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The relationship between the Grade 11 Life Sciences curriculum documents, HIV/AIDS knowledge and behavioural preferences

By

Lindelani Elphas Mnguni

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Abstract

In this study the relationship between the South African Grade 11 Life Sciences curriculum documents, HIV and AIDS knowledge and behavioural preferences of students was investigated. The Life Sciences curriculum and textbooks used in Grade 11 Life Sciences were analysed to determine the curriculum ideology of the subject and concepts related to HIV and AIDS that are prescribed for teaching with the aim of educating students about HIV and AIDS and promoting safe behaviour. Life Sciences and non-Life Sciences students were compared to determine whether academic HIV and AIDS knowledge taught in Life Sciences was related to functional HIV and AIDS knowledge and behavioural preferences.

Findings indicate that Life Sciences does not promote safe behaviour related to HIV and AIDS. Furthermore Life Sciences is knowledge-oriented and integrates HIV and AIDS knowledge as extra content. In addition Life Sciences does not have a clear curriculum ideology for HIV and AIDS education even though it has characteristics of various curriculum ideologies with greater emphasis on the scholar academic ideology. The Life Sciences curriculum makes provisions for the construction and application of HIV and AIDS knowledge, but it does not provide guidance with regards to application of knowledge. Moreover textbooks are not consistent with regard to presentation of content and do not present sufficient content for meaningful application in everyday life. Results also showed that academic HIV and AIDS knowledge improves some students' knowledge of functional HIV and AIDS knowledge. It was also found that HIV and AIDS knowledge does not significantly correlate with some students' behaviour presumably because students have difficulty in relating Life Sciences knowledge to real life. Consequently some students do not fully know some HIV and AIDS concepts, and they rely on alternative means to respond to questions for which they do not have the necessary content knowledge. It was also found that some students do not take ownership of social problems related to HIV and AIDS.

The researcher believes that there is a need to review HIV and AIDS education in Life Sciences by basing it on a precise curriculum ideology that will ensure that suitable scientific content, which may lead to behaviour transformation, is integrated.

Keywords: Grade 11, Life Sciences, curriculum ideologies, academic HIV and AIDS knowledge, functional HIV and AIDS knowledge, behavioural preferences, document analysis, survey

Declaration

The research work described in this thesis was carried out in the Faculty of Education, University of Pretoria, from January 2008 to August 2011, under the supervision of:

Dr A. L. Abrie
Department of Science, Mathematics and Technology Education, University of Pretoria Private bag X20, Hatfield, Pretoria, 0028, South Africa,

and co-supervision of:

Professor L. Ebersöhn
Department of Educational Psychology, University of Pretoria, Private bag X20, Hatfield, Pretoria, 0028, South Africa.

This thesis presents original work by the author and has not otherwise been submitted in any form for any degree or diploma to any university.

Signed:

Lindelani Elphas Mnguni (candidate)

Signed:

Dr A. L. Abrie (supervisor)

Signed:

Professor L. Ebersöhn (co-supervisor)

Dedication

This one is for my family; my wife Simphiwe and my son Wandile, my mother, brothers and sisters. I won't forget you Khwibi.

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I owe this entire thesis to the LORD and Saviour of my life, Jesus Christ. If your Word, LORD, had not entered my heart, I would surely not be here this day. All glory be unto you always. Thank you for seeing me through.

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1. CHAPTER 1: PRELUDE TO THE STUDY

"If we only said safe sex, use a condom, we won't stop the spread of AIDS in this country."
Thabo Mbeki[1]

1.1 Challenges for HIV and AIDS education in South Africa: A problem statement

Large amounts of money have been used to counter the spread of HIV and AIDS in South Africa. A large portion of this money is used to promote safe sex. Thabo Mbeki, the former President of South Africa, however argued that if all efforts are championed towards safe sex, then HIV and AIDS would not be eradicated. The current study therefore explored the role played by education in counteracting the spread of HIV and AIDS by changing the behaviours of students.

Much research and prevention work has been done, yet it remains a great concern that the HIV and AIDS prevalence, particularly in South Africa remains high (UNAIDS, 2010; UNAIDS, 2009; Bennett, Boerma & Brugha, 2006; Page, Ebersöhn & Rogan, 2006; UNAIDS, 2006; Kinsler & Sneed, 2004). Worldwide some 33.3 million people are living with HIV and AIDS, with 2.9 million new infections in 2009, and 1.8 million HIV and AIDS related deaths in the same year (UNAIDS, 2010). In 2009 reports suggest that 67% of people living with HIV and AIDS lived in sub-Saharan Africa, a 4% increase from 2006 (UNAIDS, 2010; UNAIDS, 2009; Dorrington, Johnson, Bradshaw & Daniel, 2006; UNAIDS, 2006). UNAIDS (2009; 2006) also reports that other continents make a noteworthy contribution to the worldwide figures, that is North America 4%, South America and the Caribbean 7%, Europe 2% and Asia and Oceania 20%.

Looking at South Africa alone, statistics show that in 2009 about 5.6 million South Africans were living with HIV (UNAIDS, 2010). Furthermore it is suggested that in South Africa a 15-year-old has a 56% probability of dying before the age of 60 due to HIV and AIDS related

[1] http://www.brainyquote.com

illnesses (Dorrington *et al.*, 2006). This high HIV and AIDS prevalence in South Africa is one of the major health education challenges facing the country.

Dorrington *et al*. (2006) report that about 24% of those infected with HIV and AIDS in South Africa are aged under 25. This age group is therefore one of the groups that raise concern for fighting the spread of HIV. There are a number of factors leading to high HIV and AIDS prevalence of which risk behaviour due to inadequate information is one (Anderson & Beutel, 2007). In this regard Anderson and Beutel (2007) suggest that more depth of HIV and AIDS knowledge is needed by South African youths. This sentiment is also echoed by a number of researchers who say while less attention is being paid to the way the education system addresses HIV and AIDS, it has a great potential of reducing the HIV and AIDS pandemic (Anderson & Beutel, 2007; Baumgartner, 2001; Christopher, Dunnagan, Duncan & Paul, 2001).

Concerning the use of the education system to fight the spread of HIV and AIDS, some researchers have questioned the accuracy of information that is available to youths through various HIV and AIDS awareness programmes. Anderson (2007) reports a limited transfer of scientific knowledge from research to secondary schools. At times this limited transfer of scientific knowledge is perpetuated by a narrow communication approach, which tends to focus on teaching students more about AIDS and less about the cause of AIDS which is HIV (Bertrand, O'Reilly, Denison, Anhang & Sweat, 2006; Kinsler & Sneed, 2004; Myhre & Flora, 2000; Kuhn & Steinberg, 1994). Compounding this is the high number of misconceptions that exist about HIV and AIDS (for example Fawole, Asuzu, Oduntan & Brieger, 1999). Because of these educational factors, a number of uninformed and poorly co-ordinated HIV and AIDS awareness programmes have been used, particularly in schools (as reported by Bertrand *et al.*, 2006; Page *et al.*, 2006; Myrhe & Flora, 2000; Kuhn & Steinberg, 1994).

Besides awareness programmes, school subjects have been modified to provide students with the necessary knowledge of HIV and AIDS. In South Africa these modules include Life Orientation and Life Sciences. In Life Sciences HIV and AIDS education usually deals with teaching students about scientific knowledge of HIV and AIDS such as the existence of HIV and AIDS, characteristics of HIV and AIDS, modes of HIV transmission and means of prevention and treatment (for example Anderson & Beutel, 2007; Bertrand *et al.*, 2006;

Department of Education, 2003a; Myhre & Flora, 2000; Kuhn & Steinberg, 1994). Knowledge which deals with life skills, stigma and discrimination related to HIV and AIDS, sexuality education, testing and management of AIDS is taught mainly in other subjects such as Life Orientation (Department of Education, 2003b).

Although some researchers (for example Page *et al.*, 2006) have explored Life Sciences as a vehicle to integrate HIV and AIDS-related scientific knowledge into, no analysis of the Life Sciences curriculum documents has been correlated with relevant knowledge and behaviour among students. Specifically there is no indication whether knowledge currently taught in Life Sciences is able to promote *i)* students' understanding of HIV and AIDS knowledge, and *ii)* the applicability of this knowledge in daily lives. It also appears that there is a dearth of knowledge regarding Life Sciences concepts that are necessary as prior knowledge to understand, for instance how HIV is transmitted. Overall the role and impact of Life Sciences in potentially minimizing the spread of HIV and AIDS through behavioural change is not clear. As a result to simply teach the characteristics of HIV and AIDS may be futile (Anderson & Beutel, 2007; Bertrand *et al.*, 2006; Page *et al.*, 2006). To this, Bertrand *et al.* (2006: 593), attest having found "no statistically significant impact" of some awareness programmes (including school-based modules) in reducing the spread and effects of HIV and AIDS through behavioural change.

While the debate on socialization through the formal curriculum continues, the Department of Education[2] in South Africa adopted the incorporation of HIV and AIDS education into Life Sciences (Anderson & Beutel, 2007; Department of Education, 2003a). One of the Learning Outcomes stipulated in the Life Sciences Curriculum Statement in this regard is that students should be "able to apply scientific knowledge in their personal lives and as responsible citizens in ways that will contribute to a healthy lifestyle" (Department of Education, 2003a: 9). Life Sciences is traditionally an academic field (that is, it focuses on the construction and understanding of scientific and discipline-specific knowledge), and therefore its ability to foster behaviour-related socialization, for example behaviour transformation[3], requires

[2] The author acknowledges that the name of the Department has been changed to the Department of Basic Education. However during the study the old name (Department of Education) was in operation and hence adopted in this thesis.

[3] Behaviour transformation is defined in the study as conscious use of curriculum-based knowledge and skills to reject unsafe behaviours and adoption of safe behavioural practices in order to prevent HIV infection.

investigation. Given the debates regarding socialization through the curriculum, the study intended to determine how the Life Sciences curriculum addresses the question of socialization. It is based on this argument that the researcher compared Life Sciences and non-Life Sciences students' behavioural preferences to examine the impact of the curriculum on socialization.

Based on current work on HIV and AIDS education, there is a dearth of knowledge regarding the ability of Life Sciences to foster socialization, particularly behaviour transformation. It appears that researchers in HIV and AIDS education may not have regarded Life Sciences as one of the HIV and AIDS intervention strategies and thus have not evaluated its effectiveness. In fact there is no clarity as to which conceptual framework was used by the Department of Education in integrating HIV and AIDS education into Life Sciences. Furthermore research has shown that knowledge (especially scholar academic knowledge) has a minimal impact on (health-related) behaviour (Schiro, 2008). However it appears that Life Sciences does attempt to facilitate a knowledge/curriculum-real life interaction. The effectiveness of this stance however requires an investigation. Overall there has not been any research done to compare Life Sciences and non-Life Sciences students' HIV and AIDS knowledge and behavioural preferences in order to interrogate the effect of curricula on behaviour transformation.

Perhaps, combining different forms of HIV and AIDS knowledge in Life Sciences could mould critical thinkers who would take the responsibility for their behaviour and their contribution to society. Furthermore maybe HIV and AIDS education can prepare students to confront HIV and AIDS in a reflective manner, exposing misconceptions of reality. Possibly students may understand that they are part of an unhealthy society that needs to transform its behaviour by reconstructing values, norms, attitudes and beliefs using knowledge. To this end Shimbira, Dlamini and Dube (2007) argue that students ought to view themselves, and act as agents of change. A Life Sciences curriculum perhaps can inspire students to take ownership of their reconstruction role in society.

1.2 The research context: conceptualization

Given the above arguments, the researcher intended to compare HIV and AIDS knowledge and behavioural preferences of Life Sciences and non-Life Sciences students in order to inform Life Sciences curriculum development from a behaviour transformation perspective. The researcher also intended to provide insight into how the Life Sciences curriculum may relate to behavioural preferences of among students. In the next subsections, the researcher contextualizes various concepts that are fundamental to the study.

1.2.1 The curriculum

Curriculum is a central concept in the current study. The researcher acknowledges that curriculum refers to documents outlining content to be covered as well as planned and unplanned learning outcomes of a particular subject area. These outcomes include those observed inside and outside the classroom. Nonetheless, within the context of the study, the researcher adopted the view of the curriculum as a planned and guided sequence of learning experiences as developed by the Department of Education of South Africa and implemented by schools, that is the curriculum statement (particularly the Life Sciences curriculum statement) (Tanner & Tanner, 1987; Good, 1959; Smith, Stanley & Shores, 1957). The curriculum facilitates student development and attainment of relevant qualifications. With respect to student development, the curriculum shapes students' intellectual capacity including construction of new knowledge and using such knowledge in everyday life. The Department of Education determines content knowledge that students should be taught as well as learning outcomes that must be attained. Teachers are responsible for facilitating students' learning experiences by developing lesson plans, conducting lessons and using assessment tools. Overall, the curriculum consists of *i)* predetermined subject matter, *ii)* a planned sequence of learning experiences, *iii)* certifiable completion, *iv)* the institution of learning, and *v)* development or socialization of students (Waks, 2003; Tanner & Tanner, 1987; Good, 1959; Smith *et al.*, 1957).

In the study the researcher espouses the views that the curriculum should have a specific objective, also referred to as the curriculum ideology. At least four curriculum ideologies can be distinguished, namely scholar academic ideology, social efficiency ideology, student-centred ideology and social reconstruction ideology (Schiro, 2008; Ravitch, 2000; Kliebard, 1996; Schubert, 1996). These ideologies are regarded by some as ideals as reality constitutes a mélange of ideologies (Þórólfsson & Lárusson, 2010; Kliebard, 1996). The researcher however believes that it is possible to define school subjects as representative of the ideologies. This classification of school subjects would require analysis of the curriculum particularly in relation to content knowledge and learning outcomes of such subjects.

In the *scholar academic ideology* students are taught fundamental didactic statements which are viewed by academic disciplines as objective content knowledge that defines a discipline (Kliebard, 1996). The objective of teaching scholar academic knowledge is to transform students to become members of the discipline once they have attained predetermined minimum standards (Schubert, 1996). Scholar academic ideologists seek continued existence and growth of disciplines (Schiro, 2008). The *social efficiency ideology* aims to prepare students for their responsibilities as adults by teaching programmed instruction for the development of predetermined skills. Supporters of the social efficiency ideology view knowledge as a normative objective reality that is socially interpreted and therefore students are provided with prerequisite behavioural capabilities such as social skills in relation to standardized norms (Kliebard, 1996). The main objective of the *student-centred ideology* is to facilitate growth of students by allowing students to construct knowledge through personal creative responses to experiences (Schiro, 2008). Students' growth is facilitated by diagnosing their abilities and adapting the curriculum according to students' needs and abilities in order to invoke new perspectives and meanings to life. The *social reconstruction ideology* is based on the assumption that an unhealthy society can be changed through education (Cotti & Schiro, 2004). By teaching new knowledge and skills, social reconstructors seek to transform social norms and values in order to enhance human civilization (Kliebard, 1996; Schubert, 1996; McNeil, 1977). Functional knowledge therefore is used to transform students' beliefs, attitudes, values and ultimately behaviours with a view that this transformation will in turn reconstruct entire social norms (Cotti & Schiro, 2004).

1.2.2 Socialization and behaviour transformation

At the centre of the different curriculum ideologies is the socialization of students. A commonality of curricula ideologies is that curricula seek to transmit some form of culture, social values, traditions, knowledge and skills to students. Socialization refers to the phenomenon where students learn social knowledge, skills, values and behaviours through interaction with other members of the society such as teachers and other students (Kentli, 2009). Furthermore socialization is the process where students develop interpersonal and intrapersonal skills such as cooperation, independence, and personal identity. A product of socialization is a distinct behavioural pattern that students who share social structures such as schools and neighbourhoods have (Kentli, 2009; Margolis, 2001). Socialization may therefore lead to behaviour transformation.

Behaviour transformation is defined in the study as the conscious use of curriculum-based knowledge and skills to reject unsafe behaviours and adopt safe behavioural practices in order to prevent HIV infection, and support and care for those infected. This concept does not imply an observed change in the behavioural pattern or preference of students before and after an intervention. Instead the author refers to behaviour transformation to signify safe behavioural preferences of students against risk behavioural preferences. A theoretical assumption in this regard is that curriculum knowledge can foster behaviour transformation. The researcher refers to such knowledge as functional knowledge which is based on the social reconstruction ideology. In this study the researcher also assumed that scholar academic knowledge, social efficiency knowledge and student-centred knowledge may not lead to behaviour transformation.

1.2.3 Behavioural preferences

To measure students' behaviour transformation in terms of the Life Sciences curriculum, the researcher investigated students' self-reported behavioural preferences related to preventing HIV infection and supporting and caring for those infected. Behavioural preferences refer to students' attitudes, subjective norms and perceived behavioural control with reference to *i)* sexual practices, *ii)* HIV and AIDS protection/prevention strategies, *iii)* acceptance (of being infected and/or of those infected), and, *iv)* beliefs concerning personal susceptibility. This conceptualization of behavioural preferences is based on the theory of planned behaviour which states that attitudes, subjective norms and perceived behavioural control are proxies that can be used (collectively) to predict actual behaviour (Ajzen, 1991). In the study attitude was defined as a set of beliefs that predisposes one to respond in a particular way to HIV and

AIDS-related situations. Subjective norms are other people's (such as teachers, friends and family) perceived opinions on HIV and AIDS-related behaviour. Perceived behavioural control is the individual's subjective belief about whether or not they have the ability to perform certain HIV and AIDS-related behaviour (Hansen, Jensen & Solgaard, 2004).

1.2.4 Life Sciences knowledge and students

In the study the researcher also investigated the relationship (i.e. correlation and not causal link) between Life Sciences knowledge and behavioural preferences to determine the effect of the curriculum on socialization. Life Sciences refers to a subject taught to students in Grades 10 to 12 in South African schools (Department of Education, 2003a). (Internationally the subject may be referred to as Biology). As a field, biology originates from Greek words *bios* meaning "life" and *logia* meaning the "study of" (Mayr, 1985). Traditionally biology students are taught scholar academic knowledge of plants, animals, micro-organisms, viruses, medicine as well as other life and health sciences (Dimmock, Easton & Leppard, 2007; Audesirk, Audesirk, & Byers, 2004). Recently Life Sciences was adapted to include more health and social sciences related to HIV and AIDS (Department of Education, 2003a; Mazzarello, 1999; Mayr , 1985; Bayrakdar, 1983). Thus Life Sciences also teaches academic HIV and AIDS knowledge, which is factual knowledge about HIV and AIDS. Academic HIV and AIDS knowledge is based on the scholar academic ideology.

In the South African context students may choose to study Life Sciences in Grades 10 to 12. Non-Life Sciences students are students who do not study Life Sciences in Grades 10 to 12. Non-Life Sciences students therefore are assumed to have lesser academic HIV and AIDS knowledge compared with Life Sciences' students as this knowledge is presumably only taught in detail in Life Sciences. While it is possible for non-Life Sciences students to independently and informally acquire academic HIV and AIDS knowledge, another assumption of the study was that Life Sciences students should have a greater understanding of academic HIV and AIDS knowledge. Both groups of students however may have functional HIV and AIDS knowledge as this knowledge is presumably not restricted to Life Sciences. Functional HIV and AIDS knowledge is based on the social reconstruction ideology.

1.2.5 Health education

The idea of functional HIV and AIDS knowledge emanates from health education. Health educators believe that behavioural preferences are influenced by *i)* knowledge of health risks and benefits of various health practices, *ii)* perceived self-efficacy, *iii)* outcomes expectation, *iv)* health goals, as well as, *v)* perceived facilitators (Bandura, 2004). Therefore, health education is a multidisciplinary science that promotes prevention and treatment of diseases and minimizes premature death by fostering behaviour transformation (DeBarr, 2004).

Health education also includes HIV and AIDS education. In the study HIV and AIDS education refers to the provision of scholar academic, social efficiency, student-centred and/or social reconstruction knowledge to students to educate them about HIV and AIDS. Therefore, the Life Sciences curriculum includes content on HIV and AIDS education and health education. Health education may be taught in other health-related subjects such as Life Orientation.

Based on the above context of the study the researcher compared Life Sciences students and non-Life Sciences students' HIV and AIDS knowledge and behavioural preferences as a way of interrogating curriculum-real life interaction.

1.3 Rationale for the study

As shown in the problem statement (Section 1.1), statistics show that South Africa has a very high HIV and AIDS prevalence (UNAIDS, 2010; UNAIDS, 2009; Dimmock *et al.*, 2007; Dorrington *et al*., 2006; UNAIDS, 2006). This is despite numerous attempts by the government and other social organisations to counteract the spread of HIV. One of the most recognized stories of HIV infection in South Africa is that of Nkosi Johnson, who, at age 12, died of AIDS-related complications. Stories of young people like Nkosi and others reflect the cruelty of HIV, which includes those infected and affected by HIV and AIDS (Anderson & Beutel, 2007). Likewise, given the high prevalence of HIV (Dorrington *et al*., 2006) most people in South Africa have witnessed the effects of HIV and AIDS. In some persons, witnessing suffering caused by HIV and AIDS leads to serious negative psychological effects, yet to others it results in a better understanding of its reality (Anderson & Beutel, 2007). This understanding of the reality of HIV and AIDS is further strengthened by learning about HIV and AIDS at school.

While many people are infected through vertical transmission, rape and accidental blood spills, there are reports of unsafe sexual behaviour that increases the risk of infection (Anderson & Beutel, 2007; Dorrington *et al*., 2006). School-going youth often display unsafe behaviour even though they learn about HIV and AIDS in their school curricula including in the subject Life Sciences (Dorrington *et al*., 2006). The question is why do young people, who are taught about HIV and AIDS in Life Sciences and arguably have knowledge regarding HIV infection and prevention strategies, voluntarily risk contracting HIV?

To respond to the above question, those who believe that there is a need for behaviour transformation argue that society is "unhealthy" (Schiro, 2008; Cotti & Schiro, 2004). While there are a number of reasons for society to be "unhealthy" and at "risk", some scholars argue that mechanisms to curb the spread of HIV are often not effective because they do not target the correct "ailment" (Anderson & Beutel, 2007). To illustrate this point, Steinberg (2008) states:

> "Sex is the most life giving of activities. That a new nation's citizens are dying from sex seems to be an attack both on ordinary people's and a nation's generative capacities, an insult too ghastly to stomach. Where there is AIDS, there is blame. It is said in the villages that the virus was hatched in laboratories…the ill are accused of having murdered loved ones by their promiscuity…neighbours are blamed for using magic to infect the beautiful and the successful…."

Steinberg's analysis provides an intriguing perspective: that perhaps while young people learn about HIV and AIDS, they still do not fully comprehend the concept of HIV and AIDS and its effects in life. This perhaps is why, irrespective of knowledge, HIV and AIDS prevalence amongst young people remains high and factors perpetuating the spread of HIV remain a subject of contention among many researchers (Bennett *et al.*, 2006; Dorrington *et al*., 2006; Page *et al.*, 2006; UNAIDS, 2006; Kinsler & Sneed, 2004).

To facilitate behavioural change, which the researcher refers to as behaviour transformation, researchers argue that curricula could play a significant role to transform behaviour among students (Centre for the Study of AIDS, 2007). Wood (2007) argues that HIV and AIDS education is broader than sexuality and health-oriented curriculum. In South Africa, functional HIV and AIDS knowledge focuses mainly on promoting abstinence, faithfulness to one sexual partner and condomizing, also known as ABC (UNAIDS, 2009; Bennett *et al.*, 2006; Dorrington *et al*., 2006). Academic HIV and AIDS knowledge on the other hand facilitates students' understanding of the scientific content knowledge of HIV and AIDS. It teaches for instance the life cycle of HIV, the structure of the virus and the immune system (Department of Education, 2003a). Wood's (2007) argument therefore is that "a reductivist approach (such as scholar academic knowledge) can in fact lead to the "othering" of the pandemic and unwittingly increase stigmatisation" (Centre for the Study of AIDS, 2007: 8).

The researcher wonders if Life Sciences students, who learn academic and functional HIV and AIDS knowledge (presumably in Life Sciences and Life Orientation respectively), would display safe behavioural practices compared with non-Life Sciences students who may not have academic HIV and AIDS knowledge. In this regard researchers indicate that in order to prepare students to be agents of social reconstruction and behaviour transformation, there needs to be a balance and cohesion between community outreach and school activities (Centre for the Study of AIDS, 2007). The argument here is that there remains a gap between real-life issues and school curricula. Mohammed (2007) suggests that the problem is that institutions of education are protective of curricula. Most curricula are not designed to influence behavioural change, but construction of discipline-specific knowledge. Scholars also argue that there is a need to humanize what is taught in schools (Centre for the Study of AIDS, 2007). At the fore of this argument for a humanized curriculum is that "students must graduate alive" (Centre for the Study of AIDS, 2007: 14).

Researchers suggest that schools, in which the majority of youths spend most of their time, are well suited to be used for behaviour transformation in order to foster an adoption of safe behavioural practices (Anderson & Beutel, 2007). School curricula can therefore be used to provide leadership and action required for behaviour transformation. It is through agents of socialization, such as schools, that attitudes, beliefs, ideals and the behaviour of society are nurtured. Consequently the school (and curricula) holds a great potential to transform social behaviour in the context of HIV and AIDS through behaviour transformation-oriented curricula.

Life Sciences could also be used to introduce students to the reality of HIV and AIDS through scientific and constructivist learning and teaching (Bennett *et al.*, 2006; Page *et al.*, 2006). By developing relevant life and socio-scientific skills, students could explore for themselves the academic and functional HIV and AIDS knowledge and integrate such knowledge into their everyday life, which involves decision-making (Bennett *et al.*, 2006; Dorrington *et al.*, 2006; Cotti & Schiro, 2004; Kinsler & Sneed, 2004). The idea is that perhaps academic and functional HIV and AIDS knowledge could facilitate the transformation and reconstruction of students' views on sexual behaviour, HIV and AIDS protection/prevention strategies, acceptance (of being infected and/or of those infected), and beliefs concerning personal susceptibility. However for this behaviour transformation to occur, a behaviour transformation-oriented curriculum is required (Donnelly, 2006). Consequently, the *raison d'être* for the current study is to explore the role of a Life Sciences curriculum in behaviour transformation.

1.4 Assumptions about knowledge and behaviour

Flowing from the above rationale, the researcher held the following theoretical assumptions relating to the study:

a) Academic HIV and AIDS knowledge is taught in Life Sciences.
b) Functional HIV and AIDS knowledge is taught in various subjects in schools, including Life Orientation[4] and to some extent Life Sciences.
c) Life Sciences students have more academic HIV and AIDS knowledge compared with non-Life Sciences students.
d) Academic and functional HIV and AIDS knowledge correlate positively with safe behavioural preferences of students.
e) Life Sciences students will report safer behavioural preferences compared with non-Life Sciences students.

[4] An analysis of the Life Orientation curriculum however falls outside of the scope of this study.

1.5 Locating the discourse of the study in the literature

The study can be located in the literature in two particular areas, namely curriculum studies and HIV and AIDS education. While these two can be regarded as distinct fields, the researcher integrated them by investigating the part of the Life Sciences curriculum that addresses HIV and AIDS. (A comprehensive discussion of curriculum studies and HIV and AIDS education appears in Chapters 2 and 3).

1.5.1 Curriculum studies

Research on curricula focuses on a number of areas, including the rationale, design process, implementation and assessment of learning. A general view in this regard is that the rationale for a curriculum determines content knowledge to be taught, the process of selecting such content, the sequence of the learning experience, learning outcomes as well as the assessment strategy (Schiro, 2008; Van den Akker, 2003; Davis, 1998; Kliebard, 1996; MacDonald, 1971). An element of contention in relation to learning outcomes is socialization of students, especially with regard to adoption of new values, norms, beliefs and behaviours (Van den Akker, 2003; MacDonald, 1971). For example Dewey strongly believed that curricula should explicitly outline and facilitate socialization of students (Schiro, 2008; Warde, 1960; Dewey, 1897). The controversy however is that in reality, curricula do not regard socialization but rather focus on subject matter content, sequence of the learning experience as well as learning outcomes from a knowledge construction or acquisition point of view (Waks, 2003). Consequently students are taught ontological arguments about reality as well as epistemology instead of application of knowledge in real life (Healy & Perry, 2000). This knowledge-oriented curriculum has over the years received much criticism because of its top-down approach which is closely associated with scholar academic ideology (Van Manen, 1978). Furthermore there is concern that ontology and epistemology are not enough to inform curriculum theory (MacDonald, 1971).

An opposing view suggests that education should be framed by a reality-oriented curriculum that promotes student development through hands-on experiential learning (Warde, 1960; Dewey, 1897). A reality-oriented curriculum promotes social consciousness (Dewey, 1897) and citizenship (Warde, 1960; Waghid, 2002). According to Dewey (1897) education should prepare students for the future by giving them command of themselves and allowing them to explore their own potential and ability to use and develop those skills they may already have. A reality-oriented curriculum discourse has been further developed by researchers who argue that education should develop enquiry and problem-solving skills among students as a way of constructing knowledge (Simsek & Kabapinar, 2010; Kong & So, 2008; Hover & Horne, 2005; Wilkie, 2000).

Both knowledge and reality-oriented curriculum ideologies however fail to address the question of socialization, particularly behaviour (Simsek & Kabapinar, 2010). Knowledge and reality-oriented curriculum ideologies are viewed by most researchers as subscribing to scholar academic and student-centred ideologies, ignoring social needs (Kliebard, 1996). To address the limitation of knowledge and reality-oriented curriculum ideologies, other researchers advocate citizenship education and critical pedagogy (Waghid, 2005; Waghid, 2002; Kerr, 1999). Citizenship education refers to the use of formal education to prepare students for their roles in society as citizens (Kerr, 1999; Cherryholmes, 1980). Students in this regard are taught decision-making (Kerr, 1999), reflective thinking (Hunt & Metcalf 1968), reflective inquiry (Barr, Barth & Shermis 1978) and the application of knowledge, rendering citizenship education a proponent of socialization. To this end critical pedagogues argue that education should lead to transformation in students' lives, particularly in the areas of psychosocial and health behaviour as well as intellectual challenges (Freire, 1993).

Even though citizenship educators and critical pedagogues advocate socialization through curricula, there are a number of researchers who argue that the formal curriculum still fails to adequately promote socialization while the hidden curriculum is thriving in this regard (Zuga, 1992; Martin, 1976). These researchers argue that students' behaviours are developed through the hidden curriculum, even in the classroom. The argument here is that interpersonal and intrapersonal skills such as cooperation, independence and personal identity are not explicit in the formal curriculum, but emerge as a consequence of the hidden curriculum (Jackson, 1968).

1.5.2 HIV and AIDS education

Socialization is however a broad concept; thus, the context of HIV and AIDS was selected for investigation in the study. As stated earlier, HIV and AIDS education forms part of the Life

Sciences curriculum. Therefore socialization of students includes behaviour transformation as defined in the study. For contextualization purposes, the objective of Life Sciences can be rephrased as follows: Life Sciences "students should be able to apply scientific [HIV and AIDS] knowledge in their personal lives and as responsible citizens in ways that will contribute to a healthy lifestyle, [that is, behaviour transformation]" (Department of Education, 2003a: 9).

However HIV and AIDS education (even outside Life Sciences) and its ability to foster behaviour transformation is a complex subject on its own. For instance as health education, HIV and AIDS education aims to facilitate adoption of healthy behaviours, that is, behaviour transformation (World Health Organization, 2010). However research suggests that behaviour is dependent on a wide range of factors (Kemm, 2003; Ajzen, 1991). Therefore, (biology or HIV and AIDS) knowledge alone may not necessarily lead to adoption of safe behaviour. Consequently researchers advise that health education should target those factors that have been shown to influence behaviour, for example life skills, self-efficacy, attitudes, beliefs, social norms (Kemm, 2003; Koelen, Vaandrager & Colomer, 2001; Kok, Van den Borne & Mullen, 1997; Ajzen, 1991). In South Africa these factors are integrated in Life Orientation. Researchers have engaged in evaluating the effectiveness of health education programmes in order to inform future projects.

Evaluation of HIV and AIDS education has led to the view that learning and behavioural theories are effective tools through which health education can be designed, implemented and evaluated (Lloyd-Williams, 2003; Kok *et al.*, 1997). This is because behavioural theories provide a lens through which health-related behaviour can be viewed and assessed. The challenge however is that there are numerous theories that inform health education and therefore, the effectiveness of a programme can only be true within the parameters of a particular theory. It should be asked which theory was adopted for designing, implementing and evaluating Life Sciences-based health education?

There are various strategies that have been adopted for HIV and AIDS education, including non-curricular programmes[5] that address various aspects of HIV and AIDS, particularly

[5] Non-curricular programmes refer to those programmes that do not form part of the formal school curriculum as prescribed by the Department of Education in South Africa. These may however be presented within the schooling environment.

sexuality education and sexual health as well as HIV/AIDS education (Beeker, Guenther-Grey & Raj, 1998). Sexuality education and sexual health often deal with reducing sexual risk behaviour and sexuality-related violence, improving knowledge of sexuality and reproductive health, life skills and resilience (Harrison, Newell, Imrie & Hoddinott, 2010; Ebersöhn, 2008; Jewkes, Nduna, Levin, Jama, Dunkle, Puren & Duvvury, 2008; Paul-Ebhohimhen, Poobalan & Van Teijlingen, 2008; Hallman, Govender, Roca, Pattman, Mbatha & Bhana, 2007; Ebersöhn, 2006; Jewkes, Nduna, Levin, Jama, Dunkle, Khuzwayo, Koss, Puren, Wood & Duvvury, 2006; Karnell, Cupp, Zimmerman, Feist-Price & Bennie, 2006; Gallant & Maticka-Tyndale, 2004). With respect to HIV and AIDS education, researchers have investigated knowledge of and attitudes toward HIV and AIDS, prevention strategies, social influences on infection, life skills for living with HIV as well as self-efficacy (Francis, 2010; Harrison *et al.*, 2010; Jewkes *et al.*, 2008; Gupta, Parkhurst, Ogden, Aggleton & Mahal, 2008; Kirby, Laris & Rolleri, 2007; Gallant & Maticka-Tyndale, 2004; Paul-Ebhohimhen *et al.*, 2004). One of the major findings with regard to HIV and AIDS education is that psychosocial, economic and cultural factors have a major impact on behaviour transformation (Francis, 2010). Other factors that have been found to greatly impact behaviour transformation are social practices, peer pressures, cultural beliefs and practices, hormonal urges, gender, stigma and discrimination, sexuality education, human rights violation as well as literacy (Harrison *et al.*, 2010; Jewkes *et al.*, 2008; Kirby *et al.*, 2007; Gallant & Maticka-Tyndale, 2004). These factors are discussed in detail in Chapter 3.

Another trend in HIV and AIDS education discourses is that HIV and AIDS education must be integrated into the curriculum, by following specific criteria (Van Laren, 2008; UNESCO, 2006), which is what the Department of Education attempted with Life Sciences. Common practice in this regard is integrating academic and/or functional HIV and AIDS knowledge into a curriculum. The effectiveness of this integration is a subject of much debate (Maticka-Tyndale & Barnett, 2010; Anderson & Beutel, 2007; Bertrand *et al.*, 2006; Askew, Chege, Njue, Radeny, Kenyan Ministry of Health & Kenyan Ministry of Education, Science and Technology, 2004; Bhuiya, Rob, Chowdhury, Rahman, Haque & Adamchak, 2004; Diop, Bathidja, Toure, Dieng, Mane & Rama Rao, 2004; Mathur, Malhotra & Mehta, 2004). In relation to Life Sciences, Keselman, Kaufman and Patel (2004) suggest that there is potential for behaviour transformation. They state that one of the factors that determines the effectiveness of HIV and AIDS knowledge is conceptual understanding of HIV and AIDS, which transforms misconception and myths about HIV and AIDS. Furthermore skills learnt in scholar academic curricula, such as reasoning, problem-solving skills and argumentation skills assist students to apply knowledge in their lives and to negotiate their sexuality.

1.6 Aims of the study

Based on the above discussion, the main aim of the current study was:

To compare Life Sciences and non-Life Sciences students' HIV and AIDS knowledge and their behavioural preferences as a way of interrogating the relationship between Life Sciences curriculum and behaviour transformation.

To achieve the above aims, specific research questions were addressed.

1.7 Research question and subquestions

Emanating from the aim of the study as stated in Section 1.6 above, the following main research question was asked:

How can the curriculum-behaviour transformation relationship be understood when comparing Life Sciences students with non-Life Sciences students on HIV and AIDS knowledge and behavioural preferences?

To respond to the main research question the researcher explored the following research subquestions:

1. *How does the Life Sciences curriculum address HIV and AIDS for safe behavioural preferences among students?*
2. *How do Life Sciences students compare with non-Life Sciences students in:*
    a) *Academic HIV and AIDS knowledge?*
    b) *Functional HIV and AIDS knowledge?*
    c) *Self-reported behavioural preferences related to HIV and AIDS?*
3. *To what extent does academic HIV and AIDS knowledge correlate with*
    a) *Functional HIV and AIDS knowledge?*
    b) *Self-reported behavioural preferences related to HIV and AIDS?*

To respond to the above research subquestions, specific methods were used (Chapter 4). In Table 1.1, an overview of how each research question is addressed is presented.

Table 1.1 Overview of how research subquestions were responded to

Research subquestion number	**Method used to respond to the question**	**Data source**	**Results reported in Chapter**
1	Analysis of Grade 11 Life Sciences curriculum	Grade 11 Life Sciences curriculum and selected textbooks	5
2	Comparative survey test on students' knowledge and behavioural preferences	Grade 11 Life Sciences and non-Life Sciences students	6
3	Comparative survey test on students' knowledge and behavioural preferences	Grade 11 Life Sciences and non-Life Sciences students	6

1.8 Theoretical approach of the study: a conceptual framework

The researcher used different behavioural theories to formulate a conceptual framework through which the research questions were answered. These theories include *i)* theories of reasoned action and of planned behaviour, *ii)* social cognitive theory and, *iii)* transformational learning. For the scope of the study, behavioural theories that relate to choice behaviour form the backbone of the conceptual framework of the study.

1.8.1 Determining behaviour: The theory of planned behaviour

Over the years researchers such as Ajzen (1991) have generated theories through which behavioural patterns can be predicted and measured, for example theories of reasoned action and of planned behaviour. According to Hansen *et al.*, (2004), the two theories are related but are different in terms of their individual components. While the theory of reasoned action is perceived as a good predictor of behaviour, it fails to recognise that behaviour is not always volitional (Guo, Johnson, Unger, Lee, Xie, Chou, Palmer, Sun, Gallaher & Pentz, 2007; Kuther, 2002). Furthermore this theory does not recognise that behaviour is also influenced by people's perceptions of their ability to behave in a particular way (Hansen *et al.*, 2004). Given this, the theory of reasoned action was modified by Ajzen to incorporate these elements. This modification led to the formulation of the theory of planned behaviour (Guo *et al.*, 2007; Figure 1.1).

The theory of planned behaviour suggests that a person's behaviour is determined by his/her behavioural intentions (see Figure 1.1; Ajzen, 2006, Ajzen, 1991). In this instance the behavioural intentions can be defined as the person's attitude towards the behaviour itself and can either be for or against the behaviour in question (Kuther, 2002). Intention relates to motivational factors that influence behaviour, willingness to try as well as the amount of effort that people are willing to exert (Ajzen, 1991).

Furthermore the person's behaviour according to Ajzen (2009) is determined by subjective norms which are other people's perceived opinions about the behaviour (Figure 1.1). This means behaviour will depend on facilitating factors, context of opportunity, resources and action control (Ajzen, 1991). Hansen *et al.* (2004) argues that this theory (Figure 1.1), focuses on the influence of the person's attitude towards behaviour rather than attitude towards the stimulus itself. Because of this the theory can only be associated with behaviours that the person has control over (Hansen *et al.*, 2004).

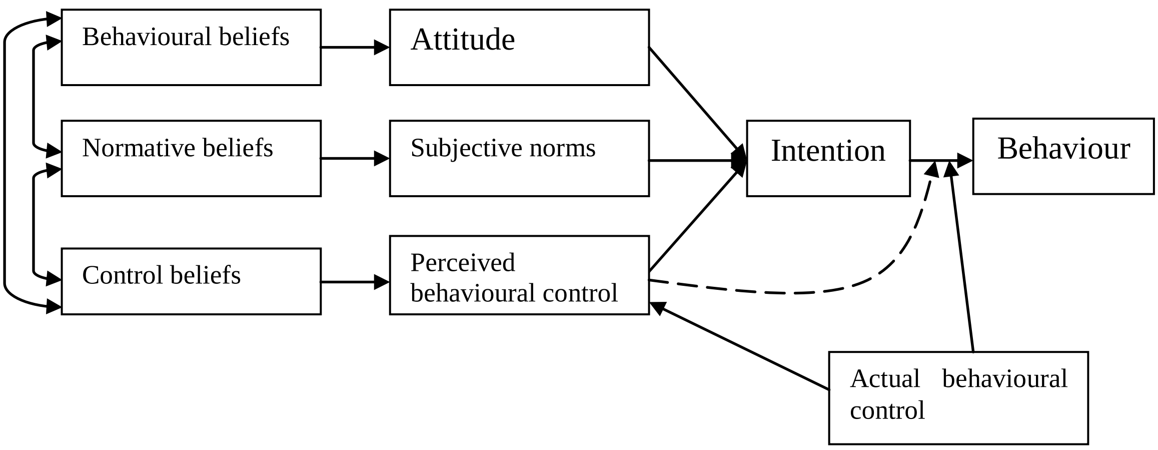

Figure 1.1 The Theory of Planned Behaviour (adapted from Ajzen, 2006)

The theory of planned behaviour suggests that in addition to attitudes and subjective norms, behaviour is influenced by perceived behavioural control (Figure 1.1; Ajzen, 1991). This is the individual's subjective belief about whether or not they have the ability to behave in a certain way (Hansen *et al.*, 2004). Other researchers have linked the perceived behavioural controls as based on the theory of achievement motivation as well self-efficacy (Ajzen, 1991). The theory of achievement motivation defines an individual's expectancy of success as the perceived probability of succeeding at a given task (Ajzen, 1991). Self-efficacy (Bandura, 1991) refers to one's judgments on how well they can execute courses of action required to deal with prospective situations, for example that behaviour is influenced by confidence in one's ability to perform. In essence, self-efficacy influences amongst other things, the choice of activities, preparation for an activity, effort expended during activity as well as thought patterns and emotional reactions (Ajzen, 1991; Bandura, 1991)

Ajzen (2006) further argues that beliefs also affect behaviour (Figure 1.1). For example, behavioural beliefs, which are beliefs about the likely consequence of a behaviour, have been shown to affect the attitude towards a behaviour. Furthermore normative beliefs, that is, beliefs about the expectations of other people influence subjective norms. In addition, Ajzen (2006: 1) indicates that control "beliefs about the presence of factors that may facilitate or impede performance of the behaviour" as they affect perceived behavioural control. Ajzen (2006) also argues that beliefs (that is, behavioural, normative and control beliefs) influence each other. Ajzen further indicates that performance of a behaviour requires a strong actual behavioural control. The actual behavioural control refers to the skills, knowledge and other resources required to performance particular behaviour. Therefore, performance of a behaviour needs both the intention as well as a sufficient level of behavioural control.

Based on the theory of planned behaviour, the researcher accepts that people's behaviour towards any life issue such as HIV and AIDS is individualistic, voluntary, under control, deliberate, planned and is performed. In this way, while knowledge is important, people still have the right to decide on their behavioural patterns based on their individualistic beliefs, attitudes and intentions. Therefore, while the study intended exploring the effects of knowledge, the researcher acknowledges that there are other factors that influence students' behaviour.

1.8.2 Factors affecting behavioural patterns: social cognitive theory

Concerning factors that affect behaviour the study adopts the social cognitive theory as a guide. While to a certain degree the social cognitive theory resembles the theory of planned behaviour, the social cognitive theory is based on much of Bandura's work (Schunk, 2000) and covers three domains unto which its assumptions are based. These are the reciprocal relationships between people, behaviours and the environment; enactive and the vicarious learning as well as a distinction between learning and performance (Chiu, Hsu & Wang, 2006; Crittenden, 2005; Schunk, 2000). Simply put, the social cognitive theory suggests that people's behaviour is, to some degree, influenced by the social networks as well as the person's cognition (Chiu *et al.*, 2006). In the following subsections, the researcher looks at each factor that influences behaviour according to the social cognitive theory.

1.8.2.1 The triadic reciprocal

The social cognitive theory discusses behaviour within the framework of triadic reciprocity (Figure 1.2; Crittenden, 2005; Schunk, 2000), a framework which Crittenden proposes to be the social learning theory. Crittenden (2005) and Schunk (2000) agree that behaviour is a result of reciprocal interaction between the cognitive, the behavioural and the environment. In this regard Crittenden (2005) refers to Davis and Luthans (1980: 960) comment that "the person and the environment do not function as independent." In this framework, the "person" component refers to cognitions, perspectives and beliefs about the world that an individual has (Crittenden, 2005; Schunk, 2000). "Environment" refers to the variable in which the person is living and "behaviour" is the manner in which people respond to the environment (Crittenden, 2005; Schunk, 2000).

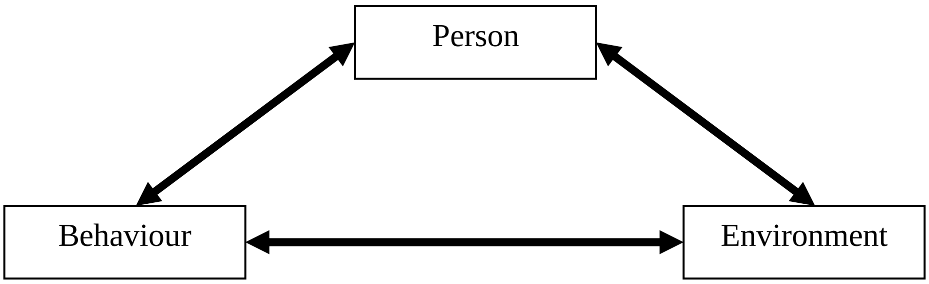

Figure 1.2 An illustration of the triadic reciprocal (adapted from Crittenden, 2005: 961)

One of the most important factors used to interpret the relationship between the person and behaviour (Figure 1.2) is self-efficacy (Schunk, 2000; Bandura, 1991). As stated before in this review, self-efficacy refers to an individual's beliefs concerning his or her capabilities to organize and implement specific actions that are necessary for the performance of a specific behaviour (Bandura, 1991). In this way, self-efficacy determines the choice of tasks, persistence and effort expenditure toward certain behavioural patterns (Schunk, 2000).

Furthermore according to the social cognitive theory, actions modify self-efficacy (Schunk, 2000). Explaining this, Crittenden (2005) says the sequence of events in this regard is such that a person notices something in the environment, the individual remembers what was noticed (that is, processes information cognitively) then produces a certain behaviour and thereafter the environment delivers a consequence (Figure 1.2). For instance if a student who believes that he cannot contract HIV has unprotected sex, this student will not immediately know if he is HIV positive (unless a medical test is done immediately to track the presence/absence of the virus in the body). Because of this, this student's self-efficacy will remain unchanged until he learns of his possibly infected status. However if the student were to immediately learn that he is HIV positive; his self-efficacy would change as he realizes that he is capable of being infected. In this way behavioural experience has the potential of changing self-efficacy.

In addition to the above, there is also a relationship between behaviour and the environment (Crittenden, 2005; Schunk, 2000). In this case, a person's behaviour has the potential of altering the environment (Schunk, 2000). For example if a teacher talks about HIV in a Life Sciences classroom and then gives an assessment activity; if most students were to fail the assessment activity, the teacher may want to re-teach the subject matter. In this way, the instructional environment is being altered by behaviour.

1.8.2.2 Enactive and vicarious learning

The social cognitive theory also attempts to define learning according to the enactive and the vicarious learning forms (Schunk, 2000). In this way the theory suggests that learning is enactive through actual doing or vicarious by observing models perform. By models Schunk (2000) suggests that they can either be living beings (for example teachers) or external representations (symbols).

Concerning enactive learning, learning occurs from the consequences of one's actions (Schunk, 2000). For instance behaviour that results in successful or comforting consequences is retained, but that which results in unsuccessful or unpleasant consequences is discarded (Schunk, 2000). This is in line with the Thorndike's Law of Effect and Watson's Laws of Frequency and Recency (Schunk, 2000). These basically suggest that behavioural consequences serve as sources of information and motivation.

Learning vicariously refers to learning without performance (Schunk, 2000). In other words, the student learns simply by observing models. This is one of the most common teaching practices in disadvantaged schools where resources are limited and only teachers have the liberty to perform experiments for instance (Muwanga-Zake, 2010). In such cases students are only expected to observe and learn. Another example is learning about the effects of HIV and AIDS. Most people know the effects of HIV and AIDS by observing them in other people and not through overt experience.

There is a difference between learning and performance (Schunk, 2000). Often learning may refer to the acquisition of new knowledge, whereas, performance means a person has had previous exposure to a certain phenomenon (Schunk, 2000). In this way it can be suggested that learning does not always require performance. Given this, the current researcher argues that in terms of transformational learning, learning about HIV and AIDS requires a specific teaching and learning method that will not only pass on information but will also influence behavioural patterns of students. In line with the social cognitive theory's epistemology, the current researcher adopts a view that effective learning about any subject matter for example HIV and AIDS, depends on an individual's perspective of self, the world and certain behaviours. Furthermore the researcher accepts that learning can occur through practice and/or observing. For subjects where practice is not possible, students can rely on observations to enhance their knowledge and then behaviour.

1.8.3 Role of knowledge in behavioural patterns

Before discussing the role of education in relation to behavioural patterns, it is important to first look at how knowledge is constructed. According to the theory of constructivism, knowledge is not acquired but created by each individual (Young & Collin, 2004; Thompson, 1995; Von Glasersfeld, 1995). As part of this process interaction with the environment is critical.

When students are exposed to new information, through experience and/or observation, they cognitively process this information by selecting and transforming the information, constructing hypotheses, and making decisions, based on already existing cognitive structure or prior knowledge (Young & Collin, 2004; Thompson, 1995). According to Thompson, (1995) when selecting information, students tend to select information that is easily comprehended and mentally manageable. Once certain segments of the new information have been selected, they are transformed into storable mental forms which become new knowledge (Thompson, 1995). Therefore, after mentally processing new information, students construct new forms of information based on already existing knowledge.

