of a loss of control at one point. Zama and Rennie tried the group work but Rennie indicated his preference for teacher-centred approaches and Zama gradually reverted to a more teacher-centred approach, while still engaged in extensive

discussions with his learners. Thus suitably designed teaching and learning support materials can play a significant role in helping teachers to conduct lessons in a way that demonstrates new approaches. However every teacher adapts the way in which they use the materials to suit their own teaching style.

The most significant problem in terms of resources was not simply the lack of any reading materials on biology such as textbooks or worksheets, but teachers' belief that these were not needed. During my study, the very idealistic notion that textbooks were not needed was supported by the teachers. In fact this had become a normative belief, put forward by the Department of Education and then strongly believed by the teachers. Teachers' reliance on a single textbook was seen as an 'un-progressive' notion, whereas the teachers' ability to use a range of materials in lesson preparation and in the classroom was considered progressive. The use of a range of teaching and learning materials is of course far preferable to being chained to one textbook. However one textbook per learner would have been a wonderful resource for learners. Although my case study teachers did report using books at home and the internet to prepare lessons, and did encourage learners to collect pamphlets from the clinic and bring books from home, once again it was the more advantaged learners at the city and suburban schools that had access to a wider range of resources, and children from very poor homes in the townships who had no resources. It was the disadvantaged learners who did not have access to resources, who only occasionally were given their own worksheets, and were rarely required to read from books or worksheets and then provide substantial written work based on what they had read. Thus, according to the teachers, many of their learners struggled to read and write even simple sentences in English. Research has shown that when learners have their own reading materials such as textbooks, their performance improves (van der Berg, et al., 2011).

There are several implications arising from this study. Firstly learners need their own learning support materials whether textbooks, workbooks or other materials. They need to be provided with the opportunity of reading up on their subject, of finding out more about what was covered in class, of being less dependent on the teachers and having greater access to other perspectives (Taylor, Van der Berg, et al., 2013). Their home circumstances may hinder their time spent reading but this is a start. These LSMs would also help teachers to cover suitable content and be guided in using appropriate approaches. Fortunately the lack of textbooks for learners has become a major issue in South Africa, and this year (2014) the Minister of Education has assured the public that textbooks or workbooks were being supplied to all learners. Whether that does in fact take place remains to be seen.

The second implication is that resources need to be provided to schools, and teachers need to order these resources. Van der Berg and colleagues (2011) point out that although the poorest of South African government schools receive six times the funding of the richest government schools, the wealthier schools charge relatively high fees compared to the poorest schools which do not charge any fees, and so still have an economic advantage. In addition, the wealthier schools have been accumulating resources over many years and teachers have paid attention to ordering these resources and ensuring they are delivered. The historically disadvantaged schools had very few resources, and because these resources were never modelled to the teachers when they were learners, I wonder if these teachers simply do not have an imagination for what can be achieved in the biological sciences

with good resources. Teachers need to be introduced to visual resources that can be ordered for, and used in the classroom within the schools' limited budget. If the lack of resources in township schools, and teachers' use of those resources, is not addressed the cycle of disadvantage will continue.

This leads to a third point, that is, the movement of teachers from classroom to classroom in township schools rather than the movement of learners from classroom to classroom. The learners then have ownership of the classrooms rather than the teachers who become visitors to this space. Not only does this shift power to the learner, but it deprives teachers of a space in which they can store their resources and can set them out in appropriate positions in the classroom when needed. Security gates on each classroom door and bars on the windows should help to reduce theft of these resources, as they do in the more advantaged schools. The choice to allocate classrooms to learners and not to teachers is indicative of the extent to which schools run to suit administrative ease, rather than for best learning practices. Careful timetabling and the rotation of only a few staff, or the construction of more classrooms, can help to address the problem of a lack of sufficient classrooms for teachers.

While research indicates that additional resources do not significantly improve the situation for poor schools due to other mitigating factors (van der Berg, et al., 2011), tables for learners to work on, books or worksheets for them to read and colourful charts that can be used to explore structure and function are likely to assist teachers to teach human reproduction in more appropriate ways whether this be through outcomes-based and learner-centred approaches or through other methods of teaching.

10.3.2 Safe environments and boundaries

One of the characteristics of learner-centred teachers is that they set up suitable learning environments in which the learner is stimulated, can grow intellectually, can interact with other learners and with the teacher, and feel comfortable emotionally (Aldridge, 2012; Schiro, 2008). I consider the latter of great importance. An emotionally safe learning environment is essential if one is to effectively teach human reproduction. Learners should not feel threatened in any way by fellow learners or by their teacher. Their learning environment needs to be a space in which they can feel confident about asking their questions, expressing their anxieties and their lack of understanding and, if they feel vulnerable for any reason, in which they can remain quiet and unexposed.

Almost all of the case study teachers did well in creating safe learning environments for their learners. They did this by encouraging appropriate behaviour in the classroom. Most of the teachers started this topic by asking their learners to construct a code of conduct, their own rules for how they would behave during the teaching of human reproduction. This was displayed at the front of the classroom. By constructing their own code of conduct and agreeing to it, the learners felt they owned it, and they would remind one another of the 'rules of conduct' that they had constructed. The 'rules' created an accepted boundary of the spoken and unspoken interactions that the group would allow in the classroom. The teachers also used the code of conduct to enforce appropriate behaviour. When teachers like Gogodi reminded their learners of what they agreed was acceptable behaviour, then learners would settle down and try to conform to their own rules. The 'safest' teachers, the ones the

learners felt most at ease with, appeared to be those who were gentle, unobtrusive and undemanding, for example Gogodi, Zama and Rennie. Mphety was also gentle by nature but very enthusiastic. Although some of the older learners did not respect her, others came to her after school to get help and ask their questions, as they did with Thobz, Zama and Rennie. Nsuku was also considered 'unthreatening'. The more forthright teachers like Jackie, Samkele and Riana were a little less 'safe' since they could be more demanding and might intrude into a learner's personal space as Samkele and Jackie did on at least one occasion. Nevertheless the learners felt safe enough with them to continually ask them questions and engage in discussion. So most classes had discussed what their boundaries were, and different learners and teachers had their own personal boundaries into which learners could not intrude. Teachers also respected these boundaries and were careful not to intrude.

The exception, in my estimation, was Sipho. He was a curious example of a person who had been brought up in a traditional rural culture with very tight boundaries on what could be spoken, and to whom it could be said, in relation to sexuality, but had no sense of where those boundaries should lie in primary schools in the urban environment in which he now lived. Interestingly, he did not establish a code of conduct with his learners. Zama, on the other hand, had a clear sense of appropriate boundaries. He too came from a rural area, and although I did not see any code of conduct, he established the boundaries of what learners could ask him. I recognize that my concern, in Sipho's case, might have been a result of my conservative standing on what should be public and what should be private in a mixed class of boys and girls aged 12-14, and that I have distinct views on where boundaries should lie regarding what learners and teachers can be asked about concerning their personal sexual lives. However I had the same sense of what were appropriate boundaries as nine of the case study teachers. I have speculated in Chapter 7 on possible reasons for Sipho's position.

The implications for the future teaching of human reproduction in the Natural Sciences is that there needs to be discussion amongst teachers on what appropriate boundaries of discussion in the classroom are. These boundaries may differ amongst different ethnic groups, between rural and urban areas, amongst different religious/non-religious groups, and between conservative and non-conservative teachers. In my workshop before teachers started teaching human reproduction, an expert in relationships from FAMSA shared her experience and understanding of appropriate boundaries based on her extensive work amongst schools at all levels. This generated a great deal of discussion. This needs to be an ongoing conversation amongst teachers. Teachers need to also take into account the wide range of perspectives amongst learners in their classroom who come from different religious or non-religious and cultural backgrounds. When a class is allowed to develop their own code of conduct, more of these perspectives are likely to be taken into account, although some of the shy learners are unlikely to insist on their position being taken into account. I therefore consider that conversations amongst teachers may help teachers to review their own position on what can be discussed in class, and conversations with learners will give each teacher a sense of what is appropriate for the unique composition of learners in a particular class.

Two further points need to be made. Firstly, the idea of a code of conduct in the classroom as well as discussions amongst teachers about boundaries is not a new idea. This is common practice amongst

Life Orientation teachers and sexuality educators. However the teaching of human reproduction was new to primary school Natural Sciences teachers in 2007 when this research was carried out in the schools. Human reproduction continues to form part of the Grade 7 curriculum and teachers need to consider the importance of addressing this aspect in their teaching of human reproduction. Secondly, the code of conduct relates to interactions in the classroom. Aspects of this code of conduct may not necessarily apply to the private individual and small group discussions that take place with the teacher during breaks and after school when learners come and share with their teacher their private anxieties about what is happening to their bodies and to them in their school and home environment.

10.3.3 Group work and other approaches

One of the critical outcomes is that learners should work effectively with others as a member of a team, group, organization and community. Group work is also a central part of learner-centred approaches in that to develop interpersonal intelligence, learners need to work together. In addition, for learners to construct new knowledge, from a Vygotskian perspective (Vygotsky, 1978), learners need to talk to one another, question one another and solve problems together, assisting one another through their zone of proximal development and using language to construct new knowledge. Group work, if learners work cooperatively, can play an important role in a learner's education. There has nevertheless been a great deal of criticism about group work in the new curriculum, based on observations that traditional teacher-centred approaches were being used while learners sat in groups (Taylor & Vinjevold, 1999) and that learners did not discuss anything substantial, or anything new (Nykiel-Herbert, 2004; Rogan, 2004). In these situations, learners were not engaged in the task of constructing new knowledge.

All classes that I observed, except for one of Nsuku's classes, were seated in a way that would enable learners to engage in group work, with learners seated around desks or in long rows facing one another. The national task team reviewing the NCS described group work as the privileged methodology in GET classrooms around the country (Dada, et al., 2009). The extent to which teachers used group work varied, some teachers such as Jackie preferring to spend more time in class engaged in extensive questioning, and others preferring to include storytelling such as Samkele. Rennie indicated that he would normally teach in a more traditional way, but because most of the module tasks were designed for group work, this was his approach for this topic. Most of the case study teachers did use group work some or most of the time in order to complete the module tasks, but also engaged in direct teaching of concepts, particularly the structure and function of the reproductive organs and the menstrual cycle. The national task team has advised that group work is only one of many methodologies and this is important advice. However it would be unfortunate if group work was sidelined or lost in the swing away from C2005 and NCS methodologies. It played an important role in two ways when teaching human reproduction.