Following construction of mental schema, students are expected to be able to transfer knowledge from one domain to another. According to Argote and Ingram (2000) knowledge transfer is a phenomenon whereby an individual applies knowledge acquired in one situation in another (Kane, Argote & Levine, 2005). Furthermore researchers suggest that knowledge transfer can be measured by measuring changes in knowledge or changes in performance such as behaviour (Kane *et al*., 2005; Argote & Ingram, 2000; Darr & Kurtzberg, 2000). Thus the researcher believes that once knowledge has been constructed through constructivism, such knowledge should be transferable and applicable in novel settings. A question is how does knowledge translate to safe behaviour?

Scholars suggest that concept understanding (that is, knowledge) can influence problem-solving skills and behavioural preferences (Guo *et al*., 2007; Williams and Noyes, 2007; Chiu *et al*., 2006; Crittenden, 2005; Magnani, MacIntyre, Karim, Brown & Hutchinson, 2005; Hansen *et al*., 2004; Kuther, 2002; Maynard, Moss, Whitehead, Narayanan, Garay, Brannon, Kantemneni & Kustra, 2001; Pakaslahti, 2000; Schunk, 2000; Ajzen, 1991; Bandura, 1991; Clark & Paivio, 1991; James & Nelson, 1981). Constructivism argues that the external source of knowledge and how this knowledge is presented will affect the students' ability to understand the concept (Thompson, 1995). However according to researchers (for example Mayer, 2001), concept understanding depends on a number of factors. For example in the area of HIV and AIDS prevention, researchers (Coates, Richter, & Caceres, 2008) suggest that integration between various fields of expertise could produce effective teaching resources that could enhance concept understanding. Heeding this call, Kiene and Barta (2006) rejected the traditional face-to-face intervention approach (Page *et al*., 2006) for a computer-delivered approach. Whereas positive results were observed in Kiene and Barta's study, researchers still argue that school-based face-to-face approaches are also effective (Gallant & Maticka-Tyndale, 2004). Also defined as significant in determining success in knowledge construction is the teaching strategy or mode of presenting information (Schönborn & Anderson, 2008; Anderson, 2007; Mnguni, 2007; Mayer, 2003). For example researchers (Mnguni, Schönborn, & Anderson, 2009; Schönborn, Anderson & Mnguni, 2007; Mayer; 2003) argue that a combination of external representation (for example animations and pictures) and text is effective in fostering construction of scientific knowledge among students.

The process of solving problems remains a debated issue. However researchers report two common problem-solving procedures which include problem-solving in a creative context (Wallas, 1926) as well as generic empirical process (Polya, 1954). In the creative context, problem-solving involves defining the problem and gathering information relevant to its solution (Wang & Chiew, 2010). This process is followed by continuous thought processes seeking to understand the problem. Through this thought process the student will get a "sudden insight into the solution" (Wang & Chiew, 2010). Thereafter, the student will verify the solution and then apply the necessary means to solve the problem. In contrast, generic empirical process to problem-solving argues that problem-solving involves devising appropriate strategies and actions needed to resolve a problem (Wang & Chiew, 2010; Polya, 1954). Once these strategies are in place, appropriate measures are taken to solve the problem. Wang and Chiew (2010) suggest that all problem-solving strategies involve a number of functions including abstraction, searching, learning, inferring, analysis and synthesis.

While behaviour is not considered as an act of solving problems, some researchers suggest that there is a significant link between problem-solving and behaviour (Magnani *et al*., 2005; Pakaslahti, 2000). Pakaslahti (2000) notes that some forms of behaviour are associated with problem-solving tasks. For example, research has shown that aggressive behaviour may be due to deficiencies in processing social information (Pakaslahti, 2000). A health study in the United States showed that people with higher problem-solving skills displayed different behavioural preferences compared with those with lower problem-solving skills (Lesley, 2007; Magnani *et al*., 2005). Attesting to this, Crick and Dodge (1994) report that deficiencies in social-cognitive activities may lead to the production of misconceptions which increases the likelihood of employing inappropriate problem-solving strategies and behavioural practices (Magnani *et al*., 2005; Pakaslahti, 2000).

Flowing from the above literature review on behavioural theories, the researcher surmises that

a) Students construct knowledge for concept understanding.
b) Concept understanding depends on a number of factors including the format of presentation.
c) Knowledge constructed in one situation is used to respond to another situation.
d) Knowledge is used in problem-solving.
e) Problem-solving depends on availability of knowledge and skills.
f) Inability to solve problems (due to unavailability of knowledge and skills) determines response mechanisms such as behaviour.

Furthermore the researcher believes that knowledge may influence behavioural patterns, albeit not directly.

1.8.4 Summary of Conceptual Framework

In summary, the conceptual framework presented above (Sections 1.8.1 to 1.8.3) indicates how different behavioural theories informed the study. As discussed above constructivism suggests that during learning, knowledge is constructed based on prior knowledge (constructivist learning 1 in Figure 1.3).

Furthermore according to the social cognitive theory (Figure 1.3), environmental-person-behaviour interactions are some of the major factors that determine behaviour (Figure 1.3). Behaviour is also influenced by experience and observation, which is exposure to new knowledge. In other words, the theory of planned behaviour and the social cognitive theory all agree that behaviour can be changed through different factors that influence it, for example by changing experiences through exposure to new knowledge (constructivist learning 2 in Figure 1.3). This new experience through knowledge will then lead to a new transformed behaviour. Even though transformed, the behaviour remains dynamic as explained by the reasoned action theory, theory of planned behaviour and the social cognitive theory.

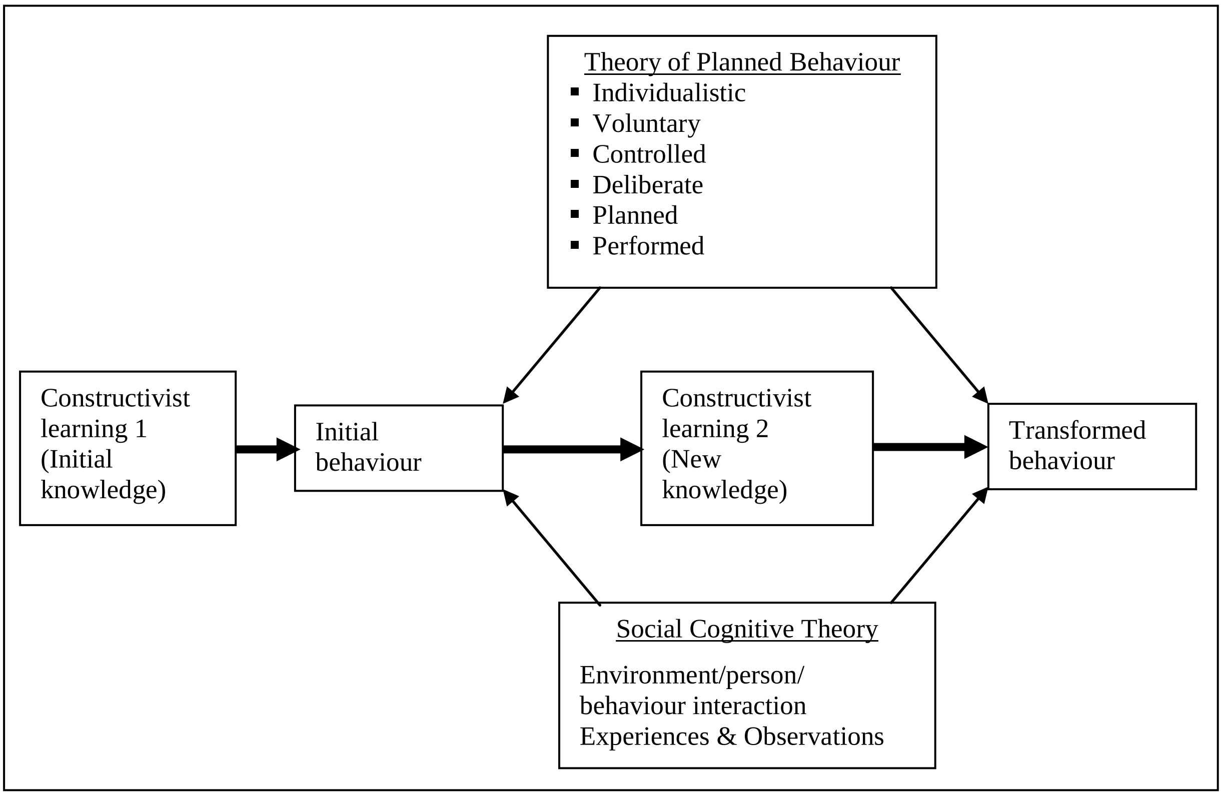

Figure 1.3 The conceptual framework of the current study

From this conceptual framework therefore the researcher intended to determine the extent and effectiveness of the Life Sciences curriculum in addressing behaviour transformation.

1.9 The researcher as a research instrument

In pursuing the current study, the researcher adopted a multiplistic realism approach for reasons described below. The researcher however takes note of the misgivings of realism as suggested in literature. For example supporters of realism proclaim realism as being objective and assuming that findings are "probably true" (Healy & Perry, 2000; Pandey, 1982). However post-modernists argue against realism in that scientific knowledge, instruments and evidence are social constructs, and therefore realists' claim of objectivity does not hold (Wright, 1996; Harding 1986; Harding & Hintikka 1983). In fact, anti-realists argue that scientific research can never achieve objective knowledge (Boyd, 1999; Knorr Cetina, 1993). Acknowledging these views, the researcher believes that in order to compensate for the misgivings of any one paradigm, a multiplistic approach is preferred (Leahey, 2007; Page *et* *al.*, 2006; Tashakkori & Teddlie, 2003; Derry, Levin, Osana, Jones & Peterson, 2000; Alford, 1998). As a result, while the current study adopts a generally realist approach, some ontological and epistemological approaches of other paradigms such as constructivism were adopted as discussed below.

While adopting a varied paradigm approach, the researcher notes Johnson and Onwuegbuzie's (2004) citation of Guba (1990: 81) who state that "accommodation between paradigms is impossible…we are led to vastly diverse, disparate, and totally antithetical ends." With this in mind, in line with Johnson and Onwuegbuzie (2004), the researcher disagrees with Guba and accepts the existence of a mixed method paradigm. For instance the researcher disagrees with the independency of the subject as suggested by positivists if such a subject is a human being (Healy & Perry, 2000). This is because human beings have perspectives that are continually transformed by exposure to new phenomena, questions and views – a constructivist's epistemology (Healy & Perry, 2000).

This then leads the researcher to agree with the constructivist. However the researcher also agrees with the positivist notion that data will not change because it is being studied (Healy & Perry, 2000). However, it is people who work with the data who may bring in new interpretations to the unchanging data – a critical theorist's ontology (Healy & Perry, 2000). Because of this "paradigm war" therefore, as suggested by Johnson & Onwuegbuzie (2004), it is possible to have a mixed method approach, which accepts the realities presented by different paradigms. Because of this, the researcher approaches the current study with such an open mind that findings of the current study will "probably be true" since the reality is real but only imperfectly and probabilistically apprehensible – a realist ontology and epistemology (Healy & Perry, 2000).

In pursuing the current study therefore, the researcher followed an inclusive approach of the realist paradigm. This paradigm is based on the idea of mixed methods as related to varied or multiplistic epistemologies (Page, 2005; Brownlee, Berthelsen & Boulton-Lewis, 2004). Realism as reviewed by Krauss (2005) neither agrees nor disagrees with other paradigms, but makes use of elements of different paradigms. Because of this flexibility, realism has gained popularity among researchers who have termed it critical realism, postpositivism and neopostpositivism (Krauss, 2005; Denzin & Lincoln, 1994; Guba & Lincoln, 1994; Hunt, 1991).

Like constructivism, realism accepts a multiple concepts approach about a single reality (Healy & Perry, 2000). In this way realism acknowledges the variations in the values of each human, including the researcher. Because of this, realism accepts that research cannot be absolutely objective or subjective because there will always be differences between reality and what people perceive as reality (Krauss, 2005). Therefore, at any one time, the reality of a researcher, conditioned by his environment, may not be the reality on the ground, conditioned by socio-environmental factors. Realism further suggests that to understand reality of any society, it is imperative to grasp the social factors involved in value-generation of that particular society (Krauss, 2005).

The goal of realism-orientated research, such as the one presented here, is therefore to discover, both observable and non-observable phenomena within a social structure (Krauss, 2005). This requires the use of both theoretical and empirical means to deduce knowledge. Furthermore realist researchers tend to use both qualitative and quantitative strategies (Healy & Perry, 2000). In this way researchers will tend to identify, name and describe phenomena while acknowledging that their work may be real yet fallible (Krauss, 2005).

1.10 Conclusion and implications of the study to the body of knowledge

The researcher believes that the findings of this study will contribute to the body of HIV and AIDS prevention with emphasis on HIV and AIDS education as well as curriculum development. Firstly the researcher hopes to provide researchers and policy makers with a reflective discourse related to the philosophy of education. Based on the findings of the study, the researcher engages in a critical dialogue of theoretical underpinnings that led to the use of Life Sciences to impart knowledge of HIV and AIDS. This could imply retaining, reviewing or removing existing conceptual frameworks of curriculum design in Life Sciences. Secondly the researcher intends providing a conceptual framework based on empirical data to guide the selection of concepts for the teaching of HIV and AIDS. For example determining the effect of Life Sciences-based HIV and AIDS education on students' understanding of HIV and AIDS could necessitate curriculum designers and teachers to reflect on their preferred pedagogical content knowledge for HIV and AIDS education. In addition findings may assist those involved in public health education to design and use effective means to provide information on HIV and AIDS. Thirdly, the study intends providing a reflective review of the role that Life Sciences can play in improving lives through dissemination and application of scientific knowledge. This will be done by describing existing relationships between Grade 11 Life Sciences curriculum and behavioural preferences of students.

The current thesis is arranged in the following manner. Chapter 1 provides an introduction to the study including the conceptualization, a problem statement the rationale, the aims and the research questions. The approach to the study (paradigm) is also presented in Chapter 1. In Chapter 2 the researcher presents a literature review that attends to behaviour transformation and curricula. In Chapter 3 the researcher addresses complexities concerning HIV and AIDS education in relation to health education, how HIV and AIDS knowledge fits into Life Sciences as well as HIV and AIDS and education. In Chapter 4 research methods are presented together with the justification of the methodological approach. Chapters 5 and 6 provide results from data collection in response to the research questions. Chapter 7 is a synthesis chapter in which the researcher provides a conclusion based on the results of the study, and how these implicate the body of Life Sciences education and HIV and AIDS education.

2. CHAPTER 2: EXPLORING THE CURRICULUM-BEHAVIOUR TRANSFORMATION RELATIONSHIP

"The aim of education should be to teach us rather how to think, than what to think - rather to improve our minds, so as to enable us to think for ourselves, than to load the memory with thoughts of other men." – Bill Beattie[6]

2.1 Introduction

Bill Beattie's quote constitutes a central question to this study of whether curriculum can inform behaviour transformation. In the current chapter the researcher therefore argues that, education and socialization are not always aligned. This misalignment could limit the ability of the curriculum to affect behaviour. Reasons for this misalignment are explored. In this regard the researcher will present literature demonstrating that curricula have intended outcomes or objectives, which may include behaviour transformation. However these objectives are not always achieved because of various curriculum-related complexities. These complexities include school and classroom dynamics, textbook compilation and use, social contexts, the role of research and interdisciplinarism, as well as the academic and social needs of students. Put together, these factors affect education's ability to influence socialization.

To address the scope of the study, the researcher also presents an argument that curriculum-specific challenges exist, that may limit attainment of intended objectives. These challenges emanate from inconsistencies with regard to curriculum theory, the rationale for curricula, curriculum ideology as well as selection of content knowledge. Given the above, the researcher then explores some documented philosophical strategies that have been shown to strengthen a curriculum-behaviour transformation relationship. In particular the researcher argues that experimentalism, transformative citizenship education and critical pedagogy could lead to behaviour transformation. At the end of the chapter the researcher poses a

[6] http://www.brainyquote.com

question of how Life Sciences could address curriculum challenges in order to effectively affect behaviour transformation of students in the context of HIV and AIDS.

2.2 Curriculum challenges can be resolved

While there are various challenges that may be hindering the effectiveness of curricula to influence socialization, the researcher argues that these challenges can be resolved. Even though Hodson (2004: 2) indicates that "regrettably, science is often regarded as a body of knowledge that can be transmitted by teachers, memorized by students, and reproduced on demand in examinations. Regrettably, too, science is often portrayed as the de-personalized and disinterested pursuit of objective truth, independent of the society in which it is practised and untouched by ordinary human emotions, values, and conventions." From Hodson's (2004) perspective, it appears that if education follows the traditional scholar academic ideology, chances are that it will fail to transform students' behavioural practices.

George (2006) mentions that another challenge for socialization through education is the attitude of teachers towards education that clashes with social norms. For example "too often, teachers avoid confronting the ... social values underlying the scientific and technological practices they teach about, and seek to avoid making judgements about them or influencing students' views" (Hodson, 2004: 2). In South Africa, a country where freedom of choice is cherished, teachers are sceptical to be seen as trying to impose their views on students (Bantwini, 2010). Consequently education fails to address social issues.

Another challenge that education may face is that a number of its fields, including biotechnology and evolutionary studies, are associated with cultural and public policy controversies (Klop, Severiens, Knippels, Van Mil, Marc, Ten & Geert, 2010; Sadler, 2004). To this end there are numerous reports of negative attitudes towards biology because it tends to conflict directly with social norms and cultures. At least three areas have been identified as responsible for the resentment shown towards biology by society and students. These elements are *i)* a lack of a solid knowledge base of basic biology constructs, *ii)* unclear or poorly developed personal values, and *iii)* an inability to make informed decisions (Klop *et al.*, 2010). This means scientific literacy or lack of it plays a significant role in shaping attitudes toward science (Sadler, 2004), and by extension, decision-making and behaviour (Ajzen, 1991).

Dewey, a popular advocate of behaviour transformation through education, however "failed to resolve the dualism between the school and society that he fought to overcome because he failed to account for the many institutions in society which provide education" (Zuga, 1992: 5). The argument is that school is not the only agent of socialization and in order for education to effectively address social issues, there has to be a synergy between all agents of socialization including the school. Integrating social issues into a curriculum however remains a challenge for researchers. For example Ekborg (2010) indicates that if the scientific component (formal curriculum) goes against a normative system of values which students subscribe to, their affect-based responses are hindered, jeopardizing even their critical reasoning. As a result students may revert back to defending socio-cultural views instead of the socio-scientific ones.

However optimists such as Klop *et al.* (2010) argue that science subjects such as Life Sciences can lead to transformation of behaviours. They argue that transformation of behaviours can happen if these subjects (e.g. Life Sciences) could incorporate "scientific literate competences that students need, to be able to live and participate with reasonable comfort, confidence, and responsibility in a society that is deeply influenced and shaped by the applications, ideas and values of science" (Klop *et al.*, 2010: 1128). This would however require an evaluation of the extent to which society (such as the South African) is influenced by science. Furthermore science curricula would have to be evaluated in order to determine their limitations as far as social needs are concerned. (The current study intended to address this area). Thereafter scientific literate competences that students need could be incorporated into curricula. Alternatively science curricula would be developed further to ensure that they are relevant to the needs of the students and society. Until then Klop *et al.*'s (2010) submission may be limited.

Furthermore Hodson (2004) states that students need to be taught and encouraged to look critically and objectively at social norms and values and explore strategies that can be used to further social transformation. In addition students' active participation in socio-scientific and political discourses should be encouraged because it is through practice that values and habits can be instilled (Zuga, 1992). Linked to this Dewey (1916: 79) concludes that science education should strive "to shape the experiences of the young so that instead of reproducing current habits, better habits shall be formed, and thus the future adult society be an improvement on their own."

Other researchers have presented empirical evidence supporting the view that education can lead to social emancipation, including behaviour transformation. Esakov (2009) reports that in South Africa education has been used to produce, sustain and challenge racial discourses. Goldberg (1996) also reports that education can be used to create social structures. Other researchers however indicate that the effectiveness of education as an agent of socialization depends on a number of factors. For example Aristotle argued that "there are opposing views about the practice of education. There is no general agreement about what the young should learn, either in relation to virtue or in relation to the best of life; nor is it clear whether their education ought to be directed more towards the intellect than towards the character of the soul" (Cohen, 1999).

The researcher therefore acknowledges that there are challenges to the curriculum-behaviour transformation relationship. However the researcher argues that it is possible to resolve these challenges in order to have a better and relevant education. The researcher believes that identifying challenges that hinder the curriculum-behaviour transformation relationship is the first step in providing ideas to address the overarching quandary.

2.3 Curriculum challenges

Before engaging into the role of curriculum to address behaviour transformation, it is important to first discuss the nature of the curriculum. According to Goodlad and Associates (1979), there is curriculum practice and curriculum inquiry. Curriculum practice is, according to Goodlad and Associates (1979: 17), what curriculum makers work at." The study of the curriculum practice is therefore termed curriculum inquiry. This includes for example, an investigation to the context, problems and outcomes of curriculum practice. The current study therefore focused on curriculum enquiry.

Within curriculum inquiry, the study focused on the substantive phenomenon. Goodlad and Associates (1979) indicate that there are two other phenomena that make up curriculum inquiry, namely, the political-social and the technical-professional phenomena. The substantive phenomenon deals with investigating and studying the goals, subject matter and study material of a curriculum. Consequently, by exploring the above elements of the Life Sciences curriculum, the study explored the substantive phenomenon. According to Goodlad and Associates (1979), the "substantive takes us to all those matters of goals – what is taught, how what is taught is arranged or evaluated, what evaluation procedures are used and so on."

There are at least five different kinds of curricula that Goodlad and Associates (1979) propose which are discussed below, namely, the ideological, formal, perceived, operational and the experienced curriculum (the hidden curriculum is not included in this list it is discussed in the following section). The ideological curriculum is that which "emerges from ideastic planning processes" (Goodlad & Associates, 1979: 60). It is the idealistic views that curriculum designers have for a particular curriculum. It is important to note that "one determines the contents of ideological curricula by examining textbooks, workbooks, teachers' guides, and the like" (Goodlad & Associates, 1979: 60). Formal curricula are those which are prepared by curriculum designers and approved by authorities for adoption to their institutions. This formal curriculum is documented in curriculum guides and curriculum statements and is a collection of ideal curricula that has been adapted or modified by authorities. Formal curricula have statements of goals which are subject to various interpretations by teachers and others who work with them. Bantwini (2010) presents evidence showing that what is intended in the formal curricula is not always what students receive. The perceived curriculum is what teachers, students, parents and various interested persons perceive in their mind as the curriculum. Goodlad and Associates (1979) posit that persons working with curricula (for example, teachers and parents) have different perceived curricula even if they work from the same formal curriculum. The operational curriculum is what teachers actually teach in class. This according to Goodlad and Associates (1979) also differs from the perceived curriculum. Furthermore, the operational curriculum differs to the experiential curriculum, which is what students actually experience.

Overall, it appears that there is an evolution of the curriculum from where it is first conceived to where it is actually experienced. Therefore what the curriculum designer may intend may not be what actually happens in the classroom. The current study however explored the formal curriculum and used it to make inferences about the ideological curriculum. Furthermore the researcher explored students' behavioural preferences with the intent of determining the relationship between the experiential curriculum and the formal curriculum. To further contextualize this in the following subsections the researcher will explore challenges to the curriculum-behaviour transformation relationship, namely the role of the hidden curriculum on socialization, the lack of prioritization of students' social needs and the intricacies of curriculum.

2.3.1 Challenge 1: The role of the hidden curriculum on socialization

Kentli (2009: 83) quotes Emile Durkheim as stating that:

> "There is a whole system of rules in the school that predetermine the child's conduct. He must come to class regularly; he must arrive at a specified time and with an appropriate bearing and attitude. He must not disrupt things in class. He must have learned his lessons, done his homework, and have done so reasonably well. There are, therefore, a host of obligations that the child is required to shoulder. Together they constitute the discipline of the school. It is through the practice of school discipline that we can inculcate the spirit of discipline in the child."

The above idea of student enculturation through schooling outside the formally curriculated parameters was also studied by Jackson (1968) who termed it the hidden curriculum. The central idea behind the hidden curriculum is that the learning outcomes achieved in the classroom (based on a formally written curriculum statement) may sometimes differ to behavioural patterns of students outside the classroom because of indirect instructions transmitted to the students by teachers and other students within the organization and structure of the school. In fact life outside the classroom requires a different set of rules, norms and standards which to some extent, are only achieved through a hidden curriculum.

Jackson (1968) suggests that through the hidden curriculum, students learn various interpersonal and intrapersonal skills such as cooperation, independence and personal identity. Through the hidden curriculum students learn and/or develop values, norms and belief systems (Kentli, 2009; Margolis, 2001). Accepting that the hidden curriculum teaches values and norms also led to the view that the hidden curriculum may also be influenced by social contexts (including undocumented social norms) within which students are. As a consequence of the hidden curriculum students may lose their original idealism, adopt a ritualized identity, become emotionally flexible, change their ethical integrity and even accept context specific hierarchy (Lempp & Seale, 2004). Overall, the hidden curriculum leads to enculturation of students by defining values, social expectations, behaviour, identity, social functioning and self-efficacy.

Based on what is known about the hidden curriculum, the researcher argues that it is students themselves who define what acceptable behaviour in their local setting is. This argument is also based on the ontology of constructivism that there are multiple and locally constructed realities (Thompson, 1995). Therefore students are designers and executors of the hidden curriculum. Because students themselves are agents of socialization through the hidden curriculum, one would expect students to accept the teaching of the hidden curriculum more than some of the views of the formal curriculum. In fact Martin (1976) argued that the formal curriculum is failing while the hidden curriculum is thriving to foster behaviour transformation because "students do not learn to read, they do not learn math or science or any of the other subjects and skills endorsed by all parties to the educational enterprise; what they do learn is to be docile and obedient, to value competition over cooperation and to stifle their creative impulses." While Martin may be extreme in his views, one cannot ignore the fact that perhaps, within the formal curricula settings, students have mastered the art of acquiring knowledge and answering assessment questions. Perhaps all they know is a set of rules and they learn but not what they are taught. Some researchers have taken the argument even further by suggesting that the formal curriculum contributes only 10% to socialization. The rest of it is due to the hidden curriculum (Massialas, 1996)

Based on the role of the hidden curriculum to socialization, it appears that the first challenge that education (and by extension Life Sciences) may have, is aligning itself to the hidden curriculum. However as far as the researcher is concerned, there is a dearth of knowledge regarding the extent to which the hidden curriculum and the Life Sciences curriculum talk to the same issues, particularly in the context of HIV and AIDS. The researcher believes that responses to these questions could inform the realignment of education and socialization.

2.3.2 Challenge 2: Students' needs are not prioritized in formal education

Since the dawn of human kind, people pass on their values and traditions from one generation to the next: a phenomenon known as enculturation (Kendall, Murray & Linden, 2004). Here skills, knowledge and beliefs are taught to children by those in society or culture who are regarded as experts and have certain standing within society (Kendall *et al.*, 2004). This was done to ensure that children are well equipped with skills and knowledge that are required to ensure their survival and prosperity (Adeyemi & Adeyinka, 2002; Hughes & More, 1997).

The researcher therefore believes that the most important person in education is the student. Without him/her, there is no curriculum, school or teacher. However the researcher also believes that this order of things has changed over the years. The student no longer seems to be the priority, even though curricula claim otherwise. Education has been invaded by various other "persons", who have imposed themselves on the student. No wonder then, that students' social needs (such as behaviour) receive the least attention in education. Instead it is the needs of curriculum designers, textbook authors, teachers, disciplines and researchers that are prioritized.

Broemmel and Lucas (2010) indicate that education departments and curriculum experts design curricula with specific intended outcomes. Textbook writers and those who formulate assessment tools use these intended outcomes to outline content knowledge and assessment strategies that will be used. However "it seems deceptively logical that teachers will follow the textbooks and teach their students everything therein and that students will in turn, record strong performances on the correlated standardized tests" (Broemmel & Lucas, 2010: 1). Instead there are numerous complexities within the education system, school, and the classroom that alter the intended curriculum. In fact there are reports of misalignments between textbooks and curriculum standards (Jitendra, Griffin & Xin, 2010). To this effect there are a numerous debates about the relationship between curricula and textbooks (Jitendra, Griffin, Deatline-Buchman, DiPipi, Sczesniak, Sokol & Xin, 2005), student achievement (Xin, 2007; Woodward & Brown, 2006) and teacher practices (Harwell, Post, Maeda, Davis, Cutler, Anderson & Kahan, 2007). Therefore, what the curriculum may be intending is not necessarily the outcome of education. Furthermore the student is not necessarily the objective of the curriculum.

Another malady in curriculum studies is with regard to the objectives of curricula. Scholars often look to taxonomies of educational objectives, such as Bloom's taxonomy, as a guide for developing learning outcomes (Anderson, Krathwohl, Airasian, Cruikshank, Mayer, Pintrich, Raths & Wittrock, 2001). The problem however is that while curricula should be context-specific, the context might be as broad as the world itself. This means that curricula should attend to multiculturalism and diversity and how these trends affect curriculum development in order to accommodate students' needs (Schlein, 2009). In this regard there are calls for culturally responsive and relevant curricula (Ladson-Billings, 1992) so that student development can be accomplished.

Furthermore there are complexities with regard to bridging the gap between classroom (particularly, secondary school classroom) and research (Anderson & Rogan, 2011). The challenge is the complex relationship between various factors that influence schooling, for example policy, local context, social expectations, research trends and technology (Anderson & Rogan, 2011). Furthermore curricula have to have purpose, be operationalized, be delivered and evaluated (Anderson & Rogan, 2011). The interrelationship between each of the above components makes curriculum a complex subject, such that curriculum objectives, selection of content knowledge, administration (teaching and learning) as well as assessment are relative to local complexities.

Other researchers also suggest that curricula's intended outcomes must incorporate a needs assessment which includes present-situation analysis and target-situation analysis (Kırkgöz, 2009; Songhori, 2008). This means curriculum should respond to the needs of students and relevant societies (Long & Crookes, 1992). Important to note in this regard is that researchers should be able to distinguish (where necessary) between needs identified by analysts and those expressed by students (Songhori, 2008). Scholars indicate that there is a need to determine students' current cognitive and behavioural status, that is present situation analysis. Thereafter there is a need to understand how students are expected to be like at the end of the course, that is target-situation analysis (Kırkgöz, 2009; Songhori, 2008). However in reality most curriculum designs lack needs assessment (Songhori, 2008).

Another complication in curriculum studies is multidisciplinary. There is an increased need for collaboration and overlap between various subject areas (O'Connell Rust, 2007), which means that any one subject can no longer be viewed independently. This also means the entire curriculum orientation and the intended outcomes should shift towards academic globalization. Besides being time-consuming, there is the challenge of varying paradigms related to ontology and epistemology rendering an interdisciplinary collaboration in curriculum design much more challenging (Holley, 2009). When paradigms are different, curriculum designers will most probably disagree on which content knowledge is important, the suitable teaching approach, the assessment strategy and intended outcomes (Holley, 2009).

Clearly there are various educational challenges that render behaviour transformation among students negligible. The researcher however does not imply that other issues such as research, student achievement and teacher practices are not significant. The point is, as far as the researcher is concerned, particularly in the context of HIV and AIDS, behaviour transformation requires greater attention. (This argument is furthered in Chapter 3).

2.3.3 Challenge 3: The intricacy of curriculum

While the above two challenges are significant the researcher believes that the biggest impediment to socialization is the curriculum itself. For instance if the curriculum does not prioritize students' social needs, then those outside the curricula will find it easy to suggest and impose other objectives. Therefore, for the scope of the current study, the researcher wanted to understand the curriculum, in relation to its role in shaping social norms, which the researcher believes should remain a priority for education. The researcher identified four main areas that need to be understood in order to inform the curriculum-behaviour transformation relationship. These areas are curriculum theory, rationale for curriculum, curriculum ideology as well as content knowledge.

2.3.3.1 Curriculum theory

The researcher argues that the use of inappropriate curriculum theory may be partly responsible for the curriculum not prioritizing students' social needs such as behaviour transformation. This is because there is a view that suggests that any one subject needs to have a specific curriculum theory (or theories) that guide the course of curriculum development (Pinar, 2004). Such a theory could be used as a guide to shape both research and development for the curriculum with respect to what should be taught and how it should be taught.

A question however is what is curriculum theory? According to Schiro (2008) curriculum theory is a way of analyzing curriculum from a historical perspective and providing ways of viewing it in a present context. Theorizing, which is the process of developing curriculum theory, assists theorists with curriculum research and development as well as ways of conceptualizing the curriculum (Schiro, 2008). Overall curriculum theory provides guidelines for practical curriculum activity as required by educational systems.

Schiro's definition suggests that curriculum theory is a subfield of a discipline for the development of a curriculum. However other researchers argue that curriculum theory is a field in its own right. For example Pinar (2004) argues that curriculum theory is an interdisciplinary field that specializes in describing the educational experience. He argues that curriculum theory is not a subfield of a single academic discipline because it is influenced by various other fields.

While curriculum theory exists in many contexts (fields and subfields), it appears that there is no agreement regarding what should be included in theorizing (Schiro, 2008; Donnelly, 2006; Pinar, 2004; Kliebard, 1996; MacDonald, 1971). For example the extent to which historical views of curriculum should inform current curriculum is not agreed on, especially given the dynamics of education. Furthermore the purpose of theorizing depends on the interests of the theorists as guided by the need for curriculum reform (MacDonald, 1971). In fact, some curricula do not have evidence of the founding curriculum theory used in its development and some even have multiple theories guiding them (Schiro, 2008; Donnelly, 2006).

Compounding these challenges for curriculum theory is the continued rise of interdisciplinary scholarship, such as psychology's influence in a traditionally philosophical field (Reid, 1979). For example psychologists may argue that learning should be done in a manner that supports the cognitive needs of students (that is student-centred constructivism) (Schiro, 2008). Meanwhile, philosophers may argue that learning should shape students to become academics within their specific disciplines (that is scholar academic ideology) (Schiro, 2008).

The argument here therefore is that curriculum theory holds the key to behaviour transformation through curriculum. However this will require an agreement among researchers as to what curriculum theory should entail. Once a broad curriculum theory has been agreed on, each subject (such as Life Sciences) can then have its unique curriculum theory or theories. Such a subject-specific curriculum theory could guide what should be included in the curriculum, how it should be taught and who should teach.

2.3.3.2 Rationale for curricula

The rationale for curricula is yet another area that could be adapted to ensure that students' social needs are addressed. According to Þórólfsson and Lárusson (2010), the rationale for a curriculum is significant as it provides an orientation for various components of the curriculum. For instance Davis (1998) suggests that curriculum rationale explains why students are taught particular content knowledge, in a particular way in a specific sequence in time. Other researchers who concur with this general view include Schiro (2008), Van den Akker (2003), Kliebard (1996) and MacDonald (1971).

The rationale for a curriculum is embedded in the definition of a curriculum (Waks, 2003). As a consequence there are various definitions given to the curriculum. Smith *et al.* (1957) define the curriculum as a "sequence of potential learning experiences ... set up in the school for ... disciplining children and youth in group ways of thinking and acting." Emerging from this definition is the issue of learning as an experiential act which is aimed at shaping cognitive functioning of the child. Good (1959) however takes a slightly different view. He argues that curriculum is an instructional strategy for shaping students' intellectual capacity in preparation for entrance to a profession. Tanner and Tanner (1987) on the other hand suggest that curriculum is "planned and guided learning experiences and related learning outcomes ... under the auspices of the school."

While there is no universally accepted definition of curriculum, there are elements that researchers generally agree should form part of the curriculum. These include *i)* predetermined subject matter, *ii)* a planned sequence of learning experiences *iii)* certifiable completion *iv)* the institution of learning *v)* socialization and *vi)* social benefits (Waks, 2003; Tanner & Tanner, 1987; Good, 1959; Smith *et al.*, 1957). Scholars however argue that curricula often do not attend to the social benefits and socialization components of the curriculum, and leave these to the hidden curriculum (Waks, 2003). John Dewey is a popular proponent of socialization through curricula (Schiro, 2008; Warde, 1960; Dewey, 1897). However researchers criticize Dewey's views because in reality, socialization is not explicitly incorporated into curricula (Zuga, 1992). Instead, curricula only contain subject matter content, sequence of the learning experience as well as learning outcomes (Waks, 2003).

The rationale for a curriculum also emerges as the orientation (focal point) of the curriculum, which is another area of great contention among researchers. Some researchers argue for the partitioning of different fields of knowledge so that specific knowledge and skills are taught and developed only in particular disciplines (MacDonald, 1971). The influence of discipline partitioning appears significantly in most natural sciences such as mathematics, physics and biology. In these disciplines emphasis is placed on the ontological argument that there is a reality out there that can be studied using objective empirical methods of a discipline (Healy & Perry, 2000). As a result students are trained to master founding knowledge and modes of enquiry that form the basis of the discipline. MacDonald (1971) calls this form of curriculum the knowledge-oriented curriculum. Nevertheless, the knowledge-oriented curriculum has been criticised for not being student-centred or context-specific because of the top-down approach of teaching predetermined content and skills (Van Manen, 1978). Furthermore some researchers feel that epistemology alone is not broad enough to inform curriculum theory (MacDonald, 1971).

Opposing the views of knowledge-oriented curriculum, Van Manen (1978) and Warde (1960) argue that curriculum should be informed by the social, cultural and personal contexts of those learning instead of the discipline (MacDonald, 1971). This view suggests that education must strive to develop students' capabilities, interests and habits as developed in social structures so that better empowered citizens can be produced. One of the most recognized names behind this "reality"-oriented curriculum is John Dewey. Dewey's ideal theory for curriculum is also known as student-centred theory which promotes the idea of hands-on experiential learning (Warde, 1960; Dewey, 1897). Dewey believed that education and learning are social processes and schools are social institutions in which social reform can occur as people share social consciousness (Dewey, 1897). For effective and meaningful learning to occur, students should actively take part in learning. Dewey also argued that learning should not only be about knowledge acquisition (as suggested by knowledge-oriented ideology), but also about learning to live; a phenomenon also called citizenship education (Warde, 1960; Waghid, 2002). “To prepare him for the future life means to give him command of himself” stated Dewey, explaining his views about a need for citizenship education (Dewey, 1897). Dewey stated that learning should not be about the acquisition of a predetermined set of skills but also about students exploring their own potential and their ability to use and develop skills they already have (Dewey, 1897). Reality-oriented curriculum also implies that content knowledge should be presented in such a way that students can relate their experiences to it. This form of knowledge presentation will foster behaviour transformation through the adjustment of individual learning activity on the basis of social consciousness. Simply put, a reality-oriented curriculum argues that learning should shape the experiences of students so that better habits and behaviours can be produced.

Other researchers however argue against both the knowledge and reality-oriented curricula by suggesting that learning should take an enquiry format. Kong and So (2008) as well as Hover and Horne (2005) believe that during learning, students must engage in problem-solving as a way of constructing knowledge. This inductive approach means students use their experiences to develop a theory. Simsek and Kabapinar (2010) also indicate that during learning, students must be given activities in which they will ask questions, formulate and test their own hypotheses by describing phenomena. Wilkie (2000: 11) refers to this type of learning as enquiry-based learning, which is “an instructional method in which students work in small groups to gain knowledge and acquire problem-solving skills.” Nonetheless, Hughes and More (1997) caution that for enquiry-oriented teaching to be effective, teachers need to ensure that students are able to set up problems and develop argumentation skills. Teachers also need to be able to identify knowledge deficits among students which may hinder progress in problem-solving. Donovan and Bransford (2005) further point out that an “inquiry”-oriented curriculum requires students to have a deep understanding of factual knowledge as well as information retrieval and application skills. Therefore Donovan and Bransford conclude that enquiry-oriented learning may not be feasible for students who lack prior knowledge and relevant skills.

The above discussion highlights the fact that there is no universal rationale for the curriculum. Consequently there is neither a global orientation nor objective for the curriculum. Because of this, it is not clear which elements should constitute a curriculum. In the context of the study, the researcher believes that the mystified nature of curriculum rationale could make it difficult for curricula to prioritize students' behaviour transformation.

2.3.3.3 Curriculum ideologies

Related to curriculum rationale is curriculum ideology. Curriculum ideology can be defined as beliefs about what should be taught, what should be the outcomes and what should be the purpose for teaching as such. The ideology provides a direction for the practices of a school, classroom and subject areas. The researcher therefore believes that curriculum ideology is another basis on which behaviour transformation could be based. However discourses in this area are limiting curricula's ability to foster socialization through education.

In the 1880s Lester Frank Ward argued that transmitting cultural knowledge should be the main objective of education (Cotti & Schiro, 2004). Ward further suggested that this cultural knowledge should lead to the betterment of individuals by making all members of society equal and promote democracy leading to social progress (Schiro, 2008). Charles Eliot attested to this by suggesting that in order for social progress to occur, the intelligence of students must be empowered allowing for greater power to think (Ravitch, 2000). Eliot further indicated that there needs to be a "plurality and autonomy of academic disciplines and the associated knowledge" (Schiro, 2008: 33). William Harris added that education should provide students with accumulated knowledge which is classified into various disciplines (Ravitch, 2000). Around the 1900s, researchers merged the views of Harris and Eliot and agreed that students should acquire scholarly academic knowledge, develop a discipline-specific thinking ability and therefore reflect disciplines they specialized in (Schiro, 2008; Cotti & Schiro, 2004). This view was later variously termed scholar academic ideology (Schiro, 2008), humanist disciplinarian (Kliebard, 1996) or intellectual traditionalist (Schubert, 1996). In the 1900s however the scholar academic ideology faced a lot of opposition, with researchers such as William Bagley being prominent defenders. For example other researchers argued that education should promote utilitarian education but Bagley opposed this view suggesting that education should focus on developing the intellect (Schiro, 2008).

Those who opposed the scholar academic curriculum include Franklin Bobbitt who argued that students should learn to use knowledge and techniques of production developed by industries. Bobbitt (1918: 42) further argued:

> "Education that prepares for life is one that prepares for the specific activities. However numerous and diverse they may be, they can be discovered. This requires only that one go out into the world of affairs and discover the particulars of which these affairs consist. These will show the abilities, attitudes, habits, appreciations, and forms of knowledge that men need. These will be the objectives of the curriculum. The curriculum will then be that series of experiences which children and youth must have by way of attaining those objectives...that series of things which children and youths must do and experience by way of developing abilities to do the things well that make up the affairs of adult life; and to be in all respects what adults should be."

Bobbitt's views were later classified as education that prepares students for their roles in society as adults (Schiro, 2008). Kliebard (1996) terms this line of thinking social efficiency ideology while Schubert (1996) and Posner (1992) refer to it as social behaviourist education.

Other researchers however oppose both the scholar academic and social efficiency ideologies. For example John Amos Comenius states that "artisans learn to forge by forging, to carve by carving, to paint by painting...let children learn to write by writing, to sing by singing, and to reason by reasoning" (Schiro, 2008: 112). Building on this discourse, Jean-Jacques Rousseau believed that education should facilitate the growth of students by helping them develop their skills and abilities further (Schiro, 2008). Other researchers added to this ideology by arguing that students should have a role in directing their own education (Kliebard, 1996). This discourse led to the formation of the child study movement which "encouraged educators to study children as they actually were – to watch them carefully, to listen to them intently, and to collect data about them so that instruction could be designed based on observations of children's nature, needs and interests" (Schiro, 2008: 113). These views led to the birth of what is now known as student-centred ideology (Schiro, 2008; Kliebard, 1996; Schubert, 1996).

Like other ideologies, student-centred ideology faced opposition from researchers who disagree with its principles. One such scholar is Lester Frank Ward who believes humans have the ability to influence their world by using intelligence and knowledge to solve social problems (Cotti & Schiro, 2004). This ability, Ward continued, should be enhanced through education because education can enhance intelligence and development of problem-solving skills (Schiro, 2008). Based on these views John Dewey defines education as that which can reconstruct experiences thereby invoking new perspectives and meaning to life (Dewey, 1897). This social reconstruction ideology (also known as social meliorism and critical reconstruction) gained popularity in the 1900s with researchers calling for the use of education to reconstruct social norms and values in order to enhance human civilization (Kliebard, 1996; Schubert, 1996; McNeil, 1977).

When one looks at each ideal individually, unique features appear with regard to the aims, the nature of knowledge, the learning process, how the student is viewed, the teaching process and assessment (Table 2.1). These distinct features of curriculum ideologies determine content knowledge selected, the instructional process as well as the assessment process for a particular curriculum. In the following subsection the researcher presents contrasting views of the curriculum ideologies regarding the aim of education, the nature of knowledge, the learning process, how the student is viewed, the teaching process and assessment.

Table 2.1 A comparison of curriculum ideologies (adapted from Schiro, 2008)

Curriculum features		**Scholar academic ideology**	**Social efficiency ideology**	**Student-centred ideology**	**Social reconstruction ideology**
Knowledge	Nature of knowledge	Didactic statements	Capabilities for action	Personal meanings	Intelligence and a moral stance
	Purpose for knowledge	Understanding	Doing / action	Actualizing oneself	Interpret and reconstruct society
	Source of knowledge	Objective reality as interpreted by academic disciplines	Normative objective reality as socially interpreted	Individuals' personal creative response to experience	Individuals' interpretation of society's past, present and future
Learning	Learning viewed from	Transmitter	Transmitter	Receiver	Transmitter
	Primary function of learning	Social transmission	Social transmission	Growth	Social transmission
	Result of learning	Changed mindset	Changed behaviour	Changed mindset	Changed behaviour
	Primary actor during learning	Agent	Agent/student	Student	Agent/student
	Student readiness	Simplification of difficult topics	Providing prerequisite behavioural capabilities	Stages of growth	Gestalt of prior experience
The student	Role during learning	Passive	Active	Active	Active
	Teachers	Child's mind	Child's	Child's mind	Child's behaviour

	focuses on		behaviour		
	Teachers concerned with children	As they ought to be	As they ought to be	As they are	As they ought to be
	Viewing children	In relation to standardized norms	In relation to standardized norms	As individuals	In relation to standardized norms
Teaching	Role of teacher	Transmitter	Supervisor	Facilitator	Colleague
	Standards used to measure teacher effectiveness	Accurate presentation of discipline	Efficiency of student learning	Facilitation of growth	Effective transference of the vision
	Teachers stimulate	Uniformity	Uniformity	Diversity	Uniformity
	Teachers	Directly implement curriculum	Directly implement curriculum	Adapt curriculum (according to children's needs)	Adapt curriculum (according to social concerns)
	Media used during learning	Didactic discourse	Programmed instruction	Child-environment interaction	Group dynamics
	Intent of teaching	To advance students in a discipline	To prepare students to perform skills	To stimulate child growth	To acculturate students into educators' vision
Assessment	Purpose of evaluation to the evaluator	Rank students for a future in the discipline	Certify that students have the skills	Diagnose students' abilities to facilitate growth	Measure student progress with respect to ability
	Nature of assessment tools	Norm reinforced	Criterion reinforced	Informal subjective diagnosis	Informal subjective diagnosis
	Assessments are	Objective	Objective	Subjective	Subjective
	Point of assessment	After instruction	After instruction	During instruction	During instruction

a) Scholar academic ideology

Scholars who support the scholar academic ideology claim that the aim of education should be to ensure a continued existence of the discipline (Schiro, 2008; Kliebard, 1996). This means students must be taught content knowledge that is regarded as important to the discipline. Students must also be trained to become future members of the discipline by understanding fundamental principles of that discipline (Cotti & Schiro, 2004). During learning, students must be transformed to reflect the discipline. An application of scholar academic ideology is seen in most natural sciences such as medicine, physics and mathematics. For example Gregg, Eisenberg, Duffy and Longo (2008) indicate that in the surgical profession, students are trained within a hospital setting. This setting ensures that students learn the fundamental principles of the profession within the discipline's parameters.

Because of its interest in advancing the discipline, scholar academic ideology projects knowledge as didactic statements that sum up the intellectual traditions of a discipline (Schiro, 2008; Table 2.1). Scholars of this ideology believe that through these didactic statements students gain an understanding of an objective reality as interpreted within that particular discipline (Schubert, 1996). Gregg *et al*. (2008: 37) argue that in their institution, they designed a "curriculum that is didactic, comprehensive, and stimulating to work-restricted residents both inside and outside the" institution. To do this, they identified topics from popular textbooks and taught these topics. This indicates that only those topics that are viewed as basic and fundamental to their discipline were taught.

In scholar academic ideology, learning is viewed from the perspective of the transmitter (that is the teacher) of knowledge (Schiro, 2008; Cotti & Schiro, 2004; Kliebard, 1996; Posner, 1992; Table 2.1). While the role of the student is important, teachers remain the primary source of knowledge and are also responsible for giving direction to the learning experience (Priest, 2006; Biley, 2005; Paterson, Crawford, Saydak, Venkatesh, Tshikota & Aronowitz, 1995). Because learning is viewed from the perspective of the transmitter, learners in the scholar academic ideology play a passive role. For example the knowledge to be learnt is defined by teachers within a discipline into which students are initiated (Schiro, 2008, Cotti & Schiro, 2004). Consequently students can only act as passive recipients of already set concepts that are defined within a discipline.

Furthermore scholar academic ideology students are assessed using what is regarded as objective quantitative instruments (Cotti & Schiro, 2004). These instruments measure the extent to which students can reproduce what they have been taught. From assessments, students can be ranked according to their abilities in the discipline's hierarchy. Other researchers believe that this assessment strategy is valid for assessing availability knowledge however it may have limitations when assessing the ability of students to use knowledge (Schubert, 1996). The problem may arise particularly if knowledge ought to be actionable and applied in unpredictable real life situations.

b) Social efficiency ideology

Social efficiency proponents argue that the aim of education should be to prepare students for their responsibilities as adults (Labaree, 2010). For instance Chen (2002) argues that the purpose of education should be promoting cultural competence so that once they have graduated, students will be able to effectively play their roles in society. To this effect, social efficiency ideologists state that there are an infinite number of performances that students must be prepared for as adults (Schubert, 1996). Teachers therefore should pay much attention to defining specific objectives that must be achieved in relation to adulthood and social efficiency. These objectives should be stated as observable behavioural skills. Because of a high number of possible objectives, students should be divided by schools into various groups according to their intellectual abilities in which specific training takes place (Schiro, 2008). This division of abilities and training would ensure that each student has a specific role to efficiently play in the society as an adult. Social efficiency ideologists believe that students must demonstrate certain behaviours as a result of being educated (Kliebard, 1996; Labaree, 2010).