Firstly, when learners engaged with activities requiring the use of new biological knowledge, they did help one another to analyse the information provided in order to decide on their answers, thus contributing to their construction of new knowledge. Secondly, and more importantly, the group

discussions played a very important role in providing learners with a safe space in which to talk about the changes in their bodies and the differences in their physical development, as well as to challenge some of the backstreet myths that they brought into the classroom using their newly acquired biological knowledge (Ivinson, 2007). Whether in single sex or mixed groups, learners compared their experiences, shared stories and brought into a more formal environment their everyday ideas about human reproduction which could then be scrutinised against new biological information.

It was true that learners and some teachers tended to get stuck at this point, spending a great deal of time reviewing everyday knowledge that had also been covered in Life Orientation i.e. physical and emotional changes during puberty. Moving into the more substantial biological content was more challenging. Here the teachers' subject content knowledge made a difference, helping them to scaffold the way forward, so that they could effectively guide learners in the acquisition of new concepts that would provide them with an understanding of the biological basis for changes. It would be interesting to see how these teachers have progressed since 2007 when most of them were teaching human reproduction for the first time. I would expect that most of them, if they continued to teach Grade 7s, would have improved their subject content knowledge as they re-taught the subject and sought answers to their learners' questions. I would then expect that they would move more confidently into the biological content. Thobz, for example, indicated that she intended to research the topic more thoroughly if she taught Grade 7s in the following year.

The implications therefore are that group work should continue to be used as an important teaching method when teaching human reproduction (but not the only method), and that to address the problem of teachers' lack of confidence in the biological content, INSET should place some emphasis on helping teachers to acquire more content knowledge on human reproduction. INSET should also provide opportunities for teachers to explore ways of maintaining the two-way traffic between common sense and scientific discourses.

10.3.4 Accommodating personal differences amongst learners

The teachers in both the survey and my multiple case study had a deep sense of the constitutional right of learners to have their religious, cultural and personal beliefs respected. Learners who wished to express their moral values as a result of their religious beliefs had to be given an opportunity to express their opinions alongside those who held very different moral values. Learners who were shy, or outspoken all had to be given the space to respond when talking about human reproduction.

Respect for personal differences was most evident when it came to circumcision, where both teachers and learners respected the right of individuals to not participate during discussion of this topic. Accommodating personal differences linked to cultural taboos, religious beliefs, learners' home background and their unique personal circumstances was an important indication of how learner-centred a teacher was. Teachers attempted to accommodate these differences by being considerate of individuals' responses to the topic. Most of the case study teachers spoke about the children who had not yet entered puberty, and who were unwilling to speak openly during a class discussion about any

matters related to human reproduction. Some of the teachers mentioned children who had become withdrawn possibly due to sexual abuse. With the high levels of sexual abuse in South Africa, teenage pregnancy and HIV/AIDS, the topic of human reproduction may have been a difficult topic for some learners who were directly affected. The teacher had to be very sensitive then to the responses of individual learners, a very difficult task in large classes.

In considering cultural taboos, there is however a further point that needs to be considered by educators, i.e. the question of whether culture should ever be challenged in the classroom? Are there cultural practices that are dangerous, unhealthy or inappropriate? In the case of circumcision, I am not referring to the many rites involved in initiation, but specifically to the unhealthy practices associated with the removal of the foreskin during circumcision particularly in illegal circumcision schools, and the inappropriate care and treatment of boys during their period of healing resulting in death, or irreversible damage to young boys' penises (Vincent, 2008). One might suggest that this is an adult conversation, but many of these boys are preparing to 'go to the mountains' and my suggestion is that they should become aware of the public debate on this issue since they may become the victims. Teachers considered other cultural taboos such as talking about menstruation in front of boys, using the biological terms for the reproductive parts, and looking at pictures of naked boys and girls. However teachers felt that it was important to move beyond these restrictions since teachers were faced with this information, sometimes distorted, on a daily basis in Gauteng's very cosmopolitan society, and these learners were living in a very different cultural context from the areas in which those taboos were first put in place. They addressed these taboos carefully, presenting a biological perspective.

Culture is not static, and cultural beliefs are continually being re-examined in the urban context, where people encounter such a mix of ideas, beliefs and practices. The implications, in my view, are that teachers should respect individuals' beliefs so that learners do not feel personally threatened, but some of the unhealthy cultural practices should be examined in the classroom in the light of scientific and medical knowledge.

10.3.5 Support structures

The human personnel in a school play a very important role in contributing to a teacher's confidence when teaching this human reproduction in outcomes-based ways. Jackie felt strongly supported while being trusted to teach the subject and was a confident teacher. Sipho was confident but resentful. Samkele and Gogodi both enjoyed the trust and support of their Principals and colleagues whereas Thabo (one of my additional cases), while supported by his HOD, was openly opposed by colleagues and support staff and the Principal was suspicious as a result. This created an unpleasant environment in which to teach. In Nsuku's new school, her Principal and HOD controlled access to equipment and printing very strictly. Thus teachers were not allowed to use the overhead projectors and were allowed a very limited supply of worksheets and, according to Nsuku, no Natural Sciences textbooks were available not even for the teachers. Nsuku was clearly dissatisfied with the situation and felt that her teaching was being severely hindered by the lack of support from those in charge of the resources.

Not too far away Thobz taught in a container school where the Principal, deputy and HOD were all extremely supportive and ran extension cords along the length of a series of containers to reach wherever Thobz was teaching so that she could use an overhead projector. Support from the Principal and other members of staff make a difference to a teacher's comfort within a school and confidence in teaching their subject.

Teachers who are connected with other teachers, as in Riana and Rennie's case and Riana with her teacher friends, are using a support network in which their ideas are affirmed or questioned and their experiences shared. They are operating within some sort of community of practice which plays a valuable role in boosting a teacher's confidence, and provides them with new ideas to try out in the classroom. Unfortunately most teachers such as Mphety and Zama, Sipho and Jackie, remain isolated with insufficient interaction even when in the same school.

There seems to be little opportunity for primary school science teachers to get together to share ideas, whether at conferences, workshops or in cluster meetings. The national review committee, responding to teachers' criticism of departmental workshops, has advised a reduction in the number of these workshops and more time spent by subject advisors in classrooms. However, greater attention needs to be paid to bringing Natural Sciences teachers together in constructive ways, in order to build effective communities of practice.

10.4 The influence of beliefs (RQ 4)

In my study, I was interested in how teachers' beliefs about teaching human reproduction to Grade 7 Natural Sciences learners influenced their teaching. In particular, I was interested in the influence of behavioural, normative and control beliefs.

Teachers' behavioural beliefs, i.e. their beliefs about whether it was important to teach human reproduction to Grade 7s, had a significant impact on their attitude to teaching human reproduction and thus on their teaching of this topic. From the start of my research, teachers indicated their concern about the type of sexual messages being conveyed through the media, the pornography that was widely available and the sort of image of sexual activity that was being portrayed as the norm. The high incidence of sexual abuse, of HIV/AIDS and teenage pregnancy throughout South Africa was a matter of deep concern. Teachers felt that since the learners were not getting information on human reproduction from their parents, and they were getting the wrong information from media and peers, they had a 'moral' role to play in providing learners with accurate information.

Their behavioural belief resulted in their willingness to teach human reproduction and thus they taught this topic. In addition, it was a joint decision by the Natural Sciences teachers in this district to teach human reproduction. They had made the decision together and so there was a strong normative belief that this was the right thing to do. Teachers felt supported by one another in this decision and so they taught human reproduction. Amongst the events leading up to my research was that first district

meeting when over 100 teachers voted to teach human reproduction to their Grade 7s. Many of these teachers attended my workshop six months later and some participated in my multiple case study. Both the subject advisor and the teachers had shown they were in favour of teaching human reproduction and so in the district where my study took place, teaching human reproduction was an agreed on practice, the norm. There were of course teachers who did not want to teach this topic, such as the Grade 7 teachers at Thobz's school who asked her to teach their learners. I assume that teachers who attended the workshop held to the normative beliefs of the Natural Sciences teachers in this district that teaching human reproduction to Grade 7s was the 'right thing to do'! However there may also have been teachers who believed one should not teach human reproduction to Grade 7s. I did not meet any such teachers.

I was also interested in teachers' behavioural and normative beliefs towards the use of outcomes-based and learner-centred approaches when teaching human reproduction. Like Rogan and Aldous' teachers (2005), the case study teachers were willing to use learner-centred and outcomes-based approaches, but their perception of what this involved was very limited, as mentioned in section 10.1. Responding to the needs and interests of learners, working in groups and responding to questions seemed to be the limit of teachers' understanding of these approaches. Within this very limited context, the teachers' behavioural and normative beliefs appeared to be supportive of these approaches.

A teacher's control beliefs about whether there were resources for, and obstacles to, the teaching of human reproduction in outcomes-based and learner-centred ways could be seen in the survey. There were teachers who anticipated that their religious beliefs would influence the perspective from which they taught and their cultural beliefs might prevent them from addressing certain topics. The religious beliefs of some of the case study teachers were influential. The effect of the case study teachers' religious and cultural beliefs have been discussed in section 10.2.1. Some teachers also thought that learners' religious and cultural values might affect the teaching and learning of human reproduction, but only cultural values seemed to have had any impact as discussed previously (section 10.3.4). The concerns expressed in the survey about the detrimental effect of large numbers of learners, no desks, and a lack of resources were evident in the case studies. The strong support that the majority (87.5%) of survey teachers' experienced from their Principals and senior staff was evident in the case studies where most teachers (for example, Gogodi, Thobz and Samkele) but not all teachers (for example Nsuku) found them very supportive. The strong support received from the biology subject advisor who was in regular contact with her teachers, and reported on by a number of survey teachers, was not mentioned again by the case study teachers. However almost all the survey and case study teachers felt that their professional development was inadequate and focussed on regulations rather than on ideas about how to teach topics. Survey teachers felt that ideas gained from TV and other media as well as from peers would have to be addressed in class and most case study teachers spent a great deal of time doing so. English was an additional language in 87% of the survey teachers' classrooms and in eight of the ten case study teachers' classrooms. The survey teachers anticipated using strategies such as translations and code-switching and this was evident in the classrooms of seven of the case study teachers. I could therefore to some extent triangulate my findings between the survey and case study

teachers. However because control beliefs were not the focus of my study, I could not definitely say that a teacher's belief about any one of these factors resulted in outcomes-based and learner-centred approaches being used or not used to teach human reproduction. I did not use methods that would allow me to find a correlation between what each teacher believed about the external and internal factors affecting their teaching and the actual effect on their teaching. I therefore cannot draw any firm conclusions about the effect of control beliefs on the teaching of human reproduction in outcomes-based and learner-centred ways.

10.5 Implications for education

Although outcomes-based education has been declared obsolete by the Minister of Education, critical and learning outcomes relegated to general and specific aims, and learner-centred approaches not mentioned in the new CAPS documents (Department of Basic Education, 2011), there are nevertheless some important implications of my research for the teaching of human reproduction in the Natural Sciences. I have, in sections 10.1-10.4, outlined these implications in relation to teaching. I will now summarise them.

Appropriate professional support is needed for teachers in the form of meaningful workshops whether at conferences or in districts, led by experts and informed by teachers. For the teaching of human reproduction, these workshops need to address subject content knowledge, the range of learners' everyday knowledge, approaches to teaching this content and approaches to communicating with learners in appropriate ways. A teacher's subject content knowledge does affect how thoroughly a teacher is able to explore a topic such as human reproduction. Although deep content knowledge is not required at a Grade 7 level for directly communicating the information, it is a valuable asset, contributing to the teacher's sense of self-efficacy when the learners start asking questions which require a more comprehensive understanding of the topic. With regard to teaching approaches, a range of approaches should be used, but group work is essential as one of these approaches. Group work, if a code of conduct is adhered to, does provide a relatively safe emotional space in which learners can share their ideas and their stories about aspects of human reproduction, and in which information may be shared which will never be communicated during a class discussion. It is also important for teachers to use effective questioning skills in both class and group discussions to probe for learners' ideas and then to get them to think critically about how valid their ideas are. Here learners' questions to one another also promote cognitive conflict when they disagree, thus assisting in the construction of new knowledge.

An important discussion that needs to take place in workshops is that of boundaries for both teachers and learners. Teachers need to recognise that their boundaries may differ, due to the impact of their beliefs on what can be said in class. However teachers do need to talk about what the limits of their boundaries are, so that learners are not subjected to inappropriate suggestions and advice. Here organisations like FAMSA can play a valuable role in advising teachers due to their extensive experience across all ages and cultural groups in South Africa.

Then teachers should encourage learners' sharing of their everyday knowledge, whether in class or group discussions. This is an extremely important starting point from which learners can start to confront their everyday ideas with scientific knowledge. If the sharing of everyday knowledge throughout the teaching of this topic is not legitimised during the teaching of human reproduction, then learners will engage in parallel collateral learning (Jegede, 1998), and as soon as they leave the school premises, will most likely only draw on their everyday knowledge to inform their actions.

Appropriate learning support materials are essential so that learners can work independently and are a resource when they work together. The promise of textbooks and/or workbooks for every learner has been given, and is a welcome promise. However beyond the provision of these learning support materials, teachers need to know how to use them in class, and learners with English as an additional language need to be helped to read this text material. There was very little interaction by teachers with the text materials in the classes I observed.

With regard to the language of teaching and learning, I have suggested that the teacher reverts to the home language of the learners whenever necessary to ensure that the conversation about, and the confrontation between, everyday and scientific knowledge, continues. I recognise that human reproduction is a sensitive subject and learners may be most comfortable talking about this topic in their home language. The difficulty of course is the multilingual nature of most Gauteng classrooms and whether the teacher can speak in the particular mix of languages evident amongst a group of learners. Code-switching appears to be a very useful way of resolving the language dilemma, allowing learners to use the English scientific names of reproductive organs thus avoiding the restricition on the use of these words in African languages, and gradually developing English speaking skills without hindering conceptual development with regard to human reproduction.

It is my expectation that the implications regarding the need for professional support in the form of meaningful workshops, for the development of strong communities of practice, for the use of appropriate boundaries in the classroom, for the use of group work to provide a safe environment for the sharing of ideas, for the use of scientific knowledge to challenge questionable everyday knowledge about human reproduction, and for appropriate language use while teaching human reproduction will all make a contribution to the field of biology education and in particular to curriculum innovation in primary school education and to teaching about human reproduction in the Natural Sciences.

10.6 Methodological findings

There are two small contributions that I can perhaps make to methodology. The first is the design of my profiles and cross-case analysis and the 2nd is my theoretical framework.

I developed teachers' profiles which allowed me to assess the extent to which each teacher taught in outcomes-based and learner-centred ways (Appendices 6.1-6.10). To construct these profiles, I was guided by Rogan and Grayson's framework and in particular by their profile of implementation of a

new curriculum (Rogan & Grayson, 2003). Rogan and Grayson proposed that teachers and schools be encouraged to assess their position in each category or sub-construct of their profiles and work towards moving to the next level through what they referred to as a 'Zone of Feasible Implementation' or what Fullan (1991) and Coll and Taylor (2012) refer to as 'small steps'. My profiles could likewise be a useful tool by which teachers could assess their strengths and weaknesses as an outcomes-based and learner-centred teacher and could attempt to address some of the areas to which they have not paid much attention.

The teacher's profiles were combined so that a matrix was developed in which a cross-case analysis could be conducted. The notion of a matrix is not new. The idea of comparing my cases (the teachers) on a matrix was obtained from Miles and Huberman's matrices (Miles & Huberman, 1994). However the use of the matrix to provide a visual representation of where the teachers in my multiple case study were situated with regard to the achievement of each outcome and each component of learner-centred approaches is new, as far as I am aware. The matrix allows a researcher to identify trends e.g. strengths and weaknesses of a group of teachers with regards to the implementation of aspects of a particular approach. An analysis of these trends could guide those who are assessing implementation of new approaches as to where support and INSET is needed or where approaches are simply not being adopted. This could lead to further research on why these approaches are not being implemented.

In order to see my particular profiles and cross-case analysis used in other contexts, I may need to wait for the next cycle of curriculum change since the new National Curriculum Statement Grades R-12, CAPS returns to a focus on the structure of the discipline and the development of content knowledge. Outcomes have been changed to aims and sidelined, and there is no mention of learner-centred approaches. Aspects of my profiles can nevertheless be used by teachers to assess their achievement of the specific aims of the Natural Sciences curriculum and their use of relevant teaching practices.

My theoretical framework (Figure 3.3) is another contribution to methodology. I have combined aspects of Rogan and Grayson's theoretical framework for curriculum implementation in developing countries and Ajzen's Theory of Planned Behaviour in order to answer my four research questions.

1. To what extent do Grade 7 Natural Sciences teachers use approaches that are learner-centred and outcomes-based during the teaching of human reproduction?
2. What factors influence the teaching of human reproduction to Grade 7 learners?
3. What factors affect the use of outcomes-based and learner-centred approaches during the teaching of human reproduction?
4. How do teachers' behavioural, normative and control beliefs affect the teaching of human reproduction in outcomes-based and learner-centred ways?

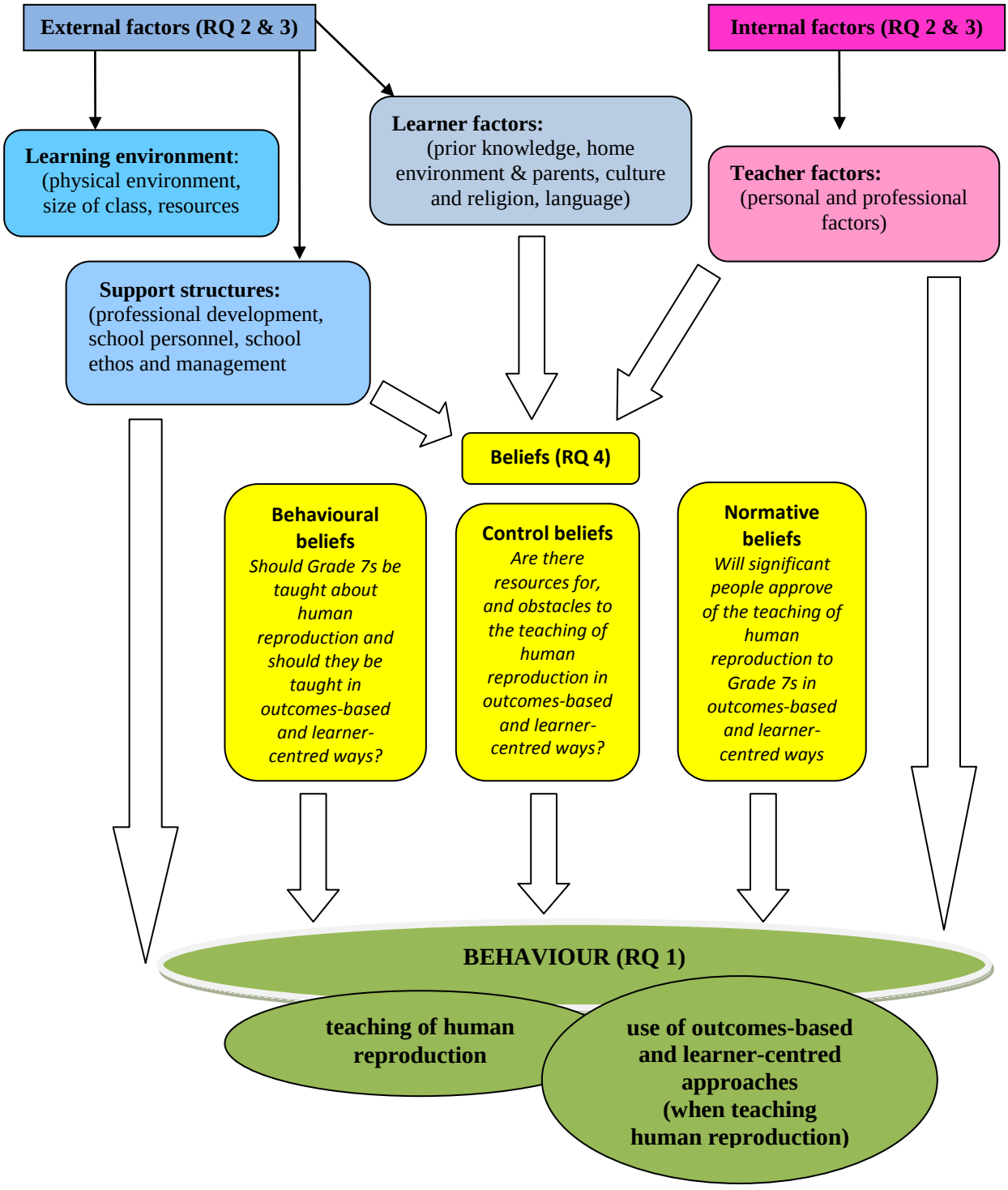


Figure 10.1: Theoretical framework
(based on Rogan and Grayson's Theoretical Framework for curriculum implementation in developing countries and Ajzen's Theory of Planned Behaviour)