Social efficacy ideologists argue further that knowledge is that which enables students to do things (Kliebard, 1996; Posner, 1992). This means knowledge is viewed as capabilities for action (Table 2.1). When students are able to perform certain social functions, they are viewed as knowledgeable. In other words having knowledge is associated with the ability to use that knowledge to perform particular functions. Furthermore because of the need to prepare students for their responsibilities as adults, knowledge is viewed from a normative objective reality that is interpreted by members of the society (Cotti & Schiro, 2004).

Similarly to scholar academic ideologists, social efficiency ideologists view learning from the perspective of the transmitter (Schiro, 2008; Cotti & Schiro, 2004; Kliebard, 1996; Posner, 1992; Table 2.1). The role of the teacher, in social efficiency ideology, is to supervise students as they encounter learning materials (Thompson, 1995). Proponents of this ideology argue that students (who have limited knowledge and skills) require the assistance and guidance of teachers as they search for new knowledge. Teachers as supervisors are expected to adhere strictly to the guidelines of the curriculum to ensure that learning objectives are met during the learning process (Schiro, 2008). This is important given that all students are guided to perform specific tasks according to present abilities as they prepare for a future as adults.

During the instructional process, teachers' main focus is the behavioural aspect of the student because learning is aimed at changing students' behaviour instead of students' mindsets (Schiro, 2008; Kliebard, 1996; Schubert, 1996; Table 2.1). Consequently during their teaching, teachers may focus on the current status of students, that is students as they are, as well as on the future potential of the students, that is students as they ought to be (Schiro, 2008; Thompson, 1995).

In social efficiency ideology the purpose of assessment is to determine whether students have the skills required to function efficiently in a society based on pre-determined binary criteria of normative values (Schiro, 2008; Table 2.1). In this instance students can either have or not have the required skills as defined in the curriculum.

c) Social reconstruction ideology

Related to social efficiency is the social reconstruction ideology. Social reconstruction ideologists argue that knowledge should be viewed as expressing both truth and value (Schiro, 2008; Cotti & Schiro, 2004; Posner, 1992; Table 2.1). Instead of focusing on the intellectual perspective only, social reconstruction ideologists attempt to integrate both scientific knowledge (an element of the scholar academic ideology) and the social moral context (an element of the social efficiency ideology). Knowledge in this regard is derived from the experiences of both the teachers and the students and can be used to reconstruct the future of the society. Priest (2006) indicates that education should promote both the understanding and application of concepts as an integral. Referring to nursing education, Priest (2006) argues that there are elements of nursing that cannot be taught but students can be prepared for through a holistic view of knowledge. These elements include attitudes, cultures and beliefs. Therefore, learning guided by social reconstruction, results in the use of knowledge and skills to change behaviours.

Because in social reconstruction the primary aim is to reconstruct the society, teachers tend to focus on transforming the students to what they ought to be, in relation to how the society ought to be. However teachers are not the only determinants of the instructional process.

Instead teachers and students are viewed as colleagues. According to social reconstruction ideologists teachers' experiences are as important as those of students who are members of a society (Schiro, 2008). It is because of this ideal that teachers and students are viewed as colleagues who share their experiences as they interpret the social conditions and formulate strategies to reconstruct society. However even though teachers and students are regarded as colleagues, teachers are expected to successfully transfer the vision of reconstructing the society to the student.

Killen (2004) also supports the views of social reconstruction by arguing that assessment must have "clarity of focus." Clarity of focus basically means curriculum designers need to specify what students need to learn and why. Killen (2004: 67) argues that clarity of focus will help teachers develop a workable set of "statements of knowledge and understanding, skills, and attitudes and values" that students should attain through learning. Once these learning outcomes have been set, teachers will be able to use teaching and assessment strategies that will foster and monitor the attainment of the learning outcomes, so that the learning process is able to achieve social reconstruction.

Through the specification of learning outcomes, Killen (2004) believes that teachers need to clearly define what behavioural outcomes students should demonstrate at the end of their learning experience. Furthermore there needs to be clarity regarding activities that students should be asked to perform, so that their learning can be gauged. Because of unique students' abilities and interests, teachers need to be aware of the various ways that students' performance of a particular outcome may vary. To this end teachers ought to be able to distinguish between these varying levels of performance. Overall social reconstruction acknowledges the individuality of students and the learning contexts, the significance of knowledge and skills as well as the need for schooling to be relevant to society.

d) Student-centred ideology

While the above curriculum ideologies focus on preparing students to be members of a particular group of people, the student-centred ideology takes a slightly different direction. Scholars who promote student-centred ideology argue that the aim of education should be to stimulate growth and development of students through education (Schiro, 2008; Posner, 1992). In this ideology students are exposed to experiences through which their needs can be fulfilled by stimulating students to pursue their interests. Therefore the main contrast between student-centred ideology and the other ideologies is that the student-centred ideology addresses the needs and interests of students instead of those of the society or a discipline.

In the student-centred ideology the student is the objective of education when every other element of the curriculum is adapted to meet the needs of the student. For example knowledge is viewed as personal meanings as constructed by students themselves (Schiro, 2008; Cotti & Schiro, 2004; Table 2.1). Knowledge therefore is derived from students' personal and creative response to experience. Through this self-discovered knowledge, students have the chance of self-discovery as they grow and develop. Therefore in the student-centred ideology, learning is viewed from the perspective of the receiver (the student) (Cotti & Schiro, 2004; Kliebard, 1996). For example Tsai (2008) states that health education curricula should promote self-learning and team work ethos. Good (1994) attests to this by suggesting that students can better learn humanitarian values related to health education if they take ownership of their learning.

Furthermore student-centred ideologists believe that the focus of teachers should be the student as he is in order to allow him to develop and grow according to his abilities and interests. Teachers should therefore be facilitators of student development by presenting relevant conditions to inspire meaning-making and growth among student (Posner, 1992). To this end a number for curriculum designers (for example Lea, Stephenson & Troy, 2003; McEwen & Brown, 2002; Weimer, 2002; McCombs & Whisler, 1997) argue that education should privilege the student in the learning process. Therefore the purpose of assessment in student-centred curriculum ideologies is to determine abilities of students in order to facilitate growth. As a result assessment is student-oriented and subjective (Thompson, 1995).

What emerges from the above presentation of curriculum ideologies is an ideological war that results in the polarization of academic fields. This polarization can be seen in the curriculum formats of natural sciences compared with social sciences. While this may be seen as insignificant, it has serious repercussions for subjects that seek to incorporate socio-scientific issues. For example biology is a field that traditionally uses a scholar academic ideology to teach about life and living organisms (Dimmock *et al.*, 2007; Audesirk *et al.*, 2004). Also taught in biology is the concept of HIV and AIDS, which to a great extent affects (at least in theory) social issues such as safe behaviour to prevent HIV infection. However the ability of this previously natural science to address social issues is not clear. In fact, the ability of natural science teachers to incorporate a social studies concept is not well documented. The researcher therefore argues that if curriculum ideologies remain distinct, the ability of education to effectively use scientific knowledge to address social issues will remain a challenge. Nonetheless other researchers argue that curriculum ideologies are only ideals. In reality there exists a mélange of ideologies, slightly favouring one view over others in particular aspects (Þórólfsson & Lárusson, 2010; Kliebard, 1996).

2.4 Selection of content knowledge

One of the significant observations that the researcher has made is that curriculum theorists, textbook authors and teachers are different people with varying educational philosophies. This therefore means it is not judicious to assume that curricula and textbooks advocate the same ideology. To this end the researcher argues that it is possible to have a curriculum with a founding theory, rationale, and ideology that seek to address social issues such as behaviour transformation. However that does not mean content knowledge taught within the same curriculum is relevant and suitable to achieve the intended outcomes. Consequently selection of content knowledge to be taught provides yet another challenge toward education's ability to address behaviour transformation.

With regard to selection of content knowledge, Beauchamp (1981: 2) believes that "the basic curriculum question is, and always has been that of what shall be taught in schools, and a major function of a curriculum is to translate the answer to that question into such forms that schools can fulfil their commitment and demonstrate that they have done so." Regarding "what shall be taught in schools" Veness (2010: 1002) states that "everything should be made as simple as possible, but not simpler." Conversely, Fraser (1993) suggests that various institutions tend to select content and tasks that are relevant to the task and function of the institution. Fraser (1993) points out however that for primary and secondary education, the emphasis is usually on orientating students towards a wide variety of subjects, skills and abilities. This diversity is intended to avoid early specialization. However as students progress to senior grades, a gradual shift towards specialisation occurs. This specialization prepares students for their future professions (Fraser, 1993). Other researchers however argue that in selecting content, the main issue is ensuring that key principles and concepts are included in order to ensure that students have a good understanding of the discipline (Shulman, 1986). Shulman's philosophy is well understood in mathematics (Lampert, 1986) and physics (Chi, Feltovich & Glaser, 1981).

In advancing the discourse regarding the selection of content knowledge, Veness (2010) and Chi *et al*. (1981) suggest that designers need to ask the following questions, *i)* what are the objectives of the curriculum, that is the rationale, *ii)* which discipline-specific knowledge and skills would be suitable to achieve these objectives, and *iii)* how should content and skills be balanced (depth/breadth) in order for students to learn effectively? Beauchamp (1981) also indicates that curriculum designers have to define "a body of culture content selected and organized with the expectancy that if the culture content is judiciously implemented in classrooms through the instructional programme, the goals or purposes for the schools will be achieved." In addition to these views Fraser (1993) suggests that there needs to be clarity on whether to teach content or the process. By "processes" Fraser (1993) refers to a scientific process such as "observation, measurement, calculation, classification, ordering, communication, prediction, manipulation of variables, interpretation of data, experimenting and verification" (Fraser, 1993: 128). Furthermore he argues that perhaps there needs to be a clear balance between the content and process.

According to Fraser (1993), some of the criteria that should be used for selecting subject content include applicability, validity and significance, learnability, durability, variability and balance between superficiality and depth. On *applicability* Fraser argues that the learning content should be applicable to the needs and interests of the student. This means the learning content should foster the development of skills needed by the student to perform tasks in his own environment. *Validity* and *significance* suggests that the learning content must be able to foster the development of skills that students acquire as a result of learning. Validity and significance also means learning content should be directed towards behaviour transformation. In other words besides the development of a student as an individual, subject content should also lead to the transformation of society. Fraser argues that subject content will only be significant to the students provided it caters for their needs and aspirations. Given the variations in learning styles of students, Fraser suggests that what is *learnable* for one student may not be learnable for the other. *Learnability* means subject content that is easily mastered by one group of students will not necessarily be mastered by another group of students in a similar fashion. As a result it is important that curriculum designers make provision for meaningful learning to occur for all students. This also means subject content should be relevant and coincide with the intellectual capacity of the students. Fraser also points out that subject content should be *durable*. For instance scientific knowledge is dynamic so that what was accepted to be true ten years ago may not necessarily be accepted in a similar fashion today. As a result it is important for curriculum designers to ensure that subject content is adapted with the changing times so that knowledge taught is durable. Another selection criterion for content knowledge is *variability*. By *variability* Fraser argues that subject content should not be selected and incorporated into the curriculum simply for the sake of knowledge. But subject content should be selected because it will contribute in the development of the student. Furthermore while it is important to ensure that students have a broad background to a variety of issues affecting society, superficiality should be minimal. This means a greater *depth* of concept understanding should be desired through learning and teaching. Once specific subject content has been selected, learning outcomes and assessment strategies should be employed to evaluate the effectiveness of the learning process.

Other researchers have however provided different views regarding the selection of content. Beauchamp (1981) states that content itself needs to be broken down into identifiable components, such as the cognitive, inquiry and skill, as well as the affective (value, moral, attitudinal). Thereafter, content knowledge that will allow for the development of these components must be selected. This view suggests that content knowledge selected for curricula should reflect the usability of such knowledge. To this end Beauchamp (1981) suggests that knowledge should be adaptable for associative use, replicative use, applicative use, and interpretive use. By associative use of knowledge, Beauchamp (1981) believes that students should be able to use learnt knowledge to respond to novel situations without prior exposure to similar situations. The applicative use means students use knowledge and skills that respond to problems similar to those they have been exposed to during schooling. The replicative use means students are able to use their acquired skills and knowledge in their everyday life experiences such as reading a newspaper or even choosing food with a good balance of nutrients. The interpretive use of knowledge means students are able to use knowledge and skills to conceptualize and classify new experiences in order to devise response mechanisms.

Biggs and Tang (2007) bring in yet another perspective to the issue of selection of content knowledge. These researchers suggest that there are two types of knowledge that have to be considered. Firstly there is declarative knowledge, which is derived from research and not from personal experiences of students or teachers. Declarative knowledge is “verifiable, replicable, and logically consistent” (Biggs & Tang, 2007: 72). Secondly there is actionable knowledge which is derived from performing certain activities and therefore is experiential. Scholars therefore argue that in any curriculum, there needs to be a balance between declarative and functioning knowledge (Veness, 2010). Biggs and Tang (2007) however indicate that in many academic curricula, declarative knowledge often takes precedence while functioning knowledge is less prioritized by educational designers. Overall the decision is left to those in authority to decide which knowledge should be part of the curriculum in line with the rationale for such a curriculum.

What emerges from the above discourse is that selection of content can significantly affect the curriculum-behaviour transformation relationship. The strength of this relationship depends on the framework used to select content. It is not clear though as to whether selection of content knowledge should precede adoption of a curriculum ideology or vice versa. Evidently a lack of a suitable framework has the potential to negatively affect the achievement of intended curriculum objectives, such as behaviour transformation.

Regarding the three challenges for education as discussed above, the researcher chose not to pre-empt an ideal strategy, but rather intended investigating the effectiveness of the Life Sciences curriculum in addressing behaviour transformation. To this end the researcher wanted to inductively determine how the curriculum-behaviour transformation relationship could be understood when comparing Life Sciences students with non-Life Sciences students on HIV and AIDS knowledge and behavioural preferences. Specifically the researcher investigated how did the Life Sciences curriculum addresses HIV and AIDS for behaviour transformation among students. In the following section the researcher presents some philosophical strategies that could ensure that the curriculum-behaviour transformation challenge is resolved for effective social reconstruction.

2.5 Resolving the curriculum-behaviour transformation dilemma

As shown above, researchers have widely debated the ability of education to influence behaviour as a consequence of its rationale for behaviour transformation. The researcher notes that in most curricula behaviour transformation as an attainable learning outcome is barely observed (Zuga, 1992). As stated earlier, the researcher acknowledges that forging a strong interaction between curriculum and behaviour transformation has a number of hurdles. However the researcher argues that there are philosophical approaches that can be used to frame a better curriculum and behaviour transformation relationship. Experientialism, transformative citizenship education and critical pedagogy are three philosophies that are significant to the study and are engaged below. These are significant to the study because literature survey suggests that biology is an experimentalist subject that was born out of empirical studies to understand life. Furthermore transformative citizenship and critical pedagogy are relevant because according to researchers, biology has evolved to contain attributes of socialization and there is an increasing obligation for biologists (such as health scientists) to use knowledge to better humanity.

2.5.1 Experimentalism

One of the founders of experimentalism is Edgar A. Singer, Jr. who vehemently argued that "nothing can be more important to any man than to do all he can to assure the soundness of his reasons for the faith that is in him; that is, to test the weight of evidence supporting the working hypotheses on which he is willing to act" (Krikorian, 1962: 81). This argument Singer put forward against the influence of rationalism, empiricism, and criticism as philosophical backbones of curricula for socialization. His argument here was that knowledge is fundamental to socialization and behaviour transformation. However the question arises regarding what is acceptable (and not acceptable) knowledge? Furthermore given the information explosion of the twentieth century, what knowledge should be used for behaviour transformation, and how should such knowledge be selected for curricula?

Singer believed that in order to accept information as scientific truth, and thus useful for behaviour transformation, there ought to be accompanying evidence that can be used to test claims. According to Krikorian (1962) Singer believed that humans learn by experience.

Another scholar who shared Singer's views is Dewey who promoted the philosophy of experimentalism, which is sometimes called progressivism or reconstructivism (Hlebowitsh, 2006; Tanner & Tanner, 1987). Dewey believed that the basis of education is the "reconstruction or reorganization of experience which adds to the meaning of experience and which increases the ability to direct the course of subsequent experiences" (Dewey, 1916: 89-90). He argued that all individuals and the environment they live in are unique. Therefore, reconstructing and reorganizing experience may require a transformation of the individuals' cognition and/or their environment in order to invoke new meanings to life.

Furthermore Dewey highly regarded change as a significant contributor to learning. Hlebowitsh (2006) indicates that change is the one constant truth about the universe and could be directed by human intelligence. As a consequence experimentalism should support free thinkers because this could allow for the reconstruction or reorganization of experience which brings about positive change to society (Hlebowitsh, 2006). Furthermore the concept of change refers to the dynamic nature of situations in society. Consequently there is a constant need to develop new strategies with which current problems can be solved. In addition to this Hlebowitsh (2006) argues that to solve change-generated problems, scholars have to collect data with which to test hypotheses. Students therefore have to develop experimental skills that can be used to explore and use knowledge when solving change-generated problems. Because of the change factor, researchers caution that knowledge itself is tentative in terms of relevancy, accuracy and usefulness. Experimentalists therefore call for a constant production of knowledge through evidence-based means. This will ensure that knowledge is contemporary enough to address new change-generated problems. One wonders however if curricula are oriented to the future (that is, to address new change-generated problems) or the past.

Experimentalists also argue that for behaviour transformation to occur, schools and curricula should be integrated into society (Dewey 1968). The argument here is that, in schools, students (who are part of the greater society) are grouped into smaller communities known as grades or classes. In these communities students are expected to solve specific problems using learned skills and knowledge (Morris & Pai, 1975). Furthermore students need to rely on evidence to properly negotiate and formulate their argumentation. This evidence-based approach means students must rely on an experimentalist approach to select information and solve relevant problems. However there is evidence to suggest that curriculum and classroom dynamics (particularly in relation to learning and teaching) tend to be disconnected from social dynamics (Broemmel & Lucas, 2010; Jitendra *et al.*, 2010; Harwell *et al.*, 2007; Xin, 2007; Woodward & Brown, 2006; Jitendra *et al.*, 2005). As a result even if students have knowledge and skills, these are often not applicable to life outside the school.

Experimentalists therefore argue that knowledge is acquired and increased through application of prior knowledge and skills to solving new problems (Cohen, 1999). This knowledge and skills are used to solve problems that students can directly relate with through their everyday experiences. As a result the experimentalists' curriculum for behaviour transformation is centred on experiences, interests and abilities. Students are allowed to learn through doing rather than hearing and seeing alone. In essence experimentalism contends that education should be a "perpetually enriching process of ongoing growth and not a mere preparation for adult lives" (Cohen, 1999).

While experimentalism is widely accepted in science (including biology) other researchers reject this philosophy on an epistemological basis. Howe (2004: 42) argues that traditional experimentalists tend to adopt quantitative experimental methods as the most credible and "relegate qualitative methods to an auxiliary role." Experimentalists also claim that "experiments are the only means for settling disputes regarding educational practice, as the only way of verifying educational improvements, and as the only way of establishing a cumulative tradition" (Campbell & Stanley, 1963: 2). However opponents of this view argue that experimentalists ignore the evolution of qualitative methods that can yield superior results to quantitative methods if used appropriately (Howe, 2004; Libarkin & Kurdziel, 2002; Zucker, 2001; Hoepfl, 1997; Creswell, 1994; Strauss & Corbin, 1990). Experimentalists are also accused of trading external validity for internal validity (Howe, 2004). This is because, for experimentalists to obtain valid results, they have to restrict variables thereby increasing internal validity. However this approach tends to decrease external validity.

To address the epistemological limitations, experimentalists have further developed their philosophy to include constructivism. Constructivism is based on the articulations of various researchers including Vygotsky, Piaget, Dewey, Vico and Bruner. As an extension of experimentalism (which deals with the discovery of knowledge), constructivism focuses on how students construct their own understanding of the world. Constructivists argue that learning is an active process which involves the construction of knowledge rather than acquiring it. It must be noted though that construction of knowledge by students does not mean students must create "new" knowledge, but instead student through a constructivist form of learning, discover an understanding of scientifically established knowledge. Constructivists argue that during the learning process, students construct their own understanding of existing knowledge by relying on experience as shaped by the environment. Furthermore it is believed that students are not blank slates, but they have prior knowledge which they use actively when constructing new knowledge. However this knowledge may be erroneous (Magnani *et al.*, 2005; Pakaslahti, 2000) and therefore requires correction through exposure to accurate experimentalists scientific information.

Researchers in constructivism suggest that when new information is given to students, they cognitively process this information by selecting and transforming it, construct hypotheses, and make decisions, based on prior knowledge (Magnani *et al.*, 2005). According to Thompson (1995) when selecting information, students will tend to select information that is easily comprehended and mentally manageable. Furthermore students generally avoid exploring information that seems complex (Thompson, 1995). As a consequence, some students may lose critical information just because they find it difficult to comprehend.

Scholars further suggest that students will then store segments (not all) of information into their long-term memory (Pakaslahti, 2000). This requires them to construct hypotheses, make judgements and decisions concerning the validity of what they had selected (Pakaslahti, 2000; Thompson, 1995). In this way students create new forms of information based on already existing knowledge. This knowledge is represented in the form of schema and mental models (Thompson, 1995).

In the above discourse the researcher implies that experimentalism is ideal for the construction and use of scientific knowledge to address social issues. While this is the case, the researcher takes note of some doubts raised about experimentalism. For example there are researchers who have cautioned against an isolated reliance on constructivism. For example Schönborn and Anderson (2008) warn that the variation in the language, symbols and models used to communicate scientific information to students may be a threat to effective learning, particularly in cases where students use isolated and individualistic processes to construct knowledge. In fact, other researchers contend with the very essence of the constructivist-experimentalist argument regarding discovery and use of knowledge. For example experimentalists believe that knowledge can be discovered through empirical means. These experimental means will only be valid within the parameters of the methodology which is individualistic in the sense of constructivism. Consequently knowledge cannot be objective and the tentative nature of knowledge reduces experimentalism to a relativistic narrative (Matthews, 2003; Matthews, 1998; Gross & Levitt, 1994).

Given the apparent subjectivity of knowledge, the researcher argues that social problems, their contexts and behavioural solutions are also relative. Consequently it is plausible that solutions to social challenges will be unique to each individual. Therefore, for curriculum to effectively promote behaviour transformation will require relative narratives that rely on up-to-date knowledge produced through constructivism and experimentalization.

2.5.2 Transformative citizenship education

Other researchers have suggested citizenship education as a preferred form to promote behaviour transformation (Waghid, 2005; Waghid, 2002; Kerr, 1999). Citizenship education broadly speaks about using education to prepare students for their roles in society and globally as citizens (Kerr, 1999; Cherryholmes, 1980). Such a preparation occurs through formal education when students develop skills and construct knowledge that can be used to better understand social constructs in preparation for citizenship. Ichilov (1998) believes that citizenship education is even more necessary in contexts where students are facing an uncertain future with a wide variety of challenges. To this end Waghid (2002: 457) argues for citizenship education by stating that knowledge can become useful for shaping the future of societies through the "idea of a reflexive praxis."

Borrowing from Aristotle, Waghid argues for a "praxis" in education, that is learning through which (and during which) desired outcomes will be achieved (Waghid, 2002). The praxis, Waghid (2002: 463) argues, has to be reflexive in that it should foster the use of knowledge and skills to "critically examine how one's personal and theoretical commitments serve as resources for generating particular constructions of meaning in particular contexts, meanings one would probably not have thought about." Through the reflexive praxis, it is argued that patterns of critical educational discourse could be transformed to integrate behaviour transformation. This viewpoint means knowledge production (and construction) should be in the context of its application to address social problems (Waghid, 2005). Citizenship education therefore occurs through a continuous reflection on the *status quo* which leads to a deconstruction and reconstruction of attitudes and behaviours (Waghid, 2005). Furthermore citizenship education promotes empowerment of students to develop the ability to be self-determined and reflexive (Waghid, 2005). Citizenship education also means students develop an ability to engage critically in social dialogue by making reasoned arguments based on scientifically acceptable knowledge.

To strengthen the curriculum-behaviour transformation relationship therefore, Waghid (2005) states that disciplinary knowledge should be merged with socially distributed knowledge. This merger could ensure that schooling is relevant to society and knowledge applicable to everyday life.

Critiques of citizenship education however argue that it imposes tension between “individual freedom and choice and constraints imposed on the individual by the society or government for the sake of order and survival” (Cherryholmes, 1980: 116). The argument here is who decides on the roles of an individual in society, particularly in the context of “freedom of choice”? Consequently Kerr (1999) and Newmann (1975) suggest that citizenship education should rather be defined around decision-making and not role-playing. To this end Cherryholmes (1980: 116) re-defines citizenship education as “a set of learning experiences that promote effective and responsible individual decision-making and behaviour within the constraints of democratic values and processes.”

Scholars provide reasons why citizenship education as defined by Cherryholmes (1980) is vital for behaviour transformation. First, decision-making forms a fundamental part of socialization and behaviour transformation (Kerr, 1999). Second, decision-making is associated with reflective thinking (Hunt and Metcalf 1968) and reflective inquiry (Barr, Barth, and Shermis 1978). The argument therefore is that through education, students should be equipped with relevant skills and knowledge that will shape their decision-making, reflective thinking and inquiry skills required for behaviour transformation.

2.5.3 Critical pedagogy

Scholars such as Paulo Freire and Henry Giroux provide a different angle to the issue of behaviour transformation through education. Their views form the foundation to critical pedagogy, where they argued that education should not be dehumanized but should lead to transformation of students' lives. In this regard Freire indicated that there are a number of social, health and intellectual challenges that students face and therefore there is a need to provide solutions to these challenges through education (Freire, 1993). For this to occur however education should facilitate a non-hierarchical dialogue between students and teachers through which experiences are shared.

Critical pedagogy remains a generally accepted ideology for citizenship education (Baumgartner, 2001; Christopher *et al.*, 2001). Critical pedagogues suggest that there are at least four learning strategies, namely *i)* the banking method of learning, *ii)* conscientization, *iii)* informational learning and *iv)* transformational learning. In the banking method of learning (Christopher *et al*., 2001; Freire, 1993), teachers are viewed as sources of knowledge. Because teachers are regarded as experts from whom knowledge comes, students passively accept information as factual (Christopher *et al*., 2001). Giroux (2001) criticizes this method of learning because it disconnects classroom activities and the everyday lives of particular students from marginalized backgrounds. In conscientization type of learning, students use what is being learnt to discuss and reflect on their life issues (Baumgartner, 2001). According to Kegan (2000), informational learning is when the student's already existing cognitive structures and capacities are extended by modifying what is already known. Transformational learning focuses on changing the student's perspectives about himself and his world (Christopher *et al*., 2001). In this regard the current form of understanding and response is put at risk of being changed through exposure to new alternatives (Kegan, 2000). Transformational learning can be gradual or rapid, depending on the context and depth of perceptions. Of the learning approaches presented above, transformational learning is one favoured by critical pedagogues for behaviour transformation (Christopher *et al*., 2001; Freire, 1993). Scholars argue that transformational learning can be used as a guiding framework to transform students' attitudes, beliefs and behavioural practices.

Brookfield (2003) however argues that postulates of critical pedagogy are unrealistic. For example Brookfield (2003) believes that classroom-generated transformation will remain ineffectual unless it can impact on the conditions of society. He further argues that the classroom is a small segment of the society which cannot radically alter the fundamental social norms, values and beliefs. Hardin (2001) also argued that critical pedagogy is politically motivated to promote views of liberalism. This view suggests that the critical academic discourse will be compromised by attending excessively to social dialogues. To this end Brookfield (2003: 141) refers to critical pedagogy as a "domestication" of academia.

To qualify critical pedagogy in the light of the criticism it has endured, proponents have proposed three logical approaches that will ensure that education is not merely domesticated but preserves its rigour and academic scholarship. These approaches are discussed below.

2.5.3.1 Cognitive-rational approach to transformative learning

Scholars (for example Baumgartner, 2001; Freire, 2000; Mezirow, 2000) agree that learning should provide students with life skills, a phenomenon known as the cognitive-rational approach to transformative learning. In this form of learning, learned skills can be used by students to deal with known and novel real-life challenges. Because of this, education should lead to the empowerment of students (Baumgartner, 2001). In this way learned people should be able to comprehend, understand, and respond adequately to life issues, regardless of such issues being within or outside the context of any subject matter.

2.5.3.2 Constructivist learning

Following the constructivist epistemology of development, researchers agree that knowledge is not out there to be discovered but is created from interpretations and re-interpretations (Baumgartner, 2001). Knowledge production therefore follows cognitive processes that lead to the formation of new knowledge (Thompson, 1995; Von Glasersfeld, 1995). According to Mezirow (1996), constructivist learning follows a four-step process.

Firstly the individual may have a personal crisis when they feel a need to change their perspectives based on the new knowledge (Baumgartner, 2001). This stage can be long and accumulative and is termed the disorienting dilemma (Mezirow, 1991). Secondly the person re-evaluates his/her assumptions about him/herself and his/her world (Baumgartner, 2001). This stage is called critical reflection and may include realizing that one's perspectives are not consistent with the new knowledge (Taylor-Powell, 1998). Thirdly the person will enter a reflective discourse stage where he/she talks to others about the new perspectives with the aim of obtaining consensual validation (Baumgartner, 2001). Such a consultative approach will provide a new direction which the person may follow. Finally, once certain about what needs to be done as informed by changing perspectives, the person will be confident and therefore will live according to the new perspectives (Baumgartner, 2001). However it must be mentioned that meaning is also influenced by other factors such as affective, emotional and social context. In this regard it is the most dominant factors that will influence the overall learning process (Mezirow, 2000).

2.5.3.3 Student development

Because learning has the potential to affect behavioural patterns, Daloz (1999) suggests that learning should lead to development. Here students use education as their developmental guide when they use what is learnt to help them make sense of their lives and their future (Baumgartner, 2001). In this way students may ask questions, discuss and negotiate developmental transitions based on what is being learnt. Because of this students' social environment such as family dynamics and social class may also be transformed (Baumgartner, 2001).

Development may also include the extra-rational soul-based aspect of the student which deals with feelings and imaginations (Baumgartner, 2001). Learning should not only deal with matters outside the "learning being", but also on intrapersonal matters. This leads to self-awareness, deeper self-understanding and mindfulness (Healy, 2000).

Based on the above discourse, the researcher believes that education has the potential to affect behaviour transformation. As argued, this would require an acknowledgement of various challenges to curriculum philosophies and adapting them to each particular context.

2.6 Implications for the current study

What emerges strongly in the above discussion is that serious challenges exist potentially hindering the ability of curricula to affect social issues (Sections 2.3 and 2.4). However it also emerges that these challenges could be addressed by strategies related to curriculum development and implementation (Section 2.5). A question however is how do science curricula respond to such challenges, (i.e. the role of the hidden curriculum on socialization, influence of other educational and social elements on education as well as various curriculum complexities)? While the above question is not within the scope of the current study, the researcher specifically investigated the Life Sciences curriculum to determine its approach to the curriculum-behaviour transformation relationship, particularly in the context of HIV and AIDS.

Literature has shown that there are at least four elements of curriculum that can be used to determine whether a curriculum will or will not be able to affect behaviour transformation (Section 2.3.3). These are curriculum theory, curriculum rationale, curriculum ideologies and content knowledge. Consequently the researcher decided to investigate the curriculum-behaviour transformation relationship in Life Sciences by examining the relevant curriculum statement and textbooks from which inferences were made about the curriculum theory, rationale, ideologies and content knowledge of Life Sciences.

The researcher noted the various suggestions regarding the strengthening of the curriculum-behaviour transformation relationship (Sections 2.2 and 2.5). However he preferred an inductive approach to the matter, by simply determining the approach of Life Sciences and thereafter investigating whether it was a useful approach. In this way the study would contribute to the body of knowledge of curriculum design and development, by providing insight into the strategy used in Life Sciences and its effectiveness on behaviour transformation. Furthermore this knowledge would be useful to Life Sciences curriculum designers as it would indicate the significance of the subject in relation to socialization.

To further contextualize the argument presented here, the researcher discusses HIV and AIDS education in the next chapter. As stated in Chapter 1 this context was the focus of the study.

3. CHAPTER 3: *A LUTA CONTINUA*: THE BATTLE AGAINST HIV AND AIDS

"Four hundred thousand South Africans are dying every year of AIDS. This makes the war in Iraq look like a birthday party" – Jeremy Cronin[7]

3.1 Introduction

Jeremy Cronin's quote paints a dire picture of the battle between South Africans and HIV and AIDS. He indicates that battles fought through the physical arsenal are far easier to fight than the battle against an enemy within one's own blood; a battle where the soldier is either not fighting (i.e. not infected), or almost certain to lose. The researcher therefore explores HIV and AIDS using Cronin's analogy of a battle in order to signify the urgency to develop strategies that will yield positive results.

It has been more than three decades since the venom of HIV first stung through the first victim. Since then millions of people have died. On the front line are children, women and men, who on a daily basis battle the virus, with the hope that one day in their lifetime the battle will be won. Hope also resonates in the minds and hearts of thousands of medical practitioners, teachers and researchers who have made it their mandate to battle this unrelenting enemy. With tears of hope, they roar like lionesses defending their cubs; they cry out, "*A luta continua*[8]." In the middle of the battle, the researcher paused and reflected: will these weapons yield desired results?

In this explorative chapter the researcher enters into discourse with researchers in search of a response to the question, why do HIV and AIDS remain elusive? In this discourse a comprehensive look at the cost of having HIV and AIDS in the current generation is provided, together with a glimpse at what the future holds. In this regard the researcher

[7] http://www.brainyquote.com
[8] *A luta continua* (translated "the struggle continues") is a Portuguese rallying cry used by Samora Machel and his followers in Mozambique against colonial presence. The researcher adopted the same phrase to signify a cry against HIV and AIDS presence.

explores the impact of HIV and AIDS on the education system. The researcher then surveys literature to determine the effectiveness of current educational mechanisms used to derail the spread of HIV. Here strategies that are currently used to limit the spread of HIV and AIDS are compared with factors that influence the spread of HIV and AIDS. Thereafter the researcher examines literature on other health-related issues, particularly health education. This is done in order to understand why health education would fail to produce the desired outcomes. Such an understanding could provide lessons for HIV and AIDS education. In the end the researcher argues that some strategies used to battle HIV and AIDS, are probably not effective enough to address the urgent and most effective reasons responsible for the spread of HIV and AIDS, such as behaviour transformation. Given this, a question is asked: can the school Life Sciences curriculum provide an effective solution?

3.2 The educational cost of HIV and AIDS

The impact of HIV and AIDS in society cannot be ignored. However that does not mean it should be watered down either. In this regard the researcher argues that the cost is too high for solutions to yield average or even below average results. For example since the 1980s, the number of people infected with HIV has been increasing drastically. As stated in Chapter 1, about 33 million people from six continents of the world are infected with HIV and AIDS (UNAIDS, 2010; UNAIDS, 2006). By the year 2009 5.6 million South Africans were infected with HIV and about 1400 new infections occurred every day (UNAIDS, 2010). According to Dorrington *et al.* (2006), in South Africa alone the virus was most prevalent (that is, 33%) among women aged between 25 and 29 years. This in turn had caused over 1.5 million children under the age of 18 to become orphans. Furthermore in 2006 alone, it is estimated that there were 950 AIDS related deaths every day (Dorrington *et al.*, 2006). In this regard 71% in deaths of the age group 15 to 49 were AIDS related.

Because of the HIV and AIDS pandemic, since 1990, the life expectancy in South Africa has dropped dramatically from 62 to 46 years. Dorrington *et al.* (2006) report that there is a 56% chance that a South African 15-year old will die before the age of 60. Anderson and Beutel (2007) cite a report that suggests that in 2005 10.3% of the youth aged 15 to 24 in South Africa were HIV positive. With this prevalence in the youth, Bennet *et al.* (2006) believe that by the year 2020, over 29 million people in the Sub-Saharan region will be infected with HIV and 10 million deaths would have occurred.

Given the high number of HIV infections, it is clear that sectors such as the education sector are the most affected (Bunnell, 2003; Grassly, Desai, Pegurri, Sikazwe, Malambo, Siamatowe & Bundy, 2002). Besides loss of life within schools, reports of psychological distress and socio-economical distresses have been widely reported (Manase, Nkuna, & Ngorima, 2009; Ssewamala, Ismayilova, McKay, Sperber, Bannon & Alicea, 2009; Ssewamala, Alicea, Bannon & Ismayilova, 2008; Cluver, Gardner & Operario, 2007; Lachaud, 2007; Grassly, Desai, Pegurri, Sikazwe, Malambo, Siamatowe, & Bundy, 2003; Bennell, Hyde & Swainson, 2002; Hyde, Ekatan, Kiage & Barasa, 2002; Kadzamira, Swainson, Maluwa Banda & Kamlongera, 2001). Because of the psychological and socio-economical distress both the supply and demand of education are affected (Coombe, 2000). For example Bunnell (2003) reports that in the near future, student intake will be lower starting with primary schools through to tertiary education. Bunnell (2003) suggests that this low student intake is because of high infant and adult mortality as well as increased poverty among HIV and AIDS affected households. Scholars (Bunnell, 2003; UNICEF, 2000) also suggest that within the next two decades, there might be a high mortality rate among teaching staff which will in turn affect the schooling system. Besides deaths, researchers also indicate that the rates of teacher absenteeism due to prolonged and regular illness is expected to increase (Bunnell, 2003; Grassly *et al.*, 2002). In addition reports suggest that HIV and AIDS orphans and other HIV and AIDS affected students are expected to suffer an increased emotional instability (Cluver, Gardner & Operario, 2007).

Due to psychological and socio-economical distresses reports also suggest that students' vulnerability to HIV and AIDS could increase (Bhargava, 2005; Atwine, Cantor-Graae & Bajunirwe, 2005). For instance studies have shown that when in deep financial and emotional distress, some students may rely on unsafe sexual activities and drugs both for financial gain and emotional comfort (Bhargava, 2005).

The above conversation indicates that the impact of HIV and AIDS in society is immense. An apparent question is, given the length of time that HIV has been known to human kind, why has humanity failed to stop HIV and AIDS? In search of an answer to this question, the researcher explored some educational strategies that are currently used to counteract the spread of HIV and AIDS.

3.3 Educational weaponry against HIV and AIDS

The purpose of this section is to provide a picture of educational strategies that are used to counter the spread of HIV and AIDS, and also to determine the effectiveness of such strategies. Such a look will inform the assessment of HIV and AIDS education in Life Sciences in response to the research questions of the study.

HIV and AIDS education is a complex, multidisciplinary subject. Scholars have partitioned HIV and AIDS education into specific areas with specific goals, in order to improve effectiveness in minimizing the impact of HIV and AIDS. For example HIV and AIDS education can be taught within formal school curricula or outside of formal curriculum. These educational strategies are used to present scholar academic, social efficiency, student-centred and social reconstruction knowledge. In the previous chapter the researcher engaged the complexity of curriculum ideologies in relation to behaviour transformation. Therefore, as implied in Chapter 2, basing HIV and AIDS education for behaviour transformation on any one ideology would require a clear curriculum framework.

Within the scope of HIV and AIDS education, the idea of curricular versus non-curricular strategies presents yet another dimension. Both these strategies have their own complexities, advantages and disadvantages, making it difficult to decide which method is more effective for leading to behaviour transformation than another. The complexities are compounded by the fact that there are numerous factors that affect the spread of HIV, such as behaviour, gender, stigma and discrimination and human rights. Based on the views presented in Chapter 2, the researcher believes that both strategies would be more effective in fostering behaviour transformation if they are able to integrate knowledge into the social context. Curricular strategies would however require a meticulous integration strategy in order to be able to address socialization as well as behaviour transformation. To substantiate these views, the researcher will first discuss curricular-based HIV and AIDS education. Thereafter non-curricula strategies will also be discussed.

3.3.1 Integration of HIV/AIDS knowledge into curricula: current trends

In an attempt to address HIV and AIDS in South Africa, the Department of Health (2000) instituted an HIV and AIDS/STD strategic plan. This plan led to the development of an HIV and AIDS policy which makes HIV and AIDS education a component of the curricula of all secondary schools. The policy also suggests that schools be made places where youth can access friendly and supportive counselling services related to HIV and AIDS. Previous research also supports the implementation of HIV and AIDS education at secondary school level (Anderson & Beutel, 2007; Fawole *et al.*, 1999). Page *et al.* (2006) also support this view as schools have the largest number of adolescents who are sexually active.

While suggesting that students be educated concerning HIV and AIDS, the South African government has not given any clear indication of how this should be done (Page *et al.*, 2006). Some researchers argue that students' preferences and experiences should inform HIV and AIDS curriculum design (Page *et al.*, 2006; Griessel-Roux, Ebersöhn, Smith & Eloff, 2005). This is in line with Anderson and Beutel's (2007) suggestion that HIV and AIDS education might be more effective if tailored to specific groups, which have been found to have different views and experiences with HIV and AIDS.

Although some researchers recommend HIV and AIDS education for secondary schools only, Van Laren (2008) suggests an integrating HIV and AIDS education throughout the functioning of education. Van Laren (2008) also points out that there is a need for interdisciplinary collaboration in teaching about HIV and AIDS. However she cautions that interdisciplinary collaboration will be complicated by curriculum reform. For example adding new content may mean recurriculating as well as redistribution of teachers and resources.

To prevent costly curricular reform, UNESCO (2006) suggests an integration of HIV and AIDS knowledge into an already existing subject, such as Life Sciences. In this regard HIV and AIDS knowledge is added as extra content knowledge into the curriculum. This method is cost-effective in that the same group of teachers of the mother subject are the ones who teach HIV and AIDS content. However the danger here is that HIV and AIDS knowledge could be taught from a particular curriculum ideology which may jeopardize the intended

HIV and AIDS outcomes. For example teaching HIV and AIDS content from a scholar academic ideology could limit behaviour transformation as an outcome. Another problem with integrating HIV and AIDS into an existing curriculum is that there may not be enough time (and other resources) to give information on HIV and AIDS because of the need to address other topics as well. Furthermore some teachers may be hesitant to deal with HIV and AIDS information (and sexuality education) due to cultural and religious beliefs.

To address some challenges related to the integration of HIV and AIDS knowledge into curricula, Ciccarone, Coffin and Preer (2004) suggest involvement of students in the design of the curriculum. This student-centred approach allows students to specify their needs and challenges in relation to HIV and AIDS. In turn curriculum experts would ensure that the curriculum provides sufficient knowledge and skills that students need in order to limit the spread of HIV. An example of this approach is given by Ciccarone *et al.* (2004) who report that students were asked to provide input related to curricula activities for epidemiology, prevention and risk factor language for a Medical HIV and AIDS curriculum. This process led to an inclusion of content knowledge (which was previously excluded) related to epidemiology and microbiology of sexually transmitted infections, sexuality and sex education, prevention strategies including risk and safe behaviour (Ciccarone *et al.*, 2004). The outcome of this exercise was that HIV and AIDS knowledge among students was increased together with transformed attitudes and life skills related to HIV/STD prevention (Ciccarone *et al.*, 2004). What can be learnt from Ciccarone *et al.*'s (2004) study is the significance of involving students in the review process as this allows for an informed process with regard to the needs of the students.

While supporting the inclusion of students in curriculum design, Kohi, Portillo, Safe, Okonsky, Nilsson and Holzemer (2010) highlight the need for a context specific curriculum. These researchers (Kohi *et al.*, 2010) suggest that the ideal strategy, particular for training-the-trainer, is incorporating a section of community-based care in order to provide a practical, context-specific element to the curriculum. This can be done by including learning activities such as role plays, watching videos of HIV patients and reading research articles (Kohi *et al.*, 2010). According to Kohi *et al.* (2010) students in their project were happy with the curriculum because it provided an in-depth and realistic understanding of HIV and AIDS that is relevant to their own lives (Kohi *et al.*, 2010).

Another element that complicates the integration of HIV and AIDS knowledge into a curriculum is the type of content knowledge that must be included. According to Page *et al.* (2006), there are at least two types of knowledge presented in curriculum-based HIV and AIDS education, namely functional HIV and AIDS knowledge and academic HIV and AIDS knowledge. As stated earlier (Chapter 1), functional HIV and AIDS knowledge is knowledge that is aimed at informing people about means of preventing infection. It is also intended for transformation of students' beliefs, attitudes, values and ultimately behaviours. In South Africa, functional HIV and AIDS knowledge focuses mainly on promoting abstinence, faithfulness to one sexual partner and condomizing, also known as ABC. Academic HIV and AIDS knowledge on the other hand looks to help students understand the science of HIV and AIDS. It teaches for instance the life cycle of HIV, the structure of the virus and the immune system.

Because of the obvious differences in the nature of the two types of HIV and AIDS knowledge, deciding which content should be taught requires a good understanding of the needs of students and the local context. The researcher also believes that factors affecting the spread of HIV and AIDS, such as behaviour, would determine which content should be taught. For example if academic HIV and AIDS knowledge does not affect students' behaviour, then it would be pointless to teach such content with an objective of behaviour transformation. Similarly, if the objective is improving students' understanding of HIV and AIDS, then functional HIV and AIDS knowledge would probably not yield the desired outcomes. (These two dynamics are reported on further in Chapters 6 and 7 as they fall within the scope of the study). To better understand the rationale for both functional and academic HIV and AIDS knowledge, the researcher discusses some strategies that have been used to present HIV and AIDS knowledge.

A background to these two types of knowledge in South Africa is that functional HIV and AIDS knowledge is presented in most HIV and AIDS programmes. While there is no specific divide in the mode of presenting knowledge, functional HIV and AIDS knowledge is often presented through peer education, people living with HIV, socio-economic based intervention, gender and culture specific interventions, voluntary counselling and testing (VCT) as well as mass media interventions (Table 3.1). Academic HIV and AIDS knowledge on the other hand is often presented through school-based HIV and AIDS educational programmes, computer-based interventions and public libraries. In the context of the South

African education, functional HIV and AIDS knowledge forms an integral part of Life Orientation which is taught to all school students. Academic HIV and AIDS knowledge is taught in Life Sciences which is taught only to a selected group of school students.

Table 3.1 A summary of HIV and AIDS intervention programmes

Type	Reference	Target groups
Peer education	- Ali & Dwyer, 2010 - Chimango *et al.*, 2009 - Kaponda *et al.*, 2009 - Mahat *et al.*, 2008 - Maticka-Tyndale & Barnett, 2010	Adolescents aged 13 to 15 and youth, age 15 to 24
People living with HIV/AIDS	- Bell *et al.*, 2007 - Brown *et al.*, 2001 - Levy, 2009 - Liamputtong *et al.*, 2009 - Ncama, 2005 - Rosen, 2002 - Simon-Meyer & Odallo, 2002	Age 30 to 45
Socio-economic intervention	- Lachaud, 2007 - Manase *et al.*, 2009 - Pronyk *et al.*, 2008 - Ssewamala *et al.*, 2008 - Ssewamala *et al.*, 2009	Orphaned adolescents, aged 13
Gender and culture specific interventions	- Agadjanian, 2005 - Alsallaq *et al.*, 2009 - Baeten *et al.*, 2009 - Bonner, 2001 - Brewer *et al.*, 2007 - Di Noia & Schinke, 2007 - Doyle *et al.*, 2010	Adolescents and adults
Counselling & testing (VCT)	- Angotti *et al.*, 2009 - Granich *et al.*, 2009 - Hallett *et al.*, 2009 - Kakoko *et al.*, 2006 - Painter, 2001	Door-to-door
Mass media interventions	- Aggleton *et al.*, 2005 - Babalola *et al.*, 2009 - Bertrand *et al.*, 2006 - Bessinger *et al.*, 2004 - Lemieux, *et al.*,2008	
School-based HIV/AIDS educational intervention	- Ansell, 2009 - Francis, 2009 - Kyrychenko *et al.*, 2006 - Mantell *et al.*, 2006 - Maticka-Tyndale *et al.*, 2007 - Page *et al.*, 2006	Age 15 to 16
Computer-delivered	- Di Noia *et al.*, 2004	HIV/AIDS experts

sexual risk reduction intervention	- Fisher *et al*., 2002 - Kalichman *et al.*, 2003 - Kiene & Barta., 2006 - Mackenzie *et al.*, 2007	and patients, aged 18 to 54
Public libraries	- Albright & Kawooyab, 2007 - Albright, 2006 - du Plessis, 2008 - Dube, 2005 - Ghosh, 2006	General public

3.3.1.1 Presentation of functional HIV and AIDS knowledge

The peer education approach to HIV and AIDS is often used to address social issues related to HIV and AIDS, including life skills, gender imbalances, human rights violations, stigma and discrimination. Peer education-based programmes are usually based on theories such as social learning theory, behaviour transformation and the social influence ideology (Table 3.1; Maticka-Tyndale & Barnett, 2010; Mahat, Scoloveno, De Leon & Frenkel, 2008). In these interventions, group leaders are selected and trained by researchers or project leaders in relevant areas that will be covered during the intervention (Kaponda, Jere, Chimango, Chimwaza, Crittenden, Kachingwe, McCreary, Norr & Norr, 2009). Once group leaders have enough information, they are left with their peers where they are expected to share knowledge and skills in order to resolve and reconstruct social challenges. The advantage of peer education interventions is that group leaders understand the cultural and social dynamics of their peers which allow for better understanding between the group leader and the peers. Some positive results have been reported with peer education-based interventions. For example Mahat *et al*. (2008) report that those students who participated in their peer education-based intervention showed improved HIV and AIDS knowledge compared with those who participate in traditional programmes. Other researchers also report improved HIV and AIDS knowledge and self-efficacy (Maticka-Tyndale & Barnett, 2010; Kaponda *et al.*, 2009).

Another common strategy for presenting functional HIV and AIDS knowledge is the involvement of people living with HIV who have been previously trained to transfer knowledge (Table 3.1; Levy, 2009; Liamputtong, Haritavorn, & Kiatying-Angsulee, 2009; Ncama, 2005; Simon-Meyer & Odallo, 2002). Roles played by these trained HIV positive respondents vary from one intervention to another. For example in some cases they act as counsellors for other HIV positive people (Simon-Meyer & Odallo, 2002). In some cases they advocate disclosure and establish support groups amongst themselves in which they can share information and other promotional materials (Simon-Meyer & Odallo, 2002). Furthermore prevention materials such as condoms are distributed through these support groups (Ncama, 2005). Ultimately the objective of presenting knowledge through people living with HIV is to address issues of stigma and discrimination, life skills and human rights.

Given the economic impact of HIV and AIDS, presentation of functional HIV and AIDS knowledge also attends to individuals who have been orphaned due to HIV and AIDS (Table 3.1; Ssewamala *et al*., 2009; 2008). This is because while there are children who are emotionally gifted to deal with trauma (Ebersöhn & Maree, 2006), to some, HIV and AIDS may lead to severe psychological, emotional and financial distress (Ebersöhn, 2007). Consequently, orphans participate in interventions designed to help them develop resilience (Ebersöhn, 2007; Ebersöhn & Maree, 2006) and other coping strategies to help them deal with the trauma of loss and their economic challenges (Manase *et al*., 2009; Pronyk *et al.*, 2008). These interventions also provide orphans with skills and knowledge related to careers and education in general. Scholars argue that providing orphans with HIV and AIDS related knowledge alone is not enough, and thus they also prepare youth for life challenges that may not be directly related to HIV and AIDS (Manase *et al.*, 2009).

There is also a significant need to address life skills. The main drive for such programmes is that "HIV and AIDS education should engage the whole person, go beyond mere academic and intellectual knowledge" (Griessel-Roux *et al.*, 2005: 253). As a result researchers call for the inclusion of life skills programmes that will address HIV and AIDS related issues in a manner that focuses on real-life action behaviour (Kelly, 2002). In response to this need for life skills programmes (Griessel-Roux *et al*., 2005; Hoelson and Van Schalkwyk, 2001), a number of life skills programmes, such as Life Orientation in South Africa, have been developed (James, Reddy, Ruiter, McCauley & Van den Borne, 2006; Motepe, 2006; Visser, Ashton & Vernon, 2006; United Nations, 2003). Some HIV and AIDS life skills programmes in schools have been found to lead to a significant increase in student knowledge about HIV and AIDS (James *et al*., 2006; Magnani *et al*., 2005). However there was a lesser effect on matters related to safe sex practices or on attitudes and self-efficacy (James *et al*., 2006).

3.3.1.2 Presentation of academic HIV and AIDS knowledge

Looking at the presentation of academic HIV and AIDS knowledge, the main objective is to challenge misconceptions and facilitate construction and understanding of scientifically correct knowledge. Perhaps the most common intervention strategies used in this regard are the school-based educational interventions (Table 3.1). Scholars (Mantell *et al.*, 2006) argue that these interventions are easy to carry out because students are reached in large numbers in a localized area and content knowledge can be integrated with school-based curricula. Besides integration of content to curricula, trained HIV and AIDS experts may be invited to schools where they provide students with the necessary information depending on the objectives of the intervention. For example Kyrychenko *et al.* (2006) report that in their study HIV and AIDS experts provided students with information related to the biology of HIV, transmission and prevention. Other researchers also report that HIV and AIDS experts can provide students with information related to the links between HIV infection and drug abuse (Francis, 2010; Mantell *et al.* 2006).

Given the advances in technology over the last few decades, researchers have also ventured into the use of computer-based interventions to present academic HIV and AIDS knowledge (Table 3.1; Mackenzie *et al.*, 2007; Kiene & Barta, 2006; Di Noia *et al.*, 2004). Here computers may provide interactive information where students can access specific content that they may need. The advantage of computer-based interventions is that academic HIV and AIDS knowledge can be integrated with general counselling and actionable knowledge on prevention such as how to use condoms correctly (Mackenzie *et al*., 2007; Fisher *et al.*, 2002). Mackenzie *et al*. (2007) argue that this form of intervention provides students with a broad variety of information which can correct misconceptions and myths and provide practical solutions to HIV and AIDS challenges. While computer-based interventions are thriving, other traditional methods remain highly favoured too. For example researchers (Du Plessis, 2008; Albright & Kawooyab, 2007; Albright, 2006) argue that general public libraries can be effectively used to distribute academic HIV and AIDS knowledge that addresses HIV and AIDS challenges. These researchers argue that while computer-based interventions may be financially costly, libraries are fairly viable and can reach high numbers of people.

Another approach reported by researchers for academic HIV and AIDS knowledge uses students working in groups to learn about HIV and AIDS (Cornelius, Moneyham & LeGrand, 2008). Depending on their sexual activity status, students can discuss problems, myths and misconceptions they have experienced, observed or heard of regarding safe sex practices and HIV and AIDS. Thereafter the teacher provides corrective knowledge that addresses major problems that emerge from the discussion. Cornelius *et al*. (2008) argue that this discussion-based approach allows for openness and to some extent disclosure. The group-based approach also facilitates the establishment of support groups. The challenge however is that the teacher must be well informed on the subject and must have good group-management skills that will enable him or her to address any problems that may arise from the discussion (Cornelius *et al*., 2008).

It emerges from the above discussion that there are various approaches that can be used to integrate HIV and AIDS knowledge into curricula. What is quite clear is that there are different strategies for different forms of knowledge. In some cases however, a single approach can be adapted to present either functional or academic HIV and AIDS knowledge. For example multimedia based interventions (Table 3.1) are often used to teach prevention, treatment and care (Bertrand *et al.*, 2006). Consequently, this strategy is sometimes used for presentation of both the functional and academic HIV and AIDS knowledge, in an integrated manner or separately. Multimedia-based interventions address various topics such as providing (scholar academic) scientific evidence for the existence of HIV and AIDS. Furthermore multimedia-based approaches can provide knowledge related to modes of HIV transmission, means of prevention and behaviour (Anderson & Beutel, 2007; Bertrand *et al.*, 2006; Myhre & Flora, 2000; Kuhn & Steinberg, 1994). Myhre and Flora (2000) reported that in 1994 over 126 countries were using multimedia programmes to fight the spread of HIV. Of these countries 93% were disseminating information using television, 85% radio broadcasting and 67% were promoting the use of condoms. The targets of these multimedia programmes cover all spheres of the population from national to local audiences (Bertrand *et al.*, 2006).

In the above discussion the researcher has provided evidence related to the integration of HIV and AIDS knowledge into curricula. While academic and functional HIV and AIDS knowledge have been successfully presented independent of one another, there is a dearth of knowledge regarding the effect of one method on another. For example it remains to be investigated whether academic HIV and AIDS knowledge correlates with functional HIV and

AIDS knowledge. (The researcher reports on this further in Chapter 6). Moreover there seems to be evidence suggesting that functional HIV and AIDS knowledge can lead to behaviour transformation. However whether this is true for academic HIV and AIDS knowledge also needs to be investigated. Overall, in the current section the researcher argues that HIV and AIDS knowledge can be successfully integrated into an existing curriculum. What is not clear, particularly in the context of the study, is the impact of integrating HIV and AIDS knowledge into a Life Sciences curriculum.

While the literature indicates that integrating HIV and AIDS into formal curricula can yield desirable outcomes, one need not ignore the role played by non-curricular strategies. In fact one wonders whether non-curricular strategies are more effective than curricular strategies. Furthermore there is a need to investigate whether collaboration between curricular and non-curricular strategies is possible. With that in mind, below is a review of non-curricular strategies for HIV and AIDS education.

3.3.2 Non-curriculum strategies for HIV/AIDS education in South Africa

The overarching foci of non-curricular HIV and AIDS education are sexuality education and sexual health as well as HIV and AIDS education (Figure 3.1). Relevant programmes in this regard are aimed at *i)* preventing new HIV infections, *ii)* preventing HIV transmission from mothers living with HIV to their infants, and *iii)* providing care and support to people living with HIV, including the use of antiretroviral drugs. Non-curricular HIV and AIDS programmes include sexuality education, HIV and AIDS education, partner negotiation training, community organizing, case-management, outreach, self-help groups, consciousness raising, organizational networking, leadership training as well as individual and group-based problem-solving (Beeker *et al.*, 1998).

A number of materials have been developed to address sexuality education and sexual health in the context of HIV and AIDS in South Africa. For example work has been done to promote sexual behavioural change in order to decrease HIV prevalence. In this regard Karnell *et al.* (2006) developed an intervention that was aimed at reducing sexual risk behaviour influenced by alcohol abuse. The effect of HIV and AIDS education on risk behaviour has also been investigated widely by researchers such as Exner, Harrison, Hoffman, Smit, Mantell, Nzama and Stein (2006).

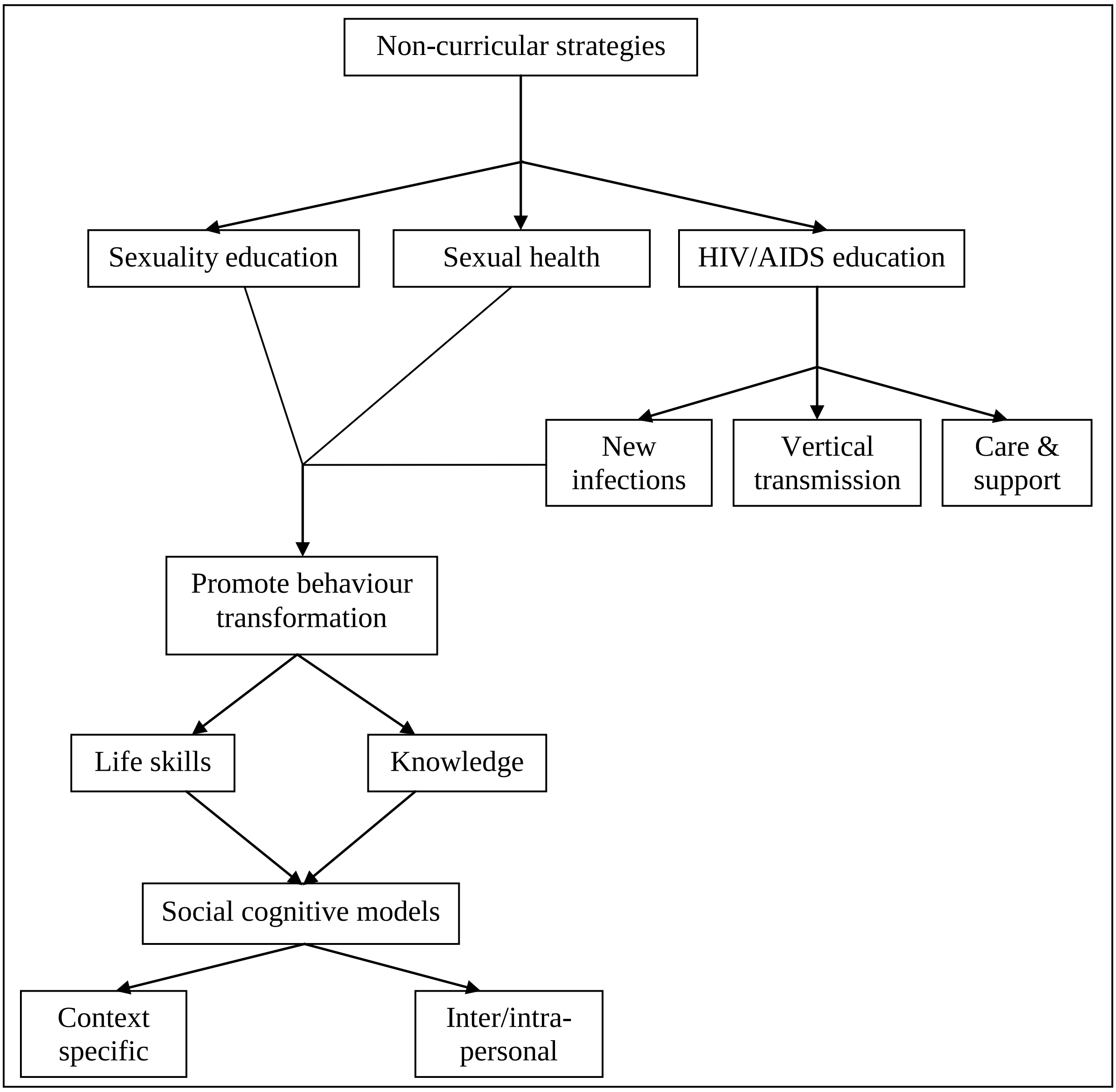

Figure 3.1 An outline of non-curricula strategies of HIV and AIDS education

Other sexuality-related areas that have been addressed through HIV and AIDS education include knowledge of sexuality and reproductive health (Harrison *et al.*, 2010; Paul-Ebhohimhen *et al.*, 2008; Gallant & Maticka-Tyndale, 2004). Other researchers have also investigated HIV and AIDS education with respect to life skills and resilience (Ebersöhn, 2008; Ebersöhn, 2006; Hallman *et al.*, 2007) role models (Exner *et al.*, 2007) as well as sexuality-related violence (Jewkes *et al.*, 2008; Jewkes *et al.*, 2006).

Other researchers however have studied health and HIV and AIDS education specifically to address HIV and AIDS. In this regard interventions on knowledge of and attitudes toward HIV and AIDS have been administered widely (Gallant & Maticka-Tyndale, 2004; Paul-Ebhohimhen *et al.*, 2004). HIV and AIDS education also targets prevention strategies (Francis, 2010; Kirby *et al*., 2007), social influences on infection (Rao Gupta, Parkhurst, Ogden, Aggleton & Mahal, 2008), and life skills for living with HIV (Harrison *et al.*, 2010; Jewkes *et al.*, 2008). Self-efficacy has also emerged as the target for most HIV and AIDS interventions (Harrison *et al.*, 2010).

A number of lessons have been learnt from non-curricular HIV and AIDS education with regard to designing, implementing and evaluating interventions. For example researchers recommend an adoption of strategies of first listening to the concerns, problems and needs of the community at large before designing and implementing any HIV and AIDS education intervention (Harrison *et al.*, 2010). To this effect a number of HIV and AIDS education programmes that effectively promote behaviour transformation are context and culture-specific (Francis, 2010). There are also reports that recommend afterschool activities as well as youth programmes for HIV and AIDS education (Harrison *et al.*, 2010; Exner *et al.*, 2007). Scholars also recommend that non-curricular HIV and AIDS education be facilitated by school teachers and peer educators instead of outsiders (Smith, Palen, Caldwell, Flisher, Graham, Mathews, Wegner & Vergnani, 2008; Visser, 2007). The idea here is that teachers and peer educators have a better understanding of social norms related to sexuality and HIV and AIDS. Other researchers also recommend that HIV and AIDS education be designed to address intrapersonal and interpersonal challenges that students have (Harrison *et al.*, 2010). Visser (2007) provides evidence to suggest that with respect to conceptual frameworks, reports suggest that programmes that use social cognitive models and address socio-cultural issues are more effective in leading to behaviour transformation.

One major concern with non-curricular strategies (Figure 3.1) is the shallow and unregulated integration of scientific knowledge with social life. As indicated earlier peer educators are often used to provide information on HIV and AIDS. However it is not clear to what extent they understand the science of HIV and AIDS and how this affects their ability to effectively disseminate information on HIV and AIDS. To this end Exner *et al.* (2007) and Mathews (2007) recommend a stronger curricular-based integration of scientific knowledge with socio-cultural knowledge.

In the above subsections (3.3.1 and 3.3.2), the researcher has indicated that there are various educational weapons used to fight the battle against HIV and AIDS. As shown these can include curricular or non-curricular strategies that present functional or academic HIV and AIDS knowledge. The ultimate question of this chapter however is how effective is this educational weaponry in the fight against HIV and AIDS? As stated earlier this question is vital to the study because based on the response, Life Sciences' quest will be determined. In this regard the study's findings (presented later) will be used to redefine and refocus attempts to minimise the spread of HIV and AIDS as discussed in the current chapter. Therefore in the following subsection the researcher will discuss the effectiveness of current HIV and AIDS education in reducing the spread of HIV.

3.3.3 Effectiveness of HIV/AIDS education to reduce the spread of HIV

One of the important issues in teaching students about HIV and AIDS is knowing what works and what does not. However the effectiveness of HIV and AIDS knowledge to reduce the spread of HIV in many HIV and AIDS awareness programmes is a question that many researchers are still debating due to different methodologies and contexts (Anderson & Beutel, 2007; Bertrand *et al.*, 2006; Page *et al.*, 2006). The debate is a result of a number of factors that are inconsistent throughout the programmes including the context, target groups, demographics, research methodologies and expertise of those presenting the work.

There have been numerous other educational programmes in KwaZulu-Natal (where the current study was located) that aimed at influencing the behaviour of their participants. These programmes include HIV/AIDS Prevention Study (HAPS) (Karnell *et al.*, 2006), Mpondombili Project (Exner *et al.*, 2006) and Adolescent Livelihoods (Hallman *et al.*, 2007). These studies targeted youth aged 12 to 24 by exposing them to HIV and AIDS-related content knowledge over periods of time that ranged from two months to two years. Using post-intervention tests, it was established that students' attitudes towards condoms, their self efficacy for sex refusal and voluntary use of condoms increased.

An example of a study that showed that academic HIV and AIDS knowledge can affect behaviour was done by Page *et al*. (2006). In this study the researchers presented a module to

Grade 11 Life Sciences students at a government, ex-model C and private school in eight weeks. The impact of the module was tested using pre-, post and retention tests which were made up of open and closed questions. Page and her colleagues found that their intervention improved students' understanding of academic and functional HIV and AIDS knowledge, and also impacted positively on students' lives and sexual behaviour by improving self efficacy regarding prevention of HIV infection.

Maticka-Tyndale *et al*. (2007) also reported on the effectiveness of an educational programme presented to primary school learners over an 18 month period. This programme was presented in 40 experimental schools (there were 40 control schools as well) with the intention of improving students' knowledge of HIV and AIDS as well as self efficacy related to condom-use and abstinence. The programme was presented by teachers as part of the curriculum. Post-intervention results showed an increase in the understanding of HIV and AIDS content knowledge. Furthermore, participating students reported improved communication with their parents and teachers about HIV and AIDS as well as sexuality. Delayed sexual intercourse debut and sexual intercourse activity were also reported.

According to Keselman, Kaufman, Kramer and Patel (2007) there are five factors that determine the effectiveness of HIV and AIDS knowledge in the lives of students. Firstly students need to have conceptual understanding of HIV and AIDS in order to identify misconception and myths about HIV and AIDS. Keselman *et al*. (2007) suggests that coupled with conceptual understanding, students need to have necessary reasoning and problem-solving skills required to apply knowledge. Secondly students need to have reasoning and argumentation skills. These skills allow students to engage their peers, parents and other members of society in discussing their personal feelings about sexuality, gender issues, stigma and discrimination. Argumentation skills also mean students would be able to express themselves in an understandable manner when discussing issues related to HIV and AIDS. Thirdly students need metacognitive competency. Metacognitive competency is the ability to reflect on information provided by multiple sources in order to differentiate between misconceptions and truth. Fourthly it is reported that an understanding of the nature of science fosters an interest in the construction and application of scientific knowledge. As a result epistemological commitment is listed as another factor that determines the effectiveness of HIV and AIDS knowledge. Fifthly it is suggested that general education affects the effectiveness of functional HIV and AIDS knowledge. In this regard it is reported that educated people have better access to information and are able to cognitively process such information. This includes access to information about HIV and AIDS. Educated people also have access to health facilities such as medication and prevention resources. Education also provides an incentive for people in life by providing better opportunities for a better life.

In 2010, Maticka-Tyndale and Barnett reported on their evaluation of various HIV and AIDS programmes that focused on both behaviour transformation and academic HIV and AIDS knowledge. These researchers report that in all cases, there are reports of desired positive outcomes, undesired negative outcomes or neutral outcomes.

Askew *et al*. (2004), Bhuiya *et al*. (2004), Diop *et al*. (2004), Mathur *et al*. (2004) and Frontiers in Reproductive Health (2001) report desired positive outcomes from academic HIV and AIDS knowledge which led to improved functional HIV and AIDS knowledge of HIV transmission, acquisition and prevention of HIV infection. Furthermore positive results are reported with respect to the use of condoms as a result of the exposure to functional HIV and AIDS knowledge (Askew *et al*., 2004; Diop *et al*., 2004). Other researchers also report positive changes in social attitudes, norms and values as a result of exposure to functional HIV and AIDS knowledge. An example of this phenomenon is reported by Hughes-d'Aeth (2002) who observed that some communities abandoned the re-use of razor blades in traditional scarring. Similarly initiation rites are reported to have been modified by certain communities to eliminate the encouragement of sexual risk behaviours (Bagamoyo College of Arts, Tanzania Theatre Centre, Mabala & Allen, 2002).

One of the areas that have been reported to be difficult to change (positively) through academic HIV and AIDS knowledge is risk behaviour such as unprotected sexual activity. For example Esu-Williams, Schenk, Motsepe, Geibel and Zulu (2004) and Mathur *et al*. (2004) reported undesirable results due to exposing students to functional HIV and AIDS knowledge that attempted to change behaviours. In this instance Esu-Williams *et al*. (2004) provided students with information related to caring for people living with HIV as well as the use of condoms. Their findings however showed that teaching students about condoms does not always lead to the use of condoms. Instead it may increase students' desire to experiment sexually.

Scholars also suggest that in some cases there is a gender split with regard to the effectiveness of HIV and AIDS knowledge. For example Nastasi, Schensul, Amarasiri de Silva, Varjas, Silva and Ratnayake (1998) reported girls having a greater positive change in knowledge compared with boys as a result of being taught functional HIV and AIDS knowledge that aimed to improve sexual negotiation skills. Maticka-Tyndale and Barnett (2010) also report that males are often susceptible to negative or non-significant results due to exposure to HIV and AIDS knowledge. Other researchers (for example Diop *et al*., 2004) however report positive changes (that is reduced risky sexual behaviour) and others report negative or non-significant changes for males exposed to HIV and AIDS knowledge (for example Esu-Williams *et al*., 2004; Mathur *et al*., 2004).

Overall it appears that HIV and AIDS education can generally lead to a reduction in the spread of HIV, if presented in the correct format and with the suitable content. While there are several factors that determine the effectiveness of HIV and AIDS education, the researcher argues that from a constructivist perspective, there ought to be prerequisite knowledge that is available in order for HIV and AIDS knowledge to be effective. Keselman, Kaufman and Patel (2004) also argue that there is a certain minimum prerequisite knowledge of biology required for effective information evaluation and decision-making. In line with Keselman *et al*.,'s (2004) argument the researcher believes that for students to fully appreciate the risks of contracting HIV and AIDS, they need to first understand, from a scientific perspective, what HIV and AIDS are. Consequently, it may not be plausible to simply provide students with functional HIV and AIDS knowledge that they are not able to understand due to lack of academic HIV and AIDS knowledge. Similarly, if students only have academic HIV and AIDS knowledge, they may not be able to effectively apply this knowledge in their lives. Consequently, one would expect students who have both academic and functional HIV and AIDS knowledge (for example Life Sciences students) to report better and safer behavioural preferences compared with students who have only one type of knowledge (for example non-Life Sciences). (The researcher discusses this idea further in Chapter 7).

Based on the above discussion, the researcher believes that with suitable educational weaponry the battle of HIV and AIDS can be won. However the researcher cautions that before these educational weapons are utilized, one needs to have a good understanding of what the actual enemy is. As argued earlier academic HIV and AIDS knowledge can be used only to attend to a specific area, which cannot be done using functional HIV and AIDS knowledge. In other words the context plays a significant role in the fight against the spread of HIV. With this the researcher believes that factors that affect the spread of HIV need to be well defined, so that any means to limit HIV are targeted in the right direction. Consequently in the following section, the researcher discusses factors that affect the spread of HIV in the context of South African youth.

3.4 The enemy redefined: factors affecting the spread of HIV

In 1987 Jonathan Mann, founding Director of the World Health Organization's former Global Programme on AIDS suggested that there are three stages of the HIV and AIDS development, which he termed "epidemics" (Parker & Aggleton, 2003). The first stage is the *epidemic of HIV infection* (Parker & Aggleton, 2003; Stein, 2003). During this stage HIV enters communities silently through various means such as unprotected sex. Members of society do not see HIV enter their communities and therefore it can enter epidemically over a long period of time. Factors that lead to the epidemic of HIV infection include risk-related behavioural practices related to sexuality and injection drug users, biological factors (for example transmission from mother to child at birth), health factors (for example exposure to infected blood or bodily fluids), and social factors (for example human rights violation, ill-informed values, norms, attitudes and beliefs such as gender imbalances) (Dimmock *et al.*, 2007; Parker & Aggleton, 2003). The epidemic of HIV infection is followed by the *epidemic of AIDS* (Stein, 2003). During this epidemic, the effects of HIV are visible. Infected people become ill from various opportunistic infections and some die. Factors leading to the epidemic of AIDS include poverty, unavailability of treatment and a cure for AIDS and multiple infections (Parker & Aggleton, 2003). During the epidemic of AIDS, the *epidemic of social, cultural and economic response* emerges (Dimmock *et al.*, 2007; Parker & Aggleton, 2003; Stein, 2003). The epidemic of social, cultural and economic response is characterized by HIV and AIDS awareness programmes, the information explosion, stigmatization and discrimination of those infected, research and production of treatment drugs, research on curability of AIDS and factors leading to HIV infection and AIDS (Dimmock *et al.*, 2007; Parker & Aggleton, 2003; Stein, 2003).

Research has shown that responses to the epidemic of AIDS as defined by Jonathan Mann are influenced greatly by culture (including social values, norms, attitudes and beliefs) (Parker & Aggleton, 2003; Stein, 2003). Culture also influences the understanding of HIV and AIDS among communities and also determines the response mechanisms adopted (Stein, 2003). Luginaah, Yiridoe and Taabazuing (2005: 1691) argue that culture serves as a "lens through which HIV prevention can be understood." This is because elements of culture such as values and beliefs influence sexual behavioural practices of societies. In this way it is believed that patterns of the spread of HIV are culture-specific, so that certain African cultures, which for instance promote polygamy, may be affecting the manner with which HIV is spreading (Luginaah *et al.*, 2005; Tobias, 2001). Therefore in order for HIV and AIDS education to be effective, these cultural factors need to be understood and addressed to through proper HIV and AIDS education. However the challenge, particularly in South Africa, is that there is a high diversity and intermingling of cultures. Consequently it would require more effort to formulate culture-specific response mechanisms. Among students cultural elements that are school-based such as social values, norms, attitudes and beliefs have been found to affect behaviour (Kentli, 2009; Johnson, Rozmus & Edmisson, 1999). For example research shows that in some cases, high self-esteem and self-efficacy is associated with abstinence and the use of condoms (Johnson *et al.*, 1999). Values of exciting life and pleasure are associated with increased risk behaviour whereas value for health is associated with reduced risk behaviour (Johnson *et al.*, 1999).

The common strategy to address the three epidemics of HIV and AIDS is provision of relevant knowledge and development of life skills, which can be used to reconstruct social norms (see Section 3.3). Much work in HIV and AIDS education has been done to teach people about how HIV is transmitted, prevention of HIV infection, treatment of AIDS, acceptance and resilience towards being infected or affected by HIV and AIDS and changing attitudes, norms and beliefs about those infected. In the following sections the researcher will discuss some prominent factors related to an HIV and AIDS epidemic, namely behaviour, stigma and discrimination, sexuality education, as well as human rights. These are selected because researchers have found that they play a significant role in the spread of HIV and AIDS and can be transformed through curriculum-based education. (The researcher also investigated the effect of Life Sciences on behaviour (see Chapter 6 and 7). Further research is needed with respect to the other factors).

3.4.1 Risk behaviour

One question that resonated in the mind of the researcher at the beginning of the study is; if unprotected sex may lead to HIV infection (that is, the most common way through which HIV is contracted), why do people engage in it? Steinberg (2008) and Donovan and Ross (2000) respond by arguing that people engage in sex (even if it is unsafe) simply because sex is pleasurable. Therefore the objective of HIV and AIDS education should be balancing the natural demand of pleasure and the negative consequences of such pleasure. Consequently most HIV and AIDS education and awareness programmes focus on transforming risky behavioural practices, particularly sexual behaviours (Kirby *et al*., 2007). Of particular interest is delaying the age of first sexual experience, frequency of sex, number of sexual partners and use of protection during sexual intercourse by those targeted (Kirby *et al*., 2007).

With regard to age of first sexual experience, researchers have found that an early sexual debut increases chances of contracting HIV because chances of having many sexual partners are higher (Francis, 2010; Kirby *et al*., 2007). Furthermore researchers believe that at a younger age, people are vulnerable to psychological and sexual manipulation as well as abuse (Kirby *et al*., 2007). As a result HIV and AIDS education attempts to transform behaviours so that youths postpone their sexual debut. Concerning frequency of sex, researchers tend to measure how often young people engage in sexual activity over a given period of time (Francis, 2010; Kirby *et al*., 2007). The argument here is that frequent sexual intercourse may increase chances of contracting HIV. This may be because such activity will increase chances of not using protection (for example condoms) and having multiple or many successive sexual partners. Furthermore if one is already infected, risks of multiple infections are increased leading to accelerated development of AIDS (Kirby *et al*., 2007). The number of sexual partners is another behavioural pattern of concern (Donovan & Ross, 2000). Research has shown that multiple sexual partners increase the probability of HIV infection (Francis, 2010; Kirby *et al*., 2007; Donovan & Ross, 2000). Therefore young people are encouraged to minimize the number of sexual partners. Related to the number of sexual partners is the use of protection, namely condoms. At best condoms are the most accessible prevention tool available. As a result young people are encouraged to use protection whenever they engage in sexual activities.

Clearly, there is weaponry that is being used to fight the battle of HIV and AIDS by targeting unsafe behaviour. In line with Donovan and Ross (2000) the researcher however believes that this weaponry will not yield desirable results. One of the reasons cited by Donovan and Ross (2000) for this is that HIV and AIDS education aimed at changing behaviour is often based on an individualistic approach. However in reality, young people's behaviours are not individualistic but collective and social. Furthermore researchers argue that ideologies that focus on alerting students about risky sexual behaviour are not effective because they clash directly with human nature such as the natural desire for sex (Steinberg, 2008; Donovan & Ross, 2000).

Francis (2010) argues that desirable results will be achieved by shifting the focus of HIV and AIDS education. For instance it is suggested that HIV and AIDS education should focus on alerting students about risk situations that can be controlled by those involved (Donovan & Ross, 2000). In other words, the focus of HIV and AIDS education in relation to behaviour should firstly address those factors that lead to risk, such as alcohol and drug abuse, which have been shown to increase the risk of HIV infection (Bailey, Camlin & Ennett, 1998). Furthermore HIV and AIDS education should "account for the processes that occur in the heat of the moment" (Donovan & Ross, 2000: 1900).

3.4.2 Gender

Scholars have indicated that gender identity plays a significant role in the spread of HIV, particularly in Africa (Rembeck & Gunnarsson, 2009; Jewkes, Levin & Penn-Kekana, 2003; Campbell & MacPhail, 2002; Campbell, 2000; Simbayi, Andipatin, Potgieter, Msomi, Ratele, Shefer, Strebel & Wilson, 2000; Wood, 2000; Varga, 1997). The role of gender in the spread of HIV is related to social norms, stigma and discrimination as well as human rights violations. Furthermore the feminine gender is often the victim of sexual violation which leads to HIV infection.

Campbell and MacPhail (2002) report that in most communities in South Africa, the dominant social norms place males in a dominant position where they are enthused to take a dominant role in sexual activities. This norm places women in a position where they play a passive role dominated by fruitless resistance to male's sexual advances. Furthermore sexual activities where women are submissive are often characterized by emotional pressure against them (Campbell & MacPhail, 2002). Consequently women are not able to enquire about the HIV status of their partners and/or negotiate safe sex and thus are vulnerable to HIV infection.

Another product of gender-related social norms is that females are often condemned when involved in premarital sex (Jewkes *et al.*, 2003). This condemnation stems from the view that women are seen as repositories of physical and moral sexual uncleanness (Simbayi *et al.*, 2000). For example in some communities, women are viewed as unclean during their menstruation. In other contexts, female virgins are regarded as sexually and morally clean (Francis, 2010). Consequently if a women attempts to use a condom during sex, she is seen as admitting to being unclean. This may also mean she is promiscuous and therefore is carrying sexually transmitted diseases. Some men (living with HIV) believe that having sex with a virgin (who is seen as clean) eradicates HIV (Francis, 2010).

Another gender-related factor to the spread of HIV is that of social worth. Campbell (2000) reports that in some communities social worth depends on one's ability to have and keep a partner. For example in some societies single women (adult unmarried, widowed and divorced) have a lower social status than married women or women with partners (Simbayi *et al.*, 2000). As a result women are pressurised to have male (sexual) partners for the sake of having a respected social status. However in males, social worth is dependent on having multiple partners (Campbell, 2000). Therefore, women are forced by social norms to share partners, which increase their risk of contracting HIV.

Economic needs also play a significant role in gender-related HIV infections. For example Jewkes, *et al.* (2003) report that besides prostitution, some women sleep with men in exchange for money and gifts. For example it is reported that in some cases, after a night of sex, women are left with money for cosmetics (Jewkes, *et al.*, 2003). Some schoolgirls are reported to sleep with teachers in exchange for grades and pocket money (Jewkes, *et al.*, 2003). Young women have also been reported of having sex with older richer men in exchange for a luxurious life. Jewkes, *et al.* (2003: 126) argue that this older-man-younger-woman sexual relationship may explain the "gender differences in age-specific HIV prevalence in South Africa."

3.4.3 Stigma and discrimination

According to Goffman (1963) stigma is an attribute given to a person living with HIV that significantly discredits the person. Parker and Aggleton (2003) define stigma as a negative feeling towards a person living with HIV associated with a belief that such a person deserves AIDS, avoidance and ostracism. Stein (2003) suggests that there are two types of stigma, namely instrumental stigma and symbolic stigma. Instrumental stigma is stigma based on the fear of being infected with HIV and dying from AIDS. Instrumental stigma therefore may decrease due to the availability of AIDS treatment because it means AIDS is no longer terminal but chronic. Symbolic stigma is value-based because it emerges when people associate HIV infection with sexual activity, particularly promiscuity and homosexuality. In this instance people tend to distinguish between innocent victims and voluntary victims (Parker & Aggleton, 2003; Stein, 2003). Discrimination on the other hand refers to unfair treatment of people living with HIV as a result of being stigmatized (Parker & Aggleton, 2003). Discriminating people believe that there is social inequality between themselves and those infected with HIV. They believe that they have a superior position in society.

Stigma and discrimination have been reported to cause a number of negative responses to HIV and AIDS. For example Brown *et al.* (2001) report that some people avoid testing for HIV, disclosing their status and accessing health care because of stigmatization of people living with HIV. It is also reported that some people avoid participating in HIV and AIDS education programmes for fear of being stigmatized (Makoae, Greeff, Phetlhu, Uys, Naidoo, Kohi, Dlamini, Chirwa & Holzemer, 2008; Brown *et al.*, 2001). Scholars however indicate that there are coping strategies that people living with HIV use in response to stigma and discrimination. Ebersöhn and Maree (2006) argue that some people develop buoyancy that allows them to be resilient against hardships caused by HIV and AIDS. For example some people adopt a problem-focused proactive coping style in which they avoid being discredited through hiding their status (Makoae *et al.*, 2008). Some people also control HIV and AIDS information within their close associates. Furthermore people living with HIV may use information to redefine values, beliefs and power imbalances within their close associates in order to limit the effect of stigma and discrimination (Makoae *et al.*, 2008).

Scholars indicate that stigma and discrimination are due to misconceptions concerning the transmission of HIV as well as the risk of infection for everybody (Parker & Aggleton, 2003; Stein, 2003). Scholars believe that correction of misconceptions, transformation of attitudes and beliefs can help eradicate stigma and discrimination (Stein, 2003). Furthermore researchers believe that increased resilience, tolerance, apathy, altruism and understanding human rights can facilitate acceptance and decrease anxiety and fear and consequently stigmatization and discrimination (Parker & Aggleton, 2003).

Access to academic and functional HIV and AIDS knowledge has been cited as a useful tool for coping with stigma and discrimination as well as reducing stigmatization and discrimination. Brown *et al.* (2001) suggest that scholar academic knowledge can be used as didactic statements, in combination with psychological counselling or in combination with coping skills acquisition. Scholar academic knowledge as didactic statements can be delivered through various forms including presentation in classrooms. Reports suggest that factual description of HIV, transmission mechanisms and methods to reduce infection risk decreases stigmatization and discrimination (Brown *et al.*, 2001; Hue & Kauffman 1998; Mwambu 1998). Functional HIV and AIDS knowledge also results in tolerance and positive attitudes toward HIV and AIDS. In cases in which functional HIV and AIDS knowledge is presented together with psychological counselling, it provides praise and social support to persons displaying positive attitudes and safe behaviours (Brown *et al.*, 2001; Hue & Kauffman 1998; Mwambu 1998). Scholar academic knowledge together with psychological counselling has been found to improve chances of testing for HIV as well as reduction of post-HIV test stress (Brown *et al.*, 2001). Furthermore evidence of status disclosure has been reported (Brown *et al.*, 2001). Presentation of knowledge with coping skills acquisition has also been reported to be effective in changing attitudes (Brown *et al.*, 2001).

Nevertheless the researcher maintains that access to knowledge alone may not translate to eradication of misconceptions, stigma and discrimination. This is because people retain the right to accept or disregard information. Furthermore stigma and discrimination are often a result of social norms and values, which means HIV and AIDS education has to penetrate through social structures in order to eliminate stigma and discrimination. This however cannot be easy given that social norms and values are localized and context-specific. In South Africa, a country where education is the same for different cultural and ethnic groups, the task of HIV and AIDS education is even more complicated.

3.4.4 Sexuality education

According to Francis (2010) sexuality education is the main component of HIV and AIDS education because it is believed that most HIV infections among the youth are through unprotected sexual intercourse. Sexuality education can be defined as a “lifelong process of acquiring information and forming attitudes, beliefs, and values concerning identity, relationships, and intimacy. It encompasses sexual development, reproductive health, interpersonal relationships, affection, intimacy, body image, and gender roles. Sexuality education addresses the biological, socio-cultural, psychological, and spiritual dimensions of sexuality” (Rosen, Murray & Moreland, 2004: 4). The definition of sexuality education signifies that in sexuality education there is an element of acquiring information and an element of using such information to formulate identity. Furthermore it indicates that sexuality education is multidisciplinary in that it encompasses sociological, psychological and biological attributes. The researcher believes that sexuality education can play a significant role in the fight against HIV and AIDS.

There are a number of reasons why sexuality education is a significant component of HIV and AIDS education. In South Africa sexuality education is seen as an educational response to HIV and AIDS. Rosen *et al.* (2004) suggest that sexuality education in the context of HIV and AIDS may be aimed at reducing sexual activity, postponing the age of sexual intercourse debut, reducing number of sexual partners and lowering the rate of unwanted teenage pregnancies. Furthermore Francis (2010) suggests that media images make a significant contribution to developing a personal identity for most young people. Some of these identities may promote behaviours that increase the risk of HIV infection. As a consequence students need to be taught about their sexuality in a manner that promotes reconstruction of behavioural practices. Francis (2010) argues that positive sexuality education can also promote sexual openness to minimize shaming and blaming with regard to sexual feelings. The argument here is that open discussion on sexuality may lead to an adoption of safe behavioural practices. Furthermore it is argued that youths must be viewed as sexual subjects and sexual agents instead of sexual victims only (Rosen *et al.*, 2004). In this manner it would be acknowledged that students know about sex, even though some may lack practical and social knowledge. As a result it could be avoided to present sexuality only in a negative way which often highlights diseases, abuse and HIV and AIDS. Francis (2010) suggests that sexuality education has to consider portraying sexuality as desirable highlighting mental, emotional and social dimensions of sexuality. It is also suggested that researchers need to acknowledge that the needs of boys and girls for sexuality education differ depending on culture and social norms (Francis, 2010; Rosen *et al.*, 2004). Therefore sexuality education has to be context specific and address the immediate needs of the audience.

Schools have been identified as conducive places where sexuality education related to HIV and AIDS should be taught (Francis, 2010). This is because the majority of young people attend school and interact with other young people who are at a similar developmental stage. Furthermore some young people debut for sexual intercourse during their schooldays. Consequently if sexuality education is aimed at reconstructing behavioural norms such as unsafe sex, schools ought to be used as a vehicle for sexuality education. Nevertheless a number of concerns have been raised regarding teaching sexuality education in schools. For instance in South Africa sexuality education is taught in Life Orientation. However some Life Orientation teachers do not have pedagogical content knowledge to teach sexuality education (Francis, 2010). In fact some teachers and schools are not able to comfortably and openly discuss sexuality with students because it could promote sexual activities (Francis, 2010; Rosen *et al.*, 2004). In some cases teachers fear that discussing sexuality with students may be interpreted as interfering with culture and norms. Homes are therefore an alternative place where sexuality education can be taught. However the challenge of home-based sexuality education is that some parents are not comfortable discussing sexuality with their children. Again this is because of social norms (Francis, 2010; Rosen *et al.*, 2004). In the meantime students remain in a position where they are curious and experimental about their sexuality but may lack practical knowledge regarding this (Rosen *et al.*, 2004). As a consequence through their desire to know and experiment, a number of them engage in unprotected sexual activities at a young age which increases their risk of infection.

Another significant component of HIV and AIDS education is which content knowledge should form part of sexuality education. The traditional view is that sexuality education should contain a great deal of biology knowledge in the form of scholar academic content focusing on growth and development, physiology and anatomy as well as reproduction (Francis, 2010). In other cases where a behaviour transformation view is upheld, content knowledge often contains negative views on sexuality, such as sexually transmitted diseases and teenage pregnancy. However researchers have argued against this traditional approach. Allen (2005: 390) states that there is a need to "reconceptualise youth by sexual health programs as positive, active sexual subjects, which in turn will require a shift in classroom practice." Allen (2005: 402) further argues that "to be effective, sexuality education must meet the needs and interests of young people as conceptualised by them." The argument here is that students need to be taught the logistics of sexuality, desire and pleasure as well as risks. Furthermore students need to be taught practical social knowledge that can be translated into behaviour. Students also need to acquire practical negotiation and argumentation skills that are needed to negotiate their sexual behavioural preferences.

As stated earlier, Life Sciences may contain the academic HIV and AIDS knowledge related to sexuality and Life Orientation, functional HIV and AIDS knowledge. The researcher however believes that if Life Sciences intends to play a significant role in addressing behavioural change related to HIV and AIDS, it would have to adopt a more social approach in which students are able to relate scholar academic knowledge with real life. The researcher also believes that Life Sciences should be able to provide students with relevant knowledge that students can use when confronted with real-life challenges. Another issue that complicates the aim of HIV and AIDS education however are human rights.

3.4.5 Human rights

Louw (2004: 4) argues that "in the context of HIV and AIDS, an environment in which human rights are respected ensures that vulnerability to HIV and AIDS is reduced, those infected with and affected by HIV and AIDS live a life of dignity without discrimination and the personal and social impact of HIV infection is alleviated." As a result the researcher believes that any effective HIV and AIDS education should be grounded in the realization of human rights. One such right is that every human being has the right to "the enjoyment of the highest attainable standard of physical and mental health" (Viljoen & Precious, 2007: 4). Governments therefore have an obligation to ensure that people living with HIV are treated with dignity and respect. This includes protecting those who are not infected by providing them with sufficient information regarding risk of infection and prevention.

However some human rights have been demonstrated to complicate the issue of HIV and AIDS. HIV and AIDS education is guided by international treaties that are aimed to promote health and reduce the spread of HIV. Some of these international treaties include "the Universal Declaration of Human Rights of 1948, the International Covenant on Civil and Political Rights of 1976, and the International Covenant on Economic, Social and Cultural Rights of 1976" (Luginaah *et al*., 2005: 1691). According to these treaties, HIV testing and disclosing the results are promoted. However this view (of testing for HIV and disclosing) contradicts other international laws related to privacy and confidentiality. For example governments cannot make it mandatory for people to be tested for HIV because such a law would violate International Covenant on Civil and Political Rights which stipulates that a person should not be "subjected to arbitrary or unlawful interference with his privacy" (Luginaah *et al*., 2005: 1691). Furthermore individuals can only be tested for HIV or disclose their status if they have given consent. As a result while HIV and AIDS education may promote the idea of HIV testing, it remains the students' right to decide whether to be tested or not.

Another human rights-related aspect of HIV and AIDS education that is contentious is the provision of condoms in schools. A number of researchers (and lately the South African government) have advocated this idea to provide students with a practical means to minimize the risk of infection (Viljoen & Precious, 2007; Luginaah *et al*., 2005). However whether condoms are made available in schools remains at the discretion of the school, and would therefore depend on social norms, beliefs and values (Department of Education, 1999). However other researchers argue against this discretionary approach because it has the potential to limit students' right to free access to health resources (Kisoon, Caesar & Jithoo, 2002). Instead researchers argue that the distribution of condoms in schools should be based on the rights-based approach thereby allowing all students to access condoms in schools if they so wish.

Overall the researcher believes that human rights related issues may complicate HIV and AIDS education. Above all however most people and governments agree that HIV and AIDS education should lead to the eradication of HIV and AIDS, unsafe behaviour that puts others at risk of HIV infection, stigmatization and discrimination and must promote gender equality as well as open sexuality education.

Figure 3.2 summarizes the discussion presented in Sections 3.3 to 3.4. Section 3.3.1 to 3.3.3 showed that educational strategies for HIV and AIDS education are usually either curriculum-based or non-curriculum based. Both these teach functional HIV and AIDS knowledge while curriculum strategies are best suited to teach academic HIV and AIDS knowledge. The researcher also explored the issue of effectiveness of educational strategies, and literature in that regard showed that there are reports of positive desired outcomes and negative undesired outcomes. From Section 3.4.1 to Section 3.4.5, it emerged that in order for HIV and AIDS education to be effective, risk behaviour, gender imbalances, stigma and discrimination, sexuality as well as human rights should be addressed.

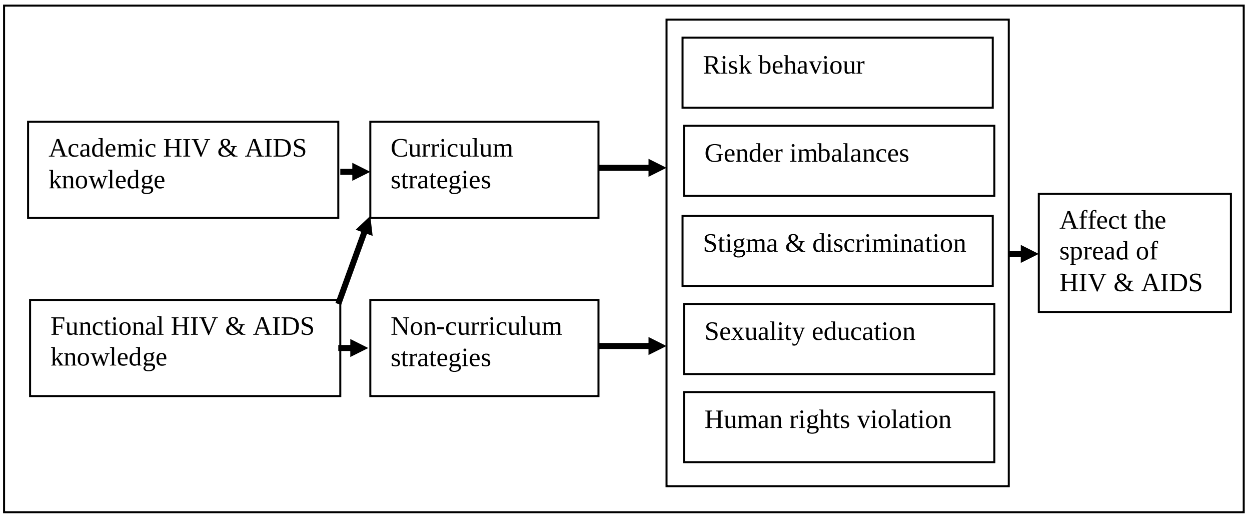

Figure 3.2 An illustration of how HIV and AIDS education addresses factors that lead to the spread of HIV and AIDS

From the above discussion the researcher argues therefore that failure of curriculum strategies may be due to their inability to address social challenges that students have. This may be because curricula in which HIV and AIDS knowledge is integrated are not oriented for social reconstruction. As shown in Chapter 2 some curricula are not oriented for student empowerment with respect to social issues such as behaviour transformation. Furthermore if knowledge provided in the curriculum is not actionable (as is the case with academic HIV and AIDS knowledge), then the probability of achieving social reconstruction (e.g. behaviour transformation) will be lowered. This will be worsened if academic and functional HIV and AIDS knowledge are not linked together to enhance one another. The current study intended therefore to inform HIV and AIDS education by exploring the relationship between a curriculum-based approach (Life Sciences) and behaviour transformation. Furthermore the researcher explored the relationship between academic HIV and AIDS knowledge and functional HIV and AIDS knowledge. (Results of this exercise are presented in Chapters 5 to 7).

While HIV and AIDS education can be viewed as an independent field, the researcher believes that it is imperative that other related health education areas be explored in order to provide insight into HIV and AIDS education. As stated by Van Laren (2008), HIV and AIDS education requires a multidisciplinary approach. The researcher therefore believes that other health education programmes could help re-define HIV and AIDS education. In the following section the researcher explored health education with a view to determine what can be learnt from it in order to inform HIV and AIDS education.

3.5 Why does health education fail? Lessons for HIV and AIDS education

In Section 3.4, the researcher identified five factors that are perpetuating the spread of HIV and AIDS. The researcher also argued that HIV and AIDS education needs to address these in order to yield positive results. However the researcher acknowledges that there are other factors that may hamper the effectiveness of HIV and AIDS education. These factors however do not directly lead to the spread of HIV and AIDS as discussed below. The approach taken in this regard is that HIV and AIDS education is not an independent field, but forms part of health education. Consequently those factors that affect health education will also affect HIV and AIDS education. These factors are discussed below. As stated above, these factors do not directly inform the current study but are essential for noting.