The framework allows me to consider the influence of external factors (the learning environment, support structures and the learners) and internal factors (personal and professional attributes of the teachers) on two aspects of behaviour i.e. teaching human reproduction and the use of outcomes-based and learner-centred approaches to teach human reproduction. While learner-centred and outcomes-based approaches have presently been abandoned, the framework remains useful in examining the influence of the above-mentioned factors directly on the teaching of human reproduction. In addition the framework allows for a link between the internal and external factors (RQ 2 & 3) and beliefs about these factors, in particular control beliefs, and how these beliefs influence the teaching of human reproduction in outcomes-based and learner-centred ways (RQ 1& 4). Thus the framework allows one to explore the relationship between factors that could influence behaviour, beliefs about these factors and the actual behaviour. This model could be adapted in a variety of ways by other researchers to suit their research questions.

10.7 Critical reflection of the research process

I encountered several gaps or deficiencies in my research design which affected the data I collected and I will mention the most problematic aspects. Firstly, the survey questionnaire needed more careful revision to remove all double-barrelled questions. This would have resulted in a less diverse range of answers in response to what teachers thought I wanted. However even with some questions that required only one answer, some teachers managed to misinterpret the questions. This may have been indicative of their lack of competence in English. However judging by their answers, they simply did not read the questions properly and made assumptions about the sort of data I was seeking to collect.

The use of field notes and transcriptions of lessons was very useful, allowing me to compare the data gained from both methods. The field notes provided me with a description of the context, and of interactions that were not recorded, for example the actions of teachers and learners at different points of the lesson. However I did not manage to record all the audible discussions in my field notes. The transcripts were most useful as a more comprehensive record of these class discussions between teachers and learners. However the digital recorder did not always pick up learners' responses so even the transcripts do not provide a comprehensive record of classroom interactions. In addition when teachers and learners reverted to their own languages, I could not follow the conversations except to record some of the words indicating the content of the lesson. The translation of one of Zama's lessons from Xhosa to English by a teacher was very helpful in confirming that the discussion in the home language was covering common sense knowledge related to human reproduction and healthy living.

Returning the interview transcripts to the teachers was useful in that teachers could see the type of data I was working with and could corroborate that their transcription accurately reflected their views provided during the interview. However teachers rarely changed the substance of their statements in the interviews. They were more concerned about disjointed sentences and wanted to correct the grammar. I did not return field notes to teachers since I felt this would be counterproductive if it took place soon after the lesson as teachers might attempt to change their teaching style, and their

corrections might be inaccurate if returned some time after teaching since teachers may have wanted to portray themselves in an imagined more positive way. However I was not looking for 'good' or 'bad' teaching but whether teachers used outcomes-based and learner-centred approaches. My analysis is therefore clearly a subjective one, based on specified categories and relying on my interpretation of the teaching against those categories.

I do also recognise that teachers who participated in the case study were interested in trying out new approaches and were confident enough to allow me to observe them. This did not accurately represent all the survey teachers since only half the survey teachers agreed to participate in the study. In addition, the 40 teachers did not represent the whole district. Some teachers, such as in Thobz's school, were unwilling to teach this topic and asked Thobz to do so. Thus my multiple case study used teachers that were willing to teach human reproduction using new approaches and my results reflect this particular group of teachers.

Then one of the most important factors influencing the observations was my presence in the classroom, my taking of notes and using the small digital and audio recorders and my interpretation of the findings – a subjective perspective. All these influence my final findings.

10.8 Final statement

This research set out to find if teachers were teaching in outcomes-based ways using learner-centred approaches, and I found that amongst those who were willing to be observed, teachers showed strengths in some aspects of their use of these multifaceted approaches and not in others. These teachers were assisted in their use of outcomes-based and learner-centred approaches by the teaching and learning materials provided, indicating the value of carefully developed learning support materials. Teachers did find that a range of different factors either hindered or supported their teaching of human reproduction. However their beliefs about the value of teaching human reproduction to Grade 7s contributed to their teaching of this topic in often difficult circumstances.

References:

Abimbola, I. (1977). African world-view and school science. *Journal of the Science Teacher's Association of Nigeria, 16*(1), 15-28.

Adler, J., Reed, Y., Lelliott, T., & Setati, M. (2002). Availability and use of resources: a dual challenge for teacher education. In J. Adler & Y. Reed (Eds.), *Challenges of teacher development: An investigation of take-up in South Africa* (pp. 53-71). Pretoria: Van Schaik.

Aikenhead, G. (1994). What is STS science teaching? In J. Solomon & G. Aikenhead (Eds.), *STS education: International perspectives on reform*. New York: Teachers College Press.

Aikenhead, G., & Jegede, O. (1999). Cross-cultural science education: A cognitive explanation of a cultural phenomenon. *Journal of Research in Science Teaching, 36*, 269-287.

Ajzen, I. (1991). The theory of planned behaviour. *Organizational Behaviour and Human Decision Processes, 50*, 179-211.

Ajzen, I. (2002). Perceived behavioural control, self efficiency, locus of control and the theory of planned behaviour. *Journal of Applied Social Psychology, 32*(4), 665-683.

Ajzen, I., & Madden, T. (1986). Prediction of goal directed behaviour: Attitudes, intentions and perceived behavioural control. *Journal of Experimental Social Psychology, 22*, 453-474.

Aldous, C., & Rogan, J. (2009). The implementation of the Natural Science Outcome Three: Embedding the learning of science in societal and environmental issues. *African Journal of Research in Maths, Science and Technology Education, 13*(1), 62-78.

Aldridge, J. (2012). Outcomes-focussed learning environments. In B. Fraser, K. Tobin & C. McRobbie (Eds.), *Second International Handbook of Science Education* (pp. 1257-1276). Dordrecht: Springer.

Anastácio, Z., Carvalho, G., & Clément, P. (2004). Teachers' conceptions of, and obstacles to, sex education in Portuguese primary schools: the ESERA summer school 2004. In H. E. Fisher (Ed.), *Developing standards in research on science education* (pp. 47-54). London: Taylor & Francis.

Anastácio, Z., Carvalho, G., & Clément, P. (2008, September 21-26). *Children sexual arousal and primary school teachers' perceptions of sex education training needs.* Paper presented at the X111 IOSTE symposium, The use of science and technology education for peace and sustainable development, Kuşadasi, Turkey.

Armitage, C., & Conner, M. (2001). Efficacy of the theory of planned behaviour: A meta-analytic review. *British Journal of Social Psychology, 40*, 471-499.

Ausubel, D. (1968). *Educational psychology: A cognitive view*. New York: Holt, Rinehart and Winston.

Bandura, A. (1977). Self-efficacy: Towards a unifying theory of behavioural change. *Psychological Review, 84*, 191-215.

Bandura, A. (1991). Social cognitive theory of self-regulation. *Organizational Behaviour and Human Decision Processes, 50*, 248-287.

Bassey, M. (1999). *Case study research in educational settings*. Buckingham: Open University Press.

Baxen, J., & Breidlid, A. (2004). Researching HIV/AIDS and education in sub-Saharan Africa: Examining the gaps and challenges. *Journal of Education, 34*, 9-29.

Baxen, J., & Soudien, C. (1999). Outcomes-based education: Teacher identity and the politics of participation. In J. Jansen & P. Christie (Eds.), *Changing curriculum: Studies on outcomes-based education in South Africa*. Kenwyn: Juta.

Beeby, C. (1966). *The quality of education in developing countries*. Cambridge, MA: Harvard University Press.

Bell, B., & Gilbert, J. (1996). *Teacher development: A model from science education*. London: Falmer.

Bell, J. (2005). *Doing your research project: A guide for first-time researchers in education, health and social science* (4th ed.). Buckingham: Open University Press.

Bennett, J. (2003). *Teaching and learning Science*. London: Continuum.

Berger, D., Bernard, S., Khzami, S., Selmaoui, S., & de Carvalho, G. (2008, September 21-26). *Sex education: Teachers' and future teachers' conceptions and social representations; What relevance for teachers' training?* Paper presented at the X111 IOSTE symposium, The use of science and technology education for peace and sustainable development., Kuşadasi, Turkey.

Bernstein, B. (1996). *Pedagogy symbolic control and identity: theory, research and critique*. London: Taylor & Francis.

Bernstein, B. (1999). Vertical and horizontal discourse: An essay. *British Journal of Sociology of Education, 20*(2), 157-173.

Bhana, A., Riba, V., & Vawda, M. (2011). Let's talk about sex: Giving children knowledge is giving them power: the power to make better decisions about sex. *HSRC Review, 9*(4), 14-15.

Black, P., & Harrison, C. (2000). Formative assessment. In M. Monk & J. Osborne (Eds.), *Good practice in science teaching: What research has to say.* Buckingham: Open University Press.