3.5.1 Attitude towards health education

In South Africa a subject, Life Orientation, was introduced with the aim of teaching about health among other things. The subject also teaches knowledge on HIV and AIDS, sexuality and life skills. While Life Orientation is a well accepted concept in South Africa, there are some challenges that have been identified. For example Van Deventer (2009), Rooth (2005) and Van Deventer (2004) report that there are wide spread negative perceptions of nonexaminable subjects such as Guidance, Religious Studies and Life Orientation. In this regard students and teachers are reported to dislike these subjects and not to take these subjects seriously. The reasons for this problem are not clear.

However other researchers point out that Life Orientation follows a top-down approach and therefore students' needs and expectations are not attended to. For example Theron and Dalzell (2006) list a number of skills that are not covered in Life Orientation but are reported to be demanded by students. In relation to health education, it is reported that students would like to develop "skills that teach you to stand up for your rights, skills that teach you how to avoid contracting HIV and AIDS, skills that teach you how to cope when you or someone close to you has HIV and AIDS as well as skills that teach you to establish reliable social support networks to help you cope with problems" (Theron & Dalzell, 2006: 402). Furthermore it is reported that students indicate that they need knowledge regarding HIV and AIDS infection, prevention and support (Mash & Wolfe, 2005).

Scholars also caution that Life Orientation and health education should be designed in such a way that they address the needs of both males and females. Theron and Dalzell (2006) indicate here that boys and girls have different health, emotional, physical and social needs. To this effect Dines, Cornish and Weston (1996) argue that health education and life orientation programmes tend to fail to address the needs of boys simply because they are delivered by females who do not have firsthand experience of the needs of boys. For example boys differ from girls in that they do not usually share their health problems as girls do (Dines *et al.*, 1996).

However Life Orientation and other health education programmes do not address the above concerns, such as the unique needs of student groups. As a result students and teachers tend to have a negative attitude towards Life Orientation and health education in general.

3.5.2 Designing health education programmes

Another challenge for health education is with regard to designing programmes. In this instance reports indicate that health educators often treat theory dismissively (DeBarr, 2004). These educators construct and use various concepts in their practices without acknowledging that these have their basis in theory. Glanz, Lewis and Rimer (1997) however state that if practitioners had acknowledged the conceptual framework that frames their practice, they would have been more efficient in introducing concepts, constructs and relationships of behaviour. To this end DeBarr (2004: 74) suggests that “dynamic and quality practice and research apply state-of-the-art theory and technology in the design, implementation, and evaluation of health education programs.” Based on these submissions, in studying health education therefore, one cannot dismiss the role of theory.

According to Glanz *et al.*, (1997), a useful theory in health education is one that has internal consistency, parsimony, plausibility, pragmatism and ecological validity. DeBarr (2004: 75) suggests that useful theories can be used to explain a wide range of human behaviours including “obesity, drug use, sexual behaviours, violence, vaccinations, condom use, alcohol abuse, racial, ethnic and gender disparities, use of complementary and alternative medicine, tobacco use, sugar restriction, nutrition education, smoking, chronic illness management, hormone replacement therapy, soft drink consumption, environmental policy, family planning, and screening for colorectal cancer.” Theories can also be adapted to explain those health-related behaviours which do not have a direct theory for explanation. The challenge for health education however is the wide variety of theories that all aim to explain particular health behaviour.

One theory-based strategy for health education is using theory as a framework to design and implement health education interventions that are in line with international law and practice. For instance a number of researchers believe that health behaviour of an individual is significantly influenced by other people’s views on health behaviour. To this end House (1981) and Caplan (1974) define health behaviours in terms of social support and coping theories of behaviour. Similarly, Page *et al.* (2006) and Berk (2000) use Bronfenbrenner's social ecological model to understand individuals’ health behaviours. The social ecological model basically states that there is a system of relationships that influence a person. Bronfenbrenner states that the first level of influence is the microsystem, which is made up of the “biological disposition and intrapersonal factors of the individual, close friends and family” (Page *et al.*, 2006: 106). Thereafter is the mesosystem, which comprises neighbours and school friends. Extension of the mesosystem gives rise to the exosystem which is the extended family and family friends. Finally there is the macrosystem, which is basically the influence of the government, community traditions and cultural customs. Overall

Bronfenbrenner's point is that one's health behaviour is not necessarily individualistic, but depends on a number of interpersonal relationships (Berk, 2000). Therefore health education must be tailored to address each of the systems that affect health behaviour.

While health education that focuses on social systems could be effective in promoting health, other researchers have chosen to focus more on intrapersonal factors, with a belief that these have a greater influence on health and health behaviour (Becker, 1974). To this end researchers have developed a Health Belief Model, which states that individual health behaviour depends on perceived threat, susceptibility and severity, perceived benefits and barriers for action, cues to action and self-efficacy (Harrison, Mullen & Green, 1992; Becker, 1974). According to this model, in order for a person to seek medical assistance and transform their health behaviour, they must first believe that their health is in jeopardy. This belief in susceptibility means a person believes that he can have the disease even though he may not have the symptoms. In addition the model states that people's health behaviour depends on their perception of the seriousness of the condition as based on their feeling of pain and discomfort, both psychologically and physically. Furthermore health behaviour is influenced by one's conviction that benefits of the recommended or anticipated health behaviour outweigh those of their current behaviour. Health behaviour is also influenced by a precipitating force that makes the person feel the need to take action.

Some however may argue that health behaviour is more dependent on intentions, attitudes, outcome expectancy, subjective norms, normative beliefs, perceived behavioural control as well as actual behavioural control. To understand behaviour in the light of these factors Ajzen (1991) and Ajzen & Fishbein (1980) developed a theory of reasoned action/planned behaviour. The theories of planned behaviour and reasoned action argue that health behaviour is informed by attitudes, subjective norms and perceived behavioural control. These factors then influence intention which in turn informs behaviour. The main idea behind Ajzen's (1991) and Ajzen & Fishbein's (1980) theories is that health behaviour is individualistic but depends on social norms. Therefore health education should address both intraspecific and interspecific determinants.

Luszczynska and Schwarzer (2005) as well as Bandura (1986) however believe that health behaviour depends almost solely on an individual's sense of control. Self-efficacy means when people feel that they can do something to solve their health challenges "they become more inclined to do so and feel more committed to the decision" (Luszczynska & Schwarzer, 2005: 128). In this regard a low self-efficacy is associated with a "giving up" mentality where individuals display hopelessness, anxiety and depression. Self-efficacy is often associated with outcomes expectancy (DeBarr, 2004). Alfred Bandura's social cognitive theory describes the relationship between health behaviour, self-efficacy and expected outcomes (DeBarr, 2004; Bandura, 1986). Overall Bandura's work suggests that health education must attempt to transform self-efficacy and expected outcomes in order to be effective.

3.5.3 Evaluating the effectiveness

Health education may also be limited by the fact that there are no standard criteria for measuring effectiveness. Instead researchers tend to use strategies favourable to their working paradigm. One prominent strategy is using statistical approaches. The argument here is that quantitative strategies offer a standard and objective procedure rather than a qualitative often "vague criterion for including studies in the review and haphazard strategies for locating relevant literature and where reviewers rely on potentially misleading methods of analysis" (Kok *et al.*, 1997: 22). An example of a statistical approach to evaluate the effectiveness of health education is the use of an index, called the effect size which indicates the change in the dependent variable as a result of a health education intervention with respect to the means and standard deviations (Kok *et al.*, 1997). The effect size approach has been used successfully by a number of researchers evaluating the effectiveness of health interventions addressing diabetes, alcohol abuse as well as tobacco and drug abuse (Kok *et al.*, 1997; Padgett, Mumford, Hynes and Carter, 1988).

Lloyd-Williams (2003) however remains adamant that the effectiveness of health education must be measured qualitatively. For example Lloyd-Williams (2003) argues that there is a need to evaluate the quality of health education programmes. Lloyd-Williams' (2003) view suggests that it is not adequate to evaluate the outcomes of a health education intervention without first evaluating the intervention itself. To this end researchers attest that the administration procedure, such as how leaflets are displayed, needs to be evaluated as this may have implications for the overall health education (Mullan, Fry & Tudor-Smith, 1999).

Reports also indicate that some researchers prefer to evaluate both the intervention as well as the learning outcomes. For example Schwandt, Geiß, Ritter, Üblacker, Parhofer, Otto, Laubach, Donner, Haas and Richter (1999) report evaluating the effect of health education by examining blood-cholesterol levels of children. Here there is evidence of researchers using clinical data to determine the effectiveness of health education.

Meanwhile Oakley, Fullerton, Holland, Arnold, France-Dawson, Kelley, and McGrellis (1995) provide a different view regarding the evaluation of the effectiveness of health education. According to Oakley *et al.* (1995), the problem with evaluating health education interventions is that researchers tend to focus on describing and evaluating the process of implementing the intervention instead of focusing on the impact on related health outcomes. Furthermore Oakley *et al.* (1995) argue that effective interventions are those that are designed according to scientific evidence of effective strategies. Furthermore effective interventions follow a student-centred approach regarding selection of content and pedagogy. Oakley *et al.* (1995) also indicate that there is a need for researchers to use relevant theory to design and implement interventions that will change students' health behavioural patterns. The argument here is that health is related to behaviour whereas knowledge may not be (DiCenso, Guyatt, Willan & Griffith, 2002). Some interventions may also have short-term effects while others may have long-term effects, and these need to be considered in the design and implementation of interventions.

While the idea of using evidence to evaluate health education is generally accepted, researchers argue that "the current search for evidence of effective health promotion is unlikely to succeed and may result in drawing false conclusions about health promotion practice to the long-term detriment of public health" (Speller, Learmonth & Harrison, 1997: 361). Speller *et al.*'s views are based on the fact that there is no consensus about the nature of health education and health education programmes. Furthermore there is lack of agreement over what evidence to use to assess effectiveness and the methodology for reviewing health education programmes is not standardized. Consequently what may be an effective health education programme for one scholar may be ineffective for another. In an attempt to resolve Speller *et al.*'s (1997) concerns, other researchers have relied on theory to design, implement and evaluate health education. However there are complications associated with this ideology too.

3.6 Implications for the study

At the beginning of this chapter the researcher asked: why does HIV and AIDS prevention through education remain elusive? As implied earlier, this question was vital because by identifying factors that are responsible for the continuing spread of HIV, the researcher would have a point of reference, against which Life Sciences would be evaluated. Evaluating Life Sciences would in turn inform future curriculum development in the context of HIV and AIDS education.

The main outcome of the above discussion is that HIV and AIDS education could be projected in a way to address particular areas which are known to affect the spread of HIV and AIDS. For example appropriate academic HIV and AIDS knowledge integrated into a scientific curriculum could be used to address stigma and discrimination. However the programme alone will not yield results. To this there is a need to ensure that the effect of external factors such as those discussed in Section 3.5 is limited. In relation to curriculum-based HIV and AIDS programme, literature shows that there is a need to align HIV and AIDS education with a suitable curriculum. This means the mother subject must have a curriculum theory, rationale, ideology, and content knowledge that is in line with the intended outcomes of HIV and AIDS education.

For the scope of the study, the researcher decided to focus on behaviour, which is one factor that was shown to affect the spread of HIV and AIDS. In terms of knowledge the researcher explored both academic and functional HIV and AIDS knowledge. Overall the researcher interrogated the relationship between Life Sciences curriculum and behaviour transformation in the context of HIV and AIDS. Here the researcher wanted to inform curriculum-based HIV and AIDS education, by determining whether the strategy used in Life Sciences leads to behaviour transformation or not. The methodology used in this regard is discussed in the following chapter.

4. CHAPTER 4: METHODOLOGICAL APPROACH TO THE STUDY

"Do all you can with what you have, in the time you have, in the place you are" Nkosi Johnson[9]

4.1 Introduction

The researcher notes the challenges of education to transform HIV and AIDS related behavioural patterns as discussed in the previous chapters. However inspired by Nkosi Johnson's call for action, the researcher engaged the main objective of the study to investigate the relationship between the Life Sciences curriculum and behavioural transformation by comparing HIV and AIDS knowledge and behavioural preferences of Life Sciences and non-Life Sciences students. The research question in this regard is:

> *How can the curriculum-behaviour transformation relationship be understood when comparing Life Sciences students with non-Life Sciences students on HIV and AIDS knowledge and behavioural preferences?*

As argued in Chapters 1 to 3 this question assumes that knowledge may play a key role in students' behavioural preferences. As a result, before this question could be answered the variables that are embedded in the question needed to be explored. Looking at the research question the two main variables requiring exploration were HIV and AIDS knowledge and behavioural preferences. Questions related to these variables may be whether students have sufficient understanding of HIV and AIDS knowledge, and what their HIV and AIDS related behavioural preferences are. Given these variables, the researcher decided to respond to the main research question by first breaking it down into subquestions (Section 1.7), addressing each variable individually. Each subquestion also determined methods used in data collection and analysis. In this regard the researcher will in this chapter first present an argument for the overall research methodology used to respond to the main research question.

[9] http://www.brainyquote.com

4.2 Justification of methodological and metatheoretical paradigms

While there are various methodological paradigms that could be used to respond to the main research question of the study, the researcher, based on the adoption of a realism paradigm, decided to use a mixed method approach (Creswell, 2008; Bazeley, 2003). A mixed method approach was chosen because the researcher concurs with researchers (for example Libarkin & Kurdziel, 2002) who argue that mixing methods strengthens research findings in that each approach is validated by the other when used together. The need to substantiate each approach is that each individual approach has its limitations that may be minimized by the other (Derry *et al.*, 2000).

Given the above argument the researcher saw a mixed method paradigm described by realism as best suitable to respond to the research question. Realists argue that in order to compensate for the misgivings of any one research approach, a multiplistic mixed method approach is preferred (Leahey, 2007; Page *et al*., 2006; Tashakkori & Teddlie, 2003; Derry, 2000; Alford, 1998). Like other realists, the researcher acknowledges that the study/research cannot be absolutely objective or subjective because of differences between reality and what the researcher perceives as reality (Krauss, 2005). Nevertheless, given the use of a mixed method approach to minimise the misgivings of either the qualitative and the quantitative approaches, the researcher believes that the findings of the study will "probably be true" – a realist ontology and epistemology (Healy & Perry, 2000).

In relation to this study the use of a qualitative method alone would have been a disadvantage in that qualitative research, as described by critical theorists (Healy & Perry, 2000) relies mostly on the researchers' subjectivity (Bogdan & Biklen, 1992). This is because there are no universally established rules for analysing or interpreting data, and each researcher may analyse or interpret data differently (Bogdan & Biklen, 1992). To cater for this limitation, a quantitative approach of data collection and analysis were also employed. Scholars (for example Ary, Jacobs, Razavieh & Sorensen, 2006; Johnson & Christensen, 2004; Libarkin & Kurdziel, 2002; Hoepfl, 1997; Creswell, 1994) suggest that in quantitative approaches, as described by a positivist paradigm (Healy & Perry, 2000), subjectivity is minimal. Another advantage of employing quantitative methods together with qualitative methods is that findings can be generalized (Creswell, 2008; 2007; 1994). This is because according to Hoepfl (1997: 2), "quantitative researchers seek causal determination, prediction, and generalization of findings" by employing statistical principles to collect, analyse and report data. On the other hand qualitative approaches are not generalizable in that they generate knowledge of context-specific phenomena (Hoepfl, 1997). At the same time qualitative methods alone would not provide the causal effect (Creswell, 2008; Ary *et al*., 2006) of HIV and AIDS knowledge on behavioural preferences, a measure that can be predicted using quantitative elements such as correlations and regressions (Libarkin & Kurdziel, 2002; Hoepfl, 1997; Creswell, 1994).

By using qualitative methods together with quantitative methods, limitations of the latter could also be addressed (Creswell, 1994; Bogdan & Biklen, 1992). For example qualitative research uses a "wide-angle and deep-angle lens to examine the breadth and depth of phenomena" (Johnson & Christensen, 2004: 31). This means qualitative methods are phenomenological enquiries that are used to study opinions, behaviours and experiences of a given individual or population through explorative means (Creswell, 2008; 2007). Given that the researcher wanted to determine the influence of HIV and AIDS knowledge on behavioural preferences of students, it was not sensible to rely only on a quantitative approach which would not be able to determine phenomenological phenomena such as opinions, behaviours and experiences of students and other sources of data (Ary *et al*., 2006; Johnson & Christensen, 2004).

About the realist approach to mixed method the researcher acknowledges limitations as documented in literature. One limitation of mixed methods is that the researcher would require expertise in both methods (Tashakkori & Teddlie, 2003). While this may be viewed as a limitation, the researcher saw it as an opportunity to learn and develop as a scholar. Such learning was obtained through the guidance of a number of experts in both fields coupled with reading of relevant literature. Scholars also suggest that a mixed method approach requires extensive data collection and may be lengthy (Creswell, 2007; Tashakkori & Teddlie, 2003). However the researcher was willing to collect extensive data as this would provide enough information to respond to the research question.

Libarkin and Kurdziel (2002) also suggest that it is not always possible to blend qualitative and quantitative methods. To this end the researcher planned a clear research strategy (Table 4.1) before any data collection or analysis was performed, in order to know specifically how the two methodologies would be used (Leahey, 2007; Tashakkori & Teddlie, 2003; Alford, 1998).

As shown in Table 4.1 the researcher opted for a concurrent embedded mixed method design (Creswell, 2008; 2007). For instance in responding to the first research subquestions (see Section 1.7), a predominantly qualitative document analysis approach was used (Creswell, 2008). During data analysis descriptive statistics (such as frequencies) were calculated emphasising elements of a quantitative approach.

Table 4.1 An outline of the research methodology used

Question	**Subquestion 1**	**Subquestion 2**	**Subquestion 3**
Methodology	QUAL + quan	QUAN + qual	QUAN + qual
Data source	Life Sciences curriculum statement & 2 textbooks	300 Life Sciences students & 243 non-Life Sciences students	300 Life Sciences students & 243 non-Life Sciences students
Analysis approach	Document analysis	Questionnaire analysis	Questionnaire analysis
Analysis procedure	**QUAL** (Generate themes & meanings inductively) + **quan** (calculate descriptive statistics such as frequencies)	**QUAN** (calculation of frequency distribution, mean comparisons & correlations) + **qual** (use written text to explain statistics)	**QUAN** (calculation of frequency distribution, mean comparisons & correlations) + **qual** (use written text to explain statistics)

In responding to research subquestions 2 and 3, survey questionnaires were used for data collection and data were analysed mainly from a quantitative approach to determine inferential statistics such as correlations (Table 4.1; Creswell, 2008). Elements of qualitative methods were also used in seeking meanings embedded in responses. The manner with which these methods were used in each subquestion is discussed in the following sections.

4.3 Methodology for research subquestion 1

4.3.1 General approach

The first research subquestion asks, "*How does the Life Sciences curriculum address HIV and AIDS for safe behavioural preferences among students?*" The researcher investigated two areas as a way of responding to this question. Firstly the Grade 11 Life Sciences curriculum statement (Department of Education, 2003a) was examined in order to make inferences about its curriculum ideology (Schiro, 2008). As discussed in Chapter 2 the curriculum ideology would indicate if the subject is meant to affect students' values, norm, beliefs and ultimately behavioural practices. Secondly, content knowledge taught in Life Sciences was investigated to identify specific concepts taught in Life Sciences with the aim of understanding the presence of academic and functional HIV and AIDS knowledge in the curriculum. Document analysis (Nicholls, 2003) was used because documents (that is, the curriculum statement (Department of Education, 2003a) and textbooks (Ayerst, Langley, Majozi, Metherell, Raciborska, & Smith, 2008; Clitheroe, Doidge, Marsden, van Aarde, Ashwell, Buckley, & Dilley, 2008)) were regarded by the researcher as the suitable sources of the data, and thus document analysis was the appropriate way to respond to the research question.

Table 4.2 A framework for document analysis (adapted from Nicholls, 2003)

Focus	**Description**
Area of specialization	- The researcher must be familiar with the field under study in order to make appropriate judgements.
Sampling	- Sample size is not a major factor if the process is more qualitative rather than quantitative.
Analytical instrument	- An instrument must be developed (or adapted) and used to guide and frame the process of analysis. - The instrument must be able to provide robust and critical analysis of the document. - The instrument must allow for a coherent and free-flowing analysis.

In the study Nicholls' (2003) document analysis framework was used (Table 4.2). This framework consists of parameters set by the researcher and are used to determine what is regarded as useful during the analysis (Asay & Orgill, 2009; De La Caba Collado & Atxurra, 2005; Gingras, 2005; Nicholls, 2003; Evans & Davies, 2000). The first parameter that was set is that the document analyst must be a specialist in the field (Table 4.2; Nicholls, 2003). This is because "it is only on the basis of the extremely specialized often painstaking work of area scholarship that a comparative student can attain the required breadth of perception"

(Bereday, 1964: 10). As a result the researcher familiarised himself through reading (Asay & Orgill, 2009) with curriculum studies and science education (including Life Sciences and HIV and AIDS education).

As suggested earlier this predominantly qualitative methodology was chosen because the researcher wanted to inductively generate knowledge of context-specific phenomena (Nicholls, 2003; Hoepfl, 1997). Consequently generalizability was not the intention (Nicholls, 2003). To this end the researcher acknowledges that his response (and methodology) is limited in that it is subjective to the researcher. This limitation is also echoed by other researchers (Healy & Perry, 2000; Bogdan & Biklen, 1992). Furthermore validity is only as correct as the instrument used which, in this study, were validated by the panel of experts as explained in Subsections 4.3.2 and 4.3.3 (Nicholls, 2003). Other validation methods such as theory triangulation where a single set of data are interpreted by different investigators (Guion, 2002) were not considered. This was because the study was carried out by a single researcher for an academic qualification purposes and therefore no second researcher was engaged to analyse the data.

The second parameter was that a suitable sample of documents had to be selected (Table 4.2). Since the analysis is usually qualitative with respect to subjects (documents being analysed) there are no specifications in relation to sample size (Asay & Orgill, 2009; Nicholls, 2003; Evans & Davies, 2000). To this end the researcher decided to use purposive sampling (Maree & Pietersen, 2007; Taylor–Powell, 1998) by focusing on the South African Life Sciences curriculum for Further Education and Training (FET), that is Grades 10 to 12. The FET level was chosen because the study intended to specifically investigate knowledge taught in Life Sciences Grade 11. In this regard the researcher focused on the curriculum statement (Department of Education, 2003a) and textbooks (Ayerst *et al.*, 2008; Clitheroe *et al.*, 2008) that would provide information regarding the construction of scientific knowledge as taught in Grade 11.

Nicholls' (2006: 44) framework (Table 4.2) also suggests that "it is critical to construct a robust analytical instrument." This analytical instrument is made up of questions that the researcher develops and uses in the analysis (Britton, Letassy, Medina & Er, 2008; Gingras, 2005; Evans & Davies, 2000). Two sets of instruments were developed and used in this regard (as discussed in the following subsections), namely an instrument to determine the curriculum ideology favoured in Life Sciences and another to investigate concepts that are taught in Life Sciences that may affect behaviour transformation.

4.3.2 Investigating the curriculum ideology for Life Sciences

An inductive analysis approach was used to determine the curriculum ideology for Life Sciences. The researcher first reviewed components of the Life Sciences curriculum (Department of Education, 2003a) and then compared these components with similar components of various established curriculum ideologies as indicated in Table 2.1 (Britton *et al.*, 2008). This procedure is known as curriculum mapping (Plaza, Draugalis, Slack, Skrepnek & Sauer, 2007). The objective of curriculum mapping is to determine the intentions of the curriculum by examining specific sections of the curriculum document (Plaza *et al.*, 2007).

The first step in reviewing components of the Life Sciences curriculum (Department of Education, 2003a), that is curriculum mapping, was close reading of the Life Sciences curriculum statement (Creswell, 2008; Nieuwenhuis, 2007; Ferreira, Lucen, Stoffels, & Soobrayan, 2003). Text was read in detail so that the researcher could familiarise himself with the content. During this critical reading the researcher examined "the overarching aims or purposes of education, the nature of the child or student, the way learning must take place, the role of the teacher during instruction, the most important kind of knowledge that the curriculum is concerned with and the nature of this kind of knowledge, and the nature of evaluation" or assessment (Schiro, 2008: 7). Secondly the researcher used a standard data collection instrument (Britton *et al.*, 2008; Nicholls, 2003; Evans & Davies, 2000) to examine specific portions of the curriculum in order to determine its ideology (Schiro, 2008). Other researchers suggest that a researcher may develop his own instrument for analysing the curriculum (Nicholls, 2003; Evans & Davies, 2000). This instrument consists of a pool of questions which the researcher believes could be used to analyse documents based on the objectives of the study as well as the research question understudy (Nicholls, 2003; Evans & Davies, 2000).

In the study however the researcher opted to use Schiro's (2008) standard inventory for curriculum analysis as this tool has been successfully used by other researchers (Williams, 2010; Cherubini, 2009). In Table 4.3 the instrument used in the study is described. It indicates the overall objective of curriculum mapping as well as the actual questions (adapted from Schiro, 2008) that were asked and responded to by the researcher (Britton *et al.*, 2008). In responding to these questions, the researcher collected evidence from the curriculum by extracting actual phrases used in specific text segments (Creswell, 2008; Nieuwenhuis, 2007; Ferreira *et al.*, 2003; Thomas, 2003).

Table 4.3 An instrument used for reviewing components of the Life Sciences curriculum statement (Adapted from Schiro, 2008).

Purpose of analysis	Data Sources	Actual questions used
To examine the Life Sciences curriculum in order to determine its curriculum ideology	- Life Sciences curriculum statement (Department of Education, 2003a)	1. What is the aim of the curriculum? 2. What kind of knowledge is prescribed in the curriculum?
		3. How is learning supposed to take place?
		4. What is the nature and the role of students in the learning process?
		5. What is the role of teachers during instruction?
		6. What is the purpose of assessment?

Having collected these evidence-based responses, the researcher went on to determine which curriculum ideology is best reflected by the Life Sciences curriculum. Here the researcher used Table 2.1, which details characteristics of various curriculum ideologies with respect to the questions in Table 4.3, to determine the curriculum ideology of Life Sciences (Cochran, 2010; Britton *et al.*, 2008). This was done by classifying and narrating the extracted data according to the characteristics of various curriculum ideologies as given in Table 2.1. Final results of the above process are presented in Chapter 5.

4.3.3 Determining Life Sciences concepts that may affect behavioural preferences

Document analysis was also performed to identify specific concepts related to HIV and AIDS as taught in Grade 11 Life Sciences with the aim of influencing behavioural preferences. The Grade 11 Life Sciences curriculum statement (Department of Education, 2003a) and Life Sciences textbooks (Ayerst *et al.*, 2008; Clitheroe *et al.*, 2008) were purposely selected for analysis as they provide a fundamental overview of content, assessment procedure and learning outcomes (Department of Education, 2003a). The instrument used for content analysis was constructed and validated by the researcher since no previous comparable study could be identified.

In constructing the instrument for content analysis, the researcher first developed a pool of nine questions which he believed could be used to analyse the documents (Figure 4.1; Appendix 1; Evans & Davies, 2000). These questions were constructed by the researcher and based on the objectives of the study as well as the research question under study (Nicholls, 2003). Since research has shown that cognitive skills have an influence on behavioural preferences, through the content analysis instrument, the researcher first investigated cognitive and life skills acquired through Life Sciences (Table 4.4) (Lesley, 2007; Williams & Noyes, 2007; Pakaslahti, 2000).

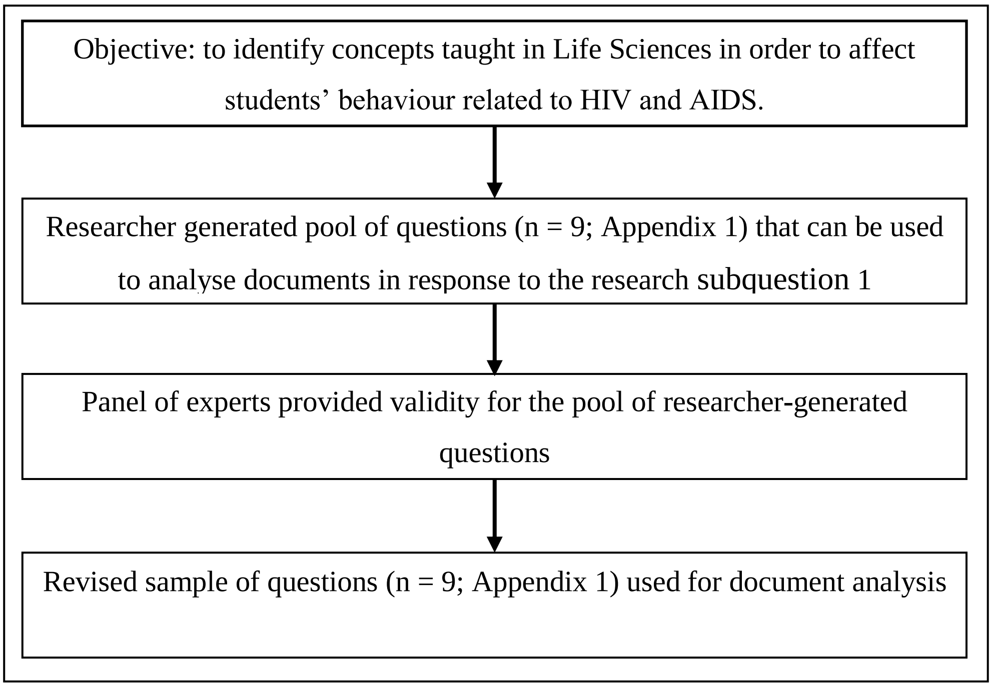

Figure 4.1 An overview of how the instrument for document analysis was developed

Secondly the researcher identified concepts taught in Life Sciences (Table 4.4). These concepts would present knowledge (taught in Grade 11 Life Sciences) that will be integrated with prior knowledge (learnt in previous Life Sciences Grades, other subjects and informally outside classroom settings) for the development of skills. Thirdly learning outcomes for Life Sciences curriculum were investigated (Table 4.4). In this regard based on the research question of the study, the researcher deemed it important to establish whether there was any intention to transform students' behaviour by learning Life Sciences. Another critical area was that of assessment (Table 4.4). The researcher investigated whether the strategies used to assess students' skills and concept understanding would be effective in assessing changes (if any) in behavioural preferences of students.

Table 4.4 Instrument for identifying concepts and skills foregrounded in Life Sciences as important to influence behavioural preferences of students

Action	Details
Sampling	Life Sciences curriculum statement collected from Department of Education. Life Sciences textbooks recommended and used by teachers and students.
Analysis procedure	Analyse each document to determine concepts that are taught to students.
Instrument for Life Sciences curriculum analysis	1. Which skills (competences) does the document encourage Grade 11 students to attain regarding HIV and AIDS? 2. Which concepts does the curriculum foreground for Grade 11 students in relation to HIV and AIDS? 3. What are the expected learning outcomes of Life Sciences in relation to HIV and AIDS? 4. Which assessment strategy is the document endorsing?
Instrument for textbook analysis	5. Which HIV and AIDS related concepts have the highest text page volume in the textbooks? 6. What is the textbooks' approach to HIV and AIDS related concepts? 7. What is the frequency of appearance for HIV and AIDS related concepts? 8. How does the content of the textbooks relate to HIV and AIDS? 9. What assumptions underlie the textual discourse?

Having developed a pool of questions, a panel of six science teachers (including two researchers) and an English language expert (Table 4.5) were purposively selected to validate the pool of questions shown in Table 4.4. The number of experts was guided by Lynn (1986), who suggests that the minimum number of experts should be five. These experts (Table 4.5) were chosen because of their familiarity with the curriculum statement. As a result the panel could determine how suitable questions were for the curriculum analysis. The expertise provided by the English expert was also important as she ensured that the questions were concise, clear, elegant, self-explanatory and grammatically correct (Maree, 2007).

The panel of experts scrutinized the nine questions (given in Table 4.4) based on Maree's (2007) description of a good question for document analysis (see Appendix 1) in order to determine whether each question asks what it intended to (i.e. face validity). The aim was to eliminate irrelevant items (questions) from the instrument (Chaiyawat & Brown, 2000) and rephrase items where clarity and grammatical errors are reported (Hughes, 1998). Validity of the questionnaire was therefore demonstrated by asking experts to review the content of the instrument by responding to the validation questionnaire (see Sections A and B in Appendix

1; Hyrkas *et al*., 2003). In this regard experts either agreed or disagreed with the statement given in the suitability questionnaire.

Table 4.5 Panel of experts participating in the validation of instruments in the study. Research IDs are used instead of real names for ethical reasons

Research ID	Occupation	Work place
E1	Life Sciences teacher & researcher	Tertiary institution
E2	Life Sciences teacher & researcher	Tertiary institution
E3	Life Sciences teacher	Township government school
E4	Life Sciences teacher	Township government school
E5	Life Sciences teacher	Urban private school
E6	English specialist/teacher	Urban private school

Thereafter percentage agreement between experts (Hyrkas *et al*., 2003) was calculated for all items (Sections C in Appendix 1). Experts justified their views using written responses. Results indicated that Question 9 (Appendix 1) was not necessary for the study and therefore must be eliminated. At the end of the process explained above, it emerged that experts generally felt that the questions in the instrument were suitable for the study.

According to Mohammed (2007) the Life Sciences curriculum statement that was analysed provides only a guideline of what needs to be taught whereas textbooks are primary vehicles for delivering content knowledge. Therefore as stated earlier, other than the analysis of the curriculum statement, the researcher also analysed textbooks. This was done to avoid a premature assumption that textbooks and curriculum statements profess the same message. For example the researcher wanted to establish if the concepts and skills recommended by the curriculum are actually addressed in the prescribed textbooks. As a result prescribed Life Sciences textbooks were also analysed.

Textbooks were selected based on purposive, non-probability sampling according to which a specific set of documents which best fit the aims of the study was used (Maree & Pietersen, 2007; Taylor–Powell, 1998). Textbooks were selected purposively because only Grade 11 Life Sciences textbooks were deemed relevant. These textbooks were identified through a brief structured telephonic interview (Appendix 2) with teachers from various schools in KwaZulu-Natal, South Africa. Participating teachers were selected using a purposive, non-probability sampling method because their schools would participate in other sections of the study (see later). In this regard a sample of Life Sciences teachers (n = 12) were asked questions (Appendix 2) telephonically to indicate which textbook they preferred for Life

Sciences Grade 11. From the interviews two textbooks were identified as preferred by most respondents (that is, 7 of 12). These are *Focus on Life Sciences* (Clitheroe *et al*., 2008) and *Shuters Life Sciences Grade 11 Students Book* (Ayerst *et al*., 2008). Teachers indicated that they rely on these two textbooks when selecting HIV and AIDS related content knowledge to be taught in Grade 11 Life Sciences (Appendix 2). Teachers also indicated that *Focus on Life Sciences* (Clitheroe *et al*., 2008) and *Shuters Life Sciences Grade 11 Students Book* (Ayerst *et al*., 2008) are prescribed for students (in cases where students have access to textbooks).

Having identified textbooks the researcher performed document analysis of this data source (Table 4.4). Textbook analysis was done independently of the curriculum analysis. Thus the purpose was not to verify what was found during the analysis of the Life Sciences curriculum statement, but rather to determine scientific concepts foregrounded as important in the Life Sciences textbooks which could potentially influence the behavioural preferences of students related to HIV and AIDS infection risks (see Table 4.4 for specific questions).

Scholars (Dimmock *et al*., 2007; Audesirk *et al*., 2004) suggest that knowledge of viruses, bacteria, HIV and AIDS, tuberculosis, immunity, circulatory system and vaccination serves as point of reference for disseminating knowledge on HIV and AIDS. Knowledge in the above areas is presented in the section titled "tissues, cells and molecular studies" in the Life Sciences curriculum (Department of Education, 2003a). As a consequence the researcher decided to investigate these seven areas (viruses, bacteria, HIV and AIDS, TB, immunity, the circulatory system and vaccination) to respond to research subquestion 1.

Matson and LoVullo (2009) as well as Ott and Donnelly (1999) suggest that the level of emphasis on a certain concept is proportional to the frequency of that concept in a document and indicates the value of such a concept. Therefore with regard to the question "which HIV and AIDS related concepts have the highest page volume in the textbooks?" (Table 4.4; Appendix 1), the researcher calculated page volume devoted to presenting knowledge on viruses, bacteria, HIV and AIDS, TB, immunity, the circulatory system and vaccination in the section of the textbooks titled "tissues, cells and molecular studies" (Department of Education, 2003a). In this instance, the researcher believes that page volume on each of the above areas indicates the level of significance of that particular area in relation to students' understanding of HIV and AIDS (Matson & LoVullo, 2009; Ott & Donnelly, 1999).

According to Dimmock *et al.* (2007) and Audesirk *et al.* (2004), scientific knowledge of HIV and AIDS can be subdivided into eleven themes. These themes are definition of HIV and AIDS, types of HIV, biological domain in which HIV belongs (that is, type of organism), transmission mechanisms of HIV, target cells of HIV, the binding mechanism, HIV's entry into target cells, reproduction of HIV, effects of HIV in the body and the prevention of HIV infection (Dimmock *et al.*, 2007; Audesirk *et al.*, 2004). The researcher therefore investigated "how does the content of the textbooks relate to scientific understanding of HIV and AIDS" (Table 4.4; Appendix 1) by calculating the frequency of appearance of the above eleven themes (and their related concepts) in relation to the total number of pages dealing with "tissues, cells and molecular studies" (Matson & LoVullo, 2009; Department of Education, 2003a). The presence of the concepts did not include those that are presented in statistical data, assessments and case studies used as these would differ with textbooks. For example statistical data presented in a textbook would be relative to the date of publication of that particular textbook.

Finally, given Baumgartner's (2001) argument of student empowerment through education, the researcher wanted to discover if the textbooks envision empowerment of students through specific learning outcomes. For example the researcher investigated whether there was any learning outcome that addressed students' empowerment in relation to HIV and AIDS. Results of document analysis in response to research subquestion 1 are presented and discussed in Chapter 5.

4.4 Methodology for research subquestions 2 and 3

4.4.1 General approach

In collecting data for research subquestions 2 and 3, a non-experimental survey design was used (Maree & Pietersen, 2007). This survey was aimed at assessing the respondents' level of content knowledge and behavioural preferences related to HIV and AIDS (McMillan & Schumacher, 2001) as per subquestions 2 and 3. Subquestion 2 asks:

How do Life Sciences students compare with non-Life Sciences students in:

a) Academic HIV and AIDS knowledge?

b) Functional HIV and AIDS knowledge?

c) Self-reported behavioural preferences related to HIV and AIDS?

Subquestion 3 is a follow-up question which asks:

To what extent does academic HIV and AIDS knowledge correlate with:

a) Functional HIV and AIDS knowledge? and,

b) Self-reported behavioural preferences related to HIV and AIDS?

The hypotheses that led to these questions are that:

a) Life Sciences students have higher academic HIV and AIDS knowledge than non-Life Sciences students.

b) Having a higher understanding of academic HIV and AIDS knowledge translates to a better understanding of functional HIV and AIDS knowledge.

c) Academic and functional HIV and AIDS knowledge are associated with safe behavioural preferences.

These hypotheses were tested using a predominantly quantitative mixed method approach (Table 4.1; Creswell, 2008; 2007). By means of a survey, Life Sciences students were compared with non-Life Sciences students with respect to their knowledge of academic and functional HIV and AIDS knowledge. Thereafter self-reported behavioural preferences of students from both groups were compared. Before delving into how this phase of the study was conducted, the researcher will first describe the sampling strategy that was used.

4.4.2 Sampling and sample description

In selecting students to participate in the study, a non-probability convenience sampling approach was followed. The researcher chose schools around Umsunduzi district because this location is in KwaZulu-Natal, a province which has been reported to have a relatively high HIV and AIDS prevalence in South Africa (Nicolay, 2008). This district is also where the provincial legislature and the provincial offices of the Department of Education are located. The district was also the most accessible to the researcher in terms of knowing where the schools were located.

For the study the researcher aimed for a demographically representative sample. This would mean each type of school (that is, government or private) and location (that is, rural, urban and township) as they occur in Umsunduzi district needed to be part of the study. At the time of the study, Umsunduzi district had about 42 government and private high schools which were located in urban, rural and township areas. The researcher arranged the 42 schools alphabetically according to their names. Thereafter a 1/3 sampling rate was used to select schools, so that every third school within each type-location category was selected for participation (Kasonga, 2009). This yielded a total of nine schools, that is, two rural/government schools, two suburbs/government schools, three suburbs/private schools and two township/government schools. All of the selected schools had Life Sciences students and class sizes ranged from 25 to 28, with some schools having more classes for the same grade than others. Within these schools a total of 300 students were enrolled for Life Sciences and selected for participation. Two hundred and forty three non-Life Sciences students from the same schools also participated (Table 4.6). All students were in Grade 11 and aged between 15 and 17. Non-Life Sciences students from schools S04 and S05 did not volunteer to participate and were therefore excluded.

Table 4.6 Summary of students participating in the study. (A complete profile of students is given in Appendix 3)

School ID	School type	Students' ID	Total students	Males	Females	Average age	Life Sciences students	Non-Life Sciences students
S01	Rural/government schools	L448 to L544	96	71	25	17	37	59
S02	Rural/government schools	L387 to L448	61	43	17	17	22	39
S03	Urban/government schools	L311 to L386	75	56	17	16	22	53
S04	Urban/government schools	L252 to L310	30	14	16	17	30	0
S05	Urban/private schools	L200 to L251	52	25	27	17	52	0
S06	Urban/private schools	L135 to L199	84	44	40	18	59	25
S07	Urban/private schools	L098 to L134	42	11	30	17	27	15
S08	Township/government schools	L065 to L097	40	18	21	17	26	14
S09	Township/government schools	L001 to L064	63	22	40	17	25	38
TOTALS			**543**[10]	**304**	**233**	**17**	**300**	**243**

[10] Six students who participated in the study voluntarily did not disclose their gender.

The researcher obtained ethical clearance to conduct the study from the University of Pretoria (reference CS08/11/04), KwaZulu-Natal Department of Education (reference 0046/2008) and the schools (Appendix 4). Furthermore students and teachers (and parents in case of minors) signed a consent that explained, in their first language (isiZulu) and English specific conditions and implications of participation (Appendix 4). Participation in the study was voluntary.

4.4.3 Instrument design and validation

The researcher systematically developed a questionnaire for data collection. The purpose of this questionnaire was to measure three areas, namely students' understanding of academic HIV and AIDS knowledge, functional HIV and AIDS knowledge as well as self-reported behavioural preferences in relation to contracting HIV and AIDS. The development of the questionnaire is described below.

4.4.3.1 Drafting the questionnaire

The questionnaire that was used in this phase went through various stages of preparation (Figure 4.2). As shown in Figure 4.2 the first step in preparing the questionnaire was identifying which HIV and AIDS related concepts needed to be incorporated into the questionnaire for investigation.

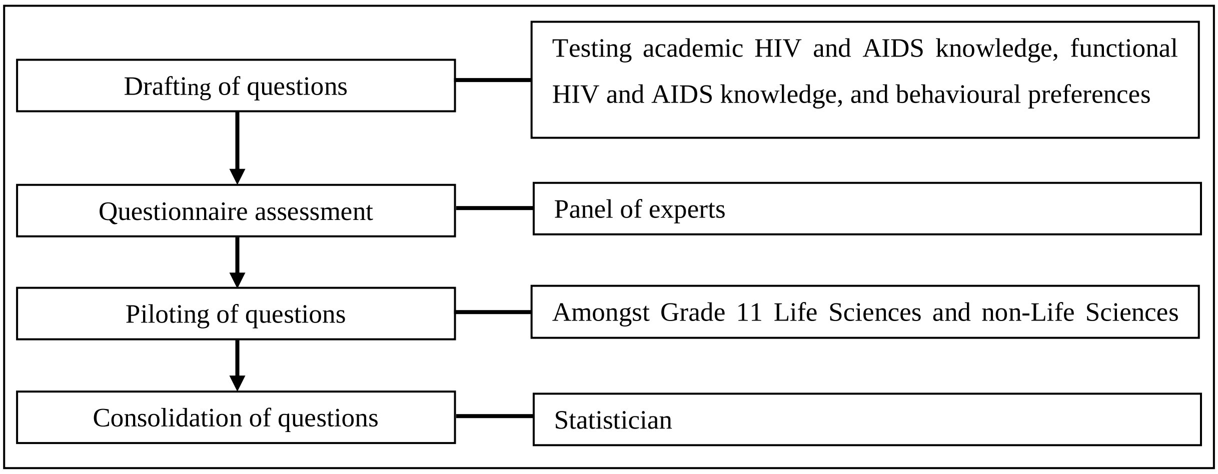

Figure 4.2 The process used to prepare and validate the questionnaire

Scholars (Dimmock *et al.*, 2007; Audesirk *et al.*, 2004) indicate that the scientific nature of HIV and AIDS can be understood by learning academic HIV and AIDS knowledge. This academic HIV and AIDS knowledge describes viruses, bacteria, HIV and AIDS, immunity, the circulatory system and vaccination. During curriculum analysis (Section 4.3 and Chapter 5), the researcher found that academic HIV and AIDS knowledge is taught in Grade 11 Life Sciences (Ayerst *et al.*, 2008; Clitheroe *et al.*, 2008; Department of Education, 2003a). Even though not exclusive to HIV and AIDS, this academic knowledge is used to provide a scientific description of HIV and AIDS. It is this knowledge that was tested in the study (that is, Section 1 in Appendix 5).

In addition to academic HIV and AIDS knowledge the questionnaire tested functional HIV and AIDS knowledge (Section 2 in Appendix 5). Researchers report that this knowledge is necessary to influence behavioural practices by transforming social norms, values and beliefs (Maticka-Tyndale & Barnett, 2010; Kaponda *et al.*, 2009; Mahat *et al.*, 2008; Page *et al.*, 2006). Furthermore functional HIV and AIDS knowledge is taught in a number of HIV and AIDS awareness campaigns (Maticka-Tyndale & Barnett, 2010; Kaponda *et al.*, 2009; Levy, 2009; Ssewamala *et al.*, 2009) as well as in Life Orientation (Francis, 2010; Du Plessis, 2008; Kirby *et al.*, 2007; Mackenzie *et al.*, 2007; James *et al.*, 2006; Motepe, 2006; Visser *et al.*, 2006). It provides information on the nature of HIV (that is, what HIV is), HIV mode(s) of transmission between persons, the nature of AIDS (that is, what AIDS is), curability and treatability of AIDS, as well as HIV/AIDS prevention strategies. In the study students' understanding of functional HIV and AIDS knowledge was therefore tested (Section 2 in Appendix 5).

The researcher also wanted to determine self-reported behavioural preferences of students (Section 3 in Appendix 5) as defined in Chapter 1. To investigate behavioural preferences of students, the theory of planned behaviour was used as a framework for developing the questions. According to the theory of planned behaviour, attitudes, subjective norms and perceived behavioural control are factors affecting behaviour (Ajzen, 1991). From this premise, questions probing these factors were incorporated in the questionnaire. These questions were adapted from other studies related to the current study (Anderson & Beutel, 2007; Anderson, Beutel & Maughan-Brown, 2007; Guo *et al.*, 2007). Questions testing for behavioural preferences are presented in Section 3 of Appendix 5. At the end of this "drafting stage" (Esposito, 2002) a total of 116 questions had been drafted (Figure 4.2, Appendix 5).

4.4.3.2 Validation through a panel of experts

The 116 items were given to a panel of experts (n = 6; Table 4.5) for validation using a validation questionnaire (Appendix 6). As stated earlier the panel consisted of science teachers and an English specialist. The validation questionnaire given to the panel of experts was designed to address two fundamental questions, through which face and content validity of the probes would be established. These questions were:

a) *Do questions (items) in the questionnaire test what they ought to?* Given that each item was meant to assess specific knowledge, the panel was therefore meant to determine whether the questions were able to test for such knowledge, that is academic HIV and AIDS knowledge, functional HIV and AIDS knowledge and behavioural preferences.
b) *Is the questionnaire suitable for the purpose it is designed for?* In this instance the main focus of questionnaire assessment was on the conceptual background of each question. Experts were to assess the use of terms, especially Life Sciences terms so that non-Life Sciences students would be able to understand the questions. The experts were also asked to check whether, in their view, the questions were suitable for the educational level of the students, that is, Grade 11.

The validation questionnaire consisted of closed and open-ended items (Appendix 6). Expert responses to the closed questions were analysed using a four-point rating scale that is, strongly agree = 3, agree = 2, disagree = 1 and strongly disagree = 0 (Hyrkäs *et al.*, 2003). The open-ended questions were used to explain responses to the closed questions. For example if the respondent “agrees” with a particular statement in the questionnaire, the respondent was asked to explain his/her reasoning in spaces provided (Appendix 6). In this way, the researcher aimed to determine content and face validity of the items in Appendix 5.

Expert responses to the questionnaire (that is, closed questions) were then used to calculate content validity indices (CVI) which according to Hyrkäs *et al.*, (2003) can be used to determine validity. The CVIs were calculated for each question according to Hyrkäs *et al.*’s formula:

$$\text{CVI} = \frac{\text{number of experts giving a rating of '2' or '3'}}{\text{Total number of experts}}$$

Here “experts” are the panel members (Table 4.5), and ratings ‘2’ or ‘3’ (that is, strongly agree or agree, respectively) are generated from a four-point rating scale. In the study the total number of experts is six, since there were six panellists. As suggested by Hyrkäs *et al*. (2003), for the CVIs obtained, those questions in relation to the items in the questionnaire that scored a CVI above 0.79 were regarded as acceptable, those between 0.7 and 0.78 as in need of attention and those below 0.69 as requiring revision or elimination.

Data from the CVIs indicated that the panel of experts had two concerns with the questionnaire (Figure 4.3). This means, of the questions sent to the panel, only two received CVIs lower than 0.69 and required revision or elimination. Qualitative analysis of this trend suggested that the experts (that is 2 out of 5) were concerned about some questions being ambiguous. To this expert *E6* (Table 4.5), commented that “some terms are complex and might be hard for students to understand.” Related to this, another expert (*E1*) was concerned with some spelling errors which rendered relevant questions ambiguous or meaningless. Another area of concern from the experts was the length of the test. In this case, three out of five experts (that is, *E1*, *E3* and *E6*) felt that the test was rather too long with 116 questions. Related to this, experts suggested that some questions were repeated and thus should be removed. In such instances the experts used the open-ended questions to specify the questions of concern.