Bockarie, A. (2002). The potential of Vygotsky's contributions to our understanding of cognitive apprenticeship as a process of development in adult vocational and technical education. *Journal of Career and Technical Education, 19*, 47-66

Bogdan, R., & Biklen, S. (2007). *Qualitative research for education: An introduction to theories and methods*. Boston: Pearson.

Bonner, P. (2012). South African society and culture, 1910-1948. In R. Ross, A. Mager & B. Nasson (Eds.), *The Cambridge history of South Africa* (pp. 254-318). Cambridge: Cambridge University Press.

Breakwell, G. (1995). Interviewing. In G. Breakwell, S. Hammond & C. Fife-Shaw (Eds.), *Research Methods in Psychology* (pp. 230-242). London: Sage.

Brodie, K., Lelliott, A., & Davis, H. (2002a). Forms and substance in learner-centred teaching: Teachers' take-up from an in-service programme in South Africa. *Teaching and Teacher Education, 18*, 541-559.

Brodie, K., Lelliott, T., & Davis, H. (2002b). Developing learner-centred practices through the FDE programme. In J. Adler & Y. Reed (Eds.), *Challenges of teacher development: An investigation of take-up in South Africa* (pp. 94-117). Pretoria: Van Schaik.

Brooks, J., & Brooks, M. (1999). *In search of understanding: The case for constructivist classrooms*. Alexandria, Virginia: Association for Supervision and Curriculum Development.

Brush, T., & Saye, J. (2002). A summary of research exploring hard and soft scaffolding for teachers and students using a multimedia supported learning environment . *The Journal of Interactive Online Learning, 1*(2), 1-12.

Bryan, L. (2012). Research on science teacher beliefs. In B. Fraser, K. Tobin & C. McRobbie (Eds.), *Second International Handbook of Science Education* (Vol. 1, pp. 477-495). Dordrecht: Springer.

Bush, T., Joubert, R., Kiggundu, E., & Van Rooyen, J. (2010). Managing teaching and learning in South African schools. *International Journal of Educational Development, 30*, 162-168.

Casemore, B., Sandlos, K., & Gilbert, J. (2011). On taking an interpretive risk in sex education. *Teachers College Record*,

Chisholm, L. (2003). *The politics of curriculum review and revision in South Africa*. Paper presented at the 'Oxford' International Conference on Education and Development. Oxford.

Chisholm, L., & Leyendecker, R. (2008). Curriculum reform in post-1990's subSaharan Africa. *International Journal of Educational Development, 28*, 195-205.

Chisholm, L., Volmink, J., Ndhlovu, T., Potenza, A., Mahomed, H., Muller, J., et al. (2000). *A South African curriculum for the 21st century. Report of the Ministerial Review Committee on Curriculum 2005*. Pretoria.

Chung, S., & Walsh, D. (2000). Unpacking child-centredness: a history of meanings. *Journal of Curriculum Studies, 32*(2), 215-234.

Clacherty, G., Matshai, K., Pelo, J., Woolf, I., Clacherty, A., & Gaylard, C. (1998). *Research into selected health issues facing children in South Africa*. Johannesburg: Soul City.

Clark, J., & Linder, C. (2006). *Changing teaching, changing times: Lessons from a South African township science classroom*. Rotterdam: Sense.

Cohen, L., Manion, L., & Morrison, K. (2007). *Research Methods in Education* (6th ed.). London: Routledge.

Coleman, L., & Testa, A. (2007). Sexual health knowledge, attitudes and behaviours among an ethnically diverse sample of young people in the UK. *Health Educational Journal, 66*(1), 68-81.

Coll, R., & Taylor, N. (2012). An international perspective on science curriculum development and implementation. In B. J. Fraser, K. Tobin & C. McRobbie (Eds.), *Second International Handbook of Science Education* (Vol. 2, pp. 771-782). Dordrecht: Springer.

Collins, A., Brown, J., & Holum, A. (1991). Cognitive apprenticeship: Making thinking visible. *American Educator Winter*, 6-46.

Coombe, C. (2000). Keeping the education system healthy: Managing the impact of HIV/AIDS on education in South Africa. *Current Issues in Comparative Education, 3*(1), 14-27.

Crawley, F. (1990). Intentions of science teachers to use investigative teaching methods: A test of the Theory of Planned Behaviour. *Journal of Research in Science Teaching, 27*, 685-697.

Cresswell, J. (2012). *Educational research: Planning, conducting and evaluating quantitiative and qualitative research* (4th ed.). Boston: Pearson.

Cuban, L. (1990). Reforming again, again, and again. *Educational Researcher, 19*, 3-13.

Cuban, L. (1993). *How teachers taught: Constancy and change in American classrooms, 1880-1990*. New York: Teachers' College Press.

Dada, F., Dipholo, T., Hoadley, U., Khembo, E., Muller, S., & Volmink, J. (2009). *Report of the Task Team for the Review of the Implementation of the National Curriculum Statement*. Pretoria: DOE.

Davis, K. (2002). "Change is hard": What science teachers are telling us about reform and teacher learning of innovative practices. *Science Education, 87*, 3-30.

De Feiter, L., Vonk, H., & Van Den Akker, J. (1995). *Towards more effective science teacher development in*

southern Africa. Amsterdam: VU University Press.
Denscombe, M. (2007). *The good research guide* (3rd ed.). New York: Open University Press.
Denzin, N., & Lincoln, Y. (2011). Introduction, disciplining the practice of qualitative research. In N. Denzin & Y. Lincoln (Eds.), *The Sage Handbook of Qualitative Research* (pp. 1-20). Thousand Oaks, CA: Sage.
Department of Basic Education (2011). *National Curriculum Statement; Curriculum and Assessment Policy Statement: Grades 7-9 Natural Sciences*. Pretoria: DBE.
Department of Education (1996a). *Curriculum Framework for General and Further Education and Training*. Pretoria: DOE.
Department of Education (1996b). *Lifelong learning through a National Qualifications Framework. Report of the Ministerial Committee for development work on the NQF*. Pretoria: DOE.
Department of Education (1997a). *Curriculum 2005 Discussion Document, Grades 1 to 9.* Pretoria: DOE.
Department of Education (1997b). *Curriculum 2005: Lifelong learning for the 21st Century*. Pretoria: DOE.
Department of Education (2002a). *Revised National Curriculum Statement for Grades R-9 (Schools). Policy. Natural Sciences*. Pretoria: DOE.
Department of Education (2002b). *Revised National Curriculum Statement Grades R-9 (Schools). Policy. Overview*. Pretoria: DOE.
Department of Education (2002c). *Revised National Curriculum Statement Grades R-9 (Schools): Policy. Life Orientation*. Pretoria: DOE.
Department of Education (2003). *Revised National Curriculum Statement Grades R-9 (Schools): Teacher's guide for the development of learning programmes, Natural Sciences*. Pretoria: DOE.
Djite, P. (2008). *The nexus between education, learning and language*. Paper presented at the UNESCO/UNU 2008 conference on "Globalization and languages: Building on our rich heritage". Tokyo.
Doidge, M., & Lelliott, A. (2008). *Is Grade 7 too early? Teaching human reproduction in primary schools*. Paper presented at the Proceedings of the 16th Annual Conference of the Southern African Association for Research in Mathematics, Science and Technology Education.
Driver, R., Asoko, H., Leach, J., Mortimer, E., & Scott, P. (1994). Constructing scientific knowledge in the classroom. *Educational Researcher, 23*(7), 5-12.
Duit, R., & Treagust, D. (1998). Learning in Science - From behaviourism towards social constructivism and beyond. In B. Fraser & K. Tobin (Eds.), *International Handbook of Science Education* (pp. 3-25). Great Britain: Kluwer.
Fleisch, B. (2002). *Managing educational change: The state and school reform in South Africa*. Sandown: Heinemann.
Fleisch, B. (2008). *Primary education in crisis: Why South African school children underachieve in reading and mathematics*. Cape Town: Juta.
Foddy, W. (1993). *Constructing questions for interviews and questionnaires: Theory and practice in social research*. Cambridge: Cambridge University Press.
Fraenkel, J., & Wallen, N. (1990). *How to design and evaluate research in education*. New York: McGraw-Hill.
French, D., & Hankins, M. (2003). The expectancy-value muddle in the theory of planned behaviour - and some proposed solutions. *British Journal of Health Psychology, 8*, 37-55.
Freund, B. (2012). South Africa: The Union years, 1910-1948 - political and economic foundations. In R. Ross, A. Mager & B. Nasson (Eds.), *The Cambridge History of South Africa* (Vol. 2, pp. 211-253). Cambridge: Cambridge University Press.
Fullan, M. (1991). *The new meaning of educational change* (2nd ed.). New York: Teachers College Press.
Fullan, M. (2001). *The new meaning of educational change* (3rd ed.). New York: Teachers College Press.
Fullan, M. (2003). *Change forces with a vengeance*. London: Routledge Falmer.
Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences* (2nd ed.). New York: Fontana Press.
Geertz, C. (1973). Thick description: Towards an interpretive theory of culture. In C. Geertz (Ed.), *The interpretation of cultures*. New York: Basic Books.
Goodnough, K. (2001). Multiple intelligences: A framework for personalizing science curricula. *School Science and Mathematics, 101*, 180-193.
Gorard, S., & Taylor, C. (2004). *Combining methods in educational and social research*. Maidenhead: Open University Press.
Gray, B. (1998). Science education in the developing world: Issues and considerations. *Journal of Research in Science Teaching, 36*, 261-268.
Greathead, E., Devenish, C., & Funnell, G. (1998). *Responsible teenage sexuality*. Pretoria: Van Schaik.
Greene, J. (2001). Mixing social inquiry methodologies. In V. Richardson (Ed.), *Handbook of Research on Teaching.* (4th ed., pp. 251-258). Washington, DC: AERA.
Guba, E. G., & Lincoln, Y. S. (1983). Epistemological and methodological bases of naturalistic inquiry. In G. Madaus, M. Scriven & D. Stufflebeam (Eds.), *Evaluation Models* (pp. 311-333). Boston: Kluwer Nijhoff.

Halstead, J., & Waite, S. (2001). Living in different worlds: Gender differences in the developing sexual values and attitudes of primary school children. *Sex Education, 1*(1), 59-76.
Halstead, J. M. (1997). Muslims and sex education. *Journal of Moral Education, 26*, 317-330.
Hargreaves, A. (1997). Cultures of teaching and educational change. In B. Biddle, T. Good & I. Goodson (Eds.), *International Handbook of Teachers and Teaching* (pp. 1297-1319). Netherlands: Kluwer Academic.
Hargreaves, A. (1998a). The emotions of teaching and educational change. In A. Hargreaves, A. Lieberman, M. Fullan & D. Hopkins (Eds.), *International Handbook of Educational Change* (pp. 558-575). Dordrecht: Kluwer Academic Publishers.
Hargreaves, A. (1998b). Pushing the boundaries of educational change. In A. Hargreaves, A. Lieberman, M. Fullan & D. Hopkins (Eds.), *International Handbook of Educational Change* (pp. 281-294). Dordrecht: Kluwer Academic.
Hargreaves, A. (2002). *Four ages of professionalism and professional learning. Closing the gap between curriculum policy and practice*. Paper presented at the GICD (Gauteng Institute of Curriculum Development) Curriculum Conference.
Harley, K., & Wedekind, V. (2004). Political change, curriculum change and social formation, 1990 to 2002. In L. Chisholm (Ed.), *Changing class, education and social change in post-apartheid South Africa* (pp. 195-220). Cape Town: HSRC Press.
Hartell, C. (2005). HIV/AIDS in South Africa: A review of sexual behaviour among adolescents. *Adolescence, 40*(157), 171-181.
Hassard, J. (2005). *The art of teaching science*. New York: Oxford University Press.
Hatch, J. (2002). *Doing qualitative research in educational settings*. New York: Suny.
Hattingh, A. (2008). Assessing curriculum change in underdeveloped contexts: A case study of reform in South Africa. In E. Weber (Ed.), *Educational change in South Africa: Reflections on local realities, practices, and reforms* (pp. 41-56). Rotterdam: Sense.
Hattingh, A., Rogan, J., Aldous, C., Howie, S., & Venter, E. (2005). Assessing the attainment of learner outcomes in Natural Sciences of the new South African curriculum. *African Journal of Research in Mathematics, Science and Technology Education, 9*(1), 13-24.
Hawes, H., & Stephens, D. (1990). *Questions of quality. Primary education and development*. Essex: Longman.
Helleve, A., Flisher, A., Onya, H., Mukoma, W., & Klepp, K. (2009). South African teachers' reflections on the impact of culture on their teaching of sexuality and HIV/AIDS. *Culture, Health & Sexuality, 11*(2), 189-204.
Helleve, A., Flisher, A., Onya, H., Mukoma, W., & Klepp, K. (2011). Can any teacher teach sexuality and HIV/AIDS? Perspectives of South African Life Orientation teachers. *Sex Education, 11*(1), 13-26.
Henderson, J. (1994). Teaching sensitive issues in science: The case of sex education. In J. Wellington (Ed.), *Secondary science: Contemporary issues and practical approaches* (pp. 240-257). London: Routledge.
Henning, E. (2004). *Finding your way in qualitative research*. Pretoria: Van Schaik.
Hewson, P., Beeth, M., & Thorley, N. (1998). Teaching for conceptual change. In B. Fraser & T. Tobin (Eds.), *International Handbook of Science Education* (pp. 199-218). Dordrecht: Kluwer Academic.
Hindle, D. (1999). Preface. In N. Taylor & P. Vinjevold (Eds.), *Getting learning right. Report of the President's Education Initiative research project*. Johannesburg: Joint Education Trust.
IRIN (2007). *Blood blockages and scolding nurses: Barriers to adolescent contraceptive use in South Africa*.
Ivinson, G. (2007). Pedagogic discourse and sex education: Myths, science and subversion. *Sex Education, 7*(2), 201-216.
Jansen, J. (1999a). Setting the scene: Historiographies of curriculum policy in South Africa. In J. Jansen & P. Christie (Eds.), *Changing curriculum: Studies on outcomes-based education in South Africa* (pp. 3-18). Cape Town: Juta.
Jansen, J. (1999b). 'A very noisy OBE': The implementation of OBE in Grade 1 classrooms. In J. Jansen & P. Christie (Eds.), *Changing curriculum: Studies on outcomes-based education in South Africa* (pp. 203-217). Cape Town: Juta.
Jansen, J. (1999c). Why outcomes-based education will fail: An elaboration. In J. Jansen & P. Christie (Eds.), *Changing curriculum: Studies on outcomes-based education in South Africa* (pp. 145-156). Cape Town: Juta.
Jaworski, B. (1994). *Investigating mathematics teaching: A constructivist enquiry*. London: Falmer Press.
Jegede, O. (1998). The knowledge base for learning in Science and Technology education. In P. Naidoo & M. Savage (Eds.), *African Science and Technology education into the new millenium: Practice, policy and priorities* (pp. 151-176). Johannesburg: Juta.
Jegede, O., & Okebukola, P. (1991). The effect of instruction on socio-cultural beliefs hindering the learning of science. *Journal of Research in Science Teaching, 28*(3), 275-285.
Jenkins, O. (2006). What is an ethnic group? . *http://www.vernacularmedia.org/index.php*,
Jewkes, R., Abrahams, N., Mathews, S., Seedat, M., Van Niekerk, A., Suffla, S., et al. (2009). Preventing rape

and violence in South Africa: Call for leadership in a new agenda for action. *Medical Research Council Policy Brief.* Retrieved 7 November 2012, from http://www.mrc.ac.za/gender/prev_rapedd041209.pdf

Jewkes, R., Sikweyiya, Y., Morrell, R., & Dunkle, K. (2009). Understanding men's health and use of violence: interface of rape and HIV in South Africa? Retrieved 6 November 2012, from <http://en.wikipedia.org/wiki/South_African_Medical_Research_Council>

Johnson, D., Johnson, R., Holubec, E., & Roy, P. (1984). *Circles of learning. Cooperation in the classroom*. United States of America: Edward Brothers, Inc.

Johnson, R., & Onwuegbuzie, A. (2004). Mixed methods: A research paradigm whose time has come. *Educational Researcher, 33*(7), 14-26.

Kehily, M. (2002). Sexing the subject: Teachers, pedagogies and sex education. *Sex Education, 2*(3), 215-231.

Kepe, T. (2010). 'Secrets' that kill: Crisis, custodianship and responsibility in ritual male circumcision in the Eastern Cape Province, South Africa. *Social Science & Medicine, 70*(5), 729-735.

Khulisa Management Services (1999). *Evaluation of Curriculum 2005 (C2005) and Outcomes-based Education (OBE) in Gauteng Province*. Johannesburg: Gauteng Institute for Curriculum Development.

Killen, R. (2007). *Teaching strategies for outcomes-based education*. Cape Town: Juta & Co.

Klein, P. (1997). Multiplying the problem of intelligence by eight: A critique of Gardner's theory. *Canadian Journal of Education, 22*(4), 377-394.

Kwenda, C., Mndende, N., & Stonier, J. (1997). *African religion and culture alive!* Pretoria: Collegium.

Lave, J., & Wenger, E. (1991). *Situated learning; Legitimate peripheral participation*. New York: Cambridge University Press.

Le Compte, M., & Preissle, J. (1993). *Ethnography and qualitative design in educational research* (2nd ed.). San Diego: Academic Press.

Leach, J., & Scott, P. (2000). Children's thinking, learning, teaching and constructivism. In M. Monk & J. Osborne (Eds.), *Good practice in science teaching: What research has to say*. Buckingham: Open University Press.

Lelliott, A., Mwakapenda, W., Doidge, M., du Plessis, J., Mhlolo, M., Msimanga, A., et al. (2009). Issues of teaching and learning in South Africa: A disjunction between curriculum policy and implementation. *African Journal of Research in Mathematics, Science and Technology Education, Special Issue*, 47-64.

Lemke, J. (1997). Cognition, context and learning: A social semiotic perspective. In D. Kirschner & J. Whitson (Eds.), *Situated cognition: Social, semiotic and psychological perspectives* (pp. 37-56). Mahwah: Lawrence Erlbaum.

Lewin, K. (1992). *Science education in developing countries: Issues and perspectives for planners*. Paris: International Institute for Educational Planning (UNESCO).

Lincoln, Y., & Guba, E. (1985). *Naturalistic inquiry*. Beverley Hills, CA: Sage.

Lincoln, Y., Lyndham, S., & Guba, E. (2011). Paradigmatic controversies, contradictions, and emerging confluences, revisited. In N. Denzin & Y. Lincoln (Eds.), *The Sage Handbook of Qualitative Research* (pp. 97-128). Thousand Oaks, CA: Sage.

Lumpe, A., Haney, J., & Czerniak, C. (1998a). Science teacher's beliefs and intentions regarding the use of cooperative learning. *School Science and Mathematics, 98*, 123-135.

Lumpe, A. T., Haney, J. J., & Czerniak, C. M. (1998b). Science teacher's beliefs and intentions to implement science-technology-society (STS) in the classroom. *Journal of Science Teacher Education, 9*, 1-24.

Magno, M. (2007). Science education in developing countries in Asia: Issues and concerns for planners and implementers. In M. Nagao, J. Rogan & M. Magno (Eds.), *Mathematics and Science Education in Developing Countries*. Diliman, Quezon City: The University of the Phillipines Press.

Makiwane, M., & Mokomane, Z. (2010). South Africa youths' higher-risk sexual behaviour: an eco-developmental analysis. *African Journal of AIDS Research, 9*(1), 17-24.

Malambo, R. (2002). Teach them while they are young, they will live to remember. The views of teachers and pupils on the teaching of HIV/AIDS in basic education: A case study of Zambia's Lusaka and Southern Provinces. *Current Issues in Comparative Education, 3*(1), 39-51.

Malcolm, C. (2000). *Implementation of outcomes based approaches to education in Australia and South Africa: A comparative study*. Johannesburg: Gauteng Institute for Curriculum Development.