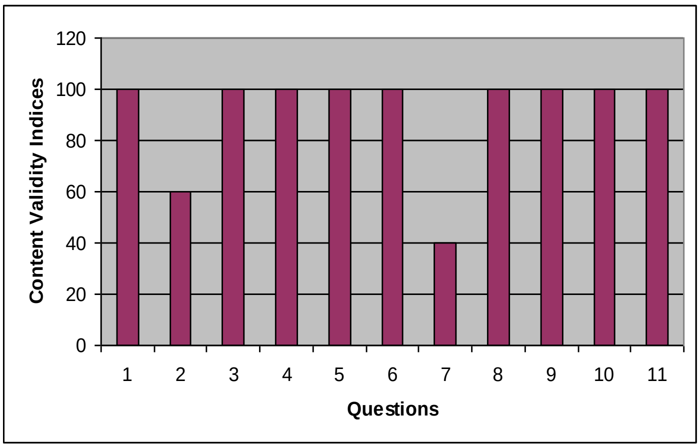

Figure 4.3 Content validity indices obtained from the panel of experts

Other than the concerns reported above, the experts were fairly satisfied with the standard of the questionnaire. For example one expert (*E3*) suggested that the questionnaire is “excellent and appropriate for the intended group of students.” Attesting to this, another expert (*E5*) reported that the questions in the questionnaire are "well thought and practical." Nevertheless adjustments were made in line with the recommendations of the panel of experts, that is shortening the questionnaire and clarifying some complex terms. At the end of this process, 44 knowledge questions and 22 behavioural questions were deemed useful for the study (the number of questions was reduced from 116 to 66) (Appendix 7).

4.4.3.3 Piloting the questionnaire

While the experts' comments were taken into consideration a number of issues still remained concerning the validity of the questionnaire, particularly in relation to Taylor-Powell's (2008) perspectives on questionnaires. Taylor-Powell suggests that researchers should ensure that:

a) The items in the questionnaire measure what they are supposed to measure.
b) All the words are understood by the respondents.
c) All respondents interpret the item in the same way.
d) All response choices are appropriate.
e) The range of response choices is actually used.
f) The respondents correctly follow the instructions.
g) The questionnaire creates a positive impression that motivates students to respond.
h) Length of time available to complete the questionnaire is adequate.

In line with Taylor-Powell's views, other researchers (for example Creswell, 2008; Maree & Pietersen, 2007; Libarkin & Kurdziel, 2002) suggest that questionnaires should be piloted on a sample of respondents within the same context as the actual study. As a result a group of Grade 11 Life Sciences students (n = 37) were purposively sampled to participate in a pilot study to pilot the questionnaire described in this phase. This sample of students was sampled because their living conditions (that is, they reside in semirural areas where HIV and AIDS is relatively high) and schooling conditions (that is, their Life Sciences curriculum and textbooks) are similar to those of the students who would participate in the actual study (Nicolay, 2008). Given this similarity of the living and schooling conditions the researcher decided that this pilot group would provide a sensible indication of how students of the actual study would respond to the questionnaire.

Only the 66 questions (Appendix 7) recommended by the experts were piloted. During the piloting of the questionnaire, the researcher administered the test at a school which pilot students attend. Two Life Sciences teachers from the same school were also present and assisted with the administration of the test, namely distributing and collecting the questionnaires. In the pilot study a specific procedure for administering the questionnaire was followed. This procedure is similar to that used in administering Aptitude Tests (O'Neill, 2007), namely announcing all relevant instructions, providing an example or a practice question, recording time for completion, ensuring that students work independently and collecting the scripts soon after the students finished answering the questionnaire. This procedure was also used during later data collection of the validated questionnaire.

After administering the test all questionnaires were collected and scored by the researcher against a set of correct answers prepared by him (Section B in Appendix 8). It must be mentioned here that the behaviour-related questions (Section C in Appendix 7), were not scored for marks but were analysed for expediency (Section B in Appendix 8). In this instance, the researcher evaluated the responses qualitatively to determine whether students *i)* understood the question, *ii)* answered what was asked, *iii)* used the range of response options available, and *iv)* followed the instructions (Taylor-Powell, 2008). For knowledge questions (Sections A and B in Appendix 7), students were allocated one mark per correct response and zero for an incorrect response. Thereafter a total score was calculated based on the total number of marks scored by each student out of the total marks available.

Upon analysing the data from the pilot study it appeared that the questionnaire (Appendix 7) generally met Taylor-Powell's (2008) stipulations for good questions (Table 4.7). In this regard results showed that students were able to respond to all the items in the questionnaire. However some students provided multiple answers for the same questions, even though no item required more than one response. In this regard the questionnaire had failed to indicate that only one answer was required for each item.

Besides the multiple responses cases mentioned above, students generally interpreted the questions (that is 80% of all questions) similarly by giving exactly the same response, for example all students selecting choice A for item 3. Students' response pattern was however influenced by the fact that most questions had two options that is true or false. The researcher noted this to be a possible limitation because some students may simply guess the response from the two options without thinking through other options; which may be the reason for the response time of as low as 15 minutes (the average time was 25 minutes).

Table 4.7 Students' response patterns to the questionnaire, adapted from Taylor-Powell (2008)

Guiding question	Response from data
a. The questions in the questionnaire measure what they are supposed to measure	- All responses given were appropriate.
b. All the words are understood	- All questions were answered. - Varying response choices chosen by respondents. - 2% of questions answered with multiple answers which was incorrect.
c. All respondents interpret the item in the same way	- 80% of questions were given exactly the same answers.
d. All response choices are appropriate	- Varying response choices chosen by respondents.
e. The range of response choices is actually used	- All response choices were used in 84% of the questions.
f. The respondents correctly follow directions	- Instructions correctly followed for example using an "X" to select response. - Only 2% of questions answered with multiple answers which was incorrect.
g. The questionnaire creates a positive impression that motivates students to respond	- A 100% response to questionnaire was obtained.
h. Length of time that it takes to complete the questionnaire	- The response time was between 15 and 30 minutes.

With respect to following instructions (Table 4.7), students generally performed well. For instance all students used an "*X*" to mark their choice as they were instructed. Regarding the attitude towards the questionnaire, it was found that 100% of participating students completed it.

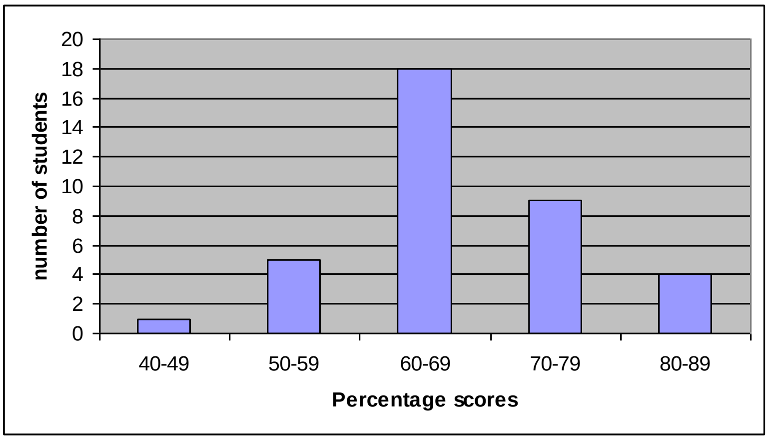

Figure 4.4 Distribution of students' scores in the pilot study

To obtain further clarity on the issue of whether the questionnaire was clear, students' responses in the pilot study were analysed. Results of the pilot study suggest that the average score for the 37 respondents was 67% (Figure 4.4). This relatively high score is an indication that the concepts covered in the test are probably addressed in Grade 11 Life Sciences. In this instance, only one student obtained a score of less than 50%.

Furthermore a normal distribution of scores (Figure 4.4) was found suggesting that most respondents clustered around the mean of 67%. This suggests that students in this group had a relatively similar understanding of the HIV and AIDS concepts as well as the cognitive ability to respond to them. This may further suggest that there are probably very few cases where "other" knowledge is required to respond to the test. For instance if the knowledge tested in the questionnaire is not covered in the curriculum, then a more skewed distribution would have been found, suggesting an imbalance in respondents' knowledge.

At the end of the data analysis however further corrections were made to the questionnaire. These corrections included:

a) adding instructions regarding the number of possible responses that students had to provide for particular questions,
b) replacing "true or false" options with more options in a multiple choice format, and
c) restructuring items to combine items asking similar concepts.

Following these adjustments the number of questions was reduced from 66 to 30 (Appendix 8).

Having prepared the questionnaire with 30 items, a statistician was consulted about questionnaire validation (Figure 4.2). This statistician evaluated items to indicate whether using statistical methods, the researcher would be able to answer the research subquestion. The statistician approved the use of the questionnaire.

4.4.4 Summary of the questionnaire generated in this phase

Having obtained validity of the questionnaire, the final set of items was structured in the manner presented in Table 4.8. The final questionnaire consisted of 30 items. However the researcher noted that the reliability of the questionnaire had not been determined. This attribute is however not presented in the current chapter as it was only calculated during the actual study (Chapter 6).

Table 4.8 Categories of questions in the final questionnaire

Category	Concepts covered	Number of questions
1. Academic HIV and AIDS knowledge	- Virology	2
	- Bacteriology	2
	- Circulatory system	2
	- Immunology	2
	- Vaccination	2
2. Functional HIV and AIDS knowledge	- Cause	2
	- Transmission	2
	- Symptoms	1
	- Effects of HIV on the body	2
	- Cure	3
3. Behaviour	- Attitude	4
	- Subjective norms	3
	- Perceived behavioural control (PCB)	3

4.4.5 Data collection and analysis

Having identified the sample of students for participation (Section 4.4.2), the questionnaire (Appendix 8) was administered by the researcher for data collection. The questionnaire was administered to all students within one week in October 2009. Students were not told about the questionnaire prior to administering it in order to ensure that they did not prepare for the questionnaire by studying. The procedure for administering the questionnaire is the one used during piloting of the questionnaire. During administration of the questionnaire by the researcher, Life Sciences teachers of the relevant schools as well as three other assistants were present and helped with the distribution of the questionnaire, invigilating and collecting the completed questionnaires afterward. The time spent by students to complete the questionnaire was also recorded. Five hundred and forty three students (Table 4.6) from the sampled schools participated in the study. Students' responses to the questionnaire were scored by the researcher against a set of correct answers, developed by the researcher (Section B in Appendix 8). Students' responses to the questionnaire were scored as either correct (allocating a score of 1 point) or incorrect (allocating a score of 0 point). In cases where no responses were given or where multiple answers were given, the researcher allocated a score mark of zero. With regards to behavioural preference items (item V21 to item V20) the researcher had prepared answers that would imply safe behavioural preference.

Students responses where therefore scored against these by giving one point for a safe behavioural preference and zero for a risk behaviour. Students' scores were then aggregated such that a score of less than 50% would imply overall risk behavioural preference and a score of 50% or more implied safe behavioural preference. Since the questionnaire only entailed closed questions, no responses were partially correct or incorrect.

Following the scoring process, percentage scores were generated for each student, per school and for each section of the questionnaire (that is, academic HIV and AIDS knowledge, functional HIV and AIDS knowledge and behavioural preferences). These percentage scores were used to compare the performance of Life Sciences and non-Life Sciences students. Data were also analysed per school for all nine participating schools. All statistical analyses were performed using *SPSS Statistics 17.0 Ink* software where descriptive and inferential statistics were calculated. The primary statistical analysis performed on the data was the non-parametric Mann-Whitney (or Wilcoxon-Mann-Whitney) test which is used to detect differences in data distribution, shape and spread as well as differences in medians of two independent samples (Nachar, 2008; Hart, 2001). Non-parametric statistics are those that are used when the populations are not normally distributed. The researcher chose this statistic because of the differences in the nature of samples (Life Sciences and non-Life Sciences background). Furthermore the sample sizes differed. Non-parametric tests are also used when data is ordinal. For example, data related to students' behavioural preferences were ordinal and hence a non-parametric text was suitable for them. While there are other non-parametric tests such as the unpaired t-test that could have been used, the researcher decided to use a Mann-Whitney test. The Mann-Whitney test was chosen because it assumes that the data from two independent samples (Life Sciences and non-Life Sciences) have a similar but not normal distribution, which can only be explained by determining the median instead of the mean (Hart, 2001). Similar to parametric tests, the Mann-Whitney test is used to determine if the difference between the medians of two groups is significantly different. (Non-parametric tests compare median rather than means due to data not being normally distributed). The median is the numeric value separating the higher half of a sample from the lower half, whereas the mean is the central tendency of a sample (Nachar, 2008). Using the Mann-Whitney test, the null hypothesis could be tested by generating a probability value at which the null hypothesis could either be accepted or rejected. This probability value is termed the Asymptotic Significance value. If this value was greater than the set alpha value (which can be 0.01, 0.05 or 0.1) the null hypothesis was accepted and rejected if the Asymptotic

Significance value is lower. The researcher used SPSS to test correlation between different groups. Here Spearman's correlation coefficient (represented as "*r*") was calculated. This is a non-parametric measure of statistical dependence between two variables. The generated correlation coefficient (which ranges from -1 to +1) is compared with the alpha value to determine whether the correlation is significant or not. If $r = 0$, that means there is absolutely no correlation between the variables. A correlation co-efficient of *1* means there is 100% correlation such that the two variables are directly proportional to one another. A correlation of *-1* is as strong as that which is *1* the difference is an inverse relationship. The significance of a correlation (or lack thereof) is measured against the established alpha values and denoted with asterisks.

The statistical analyses were done by the researcher who was supervised by two professional statisticians from the University of Pretoria. These statisticians also provided guidance to the researcher regarding the interpretation of results. Findings of data analysis are presented in Chapter 6**.**

4.5 Conclusion

As explained in the above sections, the study relied on both qualitative methods as well as quantitative methods. The researcher believes that based on validation processes taken to prepare instruments, the findings and conclusions drawn are acceptable responses to the research subquestions. The researcher acknowledges some limitations of the methods used. He believes that findings would have been more sensible had a second opinion been available. In this regard the researcher feels that theory triangulation (where a single set of data are interpreted by different investigators) would have rendered the findings more trustworthy. Nonetheless the researcher believes that the measures taken to strengthen the methods as described above were sufficient for rigour in the study. This view is supported in literature where researchers (Nicholls, 2003; Healy & Perry, 2000; Bogdan & Biklen, 1992) argue that in qualitative research, findings are true only within the lens of the researcher and his instrument. Findings of the methods used here are presented in Chapters 5 and 6 of this thesis. The reason for separation is that each chapter addresses a unique question using unique methods. In conclusion a broad discussion is presented in Chapter 7 as a response to the main research question.

5. CHAPTER 5: HIV AND AIDS KNOWLEDGE FOR BEHAVIOUR TRANSFORMATION IN THE BIOLOGY CURRICULUM

"He who opens a school door, closes a prison" Victor Hugo[11]

5.1 Introduction

Going into this chapter, the researcher pondered on Victor Hugo's thoughts that education should lead to freedom. While this is a good thought, one wonders if it is true, in the context of Life Sciences and HIV and AIDS. Does learning Life Sciences close the door of unsafe behaviour that could lead to HIV infection? The researcher explores Hugo's thoughts in this chapter in which results on the relationship between the Life Sciences curriculum and behaviour transformation are presented and discussed. This is in response to the first research subquestion of the study that asked:

> *How does the Life Sciences curriculum address HIV and AIDS for safe behavioural preferences among students?*

As discussed in Chapter 2 a curriculum ideology determines the aims and the nature of knowledge, the learning process, how the student is viewed, the teaching process and assessment for any subject (Schiro, 2008; Pinar, 2004; Kliebard, 1996; Posner, 1992; McNeil, 1977). Through the above research subquestion therefore, the researcher investigated the curriculum ideology for Life Sciences, with a view that the ideology will indicate if HIV and AIDS are presented in Life Sciences for behavioural transformation (Schiro, 2008). Furthermore content knowledge taught in Life Sciences was investigated. As argued earlier the researcher believes that by identifying and quantifying specific concepts related to HIV and AIDS, it is possible to understand how the Life Sciences curriculum addresses HIV and AIDS, and whether behavioural transformation is in any way signified.

[11] http://www.brainyquote.com

5.2 Results

5.2.1 Curriculum ideology for Life Sciences

As stated in Chapter 4 the researcher used a specific criterion to examine components of the curriculum to determine the curriculum ideology for Life Sciences. The document analysed was the National Curriculum Statement (NCS) for Life Sciences (Department of Education, 2003a).

5.2.1.1 The aim of the subject of Life Sciences

The aim of Life Sciences is embedded in its purpose as stipulated in the curriculum statement. According to this document (Department of Education, 2003a: 9), the aim of Life Sciences is to ensure that:

> "Learners explore those concepts that are essential for understanding basic life processes and the interrelationship and interdependence of components of the living and the physical world. Learners will develop inquiry, problem solving, critical thinking and other skills, and will use them to interpret and use Life Sciences concepts in explaining phenomena. They will be able to apply scientific knowledge in their personal lives and as responsible citizens in ways that will contribute to a healthy lifestyle and the sustainable management of resources. Through the study of the Life Sciences, learners can develop an understanding of the nature of science, the influence of ethics and biases, and the interrelationship of science, technology, indigenous knowledge, environment and society.
>
> The subject Life Sciences enables learners to understand biological, physiological, environmental, technological and social processes that impact on the environment (e.g. food production, distribution and consumption, health promotion, conservation, sustainable living and genetic engineering). All these have implications for the socio-economic and technological advancement of society. A study of concepts and processes in the Life Sciences uses contributions from the past to inform the present, and therefore promotes construction of new knowledge. Exploring indigenous

> knowledge systems related to science exposes learners to different worldviews and allows them to appreciate, compare and evaluate different scientific perspectives."

According to the above extract from the curriculum statement (Department of Education, 2003: 9), students should develop scientific skills that can be used for constructing content knowledge and then use such knowledge to better understand the environment and also apply such knowledge in their lives. What emerges strongly from the above extract is that with Life Sciences knowledge and skills, students are envisaged to improve their lives. In relation to HIV and AIDS, the curriculum statement particularly indicates that students should use knowledge and skills in order to live healthy lifestyles.

While the above aims are not directly associated with any curriculum ideology as indicated in Table 2.1, it is important to note that Life Sciences is founded on the ideology of "*social transformation*" (Department of Education, 2003a: 2). However this social transformation is not related to social efficiency or social reconstruction (Section 2.3.3.3), even though the terminology appears to be synonymous. Social efficiency and social reconstruction as defined by Schiro (2008), Cotti and Schiro (2004), Kliebard (1996) and Schubert (1996) refer to development of academic skills and knowledge that can be used to prepare students for their responsibilities as adults and eliminate deleterious practices in society by alerting students to these practices and teaching them corrective measures. On the other hand Life Sciences' social transformation "is aimed at ensuring that the educational imbalances of the past are redressed, and that equal educational opportunities are provided for all sections of the population" (Department of Education, 2003a: 2).

The social reconstruction ideology is however reflected in the curriculum. This is because the curriculum indicates that students should be taught to "apply" knowledge in everyday life. As indicated in Chapter 2, the use of scientific knowledge to better society can be regarded as social reconstruction.

Results also show that Life Sciences uses a student centred ideology to foster "construction" of knowledge. According to Schiro (2008) (see also Table 2.1) a student-centred ideology encourages students to construct their own knowledge through personal creative response to experience (Table 2.1; Schiro, 2008). However, by teaching a pre-determined set of scientific concepts, Life Sciences can be viewed as also adopting a scholar academic ideology because the curriculum is not "adapted according to students' or society's needs". Overall, based on the subject aims, it appears that Life Sciences adopts and merges different curriculum ideologies.

5.2.1.2 Knowledge prescribed in the Life Sciences curriculum

Content knowledge prescribed for Grade 11 Life Sciences learners is organized within Learning Outcome 2 which deals with the construction and application of Life Sciences knowledge. Here a scholar academic ideology is evident from the curriculum's prescription of content knowledge to be taught (and acquired). The curriculum statement (Department of Education, 2003a) indicates that Life Sciences content knowledge is divided into four knowledge areas, which develop progressively from Grade 10 to Grade 12.

Table 5.1 Content knowledge within the three knowledge strands extracted from the Grade 11 Life Sciences curriculum statement (Department of Education, 2003: 32 - 40)

Knowledge area	**Content**
1. Tissues, cells and molecular studies	• Micro-organisms (viruses, bacteria, protists and fungi): • Diseases (e.g. rust, blight, rabies, HIV/AIDS, cholera, tuberculosis, malaria, thrush); • Immunity.
2. Structure, control and processes in basic life systems of plants and humans	• Support (structural). • Transport. • Excretion. • Nervous and endocrine systems. • Related diseases of the above. • Medical conditions (e.g. stroke, diabetes, hyperthyroidism).
3. Environmental studies	• Human influences on the environment (air, land and water issues). • Sustaining our environment. • Air, land and water-borne diseases.
4. Diversity, change and continuity	• Population studies: - characteristics of populations, - population growth, - population fluctuation; - limiting factors. • Social behaviour: - predation; - competition. • Managing populations.

These knowledge areas are *i)* tissues, cells and molecular studies (Knowledge Area 1), *ii)* structures and control of processes in basic life systems (Knowledge Area 2), *iii)* environmental studies (Knowledge Area 3), and *iv)* diversity, change and continuity (Knowledge Area 4) (Department of Education, 2003a: 32). Within each knowledge area, there is specific content that must be taught (Table 5.1). This prescription of content knowledge to be taught is typical of a scholar academic ideology, where knowledge organized as didactic statements that accurately represents a discipline (such as biology) is acquired by students (Cotti & Schiro, 2004).

As shown in Table 5.1, knowledge related to HIV and AIDS which is the focus of the current study is addressed under Knowledge Area 1, Tissues, Cells and Molecular Studies. Within this area, students are taught about different organisms including viruses such as the Human Immunodeficiency Virus. Diseases caused by such organisms (for example AIDS) are also taught within this Knowledge Area. Students are also taught how the human body defends itself through its immune system.

5.2.1.3 Instructional process

The ideology of the curriculum can also be identified by understanding the prescribed instructional process (Schiro, 2008; Table 2.1). The Life Sciences curriculum statement however does not indicate which instructional process should be followed. Instead this document refers to another document, the Learning Programme Guideline (Department of Education, 2007).

The Learning Programme Guideline (Department of Education, 2007) indicates that there is no universally adopted instructional strategy for Life Sciences. Instead, "individual teachers should design Lesson Plans using the grade-specific Work Schedule as the starting point" (Department of Education, 2007: 4). These lesson plans and work schedules are designed by teachers within their school based on the needs and abilities of their students.

Lesson plans "contain a coherent series of teaching, learning and assessment activities... and also indicate other relevant issues to be considered when teaching and assessing a subject" (Department of Education, 2007: 5). Each lesson plan must stipulate a teaching method preferred by the teacher which indicates "how teaching and learning will take place, that is, how each activity will be presented in the classroom" (Department of Education, 2007: 16). Recommended teaching methods include "microscopy work, research, excursions, group work, experimental work, case studies, problem solving, interviews, questionnaires, guest talks and career opportunities" (Department of Education, 2007: 32). No further details are provided as to how the above methods should be used and whether teachers have the skills to use these methods. It also means each school will probably have a unique instructional process that suits both teachers and students within the school. It must be pointed out that there is no indication of whether teachers have the skills and resources required to carry out this task.

Nevertheless one can infer that a student-centred ideology is adopted in that teachers retain the freedom to use their creativity to develop instructional processes based on the needs of their students. Furthermore an overlap of ideologies is also evident in that the curriculum (Department of Education, 2007) does not prescribe particular instructional strategies. Instead teachers have the freedom to expand concepts and to design and organise learning experiences according to their local circumstances. This implies that the curriculum may not always be implemented as is (that is, scholar academic and social efficiency ideologies), but can be adapted to suit the needs of students and societies (an element of student-centred and social reconstruction ideologies).

5.2.1.4 The nature and the role of students in the instructional process

Regarding the role of students, the Life Sciences curriculum (Department of Education, 2003a: 2) "encourages a student-centred and activity-based approach to education." This view clearly demonstrates that a student-centred ideology is favoured. The curriculum (Department of Education, 2003a: 2) also emphasizes elements of a student-centred ideology in that students are expected to "work effectively with others as members of a team, group, organisation and community" as well as "organise and manage themselves and their activities responsibly and effectively." Based on Table 2.1 the nature and the role of students in the learning process in Life Sciences can be regarded as tilting towards a student-centred ideology.

The curriculum statement (Department of Education, 2003a: 5) also states that Life Sciences students should "be imbued with the values and act in the interests of society." This view suggests that Life Sciences' vision of their students is based on the social efficiency ideology which seeks to ensure that students play particular and important roles in and to the benefit of the society.

5.2.1.5 The role of teachers during instruction

Whereas the curriculum statement (Department of Education, 2003a) indicates that students play an active role during instruction, teachers are assigned a number of critical roles. The curriculum statement indicates that teachers are "mediators of learning, interpreters and designers of Learning Programmes and materials, leaders, administrators and managers, scholars, researchers and lifelong learners, community members, citizens and pastors, assessors, and subject specialists."

A number of inferences can be made from the above extract from the curriculum statement. For instance, it emerges that teachers are viewed as a source of information for students, which is characteristic of scholar academic ideology. However, the curriculum statement also implies that teachers need to make "decisions regarding the [instructional] sequence" based on students' abilities, which is a characteristic of a student-centred ideology. This also means teachers ought to have a sound understanding of how to recognize and address barriers to learning, and how to plan for diversity. In other words, teachers should adapt the curriculum and instruction according to the needs and abilities of students, which is an element of a student-centred ideology.

Besides the above, teachers are responsible for assessing students by "designing assessment tools" (Department of Education, 2003a: 43) which are used to assess students in all skills throughout the course of learning. Life Sciences teachers are also expected to design and use assessment tools using specific procedures that are prescribed by the Department of Education. Therefore it appears that teachers' assessment in Life Sciences favours scholar academic and social efficiency ideologies. This is because in these ideologies, the nature of assessment tools is normative and criterion reinforced (Table 2.1). In general, the role of Life

Sciences teachers overlaps between student-centered, scholar academic and social efficiency ideologies.

5.2.1.6 The purpose of assessment

According to the Department of Education (2003a: 41) “before a teacher assesses learners, it is crucial that the purposes of the assessment be clear and unambiguous. Understanding the purposes of assessment ensures that an appropriate match exists between the purposes and the methods of assessment. This, in turn, will help to ensure that decisions and conclusions based on the assessment are fair and appropriate for the particular purpose or purposes. There are many reasons why learners’ performance is assessed. These include monitoring progress and providing feedback, diagnosing or remediating barriers to learning, selection, guidance, supporting learning, certification and promotion.”

This implies that one of the purposes of assessment is to measure student progress and to certify that students have the skills that are developed in a particular grade, a feature of scholar academic and social efficiency ideologies. In this regard there are two types of formal assessment, namely continuous or school-based assessment as well as internal end-of-year examination. As indicated above, continuous assessment is used to measure students’ progress in attaining skills and knowledge within a grade. Continuous assessment may also be used to diagnose students’ abilities to facilitate further learning. End-of-year assessment is used to certify that students have attained skills and knowledge required in the subsequent grade. Both continuous and end-of-year assessments described here are typical of scholar academic and social efficiency ideologies. However it also appears that assessment may be used to rank students for a future in the discipline (a scholar academic ideology), such that only those students who acquire a certain level (rank) are deemed ready to progress to the next grade. The curriculum statement provides a clear guideline for the development of assessment tools. In this regard continuous assessment weighs 25 per cent and end-of-year examination 75 per cent toward the final mark. Therefore, as far as the assessment is concerned, Life Sciences favours a social efficiency and scholar academic ideology.

5.2.1.7 Conclusion: the curriculum ideology for Life Sciences

Based on the above results there is no clear indication as to which single curriculum ideology is favoured in Life Sciences. The aim of Life Sciences suggests that a scholar academic ideology is preferred seeking to ensure that students accumulate prescribed knowledge (Ravitch, 2000). This scholar academic ideology is further observed in that the curriculum specifies which discipline-specific knowledge should be taught. Looking at the instructional process however there seems to be an indication that Life Sciences does not strictly adhere to a scholar academic ideology. As shown in the results both student-centred and social reconstruction ideologies are incorporated. Furthermore a student-centred ideology was observed with respect to the role of students and teachers during instruction. To this end scholar academic and social efficiency ideologies were also evident. While there is obvious overlap between curriculum ideologies, there is little evidence of social reconstruction, suggesting that behavioural transformation may not be a focus in the existing curriculum for Life Sciences. In the context of the study this deduction means it is less likely that Life Sciences students will display a unique behavioural output compared with non-Life Sciences students. Furthermore one can deduce that the Life Sciences curriculum is primarily concerned with the teaching of HIV and AIDS knowledge, and probably not with the purpose of transforming social norms, values and beliefs.

5.2.2 Life Sciences concepts and skills that may affect HIV and AIDS behavioural preferences

As stated in Section 4.3, to identify prescribed content knowledge and skills, both the NCS for Life Sciences and textbooks were analysed. Hence results of the two data sources are provided separately in the following subsections.

5.2.2.1 Curriculum Analysis

The NCS for Life Sciences (Department of Education, 2003a) was analysed through generic items applied to the curriculum analysis as outlined in Table 4.4 and Appendix 1. Below are the responses formulated from this Life Sciences curriculum document.

1. ***Which skills (competences) does the curriculum encourage Grade 11 students to attain regarding HIV and AIDS?***

While the curriculum addresses several skills in a broader context, there are particular skills that Life Sciences intends imparting to the students. According to the Life Sciences curriculum statement (Department of Education, 2003a: 10), through Life Sciences, Grade 11 students will develop:

a) "Scientific enquiry and problem-solving skills,
b) Construction and application of scientific knowledge, and
c) Life Science, Technology, the environment and society."

The curriculum indicates that by ascertaining the above-listed skills, students will (amongst other things) become "responsible citizens" (Department of Education, 2003a: 10). According to Schiro (2008) and Table 2.1, "responsible citizenship" is a characteristic of both social efficiency and social reconstruction. By inference it means Life Sciences students would be expected to use their knowledge to take informed decisions in issues such as behaviour. This is reflected in the learning outcomes of Life Sciences which states that the module aims to produce "students who are able to apply knowledge in daily lives for a healthy life style" (Department of Education, 2003a: 9). While the NCS for Life Sciences (Department of Education, 2003a) clearly defines specific skills (such as scientific enquiry and problem-solving skills) that students are expected to attain through Life Sciences, the curriculum does not provide strategies that can be used to develop such skills.

2. ***Which concepts does the curriculum foreground for Grade 11 students in relation to HIV and AIDS?***

In Life Sciences the prescribed knowledge areas are (Department of Education, 2003a: 10):

a) Tissues, Cells and Molecular Studies
b) Structures and control of processes in basic life systems
c) Environmental studies, and
d) Diversity, change and continuity.

HIV and AIDS forms part of the Tissues, Cells and Molecular Studies knowledge area in the Life Sciences curriculum (Department of Education, 2003a: 35; Table 5.2).

Table 5.2 Content knowledge related to Tissues, Cells and Molecular studies for Grades 10 to 12 extracted from the Life Sciences curriculum statement[12]

Grade 10	Grade 11	Grade 12
- Cell structure. - Cell division (mitosis). - Tissues. - Related diseases (for example cancer).	- Micro-organisms (viruses, bacteria, protists and fungi): • Diseases (for example rust, blight, rabies, HIV and AIDS, cholera, tuberculosis, malaria, thrush); • Immunity.	- DNA, protein synthesis. - Chromosomes, meiosis, production of sex cells, diseases (for example Down's syndrome). - Genes, inheritance, genetic diseases.

In relation to HIV and AIDS analysis of the NCS for Life Sciences revealed that Grade 10 Life Sciences teaches cytology (Department of Education, 2003a: 34; Table 5.2). This includes "cell structure, cell division (mitosis) and Tissues and Related diseases (e.g. cancer)." In Grade 11 students learn about micro-organisms, such as viruses and bacteria (Department of Education, 2003a: 35). Here the structure, characteristics and values of these organisms are taught. The Grade 11 Life Sciences curriculum specifically refers to HIV in teaching about viruses (Department of Education, 2003a: 35; Table 5.2). With respect to characteristics of viruses, AIDS is used as a model. Other micro-organisms include tuberculosis (bacteria), malaria (protists) and rusts (fungi). Grade 11 students also learn about the human immune system, particularly the human immune response against drugs, that is drug resistance (Department of Education, 2003a: 35). Students also learn about the immune response by humans against infectious agents such as viruses and bacteria (Table 5.2). Grade 12 Life Sciences students then learn genetics, that is, DNA, RNA and protein structure and function (Department of Education, 2003a: 35).

3. What are the expected HIV and AIDS related learning outcomes of the module?

Grade 11 Life Sciences learning outcomes are the same as those of Life Sciences Grade 10 and 12. The main difference is with respect to continuity where Life Sciences Grade 10 forms a foundation, and Grade 11 and Grade 12 a consolidation (Department of Education, 2003a). As in the other grades, there are three learning outcomes that Life Sciences Grade 11 aims to achieve. These learning outcomes are given in Table 5.3 as they appear in the curriculum statement (Department of Education, 2003a: 11).

[12] This content knowledge is in relation to Learning Outcome 2 which is the construction and application of Life Sciences knowledge

The focus of Learning Outcome 1 is exploring and investigating (Table 5.3). This learning outcome focuses on developing scientific skills related to the scientific process, that is experimental and data-handling skills (Department of Education, 2003a: 11). The specific skills that together make up experimental skills in Life Sciences are following instructions, making observations and measuring trends (Department of Education, 2003a: 11; Table 5.3*)*. The curriculum lists at least six data-handling skills, namely identifying, selecting, organizing, presenting, translating and manipulating data (Department of Education, 2003a: 11). In this regard the curriculum breaks down the learning outcome into smaller components which will define whether students have achieved the data-handling skills or not.

Table 5.3 Summary of learning outcomes for Life Sciences (extracted from Department of Education, 2003a: p. 11-12)

Learning outcome	Focus	Definition
Learning outcome 1	Scientific Inquiry and Problem-solving Skills	The student is able to confidently explore and investigate phenomena relevant to Life Sciences by using inquiry, problem-solving, critical thinking and other skills.
Learning outcome 2	Construction and Application of Life Sciences Knowledge	The student is able to access, interpret, construct and use Life Sciences concepts to explain phenomena relevant to Life Sciences.
Learning outcome 3	Life Sciences, Technology, Environment and Society	The student is able to demonstrate an understanding of the nature of science, the influence of ethics and biases in Life Sciences, and the interrelationship of science, technology, indigenous knowledge, the environment and society.

The second learning outcome for Life Sciences Grade 11 is construction and application of knowledge (Table 5.3). According to the Life Sciences curriculum this learning outcome can be attained through four key areas, namely accessing information, interpreting information, constructing knowledge as well as using knowledge (Department of Education, 2003a: 11). Accessing and interpreting information depends on several factors such as the ability to communicate in the field using written, spoken or visual language (as used in textbooks) (Lowe, 2003).

Another focus area of the second learning outcome concerns the application of knowledge in daily lives (Department of Education, 2003a: 11; Table 5.3). According to Bloom's taxonomy, students are expected to use their knowledge and skills in new situations (Forehand, 2005; Anderson *et al.*, 2001). Baumgartner (2001) calls this the cognitive-rational approach to transformative learning. Here learned skills and information are used by students to deal with known and novel situations. This application of skills and knowledge results in empowerment of students (Baumgartner, 2001). The researcher believes that Learning Outcome 2 (Table 5.3) could be related to behaviour transformation where students apply academic and functional HIV and AIDS knowledge to adopt safe behaviour.

The third learning outcome deals with the integration of knowledge (Department of Education, 2003a: 12), particularly integrating new knowledge with "old" knowledge. This may refer for instance to the need for the integration of western knowledge with indigenous African knowledge.

4. ***Which assessment strategies is the Life Sciences curriculum endorsing for HIV and AIDS knowledge and skills?***

The Life Sciences curriculum recommends a variety of assessment methods that can be used in Life Sciences Grade 11 to assess presumably all knowledge and skills (including that related to HIV and AIDS). These include baseline assessment, diagnostic assessment, formative assessment and summative assessment (Department of Education, 2003a: 42). According to the NCS for Life Sciences, baseline assessment should be used to "establish what students already know and can do" (Department of Education, 2003a: 12) that is, prior knowledge. According to the curriculum, baseline assessment is important to help teachers design their lessons in such a way that students are able to build on their already existing knowledge and skills (Department of Education, 2003a). Diagnostic assessment should be used to identify or discover learning barriers (Department of Education, 2003a: 42). The Life Sciences curriculum statement argues that diagnostic assessment helps teachers decide on remediation strategies that would help students perform better (Department of Education, 2003a). Formative assessment is explained as any form of assessment that is aimed at giving students feedback on their progress (Department of Education, 2003a: 42). This form of assessment (according to the curriculum statement) is used to monitor and support the learning process. Finally, summative assessment should be used to "record a judgement of the competence or performance of the student" (Department of Education, 2003a: 42). With all these assessment methods, the Life Sciences curriculum also stipulates specific guidelines for assessment (Department of Education, 2003a: 43-47). Guidelines are important as they ensure that across the spectrum, Grade 11 students are assessed in a standardized manner (Department of Education, 2003a).

The Life Sciences curriculum statement suggests that assessment should (Department of Education, 2003a: 43):

a) "be understood by the student and by the broader public;
b) be clearly focused;
c) be integrated with teaching and learning;
d) be based on the pre-set criteria of the Assessment Standards;
e) allow for expanded opportunities for students;
f) be student-paced and fair and
g) be flexible."

These above listed parameters are consistent with the basic principles of Outcomes Based Education as discussed by Killen (2002). It is not clear from the document analysed whether teachers have sufficient skills, time and resources to carry out all the above assessments. Overall therefore, any of the above strategies can be used to assess content knowledge and skills related to HIV and AIDS.

At this stage results from the textbook analysis will be presented.

5.2.2.2 Textbook analysis

With regard to textbook analysis the researcher investigated sections relating to microorganisms, diseases and immunity which are part of Tissues, Cells and Molecular Studies (Section 4.3.3). Also investigated in the current phase of the study were those that relate to virology (including viruses and HIV and AIDS), bacteriology (including bacteria and TB), immunology (including immunity and vaccination) as well as the circulatory system. The literature also indicates that the above concepts can be used to describe HIV and AIDS (Starr, Taggart, Evers, & Starr, 2009; Dimmock *et al.*, 2007; Audesirk *et al.*, 2004). As suggested in Chapter 4 specific items were used to analyse the two sampled textbooks, namely *Focus on Life Sciences* (Clitheroe *et al.*, 2008) and *Shuters Life Sciences Grade 11 Students Book* (Ayerst *et al.*, 2008). Results are presented in the following subsections[13].

[13] Henceforth in the current section reference to the textbooks that were analysed does not include author names in order to improve readability and avoid unnecessary repetition.

1. ***Which HIV and AIDS related concepts have the highest page volume in the textbooks?***

The researcher determined concepts that have the highest page volume in the textbooks (Ott & Donnelly, 1999). The first analysis of selected textbooks therefore dealt with the extent of the coverage given to each HIV and AIDS topic (Ott & Donnelly, 1999). As argued in Chapter 4, this view was because researchers (Ott & Donnelly, 1999) argue that textbooks use high page volumes formulating concepts that are valued the most, while those concepts that are less important are given less attention and page volume (Matson & LoVullo, 2009; Ott & Donnelly, 1999).

In the textbooks under study, there was variation in page volume for each HIV and AIDS topic per textbook (Table 5.4). For instance *Shuters Life Sciences Grade 11 Students Book* dedicates 7% page volume (pages 175-177 and 189) on viruses while *Focus on Life Sciences* spends 13% (pages 78-83). Related to viruses, *Shuters Life Sciences Grade 11 Students Book* dedicates 3% page volume (that is, 291 and 221) to HIV and AIDS, while *Focus on Life Sciences* dedicates 6% (81-82 and 161) (Table 5.4).

Table 5.4 The variation in page volume given to concepts related to HIV and AIDS in Shuters Life Sciences Grade 11 Students Book and Focus on Life Sciences

Topic	**Shuters Life Sciences**			**Focus on Life Sciences**		
	Number of pages	**% out of total pages [58]**	**Reference Pages**	**Number of pages**	**% out of total pages [47]**	**Reference Pages**
Viruses	4	7	175-177 & 189	6	13	78-83
Bacteria	6	10	180-182 & 187-189	16	34	64-76
HIV and AIDS	2	3	291 &221	3	6	81-82 & 161
TB	2	3	188-189	1	2	77
Immunity	8	14	212-219	0	0	
Circulatory system	18	31	270-272 & 275-290	21	45	139-160
Vaccination	3	5	222-224	2	4	84-85

As shown in Table 5.4 *Shuters Life Sciences Grade 11 Students Book* dedicates two pages on HIV and AIDS knowledge. However it is noteworthy that such coverage consists only of two paragraphs (pages 221 and 291). The researcher noted that on page 221, *Shuters Life Sciences Grade 11 Students Book* indicates that Unit 11 (page 229) further discusses HIV and AIDS. However the researcher found that Unit 11 (page 229) does not discuss HIV and AIDS but is titled “Unit 11: Transport and support in plants.” It is not clear to the researcher as to why the textbook authors presented “Transport and support in plants” instead of HIV and AIDS as they suggested on page 221. The researcher posits that, *Shuters Life Sciences Grade 11 Students Book* misses an opportunity to further present scientific knowledge of HIV and AIDS.

2. *What is the textbooks’ approach to HIV and AIDS related concepts?*

The results indicated that there is a difference in the approach to HIV and AIDS knowledge between Grade 11 textbooks analysed in the study. For example unlike *Shuters Life Sciences Grade 11 Students Book’s* two paragraphs on HIV and AIDS, *Focus on Life Sciences* uses a different approach to describe HIV and AIDS. For example on page 80 the authors discuss lymphocytes and viral reproduction. (HIV resides and reproduces in immune cells called lymphocytes (Starr *et al.*, 2009; Dimmock *et al.*, 2007; Audesirk *et al.*, 2004)). On page 81, *Focus on Life Sciences* discusses AIDS using a case study, a diagram illustrating HIV as well as text. On page 82 the authors of *Focus on Life Sciences* present HIV and AIDS statistics in South Africa, particularly related to teenagers. On page 161 *Focus on Life Sciences* presents information on HIV and AIDS under four topics, namely “what causes AIDS, how is AIDS spread, how do you know if your have AIDS, and what happens to someone with AIDS?”

It was also found that the two textbooks place the most emphasis on the circulatory system (Table 5.4). The motive behind this trend could be that it is a tradition for the circulatory system to be presented as is in the Grade 11 textbooks. The researcher however posits that it is critical that students understand this system as it plays a significant role in HIV and AIDS. For instance research has shown that one of the most common ways through which HIV is transmitted between persons is through exchange of contaminated blood (as well as other bodily fluids) (Dimmock *et al.*, 2007; Audesirk *et al.*, 2004). As a result by understanding the characteristics of the circulatory system, for example blood, students may be in a better position to understand how blood infection occurs and what the effects of this contamination are.

Studies of virology have also shown that viruses such as HIV require a specific environment for survival (Dimmock *et al.*, 2007). Therefore by understanding the composition of a circulatory system students may be in a better position to understand why HIV resides in certain types and concentrations of bodily fluid. However to enhance this understanding, the researcher believes that it is important that students also understand the structural and functional characteristics of viruses, especially HIV, which is covered in both *Focus on Life Science* and *Shuter's Life Science* (Table 5.4). This knowledge could help students integrate their knowledge of viruses with knowledge of the circulatory system and be able to understand how HIV enters the body, how it gets transported throughout the body and what the effects of having HIV in the body are.

Given the above the researcher believes that it is crucial that students understand the body mechanisms responsible for minimizing the viral effects, especially in relation to the failure of the body to eliminate HIV (that is immunodeficiency). In this vein *Shuters Life Sciences Grade 11 Students Book* dedicates significant page volume (14%) addressing the theme of immunity (that is pages 212-219; Table 5.4). It is through learning about the immune system that students will know HIV's target cells, related binding mechanisms and factors that lead to immune deficiency (Dimmock *et al.*, 2007; Audesirk *et al.*, 2004). This information is critical as students will also learn medical means that are available to boost the immune system when attacked by the virus. Related to this *Shuters Life Sciences Grade 11 Students Book* spends three pages (that is 222-224) addressing the theme of vaccination (Table 5.4). Through the knowledge of vaccination, students get to learn more about supplements that are available to lower the impact of immune deficiency. Notably, whereas *Shuters Life Sciences Grade 11 Students Book* spends such page volume on immunity and vaccination issues, *Focus on Life Sciences* does not address this topic at all even though this topic is recommended in the curriculum statement (see Table 5.4).

The researcher observed that both textbooks do not show learners how the different concepts are related to each other (for example, link between immunity and the circulatory system). The researcher also noted that even though concepts related to HIV and AIDS are presented, there is no clear link with HIV and AIDS. Instead concepts are presented as fragmented knowledge. This means students have to create links for themselves, which might not be possible for some. The implications of this remain to be determined.

3. What is the frequency of appearance for HIV and AIDS related concepts?

The researcher also determined the frequency of specific HIV and AIDS-related terms (Section 4.3.3). As stated in Section 4.3.3, the frequency of appearance of the terms was based on the total number of pages that attend to HIV and AIDS related knowledge as given in Table 5.4. Here the researcher sought to first identify terms used by the two textbooks to describe HIV and AIDS. These terms are found in sections discussing HIV and AIDS specifically (Table 5.5). Thereafter the frequency of appearance was calculated manually by the researcher. It must be noted that concepts that are regarded in the literature as significant for HIV and AIDS education that did not appear in the Life Sciences textbooks were also identified.

In Table 5.5 it is notable that there is a substantial difference in coverage of concepts in the textbooks. For instance *Focus on Life Sciences* uses the term “Human Immunodeficiency Virus or HIV” two times more than does *Shuters Life Sciences Grade 11 Students Book*. *Focus on Life Sciences* uses the term virus two times more than *Shuters Life Sciences Grade 11 Students Book*. This variation in the use of terms may reflect what the textbook values more (Krippendorff, 2004). For instance as seen in Table 5.4 *Shuters Life Sciences Grade 11 Students Book* seems to place more emphasis on immunity rather than any one disease. In this vein, it is noteworthy that *Shuters Life Sciences Grade 11 Students Book* does not address the question of HIV transmission from one person to the other (Table 5.5). Researchers (Anderson & Beutel, 2007; Page *et al.*, 2006) have argued that based on the pandemic nature of HIV and AIDS, this question needs to be addressed. One way of doing this could be to use HIV to demonstrate how viruses enter their hosts, reproduce and exhibit their effects. Here the concepts of immunity could be emphasised using HIV and AIDS as a practical and most relevant concept. Furthermore using HIV and AIDS to discuss viruses and immunity can ensure that not only do students have a better understanding of these concepts (that is, immunity) but also understand the biochemistry of HIV and AIDS (Dimmock *et al.*, 2007).

Both textbooks, (*Shuters Life Sciences Grade 11 Students Book* and *Focus on Life Sciences*) do not present any information related to multiple strains of HIV, CD 4 + T cells (the specific immune cells targeted by HIV), the effects of HIV in the body as well as the use of antiretroviral drugs in HIV and AIDS treatment (Table 5.5). The concepts not presented in the Grade 11 text books (*Shuters Life Sciences Grade 11 Students Book* and *Focus on Life*

Sciences are however regarded by other researchers (Dimmock *et al.*, 2007; Audesirk *et al.*, 2004) as important for students to understand scientific knowledge of HIV and AIDS.

From the above results the researcher wonders about the effects of knowledge presented in the textbooks on students' understanding of HIV and AIDS. In this regard students' understanding of HIV and AIDS will be directed by the curriculum and textbook (Mohammed, 2007). Therefore, it remains to be seen whether students have a complete understanding of HIV and AIDS given the apparent superficiality of HIV and AIDS knowledge presented in the Life Sciences textbooks that were examined.

Table 5.5 List of HIV and AIDS related concepts and their appearance frequency in Grade 11 textbooks

Theme	**Concepts**	**Frequency of appearance of concepts in textbooks**	
		Focus on Life Sciences	**Shuters Life Sciences**
Definitions	Human Immunodeficiency Virus – HIV	19	9
Types	HIV I, HIV II	0	0
Domain	Virus	49	27
Transmission	Unprotected sexual intercourse	2	0
	Transfusion of infected blood	0	0
	Vertical transmission	1	0
	Injection needles	1	0
	Multiple infections	1	0
Target cells	White blood cells	5	6
Binding	Antigen	7	17
	Antibodies	9	23
	Glycoprotein	0	0
	CD 4 receptors	0	0
	Helper T lymphocytes	0	4
	Macrophages	1	2
	CD4 + T cells	0	0
Entry to cell	Plasma membrane glycoproteins	0	0
	Invasion	4	3
	Infection	19	4
Reproduction	Reverse transcription	0	0
	Host cell reproduction machinery	3	7
Effects	Non-specific flu-like symptoms	0	0
	Increase of viral concentration	0	0
	Viral spread	0	0
	Organ infection	19	14
	Asymptomatic phase	0	0
	Drop in CD4 + T cell count	0	0
	Symptomatic phase	0	0
	Acquired Immune Deficiency Syndrome – AIDS	12	6
Treatment	No cure	3	1
	antiretroviral drugs	0	0
Prevention	Condom	1	0
	Safe sex	0	0

Furthermore the researcher wonders whether students' behavioural preferences are directed by textbook content (which determines their concept understanding). Furthermore if students have a limited understanding of HIV and AIDS concepts, what do they base their behavioural practices on? Based on the theory of planned behaviour, one may argue that based on the limited knowledge that students have, societal misconceptions about HIV and AIDS may inform youth's behavioural choices and lead to the spread of HIV and AIDS. This view is in line with transformative learning which indicates that learning should be able to promote responsible behaviour amongst the students by providing them with realistic and scientifically valid information (Baumgartner, 2001; Freire, 2000; Mezirow, 2000).

4. How does the content of the textbooks relate to HIV and AIDS?

As stated earlier, the textbooks examined do not directly indicate how the different HIV and AIDS related concepts are integrated. However looking at Table 5.5, scientific knowledge on HIV and AIDS can be divided into at least eleven themes (Section 4.3.3). These themes are, definition, types, domain, transmission, target cells, binding, entry to cells, reproduction, effects, treatment and prevention (Table 5.5). As stated in Section 4.3.3, the researcher used these domains to explain how the content of the textbooks relates to HIV and AIDS (Table 4.4).

Looking at Table 5.5 it appears that both textbooks (*Focus on Life Sciences* and *Shuters Life Sciences Grade 11 Students Book*) frequently refer to HIV in an attempt to describe what HIV and AIDS are. However these textbooks do not explain the concept of multiple HIV infections, through which the variants of HIV are most relevant (Audesirk *et al.*, 2004). While one of the textbooks, *Focus on Life Sciences*, briefly discusses the modes of transmission of HIV from person to person, this concept (of transmission) is not discussed in detail. Audesirk *et al.* (2004) suggest that HIV can be transmitted through at least five different mechanisms. However *Focus on Life Sciences* mentions only four of the transmission mechanisms (Page 161; Table 5.5). *Focus on Life Sciences* only mentions the modes of transmission (Page 161) but does not discuss what these modes entail.

The target cells of HIV are white blood cells (Dimmock *et al.*, 2007; Audesirk *et al.*, 2004). Both the Grade 11 textbooks mention this concept (of HIV target cells) at almost the same frequency (Table 5.5). However the biochemistry of why HIV targets white blood cells is not discussed. For instance the concepts of glycoproteins, CD 4 receptors and CD 4 + T cells are not mentioned (Table 5.5). The textbooks only refer to the "invasion" and "infection" of the host cells by the virus. For example on page 161, *Focus on Life Sciences* states: "The virus gets into your blood and *infects* your body." In explaining the concepts of invasion and infection, the textbooks used generic terms "enter" and "attack." For example *Shuters Life Sciences Grade 11 Students Book* on page 221 states: "HIV *attacks* the helper T-lymphocytes of our body and destroys them."

Generic viral reproduction is used in both textbooks to describe how HIV reproduces. In this instance simplified schematic diagrams are used to depict various stages of viral behaviour inside the host cells. The Grade 11 Life Sciences textbooks use artistic, greyscale pictures that do not provide the magnification (for example Figure 4.2 on page 80 in *Focus on Life Sciences*). In *Focus on Life Sciences* some of the diagrams (for example Figure 4.21 page 78 and Figure 4.24 page 81) are not discussed or referenced in the text, which would make it difficult for students to understand according to Mayer (2001).

5.2.2.3 Conclusion: Life Sciences concepts and skills that could influence behaviour

Data analysis in Sections 5.2.2.1 and 5.2.2.2 (curriculum and textbooks analyses) indicates that Life Sciences is concerned with the development of scientific skills. Even though application of knowledge to real life is referred to in the curriculum, no further guidance is provided as to how these skills should be developed, especially in relation to HIV and AIDS behaviour. Instead there is evidence that HIV and AIDS knowledge is taught primarily from a scholar academic perspective. This view is supported by the recommended assessment strategies and learning outcomes (Section 5.2.2.1), which focus on assessing students' understanding of concepts rather than their behavioural practices.

Results also show that according to the NCS for Life Sciences, Life Sciences develops specific concepts and skills and has assessment strategies to evaluate specific learning outcomes. The idea of integrating the construction of content knowledge (which is presented in Section 5.2.2.1 number 2) and development of skills (as indicated in Section 5.2.2.1

number 1) in a single learning area is in line with Carnine and Carnine (2004) who argue that when science content incorporates instructional design principles, students' comprehension of scientific content and development of skills improves.

While the study has been able to identify a set of skills (from curriculum analysis) and content knowledge (from textbook analysis) that is intended to be taught in Life Sciences, there is no evidence to suggest that these skills and content knowledge could influence students' behavioural preferences in the context of HIV and AIDS. However the curriculum statement suggested that students should "apply scientific knowledge in their personal lives and as responsible citizens in ways that will contribute to a healthy lifestyle" (Department of Education, 2003a: 9). Furthermore according to researchers (Maynard *et al.*, 2001; Pakaslahti, 2000) there is an association between acquisition of knowledge and certain types of behaviours. For example aggressive behaviour among students can be associated with problem-solving skills and concept understanding (Williams & Noyes, 2007; Maynard *et al.*, 2001; Pakaslahti, 2000).

Textbook analysis also showed that content knowledge taught in Life Sciences in relation to HIV and AIDS covers various topics which differ according to textbook. In this regard it emerged from the study that textbook interpretations of the NCS for Life Sciences vary. This variation is evident in the manner in which textbooks attend to various concepts. This variation was also reported by other researchers such as Lemmer, Edwards and Rapule (2008) and Sikorova (2005). According to Sikorova (2005) there is no optimum textbook. While it is acceptable that textbooks will vary, the question, in the context of South Africa, is whether teachers are trained to select textbooks for particular reasons. According to Lemmer *et al.*'s (2008) findings some biology teachers do not have the necessary scientific and pedagogical content knowledge to effectively evaluate and select textbooks. Given the variation in textbook content, the researcher argues that teachers' lack of textbook selection skills and variation in textbook content may impede effective construction of knowledge and development of skills among students. For example students using *Shuters Life Sciences Grade 11 Students Book* (Ayerst *et al.*, 2008) (with only two paragraphs on HIV and AIDS) have a limited chance of effectively developing HIV and AIDS-related content knowledge.

5.3 Making sense of the results: reflecting on literature

The researcher observed two trends with regard to the results from the curriculum and textbooks analyses presented in this chapter. Some results support existing literature in curriculum studies and HIV and AIDS education. Other results however provide new insights into the field. Results that provide new insights are particularly so in the context of Life Sciences curriculum and HIV and AIDS education. As stated in Chapter 1 the researcher is not aware of any work that explores a biology curriculum in order to understand the curriculum-behaviour transformation relationship.

5.3.1 Results that echo existing literature in curriculum studies and HIV and AIDS education

Results that support existing literature are that *i)* Life Sciences has a generic curriculum framework, *ii)* Life Sciences is knowledge-oriented and *iii)* HIV and AIDS content is incorporated into Life Sciences as extra content. These are discussed below.

5.3.1.1 Life Sciences has a generic curriculum framework

As indicated in Chapter 2 researchers agree that a formal curriculum for any subject area ought to have *i)* predetermined subject matter, *ii)* a planned sequence of learning experiences *iii)* certifiable completion *iv)* the institution of learning *v)* socialization and *vi)* social benefits (Waks, 2003; Tanner & Tanner, 1980; Good, 1959; Smith *et al.*, 1957). There is an exception though regarding socialization and social benefits when researchers indicate that some curricula may lack these components (Waks, 2003). Results in the study indicate that the Life Sciences curriculum has the generic curriculum framework which is made up of predetermined subject matter as well as a planned sequence of learning experiences in terms of content knowledge.

5.3.1.2 Life Sciences is knowledge-oriented

According to MacDonald (1971) most subjects in natural sciences such as mathematics, physics and biology are regarded as knowledge-oriented (MacDonald, 1971). In these subjects students are taught content knowledge and empirical methods of the discipline. This is to ensure that at the end of the learning process students have mastered founding knowledge and modes of enquiry of that particular discipline (MacDonald, 1971). In line with these views, results in the study show that the Life Sciences curriculum statement does prescribe content knowledge in a form of didactic statements. This knowledge should be taught across Grade 10 to 12 presumably to ensure that at the end of the learning process students have an understanding of the overall principles of biology.

The researcher also observed that it is not indicated how content knowledge presented in the examined Life Sciences textbooks relates to everyday life of the students. This observation is in line with findings of other researchers who argue that knowledge-oriented curricula may not address social issues (Schiro, 2008; Waks, 2003; Zuga, 1992). In Schiro’s (2008) terms, Life Sciences is not likely to empower students for social progress. Instead students should be taught knowledge and skills that will ensure that they are able to function within the parameters of the discipline (Schiro, 2008; Cotti & Schiro, 2004). Because of this focus on “discipline-ing” students, the researcher believes that Life Sciences can therefore be regarded as knowledge-oriented (Van Manen, 1978).

Furthermore looking at the skills developed through Life Sciences (Section 5.2.2.1 number 1) and the Learning Outcomes (Table 5.3), there is indication no of how students should apply their knowledge to their everyday experiences (Simsek & Kabapinar, 2010). In fact the Learning Outcomes do not seem to relate to students’ everyday experiences. Overall these observations imply that the Life Sciences curriculum is probably not informed by social, cultural and/or personal contexts of students (MacDonald, 1971). Based on the Learning Outcomes, particularly the definition of Learning Outcome 2 as presented in Table 5.3, the researcher also argues that the Life Sciences curriculum is only concerned with the acquisition of knowledge and does not address citizenship (Warde, 1960; Waghid, 2002). Furthermore the mention of Learning Outcome 2 (application of knowledge) in the curriculum is not followed up with substantial evidence in the textbooks. As a result the researcher believes that the ability of Life Sciences to foster behaviour transformation would be minimal.

5.3.1.3 HIV and AIDS knowledge is integrated as extra content in Life Sciences

Van Laren (2008) indicates that HIV and AIDS knowledge can be integrated into school curricula as extra content for selected subject areas. This strategy is in line with recommendations for interdisciplinary collaboration in teaching about HIV and AIDS (UNESCO, 2006). The current study also shows that, based on page volumes dedicated for HIV and AIDS-related content, Life Sciences is not exclusively about HIV and AIDS, instead selected aspects have been included and some have been left out.

Van Laren (2008) however indicates that incorporating HIV and AIDS knowledge as extra content may limit the effectiveness of this knowledge in behaviour transformation. Results of the study supported this view. For example the researcher observed that like other biology subjects, Life Sciences follows predominantly a scholar academic ideology, which has been accused of failing to address social needs of students such as behaviour transformation (Schiro, 2008). Behaviour according to researchers (Schiro, 2008, Cotti & Schiro, 2004) can only be affected if education is tailored from social efficiency, student-centred and/or social reconstruction ideologies. Consequently the researcher argues that the HIV and AIDS content incorporated in the Life Sciences curriculum will probably not lead to behaviour transformation.

Furthermore UNESCO (2006) indicates that because there is already a certain degree of content within the subject, which carries a particular level of priority, HIV and AIDS will potentially receive lesser coverage and attention. The researcher also observed this as the extent and depth of content of HIV and AIDS knowledge were limited, at times leaving out critical content. In this instance the researcher noted that some concepts regarded in literature as important for HIV and AIDS education were either missing or addressed superficially in Life Sciences. Furthermore the results of this study have shown that content coverage (such as page volume) given to HIV and AIDS content is rather minimal compared with the complexity of the topic.

5.3.2 New insights concerning HIV and AIDS education in Life Sciences

The main finding that provides a new perspective to the relationship between curriculum and HIV and AIDS behaviour transformation is that, based on the coverage of HIV and AIDS-related content in the Life Sciences NCS and the two textbooks, Life Sciences will probably not lead to behaviour transformation. Firstly the researcher notes that the curriculum makes provisions for the construction and application knowledge, presumably including HIV and AIDS knowledge for behaviour transformation. However there is no guidance for both teachers and students as regards the application of knowledge. Furthermore there is not sufficient content knowledge in the textbooks for meaningful application in everyday life to be made. Secondly the researcher argues that a Life Sciences curriculum that adopts multiple curriculum ideologies will not lead to behaviour transformation. This argument is based on the fact that while Life Sciences inclines more toward a scholar academic ideology, it however has the characteristics of at least three other curriculum ideologies, namely social efficiency, student-centred and social reconstruction ideologies. Consequently the curriculum does not incorporate elements, such as social skills, required to foster behaviour transformation. Furthermore having many curriculum ideologies means there probably will be no standard format for textbooks, particularly with regard to presentation of content. These views are discussed in detail below.

5.3.2.1 Life Sciences does not provide sufficient guidance for behaviour transformation

The researcher found that the curriculum and textbooks have three main learning outcomes (Table 5.3). Learning Outcome 1 relates to the construction and acquisition of knowledge while Learning Outcome 2 relates to application of knowledge in novel situations. With regard to Learning Outcome 1 the researcher argues that the HIV and AIDS related content knowledge recommended for Life Sciences may not be sufficient for students to have a complete understanding of HIV and AIDS. For example it emerged from data that a number of crucial concepts for prevention of HIV and AIDS infection (Table 5.5) are not reflected in the textbooks. This means students cannot have a complete understanding of HIV and AIDS particularly in relation to the transmission and prevention of HIV infection as well as treatment of AIDS if the two textbooks are used. The researcher also believes that if students do not have sufficient knowledge they will not be able to apply such knowledge in everyday life (Learning Outcome 2). In fact the researcher believes that Life Sciences students will not be able to apply knowledge because there is no guidance in the curriculum or textbooks as regards how students should develop the skills necessary for application of knowledge. In this instance the curriculum indicates that students should be able to apply knowledge but there is no directive as to how and when should this be achieved. Therefore the researcher believes that even though behaviour transformation may be intended in Life Sciences, there is no strategy for its attainment.

5.3.2.2 Life Sciences lacks a clear curriculum ideology for HIV and AIDS education

In Chapter 2 the researcher presented views from various researchers who argue that each subject ought to have a distinct curriculum ideology which frames the subject in terms of content knowledge, instructional processes, assessment strategies as well as learning outcomes (Schiro, 2008; Cotti & Schiro, 2004). This argument was based on the belief that distinctly defining a curriculum ideology will ensure that the objectives related to the subject area are easily attained. As stated in Chapter 2 each curriculum ideology has a specific aim and rationale and therefore subject areas and their curricula could be moulded around these.

Other researchers however indicate that in reality there will be an overlap between curriculum ideologies (Þórólfsson & Lárusson, 2010; Kliebard, 1996). What was not clear from literature however is the consequence of such an overlap, particularly in relation to the development of skills and construction of knowledge that can be used to eliminate social ills and promote citizenship. In the study the researcher explored HIV and AIDS-related content in relation to behaviour transformation in the Life Sciences curriculum.

As shown in the results the researcher observed elements suggesting that at least four curriculum ideologies (namely scholar academic, social efficiency, student-centred and social reconstruction ideologies as discussed in Chapter 2) are reflected in Life Sciences. Overall, the results indicate that Life Sciences has an overlap of different ideologies without an exclusive emphasis on a particular curriculum ideology.

5.3.2.3 HIV and AIDS education in Life Sciences is a result of the epidemic of social response to HIV and AIDS

The researcher believes that the probable reason why Life Sciences lacks a single distinct curriculum ideology for HIV and AIDS is because the incorporation of HIV and AIDS knowledge is a result of the epidemic of social, cultural and economic response. Scholars (Dimmock *et al.*, 2007; Parker & Aggleton, 2003; Stein, 2003) indicate that the epidemic of social, cultural and economic response is characterized by HIV and AIDS awareness programmes, information explosion, stigmatization and discrimination of those infected, research and production of treatment drugs, research on curability of AIDS and factors leading to HIV infection and AIDS. In this regard social, cultural and economic pressure is exerted on the education system to teach knowledge of HIV and AIDS. As observed in the study the researcher believes that the risk is that there are no well defined objectives of such incorporation. Curriculum objectives are always founded on the curriculum ideology. As a result if there is no distinct ideology (such as is the case in Life Sciences) the curriculum will probably not lead to a reduction in the spread of HIV and AIDS through behaviour transformation.

5.3.2.4 Consequences of a lack of a distinct curriculum ideology for behaviour transformation in Life Sciences

The findings of the study indicate that there are several HIV and AIDS-related consequences of having multiple curriculum ideologies in one subject area that teaches HIV and AIDS knowledge; these consequences, to the researcher’s knowledge, have not been reported in literature. These consequences are that *i)* the curriculum will not be able to respond to the social needs of students, *ii)* the curriculum will not respond to the epidemics of HIV infection and AIDS, *iii)* students will not be prepared for HIV and AIDS-related social challenges, and *iv)* textbook will not have a clear framework for selecting content knowledge. The researcher discussed these below.

a) Inability to respond to social needs of students

Previous research shows that the epidemic of social, cultural and economic response to HIV and AIDS is greatly influenced by social needs (Parker & Aggleton, 2003; Luginaah *et al.*, 2005; Stein, 2003; Tobias, 2001). This means, ideally, that social needs related to HIV and AIDS, which are specific to the socio-economic status of the society, should be reflected in the curriculum design and content knowledge incorporated. This can be enhanced by adopting a specific curriculum ideology which will respond directly to the social needs of the students (Schiro, 2008). For example if the social context is such that students need discipline-specific knowledge, then a scholar academic curriculum would be suitable. Alternatively, if the students need to redefine social values, norms and beliefs, then a social reconstruction curriculum would be appropriate.

However the researcher argues that should there be multiculturalism and significant differences in the economic status of the society (as is the case in South Africa), it will be difficult to decide which curriculum ideology is suitable for social needs related to HIV and AIDS. In this case, a thorough needs analysis is required during curriculum development (Kırkgöz, 2009; Songhori, 2008).

In the study (particularly in the learning outcomes and the textbooks approach to HIV and AIDS-related concepts) the researcher found no evidence to indicate how and which social needs (including social values, norms, attitudes and beliefs) are responded to through Life Sciences. This emerges as Life Sciences adopts multiple curriculum ideologies, which by definition respond to different needs (Cotti & Schiro, 2004). Even though not empirically explored in the study, the researcher believes that this is due to multiculturalism in South Africa as well as the differences in economic status of the citizens. Overall the researcher believes that the context of South Africa as well as the multi-ideological framework of Life Sciences means the subject will probably fail to respond to particular needs of students and society.

b) Inability to respond to the epidemics of HIV infection and AIDS

The epidemic of HIV infection could be addressed through a social reconstruction curriculum (Schiro, 2008). For example the epidemic of HIV infection is characterized by people contracting HIV (Stein, 2003). Therefore, to counteract HIV infection, specific mechanisms aimed at addressing factors that are responsible for the spread of HIV and AIDS should be addressed. In this instance literature indicates that there are particular behaviour-related factors that affect the spread of HIV and AIDS in South Africa (Francis, 2010; Kirby *et al*., 2007; Donovan & Ross, 2000; Johnson *et al.*, 1999). As discussed in Section 3.4, these factors include risk behaviour, gender–related abuse, stigma and discrimination, sexuality, drug use, biological factors (such as transmission from mother to child at birth), health (for example exposure to infected blood or bodily fluids), and social factors (for example human rights, values, norms, attitudes and beliefs such as gender imbalances) (Dimmock *et al.*, 2007; Parker & Aggleton, 2003). Therefore to respond to these factors, behaviour transformation could be fostered through a suitable social reconstruction curriculum that will change students' beliefs and attitudes.

With regard to the epidemic of AIDS, the researcher believes that a student-centred curriculum can help students construct knowledge and link such knowledge with their experiences. This in turn could alter their beliefs and attitudes which in turn could help them better understand AIDS and be able to adopt suitable responses. Stein (2003) indicates that the epidemic of AIDS occurs when the effects of HIV infection, such as depletion of the immune system occur. Consequently it is necessary that students have a good understanding of issues such as opportunistic infections, treatment and cure for AIDS as well as multiple HIV infections (Parker & Aggleton, 2003; Stein, 2003). Nonetheless, the researcher observed that in Life Sciences, these concepts receive least page volume in the textbooks. The researcher believes that this is because Life Sciences does not adopt a curriculum ideology that will ensure that students have the necessary knowledge and skills required for them to efficiently function in a society using socio-scientific knowledge.

The researcher also found that critical concepts related to the transmission of HIV, the effects of HIV in the body as well as prevention are either not adequately incorporated into the Life Sciences textbooks or omitted. This is appalling given numerous scholarly reports that indicate the importance of teaching students about these topics. Furthermore the fragmentation of concepts indicates that the integration of HIV and AIDS concepts into Life Sciences was not based on a clear rationale or ideology.

c) Students are not prepared for social challenges related to HIV and AIDS

The two curriculum ideologies whose objective is to promote citizenship are social efficiency and social reconstruction (Schiro, 2008). These ideologies ensure that students have the necessary life and social skills required for them to function efficiently in society. However results show that skills recommended in the Life Sciences curriculum statement do not relate to social efficiency or social reconstruction. In this regard life skills that students would need in order to function efficiently in an HIV and AIDS world are not reflected in the Life Sciences curriculum.

As argued in Chapter 2 in social efficiency, education is aimed at teaching students various life skills and abilities which are performances that students must be prepared for as adults (Schubert, 1996). According to Schiro (2008) these performances must be stated clearly as observable behavioural skills. However the researcher did not find any behavioural skills that are recommended in the Life Sciences curriculum statement. In relation to social reconstruction, the main objective would be a transformation of behaviour of students as well as their societies. This would be achieved by alerting students to ill practices such as risk behaviour of the society and teaching them corrective measures (Schiro, 2008; Zuga, 1992). Results however showed no evidence indicating that Life Sciences addresses social issues even though Learning Outcome 3 relates to this.

According to Ciccarone *et al.* (2004), incorporating HIV and AIDS content into a curriculum requires an active participation of all stakeholders in curriculum design, development and administration in order to promote behaviour transformation. However results in the study showed that the Life Sciences curriculum and textbooks lack a strong allegiance to a student-centred ideology. This view was further supported by the fact that students are expected only to acquire and develop predetermined knowledge and skills. Scholars (Anderson & Beutel, 2007; Page *et al.*, 2006; Griessel-Roux *et al*., 2005) however argue that in order to lead to behaviour transformation, HIV and AIDS education should ensure that students' preferences and experiences related to HIV and AIDS are integrated into the learning process through a student-centred curriculum.

d) Textbooks do not have a clear framework for HIV and AIDS content knowledge

Mohammed (2007) indicates that textbooks are primary vehicles for delivering content knowledge. While it is not expected that textbooks will be identical, it is expected that textbooks will be relatively consistent with regard to content knowledge they are covering, which is directed by the curriculum statement. This can be facilitated by an adoption of a particular curriculum ideology which will inform selection of content knowledge (Mohammed, 2007; Fraser, 1993). However if a curriculum has multiple ideologies (as it apparently is the case with Life Sciences) textbook authors are left to decide for themselves as to which and how content should be incorporated and organized. This was observed in the study where there is no consistency with regard to content knowledge presented in the Life Sciences textbooks. Some concepts that are included in one textbook (for example immunity) were not included in another (see Table 5.5) even though these are recommended in the curriculum statement. Furthermore the emphasis on different concepts varied and so was the frequency of appearance of some terms. This result suggests that the textbooks have differing views and priorities concerning certain concepts.

5.4 Conclusion

Based on the findings of the study there is no indication to suggest that scientific knowledge taught in Life Sciences relates to safer behavioural practices related to HIV and AIDS. In fact the study could not identify a clear link between Life Sciences knowledge and behavioural practices in relation to HIV and AIDS even though the application of knowledge to real life is alluded to. The effect of scientific knowledge related to HIV and AIDS as found in the study on behavioural preferences remains to be investigated. (The researcher gives a full report on this in Chapter 6). However the researcher notes that, the NCS for Life Sciences claims that Life Sciences promotes both construction of scientific knowledge and application of such knowledge in real life. However to further understand the relationship between the Life Sciences curriculum and behaviour transformation, the researcher compared Life Sciences and non-Life Sciences students' HIV and AIDS knowledge and their behavioural preferences. The results of this exercise are presented in Chapter 6.

6. CHAPTER 6: HIV AND AIDS KNOWLEDGE AND BEHAVIOURAL PREFERENCES OF STUDENTS

"My education was interrupted only by my schooling" Winston Churchill[14]

6.1 Introduction

Winston Churchill suggests that education and schooling are different. His quote does not deny the power of education, but implies that schooling may impede the potential of education to empower people. The current chapter therefore explores this view in the context of HIV and AIDS. In this regard one wonders whether Life Sciences "educates" or "schools" students, so that their behavioural preferences are safe and informed by knowledge.

Wang and Chiew (2010) suggest that behavioural preferences and behaviour itself, are acts of displaying one's decisions about particular phenomena. According to Wang and Chiew (2010: 81), "most decisions that an individual makes everyday are related to certain problems needed to be solved." While behaviour is not considered as an act of solving problems, some researchers suggest that there is a significant link between problem-solving and behaviour (Magnani *et al.*, 2005; Pakaslahti, 2000). Pakaslahti notes that some forms of behaviour are associated with problem-solving tasks.

Simply put, researchers suggest that there is a link between availability of knowledge, problem-solving and behavioural preferences. As stated in Section 1.4 and based on this premise the researcher hypothesises that Life Sciences students have more academic and functional HIV and AIDS knowledge compared with non-Life Sciences students. Furthermore the researcher believes (going into the study) that academic and functional HIV and AIDS knowledge correlate positively with safe behavioural preferences of students, so that Life Sciences students should report safer behavioural preferences compared with those of non-Life Sciences students. These hypotheses were tested in the study in response to two subquestions.

[14] http://www.brainyquote.com

Subquestion 2:

How do Life Sciences students compare with non-Life Sciences students in:

a) Academic HIV and AIDS knowledge?

b) Functional HIV and AIDS knowledge?

c) Self-reported behavioural preferences related to HIV and AIDS?

Subquestion 3:

To what extent does academic HIV and AIDS knowledge correlate with:

a) Functional HIV and AIDS knowledge?

b) Self-reported behavioural preferences related to HIV and AIDS?

As stated in Chapter 4 a mixed-methodology approach was used to respond to these questions. Results and a discussion are presented below.

6.2 Results

The researcher calculated the reliability of the questionnaire used in the study using *SPSS Statistics 17.0 Ink.* Results indicate that the Chronbach alpha value was 0.710 for the questionnaire, which is an acceptable level (Maree, 2007) for statistical analyses. Other results are presented below.

6.2.1 Students' understanding of academic HIV and AIDS knowledge

As stated in Section 4.4 it was first determined whether Life Sciences students and non-Life Sciences students differ in their understanding of academic HIV and AIDS knowledge (Appendix 8). Furthermore the researcher used this information to determine whether academic HIV and AIDS knowledge taught in Life Sciences is only available to Life Sciences students.

Looking at individual items, results indicate that in all items testing academic HIV and AIDS knowledge, Life Sciences students performed better than non-Life Sciences students (Table 6.1). Table 6.1 indicates that in all five areas related to HIV and AIDS content, namely virology, bacteria, circulatory system, immunology and vaccination, Life Sciences students performed better. However it is noteworthy that, even though this knowledge is formally taught only in Life Sciences, no less than 16 per cent of non-Life Sciences students were able to respond correctly. In particular, non-Life Sciences students seemed to know that "cells of the immune system such as CD 4 cells are found in the blood" (item V6 in Appendix 8). This suggests that this group of students is aware of what CD4 cells are, which is a central concept to HIV infection. Non-Life Sciences students also scored highly in the question testing their knowledge of Bacteria (that is, V3 in Table 6.1).

Table 6.1 The difference in percentage of students from the two groups, who correctly responded to individual questions

Item[15]	**Question testing knowledge related to:**	**Life Sciences Students (%)**	**Non-Life Sciences Students (%)**	**Difference (%)**
V1	Virology	41	16	26
V2	Virology	50	19	31
V3	Bacteria	81	53	27
V4	Bacteria	40	35	5
V5	Circulatory system	58	38	20
V6	Circulatory system	81	67	14
V7	Immunology	46	28	18
V8	Immunology	46	32	14
V9	Immunology	31	16	15
V10	Vaccination	55	21	34
Average		53	33	20

Results show that Life Sciences students had difficulty with questions on immunology, the number of students who responded correctly to the questions in this regard was less than 50%. For example more than 50% of Life Sciences students seemed not to understand concepts of antigens, antibodies, the body's defences against invasion by microbes as well as immune deficiency diseases (Appendix 8). This suggests that even if Life Sciences students know about HIV, the biochemistry thereof (which includes how the virus invades immunity cells, how the body defends itself as well as the consequences of infection) may not be fully understood. Life Sciences students however performed well (that is, they achieved more than 50%) on questions probing the understanding of the circulatory system.

Further analysis of the data suggested that the groups' knowledge differed most in terms of item V2 and V10 (Table 6.1). Item V2 required students to know factual knowledge about the

[15] Due to the length of individual items, full items are only presented in Appendix 8.

composition of the structure of a virus, while V10 was testing knowledge of the role of vaccination in slowing microbial metabolism. Not having Life Sciences as a subject means the majority of non-Life Sciences students did not have the necessary knowledge to answer these items correctly. The average number of students who correctly answered was almost the same for both groups in item V4 (which tested knowledge of bacteria) (Table 6.1). Overall the number of Life Sciences students who passed[16] the test was 53% (159 out of 300). Non-Life Sciences students' pass rate exceeded 33% (80 out of 243) in academic HIV and AIDS knowledge items even though they were not enrolled in this knowledge field.

Looking at the overall scores, results related to the understanding of academic HIV and AIDS knowledge indicate that there was a significant difference between the mean scores of Life Sciences students (53%) and those of non-Life Sciences students (33%) (Tables 6.2 and 6.3). These results suggest that Life Sciences students generally performed better in academic HIV and AIDS knowledge (Items V1 to V10 in Appendix 8) while non-Life Sciences students did not.

Table 6.2 Representing the average scores of the two groups on academic HIV and AIDS knowledge

Background		Academic HIV and AIDS Knowledge	Functional HIV and AIDS Knowledge
Life Sciences students	Mean (%)	52.87	74.37
	N	300	300
	Std. Deviation (%)	21.006	16.191
Non-Life Sciences students	Mean (%)	32.75	65.19
	N	243	243
	Std. Deviation (%)	24.593	19.716
Total	Mean (%)	43.68	70.26
	N	543	543
	Std. Deviation (%)	24.855	18.413

Given the asymmetric distribution of the scores a Mann Whitney test for non-parametric data was performed to determine if the median scores were significantly different (Section 4.4.4; Nachar, 2008; Hart, 2001) by testing the null hypothesis (that is, H_0: the population medians are not different). Results of this analysis are presented in Table 6.3.

[16] Pass rate in this thesis refers to the number of students who scored above 50% on average for all items.

Results in Table 6.3 suggest that overall there was a significant difference between the medians of the two groups (that is, Life Sciences and non-Life Sciences students) and therefore the null hypothesis was rejected. This means there was a significant difference in the performance of the two groups with Life Sciences students performing significantly better (in terms of the median) than non-Life Sciences students. This result (Table 6.3) indicates that the test (Item V1 to V10 in Appendix 8) was able to show that academic HIV and AIDS knowledge is possibly taught only to Life Sciences students and not to non-Life Sciences students. Given that non-Life Sciences students on average failed the academic HIV and AIDS knowledge test (that is they scored less than 50%), results suggest that, if academic HIV and AIDS knowledge positively influences the understanding of functional HIV and AIDS knowledge (as hypothesised in Section 1.4), Life Sciences students would be expected to perform better than non-Life Sciences students with regard to functional HIV and AIDS knowledge.

Table 6.3 A Mann-Whitney test results comparing Life Sciences students and non-Life Sciences students in academic HIV and AIDS knowledge. Background refers to whether students enrol for Life Sciences or not. "1" denotes Life Sciences students and "2" denotes non-Life Sciences students.

Ranks				
	Background	N	Mean Rank	Sum of Ranks
Life Sciences knowledge	1	300	328.46	98538.00
	2	243	202.30	49158.00
	Total	543		

Test Statistics[a]	
Mann-Whitney U	19512.000
Wilcoxon W	49158.000
Z	-9.380
Asymp. Sig. (2-tailed)	< .001

a. Grouping Variable: Background

The researcher acknowledges that there are numerous factors that could affect students' performance in the test. While it was not possible to control for all these factors, the researcher did investigate whether differences in sample sizes was a factor. In this regard data were analysed per school to determine whether Life Sciences students would still perform significantly better even if the sample sizes were smaller and the local context different. This within school comparisons excluded schools 4 and 5 because in these schools only Life Sciences students participated in the study (Table 4.6).

Results in individual schools (Figure 6.1), largely supported the view that Life Sciences students scored higher on items testing academic HIV and AIDS knowledge than non-Life Sciences students. For instance in school 8, the mean difference for all items is more than 30%. This result mirrors that of the Mann Whitney analysis (Table 6.3) where Life Sciences students' scores were higher than those of non-Life Sciences students.

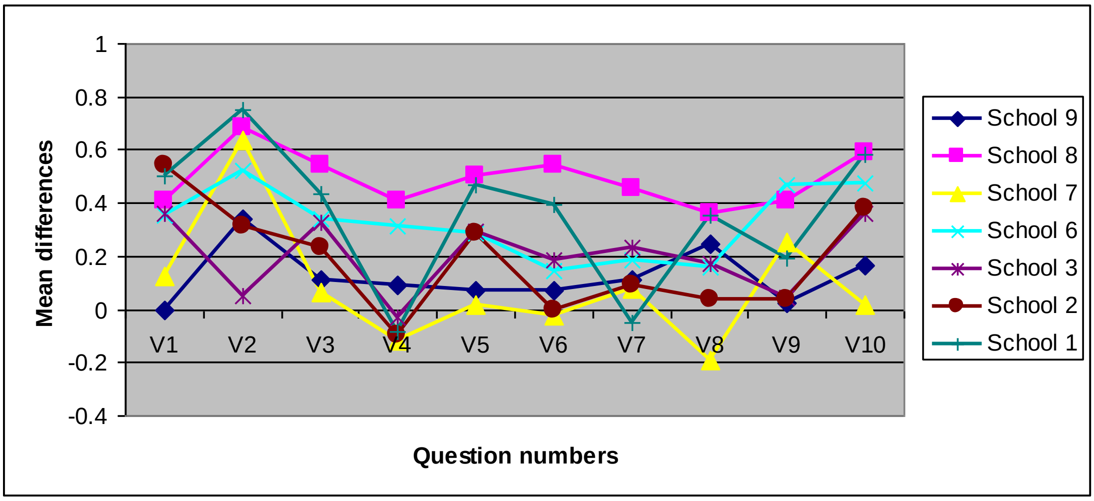

Figure 6.1 Indicating mean differences (in percentages) in scores per school for Life Sciences and non-Life Sciences students

However in some schools scores of Life Sciences students were low. For example in school 7, Life Sciences students' scores were higher (than non-Life Sciences') on items V2 and V9 but low on items V4 (which tested knowledge of HIV and AIDS related opportunistic infections), V6 (which tested knowledge of CD4 cells of the immune system) and V8 (which measured knowledge of defence mechanisms used by the human body) (see Appendix 8). A similar fluctuating trend was also observed in schools 1 and 3 (Figure 6.1). In this instance, it appears that item V4 was difficult for most Life Sciences students and easy for non-Life Sciences students (Figure 6.1). As alluded to, this item asked students to identify opportunistic infections caused by bacteria, a concept that is not only learnt in Life Sciences but also in other HIV and AIDS and sex education related areas (Table 2.1).

The above results suggest that student performance varied from one school to another. In some schools, Life Sciences students had more knowledge about academic HIV and AIDS knowledge than the non-Life Sciences students and vice versa in other schools. As a consequence, it can be argued that in some schools, having Life Sciences as a subject does not determine whether students could demonstrate academic HIV and AIDS knowledge (Items V1 to V10 in Appendix 8). It appears that other factors affect student knowledge of academic HIV and AIDS knowledge. Of particular note it appears that within schools, Life Sciences students (particularly from school 7) do not fully understand the concepts of bacteriology and immunology (items V4 and V8 in Appendix 8, respectively). Therefore one may conclude that within schools, there may be a specific reason why students struggle with certain concepts. These factors were however outside of the scope of the study and thus not investigated.

6.2.2 Students' understanding of functional HIV and AIDS knowledge

Results indicate similar trends in students' understanding of functional HIV and AIDS knowledge (V11 to V20 in Appendix 8), as with academic HIV and AIDS knowledge. Life Sciences students' average score in the functional HIV and AIDS knowledge test was 74% and 65% for non-Life Sciences. However one of the noticeable trends in the results of functional knowledge was that in six out of ten items, the difference in the score between the two groups was less than 10% (Table 6.4). In fact, non-Life Sciences students performed better in two items (V11 and V12), albeit the difference is only two per cent.

Table 6.4 The difference in percentage of students from the two groups, who correctly responded to individual questions testing functional HIV and AIDS knowledge

Item	Question	Life Sciences Students (%)	Non-Life Sciences Students (%)	Difference (%)
V11	AIDS is caused by HIV.	83	85	-2
V12	There are different strains (types) of HIV.	23	25	-2
V13	HIV cannot be transmitted through exchange of bodily fluid For example blood, between an infected person and another person.	84	84	0
V14	People with AIDS cannot be infected with HIV.	79	73	6
V15	People who have been infected with HIV do not show signs of infections immediately after infection.	86	80	6
V16	HIV disrupts the immune system leading to immune deficiency.	88	76	12
V17	People living with AIDS are highly vulnerable to many opportunistic infections that are easily cured in HIV negative people.	76	49	27
V18	There is a vaccine that can stop people from getting HIV.	67	43	24
V19	AIDS can be cured with antiretroviral drugs.	80	73	7
V20	HIV can be eliminated from the body.	76	63	13

With regard to specific content results indicate that students from both groups generally do not have knowledge of the various strains of HIV. This may suggest that while students know that a person can be re-infected (see item V14), they do not know that different strains of HIV exist. Other notable items were items V17 and V18. It appears here that a high fraction of non-Life Sciences students do not understand the concept of opportunistic infections (tested in item V17). This view is supported by the results in Table 6.1 (item V4), where students, particularly non-Life Sciences students, had did not know the concept of opportunistic infections. Another observation was that non-Life Sciences students did not know the concept of vaccination as tested in item V18. In the academic HIV and AIDS knowledge test, the concept of vaccination was also failed by 79% of non-Life Sciences students.

The issue of treating and curing HIV and AIDS emerged as one of the most difficult for students from both groups. For example results show that 73% of non-Life Sciences and 80% of Life Sciences students know that AIDS cannot be cured by antiretroviral drugs (item V19 in Table 6.4). Of the 73% non-Life Sciences though, 10% responded to item V20 by stating that HIV can be eliminated from the body. A total of 37% non-Life Sciences students and 24% Life Sciences students believe that HIV can be eliminated from the body. Furthermore 57% non-Life Sciences students stated that there is a vaccine that can stop people from becoming infected with HIV (item V18). Evidently students (mainly non-Life Sciences) have misconceptions regarding prevention of HIV infection as well treating and curing AIDS.

To determine if students' understanding of functional HIV and AIDS knowledge was statistically different the researcher performed a Mann-Whitney test through which the medians of the two samples were compared. Results here indicate that the p-value (Asymp. Sig. (2-tailed)) is less than 0.05 (Table 6.5), indicating that data distribution was not normal and the medians of these two groups of students were significantly different (Table 6.5). This means Life Sciences students have a significantly greater understanding of functional HIV and AIDS knowledge compared with non-Life Sciences students. Based on this result the researcher hypothesized that perhaps academic HIV and AIDS knowledge helps eliminate or correct misconceptions regarding HIV and AIDS. This view was tested in Section 6.2.4.

Table 6.5 Presenting students' understanding of functional HIV and AIDS knowledge

Ranks				
	Background	N	Mean Rank	Sum of Ranks
HIV and AIDS Knowledge	1.00	300	304.48	91344.00
	2.00	243	231.90	56352.00
	Total	543		

Test Statistics[a]	
Mann-Whitney U	26706.000
Wilcoxon W	56352.000
Z	-5.439
Asymp. Sig. (2-tailed)	.000

a. Grouping Variable: Background

Given students' scores of functional HIV and AIDS knowledge (Table 6.1 and 6.3), the subsequent question is whether sample size and local context is a factor for Life Sciences students performing better than non-Life Sciences students. Correspondingly data were again analysed per school.

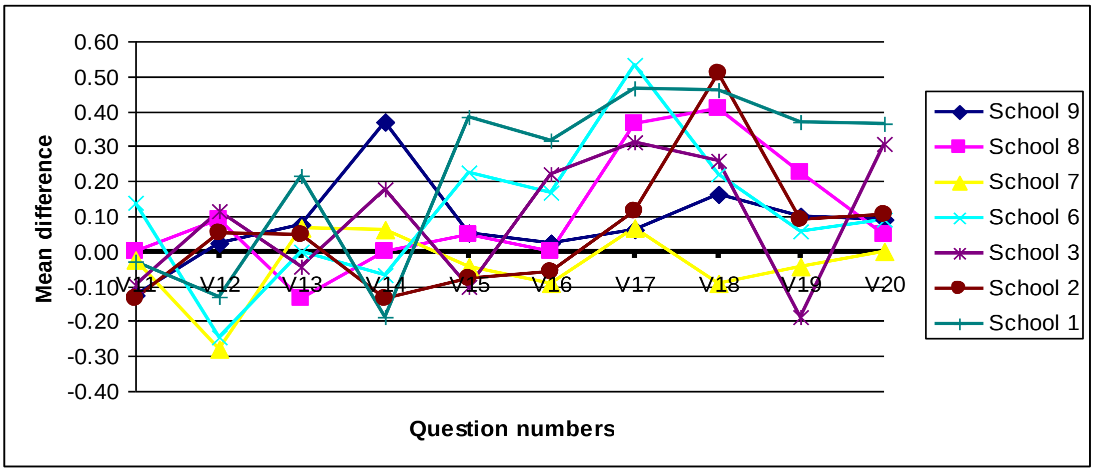

Figure 6.2 Mean differences between Life Sciences and non-Life Sciences students' scores in functional HIV and AIDS knowledge items

It emerged that school 9 was the only school where Life Sciences students' scores were higher in nine of ten items (that is, items V12 to V20 of Appendix 8) (Figure 6.2). Life Sciences students in schools 1, 6 and 7 did not get item V12 (testing knowledge of the different strains of HIV) correctly. Similarly, students from school 1 had failed item V14 (testing knowledge of multiple infections), while schools 3, 7 and 9, did not. This may also suggest that there are school-specific factors that influence students' performance. This may also explain why in school 6 Life Sciences students did not get items V12 and V14 correct.

Within the context of this study, it was not clear why non-Life Sciences students scored better in items V12 and V14. Further research is needed in this regard.

Results also indicate that Life Sciences students from seven schools (Figure 6.2) had a better understanding of concepts related to items V17 and V20 where they scored higher than non-Life Sciences students in all schools. These items measure understanding of concepts related to the effects of HIV in the body as well as curability of HIV and AIDS. Non-Life Sciences students had a better understanding of concepts related to the cause of AIDS, transmission of HIV as well as symptoms of HIV and AIDS (that is, items V11, V12, V14 and V15) than Life Sciences students.

6.2.3 Students' behavioural preferences

The researcher went on to investigate behavioural preferences of students (items V21 to V30 in Appendix 8). Here the researcher asked students to select one of two choices (Option 1 which is "agree" or Option 2 which is "disagree") which they agreed with (see Appendix 8). Thereafter the researcher plotted the frequency of students' choice in which Life Sciences students were compared with non-Life Sciences students. Results indicate that the trends between these two groups of students were generally the same (Figure 6.3).

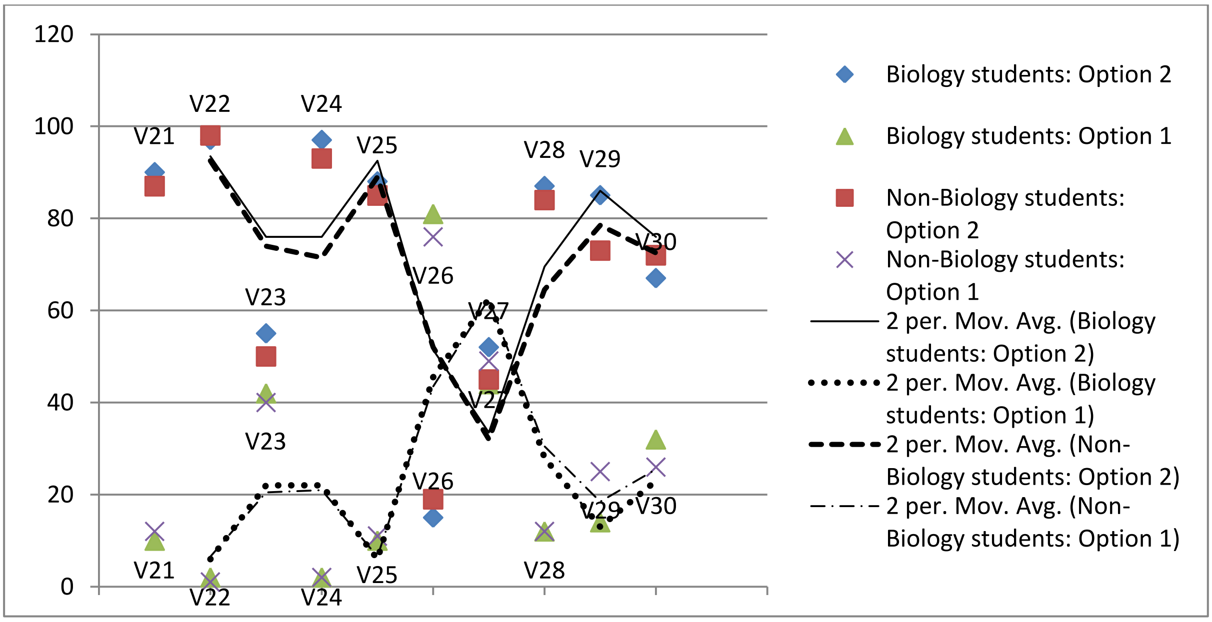

Figure 6.3 A distribution of students' responses on behavioural preferences

For example 10% of Life Sciences students chose option 1 for item V21 which was selected by 12% of non-Life Sciences students. A major difference in students' choices was only observed in item V29, where 85% and 73% of Life Sciences and non-Life Sciences students indicated that they would not have unprotected sexual intercourse respectively (the difference was 12%). Otherwise the percentage difference between students' choices was always less than 10%. These results suggest that irrespective of whether they take Life Sciences or not, students' views are similar.

The researcher performed a Mann-Whitney test to further determine whether having Life Sciences as a subject implies reporting safer behavioural preferences compared with non-Life Sciences students. Results of the Mann-Whitney test (Table 6.6) showed that Life Sciences students' reported behavioural preferences were not significantly different from those reported by non-Life Sciences students (p-value of 0.564 is greater than alpha value (0.05), therefore null hypothesis accepted). In other words reported behavioural preferences of Life Sciences students were statistically not different than for non-Life Sciences students.

Table 6.6 Mann-Whitney test comparing the behaviour of students who take Life-Sciences and students who do not take Life Sciences

Ranks				
	Life Sciences	N	Mean Rank	Sum of Ranks
Behavioural preferences	0	243	267.80	65075.00
	1	300	275.40	82621.00
	Total	543		

Test Statistics[a]	
Mann-Whitney U	35429.000
Wilcoxon W	65075.000
Z	-.577
Asymp. Sig. (2-tailed)	.564

a. Grouping Variable: Life Sciences

Given the similarities in students' reported behavioural preferences (Figure 6.3, Table 6.6), the researcher went on to determine combined students' (n = 543) attitudes, subjective norms and perceived behavioural control in relation to sexual engagement, HIV and AIDS protection/prevention strategies, acceptance (of being infected and of those infected), and, beliefs concerning personal susceptibility. With regard to attitudes (V21 to V24 in Appendix 8), results suggest that the most students (see Table 6.7 for Figures) view it as unacceptable to *have unprotected sex outside marriage*, *have multiple sexual partners* and *use unsterilized razor blades*. Of particular note regarding attitudes is that 97% of the 543 students who responded to the item believed that having multiple sexual partners was not acceptable. However students were split on the issue of using unsterilized needles. Forty one per cent of respondents suggested that it was "*okay to use sterilized needles for injections*." This result indicates that 53% of responding students do not see an HIV infection risk in using unsterilized needles.

Regarding subjective norms (V25 to V27 in Appendix 8 and Table 6.7), results indicate that according to 10% of the 543 students, *it is acceptable to have multiple sexual partners* in their communities. Furthermore 49% of the 543 students indicated that some youths do not protect themselves from HIV and AIDS. It also emerged from the data that 79% of the responding students report that most students dislike condoms. Another area that was explored was perceived behavioural control (V28 to V30 Table 6.4). Students reported that they would protect themselves from HIV infection (Table 6.7). Nevertheless it is noteworthy that 12% of the respondents indicated that they would have sexual intercourse with someone whose sexual practices (for example number of sexual partners) were unknown to them. Furthermore 19% of the respondents reported that they would have unprotected sexual intercourse.

Table 6.7 Summary of behavioural preferences of students on selected variables

Items	Agree (%)	Disagree (%)	No response (%)
V21. It is okay for unmarried people to have unprotected sexual intercourse.	10.87	88.4	0.74
V22. It is okay for people to have many sexual partners.	1.66	97.24	1.10
V23. It is okay to use sterilized needles for injections.	41.44	52.85	5.71
V24. It is okay to share one razor blade without sterilizing it before use.	2.21	95.40	2.39
V25. In my community it is okay for people to have multiple sexual partners.	10.31	86.56	3.13
V26. Most students dislike condoms.	78.82	16.57	4.60
V27. Young people in my community protect themselves from HIV infection.	46.41	49.17	4.42
V28. I would have sexual intercourse with someone whose sexual activities I do not really know.	12.15	85.45	2.39
V29. I would have unprotected sexual intercourse, For example without a condom with my boy/girlfriend.	18.97	79.56	1.47
V30. I am at risk of getting HIV.	29.47	69.06	1.47

The "within" school data revealed that there were school-specific factors that could affect behavioural preferences. This is because there were school-specific trends that emerged regarding students' attitudes, subjective norm and perceived behavioural control (Tables 6.8 and 6.9).

With regard to attitudes (items V21 to V24 in Tables 6.8 and 6.9), the results showed that students' views were sometimes school-specific and at times group-specific. For example when asked about unprotected sex outside marriage (item V21 Appendix 8), 19% Life Sciences students and 27% non-Life Sciences students in school 7, indicated that it was ok to have unprotected sex outside marriage. This was the highest observed proportion with this view in all the schools. Similarly, in school 1 and 3, a majority of non-Life Sciences students (69% and 58% respectively) recognise the danger of sharing unsterilized needles. In the other schools, the majority of students (non-Life Sciences) did not recognize this danger. Meanwhile the proportion is different for Life Sciences students, where Life Sciences students (68% in school 1 and 41% in school 3) recognized the danger of unsterilized needles. Evidently the proportions in school 1 indicate that most of their students held a similar view, whereas in school 3, there were differing views between the Life Sciences and non-Life Sciences students.