Malcolm, C., & Alant, B. (2007). Science education research in Southern Africa. In M. Nagao, J. Rogan & M. Magno (Eds.), *Mathematics and Science Education in Developing Countries*. Diliman, Quezon City: The University of the Phillipines Press.

Marris, P. (1974). *Loss and change* (1st ed.). London: Routledge & Kegan Paul.

Mathebula, D. (2001). *Sexuality education by parents and families in informal settlements.* Paper presented at the Department of Education Conference on Sexuality Education: Protecting the Right to Innocence.

Mbananga, N. (2004). Cultural clashes in reproductive health information in schools. *Health Education, 104*(3), 152-162.

Mbiti, J. (1989). *African religions and philosophy* (2nd ed.). Johannesburg: Heinemann.

Mbiti, J. (1991). *Introduction to African Religion*. Johannesburg: Heinemann
McCombs, B., & Whisler, J. (1997). *The learner-centred classroom and school. Strategies for increasing student motivation and achievement.* San Francisco: Jossey-Bass.
McKay, A. (1997). Accommodating ideological pluralism in sexuality education. *Journal of Moral Education, 26*, 285-300.
McLaughlin, M. (1998). Listening and learning from the field: Tales of policy implementation and situated practice. In A. Hargreaves, A. Lieberman, M. Fullan & D. Hopkins (Eds.), *International Handbook of Educational Change* (pp. 70-84). Dordrecht: Kluwer Academic.
McMillan, J., & Schumacher, S. (2010). *Research in education: Evidence-based inquiry* (7th ed.). Boston: Pearson.
Mengo, B. (2012). Cultural beliefs hinder pregnant women in Kenya from better health. Retrieved 15 October 2012, from news.xinhuanet.co,/english/indepth/2012-07-11
Merriam, S. (2009). *Qualitative research: A guide to design and implementation* (2nd ed.). San Francisco: Jossey-Bass.
Miles, M., & Huberman, A. (1994). *Qualitative data analysis: An expanded sourcebook.* (2nd ed.). Thousand Oaks, CA: Sage.
Morrell, R. (2003). Silence, sexuality and HIV/AIDS in South African schools. *The Australian Educational Researcher, 30*(1), 41-62.
Mturi, A. (2003). Parents' attitudes to adolescent sexual behaviour in Lesotho. *African Journal of Reproductive Health, 7*(2), 25-33.
Mudaly, R. (2006). *Empowering secondary school learners to explore risk perceptions and the role of gender among young people in the context of HIV/AIDS.* Unpublished PhD, University of KwaZulu Natal., Durban.
Mulemwa, J. (2004). Girls and gender equity - the missing half. In A. T. A. F. f. C. s. L. i. S. a. Technology) (Ed.), *Learning to teach, teaching to learn*. Lansdowne, South Africa: Juta Gariep.
Muller, J. (2006). Differentiation and progression in the curriculum. In M. Young & J. Gamble (Eds.), *Knowledge, Curriculum and Qualifications for South African Further Education*. Cape Town: HSRC Press.
Munthali, A., & Zulu, E. (2007). The timing and role of initiation rites in preparing young people for adlescence and responsible sexual and reproductive behaviour in Malawi. *African Journal of Reproductive Health, 11*(3), 150-167.
Murphy, C. (2012). Vygotsky and primary science. In B. Fraser, K. Tobin & C. McRobbie (Eds.), *Second International Handbook of Science Education* (Vol. 1, pp. 177-187). Dordrecht: Springer.
News24 (2014). Motshekga closes book on OBE. Retrieved 22 March 2014, www.news24.com/SouthAfrica/News/Motshekga-closes-book-in-OBE-20140106:
Nuthall, G. (1997). Understanding student thinking and learning in the classroom. In B. Biddle, T. Good & I. Goodson (Eds.), *International Handbook of Teachers and Teaching* (pp. 681-768). Dordrecht: Kluwer Academic Publishers.
Nykiel-Herbert, B. (2004). Misconstructing knowledge: The case of learner-centred pedagogy in South Africa. *Prospects, 34*(3), 249-265.
O'Neil, J. (1994). Aiming for new outcomes: The promise and the reality. *Educational Leadership, 51*(6), 6-10.
Onwu, G. (1998). Teaching large classes. In P. Naidoo & M. Savage (Eds.), *African Science and Technology education into the new millenium: Practice, policy and priorities*. Kenywyn: Juta.
Onwu, G., & Stoffels, N. (2005). Instructional functions in large, under-resourced science classes: Perspectives of South African teachers. *Perspectives in Education, 23*(3), 79-91.
Opie, C. (2004). Research procedures. In C. Opie (Ed.), *Doing Educational Research: A Guide to First Time Researchers* (pp. 95-129). London: Sage Publications.
Osborne, J. (1996). Beyond constructivism. *Science Education, 80*(1), 53-82.
Osci, J. (1998). *The value of African taboos for biodiversity and sustainable development*. Pretoria: UNISA.
Ottevanger, W. (2002, 22-26 January). *Teacher support materials as a catalyst for science curriculum implementation in Namibia.* Paper presented at the Proceedings of the 10th Annual Conference of the Southern African Association for Research in Mathematics, Science and Technology Education, University of Natal, Durban.
Pahad, M., Cohen, S., Marsh, R., & Tema, B. (n.d.). *Curriculum 2005: Implementing OBE - 4. Philosophy*. Pretoria: Department of Education.
Parker, J. (2001). School-based sex education: A new millenium update. Retrieved 15th December, 2005, from <http://www.ericdigests.org/2002-3/sex.htm>
Patton, M. (2002). *Qualitative research and evaluation methods* (3rd ed.). Thousand Oaks, CA: Sage.
Pedretti, E. (1999). Decision making and STS education: Exploring scientific knowledge and social responsibility in schools and science centers through an issues-based approach. *School Science and*

Mathematics, 99(4), 174-181.
Pettifor, A., Rees, H., Steffenson, A., Hlongwa-Madikizela, L., Macphail, C., Vermaak, K., et al. (2004). *HIV and sexual behaviour among young South Africans: A national survey of 15-24 year olds*. Johannesburg: Reproductive Health Research Unit, University of Witwatersrand.
Piaget, J. (1964). Development and learning. In R. Ripple & V. Rockcastle (Eds.), *Piaget rediscovered (pp.7-19)*. Ithaca: Cornell University Press.
Posel, D. (2012). The Apartheid Project, 1948-1970. In R. Ross, A. Mager & B. Nasson (Eds.), *The Cambridge History of South Africa*. Cambridge: Cambridge University Press.
Posner, G., Strike, K., Hewson, P., & Gertzog, W. (1982). Accommodation of a scientific conception: Toward a theory of conceptual change. *Science Education, 66*, 211-227.
Putnam, R., & Borko, H. (1997). Teacher learning: Implications of new views of cognition. In B. Biddle, G. T & I. Goodson (Eds.), *International Handbook of Teachers and Teaching* (pp. 1223-1296). Dordrecht: Kluwer Academic Publishers.
Ramsey, J. (1993). The science education reform movement: Implications for social responsibility. *Science Education, 77*, 235-258.
Reddy, S. (2005). "It's not as easy as ABC": Dynamics of intergenerational power and resistance within the context of HIV/AIDS. *Perspectives in Education, 23*(3), 11-18.
Reddy, S. (2008, January). *Unsafe sex as a rational choice: Young adults' sexual decision-making within the context of HIV/AIDS.* Paper presented at the Proceedings of the 16th Annual Conference of the Southern African Association for Research in Mathematics, Science and Technology Education, Maseru.
Reiss, M. (1995). Conflicting philosophies of school sex education. *Journal of Moral Education, 24*, 371-382.
Reiss, M. (1998). The representation of human sexuality in some Science textbooks for 14-16 year olds. *Research in Science & Technological Education, 16*(2), 137-148.
Richardson, V. (2003). Constructivist pedagogy. *Teachers College Record, 105*(9), 1623-1640.
Rivers, K., & Aggleton, P. (1999, 15/11/08). Adolescent sexuality, gender and the HIV epidemic. Retrieved 15 November 2012, from http://www.undp.org/hiv/publications/gender/adolesce.htm
Rogan, J. (2000). Strawberries, cream and the implementation of Curriculum 2005: towards a research agenda. *South African Journal of Education, 20*(3), 118-125.
Rogan, J. (2004). Out of the frying pan ...? The implementation of Curriculum 2005. *African Journal of Research in Mathematics, Science and Technology Education, 8*, 165-179.
Rogan, J. (2006). How much curriculum change is approrpiate? Defining a zone of feasible implementation. *Science Education, 91*, 439-460.
Rogan, J. (2007). An uncertain harvest: A case study of implementation of innovation. *Journal of Curriculum Studies, 39*(1), 97-121.
Rogan, J., & Aldous, C. (2004). *Predicting classroom innovation in science classrooms.* Paper presented at the Proceedings of the 12th Annual Conference of the Southern African Association for Research in Maths, Science and Technology Education, Durban.
Rogan, J., & Aldous, C. (2005). Relationships between the constructs of a theory of curriculum implementation. *Journal of Research in Science Teaching, 42*(3), 313-336.
Rogan, J., & Grayson, D. (2003). Towards a theory of curriculum implementation with particular reference to science education in developing countries. *International Journal of Science Education, 25*, 1171-1204.
Rollnick, M. (2000). Current issues and perspectives on second language learning of science. *Studies in Science Education, 35*, 93-112.
Roscoe, N. (2006). Teenage sexual health: The bomb is ticking. *Journal of Biological Education, 41*(1), 3-4.
Rose-Innes, O. (2006). Sociocultural aspects of HIV/AIDS. *Health 24.* Retrieved 20 November 2012, from http://www.health24.com/medical/Condition_centres
Rosenshine, B., & Meister, C. (1992). The use of scaffolds for teaching higher-level cognitive strategies. *Educational Leadership, 49* (7), 26-33.
Sadler, T., & Dawson, V. (2012). Socio-scientific issues in science education: Contexts for the promotion of key learning outcomes. In B. Fraser, K. Tobin & C. McRobbie (Eds.), *Second International Handbook of Science Education* (Vol. 2, pp. 799-809). Dordrecht: Springer.
Sanders, M. (2006, 9-12 January). *Moving forward in research on curriculum implementation: re-examing appropriate theoretical frameworks.* Paper presented at the Proceedings of the 14th Annual Conference of the Southern African Association for Research in Mathematics, Science and Technology Education, University of Pretoria, South Africa.
Sanders, M., & Kasalu, L. (2004, 13-17 January). *Lack of understanding of policy as a factor affecting the theory-practice gap in implementing Curriculum 2005.* Paper presented at the Proceedings of the 12th Annual Conference of the Southern African Association for Research in Mathematics, Science and Technology Education, University of Natal, Durban.

Scaife, J. (2004). Reliability, validity and credibility. In C. Opie (Ed.), *Doing educational research: A guide to first time researchers* (pp. 58-72). London: Sage Publications.
Schiro, M. (2008). *Curriculum theory: Conflicting visions and enduring concerns*. London: Sage.
Schon, D. (1971). *Beyond the stable state: Public and private learning in a changing society*. London: Temple Smith.
Setati, M., & Adler, J. (2000). Between languages and discourses: Language practices in primary multilingual mathematics classrooms in South Africa. *Educational Studies in Mathematics, 43*, 243-269.
Setati, M., Adler, J., Reed, Y., & Bapoo, A. (2002). Code-switching and other language practices in mathematics, science and English language classrooms in South Africa. In J. Adler & Y. Reed (Eds.), *Challenges of teacher development: An investigation of take-up in South Africa* (pp. 72-93). Pretoria: Van Schaik.
Setati, M., Chitera, N., & Essien, A. (2009). Research on multilingualism in mathematics education in South Africa: 2000-2007. *African Journal of Research in Mathematics, Science and Technology Education. Special issue*, 65-80.
Shalaway, L. (1997). *Learning to teach....not just for beginners. The essential guide for all teachers*. New York: Scholastic Professional Books.
Shulman, L. (1986). Those who understand: knowledge growth in teaching. *Educational Researcher, 15*(2), 4-14.
Shulman, L. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review, 57*, 1-22.
Shumba, O. (1999). Relationship between secondary science teachers' orientation to traditional culture and beliefs concerning science instructional ideology. *Journal of Research in Science Teaching, 36*(3), 333-355.
SIECUS (2001). Issues and answers: Fact sheet on sexuality education. *SIECUS (Sexuality Information and Education Council of the United States) Report, 29*(6), 1.
Slavin, R. (1987). Developmental and motivational perspectives on cooperative learning: A reconciliation. *Child Development, 58*, 1161-1167.
Solomon, J., & Aikenhead, G. (1994). *STS education: International perspectives on reform*. New York: Teachers College Press.
Somers, C., & Surman, A. (2005). Sources and timing of sex education: relations with American adolescent sexual attitudes and behaviour. *Educational Review, 57*(1), 37-54.
Spady, W. (1994). *Outcomes-based education: Critical issues and answers*. Arlington, Virginia: American Association of School Administrators.
Sparks, A. (1990). The mind of South Africa. The story of the rise and fall of apartheid. London: Mandarin.
Stake, R. (2000). Case Studies. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of Qualitative Research* (2nd ed., pp. 435-454). Thousand Oaks: Sage.
Stake, R. (2005). Qualitative case studies. In N. Denzin & Y. Lincoln (Eds.), *The Sage Handbook of Qualitative Research* (pp. 443-466). Thousand Oaks, CA: Sage.
Stake, R. (2006). *Multiple Case Study Analysis*. New York: The Guildford Press.
Statistics South Africa (2011a). South Africa's population. Retrieved 9 August 2012, from http://www.statssa.gov.za/publications/P0302/P03022011.pdf
Statistics South Africa (2011b). Statistical release P0302: Mid-year population estimates 2011. Retrieved 9 August 2012, from http://www.statssa.gov.za/publications/P0302/P03022011.pdf
Statistics South Africa (2013). Statistical release P0302. Midyear population estimates. Retrieved 22 January 2014, from http://www.statssa.gov.za/publications/P0302/P03022013.pdf
Stears, M., & Malcolm, C. (2005). Learners and teachers as co-designers of relevant science curricula. *Perspectives in Education, 23*(3), 21-30.
Stein, M., & Wang, M. (1988). Teacher development and school improvement: The process of teacher change. *Teaching and Teacher Education, 4*, 171-187.
Stinson, K. (2007). Male circumcision in South Africa. How does it relate to public health. Retrieved 24 May 2007 from http://www.africanvoices.co.za/culture/circumcision.htm
Stoffels, N. (2008). Why do teachers do what they do? In E. Weber (Ed.), *Educational change in South Africa: Reflections on local realities, practices, and reforms* (pp. 25-40). Rotterdam: Sense.
Stoll, C. (1994). Science education in developing countries: What's the point? *Science Education International, 4*(4), 13-16.
Sugrue, C. (1997). *Complexities of teaching: child-centred perspectives*. London: Falmer Press.
Tabulawa, R. (1997). Pedagogical classroom practice and the social context: The case of Botswana. *International Journal of Educational Development, 17*(2), 189-204.
Tabulawa, R. (2003). International aid agencies, learner-centred pedagogy and political democratisation: A critique. *Comparative Education, 39*(1), 7-26.

Taylor, N. (1999). Curriculum 2005: Finding a balance between school and everyday knowledges. In N. Taylor & P. Vinjevold (Eds.), *Getting learning right: Report of the President's Education Initiative research project*. Johannesburg: The Joint Education Trust.

Taylor, N. (2001). *'Anything but knowledge': The case of the undisciplined curriculum*. Paper presented at the Conference in the Netherlands, November 2000 and at a seminar in Johannesburg, February 2001.

Taylor, N., Gamble, J., Spies, M., & Garisch, C. (2013). School leadership and management. In N. Taylor, S. Van der Berg & T. Moabogoane (Eds.), *Creating effective schools*. Cape Town: Pearson.

Taylor, N., Van der Berg, S., & Mabogoane, T. (2013). Context, theory, design. In N. Taylor, S. Van der Berg & T. Mobogoane (Eds.), *Creating effective schools* (pp. 1-30). Cape Town: Pearson.

Taylor, N., & Vinjevold, P. (1999). Teaching and learning in South African schools. In N. Taylor & P. Vinjevold (Eds.), *Getting learning right: Report of the President's Education Initiative research project* (pp. 131-162). Johannesburg: Joint Education Trust.

Taylor, S. (2013). Modelling educational achievement. In N. Taylor, S. Van der Berg & T. Mabogoane (Eds.), *Creating effective schools* (pp. 61-99). Cape Town: Pearson.

Terreblanche, C. (2002, March 16, 2002). Findings on child abuse disturbing. *Saturday Star*,

Thompson, R. (1997). Diversity, values and social change: renegotiating a consensus on sex education. *Journal of Moral Education, 26*, 317-330.

Turnbull, T., van Wersch, A., & van Schaik, P. (2008). A review of parental involvement in sex education: The role for effective communication in British families. *Health Education Journal, 67*(3), 182-195.

UNAIDS (2011). *Global HIV/AIDS response: Epidemic uptake and health sector progress towards universal access. Progress Report*: World Health Organisation, UNAIDS, UNICEF.

van der Berg, S., Burger, C., Burger, R., de Vos, M., du Rand, G., Gustafsson, M., et al. (2011). *Low quality education as a poverty trap*. Stellenbosch: University of Stellenbosch.

Veiga, L., Teixeira, F., Martin, I., & Meliço-Silvestre, A. (2006). Sexuality and human reproduction: A study of scientific knowledge, behaviours and beliefs of Portuguese future elementary school teachers. *Sex Education, 6*(1), 17-29.

Verenikina, I. (2008). Scaffolding and learning: its role in nurturing new learners. In P. Kell, W. Vialle, D. Konza & V. G. (Eds.), *Learning and the learner: Exploring learning for new times* (pp. 161-180). Wollongong: University of Woolongong.

Vincent, L. (2006). Virginity testing in South Africa: Re-traditioning the postcolony. *Culture, Health & Sexuality, 8*(1), 17-30.

Vincent, L. (2008). 'Boys will be boys': traditional Xhosa male circumcision, HIV and sexual socialisation in contemporary South Africa. *Culture, Health & Sexuality: An International Journal for Research, Intervention and Care, 10*(5), 431-446.

Vinjevold, P. (1999a). Language issues in South African classrooms. In N. Taylor & P. Vinjevold (Eds.), *Getting learning right. Report of the President's Education Initiative Research Project.* (pp. 205-226). Johannesburg: Joint Education Trust.

Vinjevold, P. (1999b). Learning materials. In N. Taylor & P. Vinjevold (Eds.), *Getting learning right: Report of the President's Education Initiative research project* (pp. 163-184). Johannesburg: The Joint Education Trust.

Von Glasersfeld, E. (1995). *Radical constructivism: A way of knowing and learning*. London: Falmer Press.

Vorster, C., Mayet, A., & Taylor, S. (2013). The language of teaching and learning in South African schools. In N. Taylor, S. Van der Berg & T. Mabogoane (Eds.), *Creating effective schools*. Cape Town: Pearson.

Vygotsky, L. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, MA: Harvard University Press.

Walker, J., & Milton, J. (2006). Teachers' and parents' roles in the sexuality education of primary school children: a comparison of experiences in Leeds, UK and in Sydney, Australia. *Sex Education, 6*(4), 415-428.

Waterhouse, L. (2006). Inadequate evidence for multiple intelligences, Mozart effect, and emotional intelligence theories. *Educational Psychologist, 41*(4), 247-255.

Wenger, E. (1998). *Communities of practice: Learning, meaning and identity*. Cambridge: Cambridge University Press.

Yager, R. (1992). Science-Technology-Society as reform. . In R. Yager (Ed.), *The staus of Science-Technology-Society reform efforts around the world*. Virginia: ICASE.

Yin, R. (2003a). *Applications of case study research*. Newbury Park, CA: Sage.

Yin, R. (2003b). *Case study research, design and methods*. Thousand Oaks: Sage.

Zint, M. (2002). Comparing three attitude-behaviour theories for predicting science teachers' intentions. *Journal of Research in Science Teaching, 39*, 819-844.