Table 6.8 Proportion of Life Sciences students who disagree with statements given in V21 to V30 of Appendix 8

Items[17]	**School 1**	**School 2**	**School 3**	**School 4**	**School 5**	**School 6**	**School 7**	**School 8**	**School 9**
V21	100	88	96	90	96	97	81	95	81
V22	96	100	100	95	100	97	105	100	100
V23	68	46	41	81	69	59	24	62	22
V24	100	100	96	95	100	100	105	100	100
V25	100	100	81	83	88	97	90	95	86
V26	12	19	11	16	16	10	33	14	11
V27	72	62	37	50	57	45	62	38	58
V28	96	96	78	83	80	100	95	95	89
V29	92	88	81	76	88	100	86	100	83
V30	60	54	74	57	65	97	90	90	53

Regarding subjective norms (items V25 to V27 in Tables 6.8 and 6.9), data analysis showed that students across all schools, both Life Sciences and non-Life Sciences indicated that young people generally do not like condoms. In this regard school 7 reported the highest

[17] Due to the length of individual items, full items are only presented in Appendix 8.

percentage of dislike of condoms (that is, 77% among Life Sciences students and 53% among non-Life Sciences students). Related to condoms, the majority of Life Sciences students from school 3, 6 and non-Life Sciences students from schools 1, 2, 5, 7 and 9, indicated that most young people do not protect themselves from HIV infection. Notably students from school 8 were the only group where both Life Sciences (68%) and non-Life Sciences (53%) students believed that young people did protect themselves from HIV infection.

Data also showed varying views regarding perceived behavioural control (items V28 to V30 in Tables 6.8 and 6.9). In this regard the majority of students in all the schools suggested that they would not have unprotected sex with strangers. Furthermore Life Sciences students generally said they would not have unprotected sex with their boy/girlfriends. While the majority of non-Life Sciences students said the same, 37% and 38% in schools 1 and 8 respectively, indicated that they would have unprotected sex with their boy/girlfriends. Another noteworthy observation was that a majority of students across all schools said they were not at risk of HIV infection.

Table 6.9 Proportion of non-Life Sciences students who disagree with statement in V21 to V30 of Appendix 8

Items[18]	**School 1**	**School 2**	**School 3**	**School 6**	**School 7**	**School 8**	**School 9**
V21	89	83	83	91	73	100	92
V22	97	94	100	100	100	100	100
V23	69	39	58	46	27	36	27
V24	92	92	92	97	100	91	100
V25	76	94	85	86	87	100	88
V26	14	25	8	17	47	9	31
V27	49	33	50	51	40	45	38
V28	80	81	94	80	100	73	85
V29	63	69	81	83	87	91	62
V30	65	75	77	74	73	91	69

Two observations can be made from the above report. Firstly, there were schools that seemed to have the highest unsafe behavioural preferences. For example school 7 reported the highest number of students who did not see a problem with unprotected sex outside marriage, a high dislike of condoms and high number of young people who did not protect themselves from

[18] Due to the length of individual items, full items are only presented in Appendix 8.

HIV infection. On the contrary, school 1, reported the safest behavioural preferences except for the dislike of condoms. This suggests that there were school-specific factors that affected behavioural preferences of students. Data however did not show much distinction between behavioural preferences of Life Sciences and non-Life Sciences students.

6.2.4 Does knowledge correlate with behaviour?

At the core of the study is the question whether students' understanding of academic HIV and AIDS knowledge and functional HIV and AIDS knowledge related to infection and treatment (as conveyed in the Life Sciences curriculum) correlate with the behavioural preferences of students. Having determined students' understanding of academic HIV and AIDS knowledge (Section 6.2.1), functional HIV and AIDS knowledge (Section 6.2.2) and their behavioural preferences (Section 6.2.3), the researcher investigated the correlation between academic HIV and AIDS knowledge and functional HIV and AIDS knowledge as well as behavioural preferences.

Table 6.10 Spearman's correlations between academic HIV and AIDS knowledge, functional HIV and AIDS knowledge and behavioural preferences for Life Sciences students (N = 300)

		Academic HIV and AIDS knowledge	Functional HIV and AIDS Knowledge	Behavioural preferences
Academic HIV and AIDS knowledge	Correlation Coefficient	1.000		
	Sig. (2-tailed)	.000		
	N	300		
Functional HIV and AIDS Knowledge	Correlation Coefficient	.481**	1.000	
	Sig. (2-tailed)	.000	.	
	N	300	300	
Behavioural preferences	Correlation Coefficient	.140*	.104	1.000
	Sig. (2-tailed)	.016	.073	.
	N	300	300	300

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

To start with, within group correlations (Life Sciences students' data only) were calculated. For Life Sciences students (n = 300), results suggested that there is a significant correlation (at 0.01 level of significance) between academic HIV and AIDS knowledge of students and their functional HIV and AIDS knowledge (Table 6.10). Furthermore it was found that academic HIV and AIDS knowledge correlates significantly with behavioural preferences at the 0.05 level of significance. Functional HIV and AIDS knowledge however did not correlate significantly with behavioural preferences. Results in Table 6.10 imply that those students who do well in academic HIV and AIDS knowledge will most likely display a better knowledge of functional HIV and AIDS knowledge.

For non-Life Sciences students (n = 243) no significant correlation was found between academic HIV and AIDS knowledge and reported behavioural preferences (Table 6.11). However it was found that academic HIV and AIDS knowledge correlates significantly with functional HIV and AIDS knowledge at the 0.01 level of significance. Further analysis of the data showed a significant correlation between functional HIV and AIDS knowledge and reported safe behavioural preferences (Table 6.11).

Table 6.11 Spearman's correlations between academic HIV and AIDS knowledge, functional HIV and AIDS knowledge and behavioural preferences for non-Life Sciences students (N = 243)

		Academic HIV and AIDS knowledge	Functional HIV and AIDS knowledge	Behavioural preferences
Academic HIV and AIDS knowledge	Correlation Coefficient	1.000		
	Sig. (2-tailed)	.		
	N	243		
Functional HIV and AIDS knowledge	Correlation Coefficient	.534**	1.000	
	Sig. (2-tailed)	.000	.	
	N	243	243	
Behavioural preferences	Correlation Coefficient	.095	.214**	1.000
	Sig. (2-tailed)	.142	.001	.
	N	243	243	243

**. Correlation is significant at the 0.01 level (2-tailed).

The results suggested that for non-Life Sciences students, knowledge of academic HIV and AIDS knowledge alone will not translate to safe behaviours. Furthermore academic HIV and AIDS knowledge improves understanding of functional HIV and AIDS knowledge, which in turn translates to reports of safer behavioural practices. While noting the significance between correlations presented in Tables 6.10 and 6.11, the researcher sought a clearer understanding of the trends. This is because the apparent significance of correlations between the different variables may be due to the large sample sizes (that is 300 and 243). An analysis of the data by schools was therefore made (Table 6.12).

Table 6.12 indicates that for seven of the nine participating schools, academic HIV and AIDS knowledge of students correlated significantly with their functional HIV and AIDS knowledge. However correlations of knowledge (both Life Sciences and HIV and AIDS) and behavioural preferences were not significant except for school 7, where a negative correlation (significant at 0.05 level) was observed.

A negative (but insignificant) correlation was also observed between academic HIV and AIDS knowledge and behavioural preferences for schools 2, 3 and 4. There was no significant correlation for functional HIV and AIDS knowledge and behavioural preferences in any of the participating schools. The results reported here suggest that in smaller samples, having academic HIV and AIDS knowledge does not translate to reportedly safer behavioural preferences, even though it does mean a better understanding of functional HIV and AIDS knowledge. In other words, it can be deduced that reported behavioural preferences may be influenced by factors other than knowledge.

Table 6.12 A summary of the correlations between Life Sciences, functional HIV and AIDS knowledge and behavioural preferences in schools

		Spearman's Correlation with Behavioural Preferences		Spearman's Correlation between
School	**Sample Size**	**Academic HIV and AIDS knowledge**	**Functional HIV and AIDS knowledge**	**Life Sciences and HIV and AIDS Knowledge**
1	96	0.136	0.166	0.493**
2	62	-0.008	0.165	0.303*
3	76	-0.076	0.028	0.307**
4	59	-0.034	0.152	0.119
5	52	0.014	0.057	0.357**
6	65	0.086	0.098	0.496**
7	37	-0.333*	-0.143	0.078
8	33	0.107	-0.100	0.348*
9	63	0.139	-0.124	0.451**

**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).

6.3 Making sense of the results: reflecting on literature

The researcher made two observations on reflecting on literature with the results presented in this chapter. Firstly there are results that echo existing literature in HIV and AIDS education albeit there are some contradictions. Secondly some results provide a new insight into HIV and AIDS education. With regard to findings that support the literature, the researcher argues that scientific knowledge (such as academic HIV and AIDS knowledge taught in Life Sciences) improves students' understanding of HIV and AIDS. What is not apparent in the literature is whether scientific knowledge could also promote safe behavioural patterns. The literature (Ajzen, 1991) however indicates that knowledge is generally not related to behaviour. However the literature does not indicate why knowledge, particularly HIV and AIDS knowledge, tends to have no effect on behaviour. Consequently as a contribution to HIV and AIDS education, the researcher posits that higher understanding of scientific HIV and AIDS knowledge does not translate to safe behavioural preferences among Life Sciences students. The researcher in this regard argues that the hidden curriculum as well as the nature of knowledge (e.g. scholar academic knowledge), which is based on curriculum ideologies, could prevent knowledge from affecting behaviour. These findings are discussed in detail below.

6.3.1 Results that echo existing literature in HIV and AIDS education

Findings that support existing literature indicate that scientific knowledge is important for students to better understand HIV and AIDS. As the results show, this is because *i)* prior knowledge plays a significant role in students' ability to answer questions related to HIV and AIDS concepts, *ii)* students who have a scientific understanding of HIV and AIDS report fewer misconceptions about the subject, and *iii)* academic HIV and AIDS knowledge is related to functional HIV and AIDS knowledge. These results are discussed below.

6.3.1.1 Prior knowledge plays a role when students answer questions

Keselman *et al.*, (2004) suggest that some prerequisite knowledge of biology is required for students to understand the scientific properties of HIV and AIDS. This argument is in a constructivism perspective in which students construct new knowledge by relying on prior knowledge. Starr *et al.* (2009), Dimmock *et al.* (2007) and Audesirk *et al.* (2004) indicate that knowledge of virology (including viruses and HIV and AIDS), bacteriology (including bacteria and TB), immunology (including immunity and vaccination) as well as the circulatory system is the basis on which HIV and AIDS knowledge can be built. Results of the study supported this view as Life Sciences students generally performed better than non-Life Sciences students in academic HIV and AIDS knowledge. This is because Life Sciences students learn knowledge of virology, bacteriology, immunology and the circulatory system in Life Sciences and therefore may use this knowledge to answer questions related to academic HIV and AIDS knowledge. However because non-Life Sciences students (do not learn Life Sciences where this knowledge is taught) do not have this prior knowledge, the majority were not able to answer relevant questions.

While the above is important to note, it is also noteworthy that the score of Life Sciences students was not very high (the Life Sciences students' average score was 53%). According to Forehand (2005), Mayer (2002) and Anderson *et al.* (2001), answering questions does not solely depend on availability of knowledge. Instead there is an array of skills that students need in order to successfully answer questions. These skills include the ability to interpret questions as well as recalling and transferring information from their cognitive structures. Consequently students can still fail to correctly answer questions even if they have the necessary knowledge. This phenomenon was also observed in that the average failure rate for Life Sciences students questions related to academic HIV and AIDS knowledge was 47% even though this knowledge is taught in Life Sciences.

The idea that knowledge alone does not lead to successful answering of questions was also observed where non-Life Sciences students performed better than Life Sciences students in some aspects of academic HIV and AIDS knowledge. For example non-Life Sciences students performed better than Life Sciences students in questions testing knowledge of opportunistic infection related to HIV and AIDS. While reasons for this trend were not investigated, based on available evidence, the researcher believes that in some cases, students can successfully answer questions even though they do not have supporting knowledge.

6.3.1.2 Academic HIV and AIDS knowledge reduces misconceptions about HIV and AIDS

Scholars suggest that scientific knowledge (i.e. academic HIV and AIDS knowledge) can be used to redress misconceptions through a constructivist form of learning (Young & Collin, 2004; Baumgartner, 2001; Taylor–Powell, 1998; Thompson, 1995; Mezirow, 1991). The argument here is that students can use their conceptual knowledge of HIV and AIDS to rectify misconceptions and myths about HIV and AIDS.

In the study the researcher observed that there was a higher proportion of non-Life Sciences students who reported on what appeared to be misconceptions compared with Life Sciences students in functional HIV and AIDS knowledge. (The researcher acknowledges that misconceptions were not directly investigated, even though they emerged serendipitously). As stated earlier these misconceptions were related to prevention, treatment and curability of HIV and AIDS. The researcher therefore believes that Life Sciences students' understanding of academic HIV and AIDS knowledge helped them to obtain a better understanding of prevention, treatment and curability of HIV and AIDS and hence the observed correlation. This is in line with Keselman *et al*. (2007) who indicate that having a scientific understanding of a phenomenon reduces misconceptions concerning that phenomenon.

6.3.1.3 Academic HIV and AIDS knowledge is related to functional HIV and AIDS knowledge

Results indicated that for both Life Sciences and non-Life Sciences students, there was a significant correlation between academic and functional HIV and AIDS knowledge. The study however did not show whether this relationship was causal or not. Nevertheless it is important to note that academic HIV and AIDS knowledge correlates with knowledge of functional HIV and AIDS knowledge (Askew *et al*., 2004; Bhuiya *et al*., 2004; Diop *et al*., 2004; Mathur *et al*., 2004; Frontiers in Reproductive Health, 2001). From this perspective the researcher believes that having academic HIV and AIDS knowledge may have improved students knowledge of functional HIV and AIDS knowledge. This view is also based on the fact that Life Sciences students had a better knowledge of both academic and functional HIV and AIDS knowledge than non-Life Sciences students. If non-Life Sciences students had a better knowledge of functional HIV and AIDS knowledge than Life Sciences students, then it would be plausible that the apparent correlation between academic and functional HIV and AIDS knowledge is only accidental. However under the current circumstances, the researcher has shown that there is a significant relationship between these two forms of knowledge, where higher academic HIV and AIDS knowledge significantly correlates with higher understanding of functional HIV and AIDS knowledge.

The data however suggest that there may be other factors that affect the relationship between academic and functional HIV and AIDS knowledge. For instance in some schools (schools 4 and 7, the combined total number of students in these schools was 72), the researcher did not find a correlation between the above two forms of knowledge. This observation indicates that even though there is generally a correlation between academic HIV and AIDS knowledge and functional HIV and AIDS knowledge, such a correlation may be dependent on other context-specific factors. In the case of the schools referred to above, these factors may not have been in play in other schools.

6.3.2 New insights for HIV and AIDS education

As stated earlier, findings in the study indicate that academic and functional HIV and AIDS knowledge do not correlate with behavioural preferences of students. In this regard the study showed that apparently the hidden curriculum has a greater impact on students' behaviours than the formal Life Sciences curriculum. This view is in line with other scholars' observations (e.g. Askew *et al.*, 2004; Bhuiya *et al.*, 2004). However what emerged as new insight in the study is that knowledge prescribed in the formal Life Sciences curriculum does not correlate with students' behaviours preferences probably because students have difficulty relating knowledge taught in Grade 11 Life Sciences to real life, particularly because such knowledge is presumably taught from a scholar academic perspective (see Chapter 5). Evidence of this claim is that students *i)* do not understand some HIV and AIDS concepts taught in Life Sciences, *ii)* seem to rely on other alternative means to respond to questions for which they do not have the necessary content knowledge, and, *iii)* do not take ownership of social problems but instead shift the blame to other members of society. The researcher argues that if students had a knowledge of HIV and AIDS concepts, which is taught from a social reconstruction ideology, they would have probably used such knowledge to confront social ills, such as unsafe behaviour, thereby leading to behaviour transformation. This argument is in line with researchers who promote transformative citizenship education and critical pedagogy (Waghid, 2005; Waghid, 2002; Baumgartner, 2001; Christopher *et al.*, 2001). The researcher engages each of the above points in detail below.

6.3.2.1 HIV and AIDS knowledge does not influence behavioural preferences of students

Some researchers (e.g. Lesley, 2007; Magnani *et al.*, 2005; Pakaslahti, 2000; Crick & Dodge, 1994) argue that there is a significant link between content knowledge and certain forms of behaviour. However in the study, findings show that there is no significant correlation between knowledge and behavioural preferences. Data for Life Sciences students showed that academic HIV and AIDS knowledge correlates significantly with safe behavioural preferences, however functional HIV and AIDS knowledge does not. For non-Life Sciences students an opposite observation was made. Furthermore within schools findings indicate that there is no correlation between both academic and functional HIV and AIDS knowledge and behavioural preferences of students. These results suggest that generally HIV and AIDS knowledge has an insignificant impact on students' behaviour.

To further illustrate that unsafe behavioural preferences exists even in the presence of scientific knowledge of HIV and AIDS, findings indicate that 12% (157 of 543) of the students indicated that they would have sexual intercourse with someone whose sexual activities they did not know. Nineteen per cent (103 of 543) further indicated that they would have unprotected sexual intercourse. These statistics show that some students, even when they had knowledge, remained at risk of contracting HIV.

The researcher therefore believes that the hidden curriculum is largely responsible for students' behaviours. To this end the researcher notes that the behavioural preferences of both groups of students were similar even though their levels of HIV and AIDS knowledge were different. This suggests that there is a factor that is shared among most students, which is responsible for making their behavioural preferences similar, irrespective of the differences in their knowledge background. According to researchers (Kentli, 2009; Lempp & Seale, 2004; Margolis, 2001), because of context specificity, the hidden curriculum can be shared between schools, but is shared mostly within schools. Consequently results show that the correlation between students' behavioural preferences and their academic and functional HIV and AIDS knowledge within schools is far less than that observed between schools. In this regard the researcher observed that even though behavioural preferences of all students are similar, there are some significant differences within schools. For example results showed that school 7 has the riskiest behaviours while school 1 has the safest behavioural preferences among Life Sciences students. This indicates that there may be context-specific local factors that are influencing students' behavioural preferences. Though these factors were not identified individually, they can be collectively referred to as the hidden curriculum (Kentli, 2009; Margolis, 2001; Jackson, 1968), which excludes the formal Life Sciences curriculum and relevant knowledge.

Using findings of Chapter 5 the researcher argues that the format of the Life Sciences curriculum may be the main reason why HIV and AIDS knowledge does not correlate with students' behavioural preferences. As argued in Chapter 5, Life Sciences students seem not to be taught to construct scientific understanding of HIV and AIDS that can be used to respond to novel real-life situations. Furthermore students are not taught sufficient knowledge that would allow them to understand and take ownership of social problems related to HIV and AIDS. These views are discussed further below.

a) Students do not know some critical HIV and AIDS related concepts

Results showed that almost 50% of the Life Sciences students scored less than 50% in the test on academic HIV and AIDS knowledge. Furthermore there were indications that students do not fully understand some HIV and AIDS related concepts. An important observation in this regard is that for Life Sciences students, the area of great concern is immunology. (Immunology is regarded by Starr *et al.* (2009), Dimmock *et al.* (2007) and Audesirk *et al.* (2004) as important for understanding HIV and AIDS). In this regard Life Sciences students do not fully know *i)* which component of the immune system is responsible for recognizing antigens and triggering the immune system, *ii)* the body's defence mechanism against invasion by microbes, and, *iii)* the relationship between the immune system and immune deficiency diseases.

With regard to functional HIV and AIDS knowledge results show that some students in both groups do not have knowledge related to the different strains of HIV. Some students think there is only one type of HIV. Some of the non-Life Sciences students do not know that having AIDS increases one's vulnerability to many opportunistic infections. The same group of students also thought people can be vaccinated so that they do not get infected with HIV.

It is important to note that the concepts that were not fully known by students, were also identified by the researcher as receiving least attention in the Grade 11 Life Sciences textbooks (Ayerst *et al.,* 2008; Clitheroe *et al.,* 2008) (see Chapter 5). Therefore the researcher believes that the curriculum is partly responsible for students not having a full understanding of HIV and AIDS. The researcher also believes that if students do not have sufficient knowledge of HIV and AIDS, their ability to use knowledge to decide on behavioural preferences will be lowered. As stated by Christopher *et al*. (2001) and Kegan (2000), in order to transform students' behaviours, knowledge should provide students with new perspectives about their lives as it provides new alternatives. Baumgartner (2001) also supports this view in that concept understanding may lead to a situation in which students feel a need to change their perspectives based on the new knowledge. Consequently if students do not have knowledge, then their perspectives will not be changed. The researcher therefore argues that students' lack of concept knowledge is responsible for knowledge's failure to correlate with behavioural preferences.

b) Students rely on alternative means to respond to HIV and AIDS problems when they do not have the necessary knowledge

The researcher also believes that responses to questions and students' behaviours related to HIV and AIDS are not necessarily based on the availability of concept knowledge taught in Grade 11 Life Sciences. Instead skills required to answer questions can be learnt from the hidden curriculum (MacDonald, 1971). For example in Section 6.2.1 results indicate that 33% of non-Life Sciences students passed the academic HIV and AIDS knowledge test which tested knowledge that is taught formally only in Life Sciences. The researcher argues that these students used their "creative impulses" to correctly guess answers. This phenomenon has been reported by Martin (1976) who argues that "students do not learn to read, they do not learn math or science or any of the other subjects and skills endorsed by all parties to the educational enterprise; what they do learn is to be docile and obedient, to value competition over cooperation and to stifle their creative impulses." Consequently if students lack concept knowledge, they develop intrinsic skills that will be used to respond to questions in order to ensure that they pass a test. Similarly if students do not have transformative education (such as is the case in Life Sciences), they learn survival skills, norms, values and belief systems from the hidden curriculum, which will define their behavioural preferences.

c) Students think that society (and not themselves) is at risk of HIV infection

The researcher believes that in order to transform behaviours the Life Sciences curriculum should help students to become critical thinkers who will take ownership and responsibility for their behaviour and their contribution to society. This can be achieved if the curriculum is aligned with social challenges by teaching actionable knowledge which is context-specific. In Chapter 5, the researcher argued that the Life Sciences curriculum does not meet these requirements. As a result findings in the study show that students do not view themselves as part of the greater social HIV and AIDS challenge. In this regard data showed that students (both Life Sciences and non-Life Sciences) generally report safe behavioural preferences. However results show that students' perception of their communities and fellow students was negative. For example some students reported that other youth did not like condoms and did not protect themselves from HIV infection. This observation suggests that students think their societies, including fellow students, were at higher risk of infection than themselves. This view is also supported by the fact that the majority of students do not think they are at risk of contracting HIV. However 12% (65 of 543) of the students admitted to being at risk of contracting HIV. Twenty nine per cent (157 of 543) indicated that they would have sexual intercourse with someone whose sexual activities they did not know. Nineteen per cent (103 of 543) further indicated that they would have unprotected sexual intercourse with their boyfriend or girlfriend. These statistics show that some students remain at risk of contracting HIV even though some of them do not see themselves as part of the greater social HIV and AIDS problem.

The researcher therefore believes that the Life Sciences curriculum's failure to integrate social issues with knowledge is the main reason why students blame others for the spread of HIV and AIDS. This is in line with Zuga's (1992) observation that if socialization is not explicitly incorporated in a curriculum, students will have difficulty viewing themselves and what happens in the classroom as part of the greater society. Consequently students in the study had difficulty in relating themselves and knowledge taught in Life Sciences to everyday life

6.4 Conclusion

The researcher concludes that the Life Sciences curriculum is significant for improving students' ability to answer HIV and AIDS related questions and correct misconceptions related to functional HIV and AIDS knowledge. However the Life Sciences curriculum does not lead to behaviour transformation. This is most likely because students are not taught knowledge and skills that are required for behaviour transformation. Instead students are left to rely on an alternative hidden curriculum means to respond to HIV and AIDS questions. The hidden curriculum also helps students to develop students' belief systems that frame their behavioural preferences.

With the findings in Chapter 5 and the current chapter, the researcher believes that curricula can be manipulated so that they have a greater influence on students' everyday lives in relation to HIV and AIDS. In the following chapter, the researcher provides a succinct discussion on key findings and their implications for curriculum design in Life Sciences and HIV and AIDS education as well as recommendations for further research. In this regard the researcher will reflect on the research questions asked at the beginning of the study.

7. CHAPTER 7: IMPLICATIONS OF THE STUDY FINDINGS: AN EPILOGUE

"AIDS is the biggest challenge, the major disaster facing this country and we would have wished for something more specific and far-reaching" Mangosuthu Buthelezi[19]

7.1 Introduction

In this chapter the researcher responds to Dr Mangosuthu Buthelezi's request for something more specific and far-reaching as far as HIV and AIDS education for behaviour transformation is concerned. As stated in Chapter 3 the researcher undertook the study with a view to explore some of the strategies used to fight the spread of HIV and AIDS. In particular the researcher wanted to explore the role of formal education in behaviour transformation, on the understanding that behaviour transformation is an important key to minimize the spread of HIV and AIDS in South Africa. In the process the researcher asked, "how can the curriculum-behaviour transformation relationship be understood when comparing Life Sciences students with non-Life Sciences students on HIV and AIDS knowledge and behavioural preferences?" A response to this question was embedded in responses to three subquestions explored in Chapters 5 and 6.

In this chapter the researcher reflects on the research question and subquestions in order to articulate the knowledge contribution of the study. To this end, it is important to first reflect on Chapters 2 and 3 (Figure 7.1) in order to put forward what is already known in the literature in relation to the research subquestions. In Chapter 2 the researcher pointed out that curricula have objectives. These curriculum objectives may include addressing factors that perpetuate the spread of HIV and AIDS, for example risk behaviour, gender imbalances, stigma and discrimination, sexuality and human rights (Figure 7.1). However to attain these objectives, curricula are limited by issues related to curriculum theory, curriculum rationale, content knowledge and the curriculum ideology (Figure 7.1).

[19] http://www.brainyquote.com

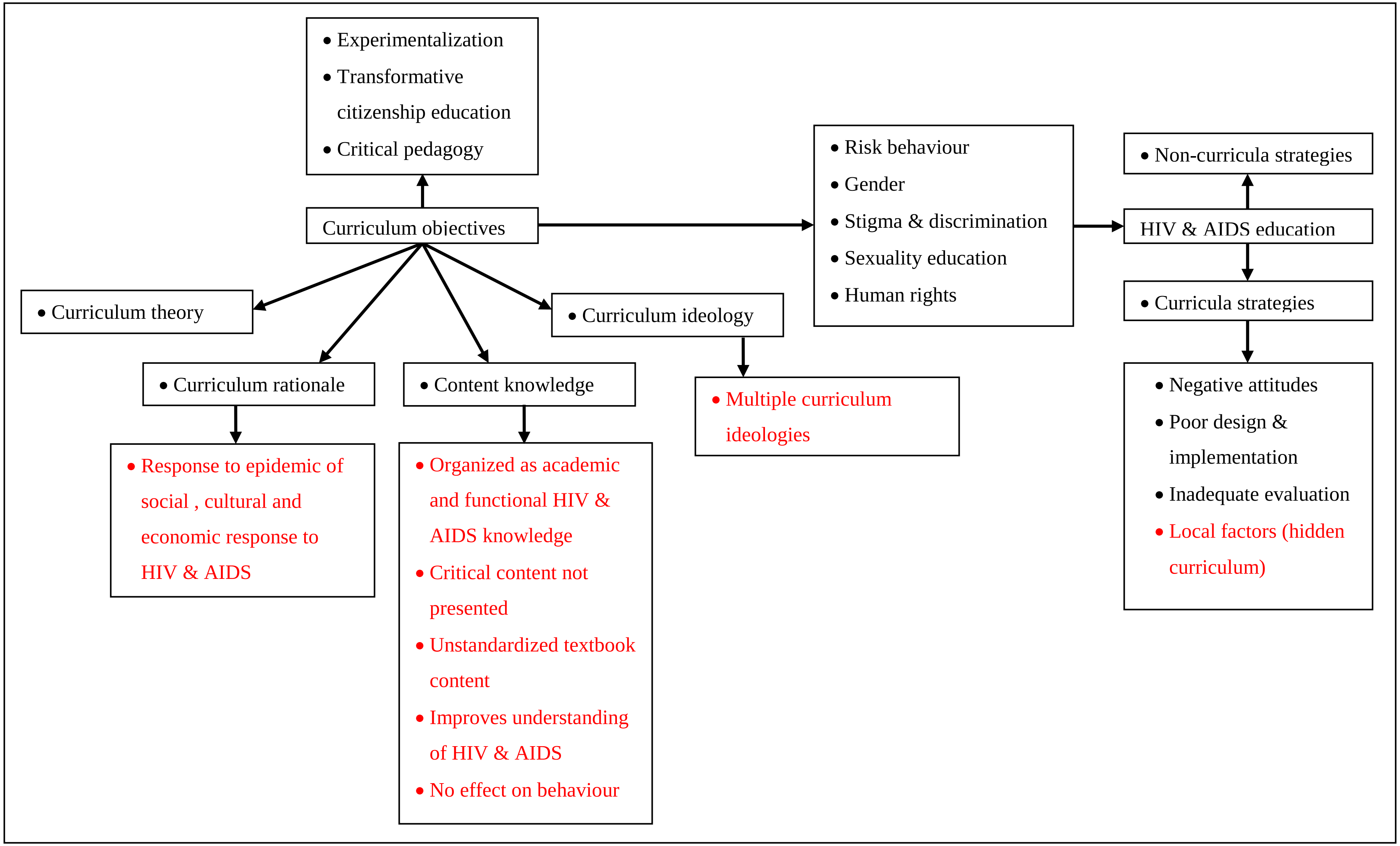

Figure 7.1 A summary of knowledge available in literature and discussed in Chapters 2 and 3 (in black). Knowledge generated in the study is presented in red. This new knowledge is in relation to Grade 11 Life Sciences curriculum investigated in the study.

To ensure that curricula are able to meet their intended objectives, especially if the objectives relate to socialization, the curriculum must follow transformative citizenship education and/or critical pedagogy (Figure 7.1). In Chapter 3 the researcher indicated that HIV and AIDS education can either be integrated into a formal curriculum or non-curricula strategies can be used (Figure 7.1). With respect to curriculum-based strategies, the literature reports that there are factors that hinder the achievement of intended outcomes. These factors include negative attitudes toward HIV and AIDS education, poorly designed and implemented programmes, as well as inadequate evaluation of HIV and AIDS programmes (Figure 7.1) as well as other non-curriculum factors that have been found to affect the spread of HIV and AIDS.

The researcher found in the study that the Life Sciences curriculum (which is meant to include HIV and AIDS content) does not have a strong relationship with behaviour transformation. This is mainly because the Life Sciences curriculum statement and textbooks do not have clear objectives that relate to HIV and AIDS and behaviour framed by a suitable curriculum ideology. Based on findings behaviour transformation is not considered in the Grade 11 Life Sciences. Further research is needed in order to better understand the primary challenges of Life Sciences in relation to behaviour transformation related to HIV and AIDS. The researcher also makes recommendations for curriculum design in relation to HIV and AIDS education.

7.2 Revisiting the research subquestions with the major findings

The main findings of the study are organized according to the three research subquestions. Each finding and its implications are discussed in detail in the following subsections.

7.2.1 Addressing HIV and AIDS for behaviour transformation in the Life Sciences curriculum: research subquestion 1

The first research subquestion asked: “How does the Life Sciences curriculum address HIV and AIDS for safe behavioural preferences among students?” In the current chapter the researcher organized findings of the study in response to this question into three categories, namely the principal reason for integration of HIV and AIDS education in Life Sciences, the structure of the Life Sciences curriculum and the content of Life Sciences in relation to HIV and AIDS. These are discussed below.

7.2.1.1 The principal reason for incorporating HIV and AIDS education into Life Sciences

The researcher argued in Section 5.3.2 that the inclusion of HIV and AIDS content into the Life Sciences curriculum is a response to the epidemic of social, cultural and economic response to HIV and AIDS (Figure 7.1). In Chapter 3 the researcher pointed out that researchers indicate that HIV and AIDS education can be based on at least three foundations, namely the epidemic of HIV infection, the epidemic of AIDS, and the epidemic of social, cultural and economic response (Stein, 2003). HIV and AIDS education is then designed and administered in accordance with factors that are responsible for the targeted epidemic (Parker & Aggleton, 2003). For example if HIV and AIDS education is aimed at behaviour transformation, then the major goal is that the epidemic of HIV infection must be addressed. As also stated in Chapter 3 the epidemic of HIV infection is a scenario in which individuals become infected with HIV (Stein, 2003). Reasons for such infection may include risk behaviour (Stein, 2003). Consequently people are provided with the knowledge and skills that are necessary to transform their behaviour.

Findings of the study however point out that the Life Sciences curriculum does not spell out the necessary life skills and actionable knowledge that are required for behaviour transformation. As discussed in Chapter 3 other scholars suggest that for behaviour transformation to occur, factors that are responsible for risk behaviour, such as stigma and discrimination must be addressed (Kirby *et al*., 2007; Donovan & Ross, 2000). However the study has shown that these factors are not spelled out in the Life Sciences curriculum statement. Furthermore researchers (Francis, 2010; Kirby *et al*., 2007; Donovan & Ross, 2000) point out that behaviour transformation is only likely to occur when students are taught about the biology of HIV related to its transmission from one person to another. However the study shows that HIV transmission is one of the concepts that receive the least attention in Life Sciences. Overall the study found no evidence to indicate that Life Sciences addresses the epidemic of HIV infection.

Findings of the study also imply that Life Sciences is not concerned with the epidemic of AIDS. As indicated in Chapter 3 the epidemic of AIDS is when the adverse effects of HIV become visible (Stein, 2003). This is when infected people become ill from various opportunistic infections and some die. To address this epidemic researchers argue that people must be taught about treatment mechanisms that can be employed to counteract or reduce the effects of HIV in their bodies (Francis, 2010). The study however found virtually no attempt to provide information on opportunistic infections, multiple HIV infections, antiretroviral drugs as well as other mechanisms related to treatment of AIDS in the Life Sciences textbooks. Therefore the researcher concludes that Life Sciences does not seem to be driven by the epidemic of AIDS.

The third area that was explored was the epidemic of social, cultural and economic response. As indicated in Chapter 3, Parker and Aggleton (2003) define this epidemic as the explosion of HIV and AIDS awareness programmes, research and production of treatment drugs, research on curability of AIDS and factors leading to HIV infection and AIDS. Based on this definition the researcher believes that the inclusion of HIV and AIDS content in Life Sciences is another human response to HIV and AIDS which seeks to provide students with knowledge that could be used to minimize the spread and effects of HIV and AIDS (Figure 7.1). Scholars however indicate that this epidemic is influenced primarily by social contexts and culture (Luginaah *et al*., 2005; Tobias, 2001). Therefore the researcher maintains that the inclusion of HIV and AIDS knowledge in Life Sciences is an example of the epidemic of social, cultural and economic response to HIV and AIDS (Figure 7.1).

To further understand how Life Sciences addresses HIV and AIDS for behaviour transformation among students, the researcher analysed the Life Sciences curriculum statement regarding its structure.

7.2.1.2 The structure of the Life Sciences curriculum

Findings in the study showed that there is no single apparent curriculum ideology for HIV and AIDS education in Life Sciences (Figure 7.1). In this instance the discussion in Chapter 2 indicated that curricula can be organized in different ways. The researcher also indicated that the effectiveness of a curriculum to address social issues (such as behaviour transformation) will depend on its ability to resolve some of the reported challenges in curricula in general

(Sections 2.2 and 2.5). In particular the researcher highlighted challenges that are embedded in the curriculum as most significant in ensuring that the curriculum is able to address social issues (Section 2.3.3).

Findings of the study point out that Life Sciences has a generic curriculum with basic curriculum components. These components include predetermined subject matter and a planned format of learning experiences based on recommended content. The implication of this framework however is that the curriculum will be vulnerable to other curricula challenges related to the curriculum ideology as well as content knowledge. For example Beauchamp (1981:2) indicates that the major question in curriculum development is "what shall be taught in schools." Responding to this question may take various forms as discussed in Chapter 2 rendering the selection of content knowledge an area of much concern.

Findings indicated that with regard to content knowledge, Life Sciences adopts multiple curriculum ideologies for HIV and AIDS. Scholars indicate that it is critical that subject areas have clear founding ideologies which provide orientation for various components of the curriculum (Þórólfsson and Lárusson, 2010). Furthermore a curriculum ideology would indicate the objectives of teaching students particular content in a specific manner and sequence (Davis, 1998). The multiplicity of curriculum ideologies for HIV and AIDS education in Life Sciences means it is not clear whether students should be taught scholar academic, social efficiency, student-centred or social reconstruction knowledge. This further implies that one cannot measure the effectiveness of Life Sciences in relation to behaviour transformation against any particular curriculum objectives related to the established curriculum ideologies.

The researcher found that the Life Sciences curriculum is knowledge-oriented. As pointed out in Chapter 2 Van Manen (1978) suggests that a knowledge-oriented curriculum is not student-centred or context-specific and follows a top-down approach of teaching predetermined content and skills. A knowledge-oriented curriculum therefore is against recommendations in HIV and AIDS education that suggest that education should be informed by social, cultural and the personal contexts of students (Page *et al.*, 2006; Griessel-Roux *et al.*, 2005). Scholars argue that a knowledge-oriented HIV and AIDS education may not lead to necessary social reform through social consciousness that is needed to address behaviour transformation, stigma and discrimination, human rights violation, gender imbalances as well as sexuality challenges related to HIV and AIDS (Anderson & Beutel, 2007).

The study also found that the content of Life Sciences textbooks is not standard. As indicated in Chapter 5, the researcher does not advocate that textbooks be identical. However textbooks are regarded by many (especially in underdeveloped and developing countries) as the primary sources of information (Gregg *et al.*, 2008; Mohammed, 2007). Furthermore in some cases, access to textbooks is very limited, in that only one textbook may be available for a given subject area. Notably the textbooks used in this study were recommended by most teachers surveyed (Section 4.3.3). The consequence of having unstandardized textbooks therefore is that students from different schools and locations may be taught different content, which may be serious if textbooks do not cover all the important areas. This also means students' content understanding could differ according to the textbooks they have access to. Overall there is a great possibility that, in the case where textbooks do not present adequate content, students' understanding of the content will be limited. As suggested by researchers (and observed in the study), if students do not have adequate HIV and AIDS content knowledge, they are prone to have misconceptions of the subject (Baumgartner, 2001).

7.2.1.3 Content knowledge taught in Life Sciences

The study found that HIV and AIDS knowledge is included in the Life Sciences curriculum as extra content organized as academic HIV and AIDS knowledge (Figure 7.1). This approach is not new as other researchers have reported on it (Van Laren, 2008). However UNESCO (2006) warns that there are various challenges associated with this approach. For example if the mother subject follows a curriculum ideology that does not address social issues (such as behaviour transformation), HIV and AIDS content could also be ineffective in that regard. The researcher also observed this in that HIV and AIDS content prescribed in Life Sciences curriculum statement and textbooks is didactic. Furthermore the researcher confirmed UNESCO's (2006) report that when added as extra content, HIV and AIDS knowledge does not receive adequate attention and some significant concepts are not covered. In this regard the researcher observed that in Life Sciences there are HIV and AIDS related concepts that are given least page volume and depth, regardless of various researchers indicating that these are crucial for improved understanding of HIV and AIDS as well as behaviour transformation.

The study found that the content knowledge presented in the Life Sciences curriculum statement and textbooks is didactic in nature. Researchers indicate that didactic knowledge is effective in providing scientifically reliable content knowledge that could be used to redress misconceptions concerning HIV and AIDS (Francis, 2010; Baumgartner, 2001). In this regard the study also found that students who have academic HIV and AIDS knowledge seem to have fewer misconceptions. However the limitation of didactic knowledge is that it must be coupled with other forms of knowledge (e.g. functional HIV and AIDS knowledge) in order to lead to behaviour transformation (Brown *et al.*, 2001). For example Brown *et al.* (2001) found that when coupled with psychological counselling, academic HIV and AIDS knowledge improves acceptance of HIV testing and also reduces post HIV test stress. This therefore means academic HIV and AIDS knowledge taught in Life Sciences may not lead to behaviour transformation unless students are also exposed to functional HIV and AIDS knowledge.

With regard to academic HIV and AIDS knowledge other researchers indicate that it is important that students are taught to use knowledge in everyday life (Cotti & Schiro, 2004). For example Klop *et al.* (2010) argue that knowledge must be coupled with good personal and social values as well as the ability to use knowledge in order to help students make informed decisions. The study however found no evidence to suggest that Life Sciences develops personal and social skills related to HIV and AIDS. This observation means enculturation of students when they develop skills and knowledge required to ensure their survival and prosperity may be limited (Kendall *et al.*, 2004; Adeyemi & Adeyinka, 2002; Hughes & More, 1997). In Chapter 2 the researcher argued that this is one of the reasons why education fails to foster socialization.

The significance of ensuring that the curriculum addresses students' needs is also discussed by Griessel-Roux *et al*. (2005) who contend that HIV and AIDS education should be tailored to specific students' needs. However the study found that Life Sciences textbooks provide predetermined content and foster development of predetermined skills. While there are no data regarding how this knowledge and skills were incorporated into the curriculum, the study did find that students' experiences and prior knowledge related to HIV and AIDS do not seem to be utilized in Life Sciences.

Overall the study was able to make inferences about the motive for including HIV and AIDS content in Life Sciences, the structure of the Life Sciences curriculum in relation to HIV and AIDS as well as the nature of HIV and AIDS content knowledge taught in Life Sciences. The conclusion derived from these findings is that Life Sciences teaches HIV and AIDS knowledge in order for students' to have knowledge of the relevant concepts. Behaviour transformation will probably not be achieved through Life Sciences because of the structure of the subject and the manner in which HIV and AIDS knowledge is incorporated.

7.2.2 HIV and AIDS knowledge and behavioural preferences of students: research subquestions 2 and 3

The second and third research subquestions asked:
"How do Life Sciences students compare with non-Life Sciences students in:

- *a) Academic HIV and AIDS knowledge?*
- *b) Functional HIV and AIDS knowledge?*
- *c) Self-reported behavioural preferences related to HIV and AIDS?"*

"To what extent does academic HIV and AIDS knowledge correlate with:

- *a) Functional HIV and AIDS knowledge?*
- *b) Self-reported behavioural preferences related to HIV and AIDS?"*

In response to these subquestions the researcher argues that academic HIV and AIDS knowledge plays a significant role in influencing students' knowledge of HIV and AIDS. However this knowledge does not correlate with the behavioural preferences of students. Instead behavioural preferences seem to be influenced by other local factors (Figure 7.1). The researcher elaborates on these views below.

7.2.2.1 The significance of HIV and AIDS knowledge

The study found that HIV and AIDS content knowledge relates to students' performance. It was shown that Life Sciences students had a better knowledge of academic HIV and AIDS knowledge compared with non-Life Sciences students. As argued in Chapter 6 these observations support views by a number of researchers who believe that students use prior knowledge when constructing new knowledge as well as when they answer questions

(Maynard *et al*., 2001). The implication of this however is that those students who lack academic HIV and AIDS knowledge will not be able to answer questions related to HIV and AIDS, which will in turn affect their behavioural patterns. For example Maynard *et al*. (2001) and Pakaslahti (2000) report observing an association between concept understanding, problem-solving abilities and certain types of behaviour. Scholars indicate that when students do not understand concepts, their ability to solve problems is jeopardized leading to them displaying adverse behavioural patterns (Williams and Noyes, 2007; Pakaslahti, 2000). Consequently the researcher believes that those students, who do not have adequate academic HIV and AIDS knowledge, may display different behavioural patterns compared with those who have such knowledge.

The above argument is also supported by the fact that academic HIV and AIDS knowledge was found to be associated with fewer misconceptions concerning HIV and AIDS. This observation indicates that students use scientific knowledge to better understand HIV and AIDS. According to critical pedagogy (Section 2.5.3) students can use new knowledge to discuss and reflect on their life issues and modify what they already know (Baumgartner, 2001; Kegan, 2000). In this way misconceptions can be modified or eliminated.

It is accepted among researchers that academic HIV and AIDS knowledge is used by students to improve their understanding of functional HIV and AIDS knowledge (Askew *et al*., 2004). The study also found data to support this argument. However the study also found that some students who did not have academic HIV and AIDS knowledge were able to answer relevant questions. There are at least two possible explanations for this phenomenon. Firstly according to Martin (1976) students develop creative impulses through which they can answer questions correctly even if they do not have the necessary content knowledge. Martin (1976) indicates that schooling does not teach students content knowledge alone, but also the strategies and skills they need in order to pass a grade. In line with Martin's (1976) argument, one can infer that some students who do not have academic HIV and AIDS knowledge used their creative impulses to correctly guess answers. However a second possible explanation is that students used functional HIV and AIDS knowledge to respond to items testing academic HIV and AIDS knowledge. This view is the opposite of what Askew *et al*. (2004), Bhuiya *et al*. (2004), Diop *et al*. (2004), Mathur *et al*. (2004) and Frontiers in Reproductive Health (2001) reported in that academic HIV and AIDS knowledge leads to improved understanding of functional HIV and AIDS knowledge. The study showed that non-Life Sciences students who were presumed not to have studied academic HIV and AIDS knowledge as they did not enrol for Life Sciences had a pass rate that was below 50% in the academic HIV and AIDS knowledge test. However the same group scored above 50% in the functional HIV and AIDS knowledge test. Therefore it is plausible that those non-Life Sciences students who passed the academic HIV and AIDS knowledge test relied on their functional HIV and AIDS knowledge to answer items testing academic HIV and AIDS knowledge.

With regard to academic HIV and AIDS knowledge the study also found that both Life Sciences and non-Life Sciences students did not perform as well as expected. Reasons for this were beyond the scope of the study. However the researcher found that there were particular areas of concern. For Life Sciences students it was found that immunity and immune deficiency were areas of concern. Other researchers have reported that immunity is one area where learning and conceptual difficulties are mostly reported (Tibell & Rundgren, 2010). These researchers also indicated that immunity was one area in biology where the content language was distinct from students' everyday language and thus the topic presents students with conceptual difficulties (Tibell & Rundgren, 2010). In the context of the study however the implication of not understanding immunity is of much concern. The researcher believes that students who do not have knowledge of immune deficiency may have problems linking HIV and AIDS. The researcher also believes that this lack of knowledge of immunity may be responsible for students not knowing the concept of opportunistic infections. Furthermore the study shows that the lack of knowledge of immunity is related to students not knowing the concept of vaccination. While not investigated in the study, the researcher hypothesizes that knowledge of immunity could help students better understand the link between HIV and AIDS, and other opportunistic infections as well as the treatment of AIDS.

Another important finding in the context of the study is that knowledge is not significantly associated with behavioural preferences of students. Earlier in this chapter the researcher referred to scholars who report that HIV and AIDS content knowledge is directly related to safe behaviour (Lesley, 2007; Magnani *et al*., 2005; Pakaslahti, 2000; Crick & Dodge, 1994). The study however found that students' content knowledge was not significantly correlated with behavioural preferences. This finding is in line with that of various other scholars who argue that knowledge alone will not lead to adoption of safe behaviours (Ajzen, 1991). In an attempt to explain this phenomenon the researcher looked back to findings related to the Life Sciences curriculum (Chapter 5).

The researcher believes that academic HIV and AIDS knowledge tested in the study is not correlated with safe behavioural preferences of students because of the principal reason for incorporating HIV and AIDS education into Life Sciences (Section 7.2.1.1), the structure of Life Sciences (Section 7.2.1.2) and content knowledge taught in Life Sciences (Section 7.2.1.3). For example the study found that Life Sciences students are not taught to apply academic HIV and AIDS knowledge in their daily lives. Therefore even if these students have the necessary knowledge that could lead to behaviour transformation, if they do not have the necessary skills, this will not occur. Furthermore if Life Sciences knowledge is didactic, students will require special skills to translate such knowledge to actionable knowledge. Therefore the fact that academic HIV and AIDS knowledge did not correlate with students' behavioural patterns may not necessarily mean knowledge cannot lead to behaviour transformation. Instead the researcher concludes that academic HIV and AIDS knowledge taught in Life Sciences is not compiled and administered in a manner that would lead to behaviour transformation.

7.2.2.2 Students' behavioural preferences

Given the finding that knowledge is not related to students' behavioural preferences, the question then is what informs students' behaviour? The study shows that students' behaviours are context-specific suggesting that the hidden curriculum has a greater influence than the formal curriculum. In Chapter 6 the researcher referred to the fact that students' behavioural preferences are generally similar even though in isolated cases they varied from school to school. This finding suggests that HIV and AIDS education should be tailor-made to address specific issues in society. Donovan and Ross (2000) indicated that HIV and AIDS education should not follow an individualistic approach because behaviours are not individualistic but collective and social. Findings of the study support this view but highlight the need to explore social factors within each context so that HIV and AIDS education is driven toward these factors.

In Chapter 3 the researcher reported on five factors that have been identified (by other scholars) as influencing the spread of HIV and AIDS, namely risk behaviour, stigma and discrimination, poor sexuality education, as well as violation of human rights. The researcher also indicated that health education (such as HIV and AIDS education) may fail because of factors such as negative attitudes towards health education, poor design and implementation of interventions and evaluation strategies employed. However the study provided another possible reason why HIV and AIDS continue to spread. Findings of the study indicate that some of the students do not view themselves as being at risk of contracting HIV even though they engage in risk behaviour. Data in this regard showed that some students view society and other students as being at risk of HIV infection. For example these students point out that others do not protect themselves from infection. However data also showed that the same students report risk behaviour that puts them at risk of infection. Some students in this regard indicated that they would have unprotected sexual intercourse. This finding suggests that some students do not take ownership and responsibility for their own behaviour and their contribution to society through a social reconstruction approach. Therefore the fact that students lack responsibility and instead point fingers may increase their risk of HIV infection.

7.3 Recommendations for further research

While the findings of the study are important the researcher believes that further research is needed to better understand the relationship between education and social factors such as behaviour transformation in the context of HIV and AIDS. Some possible research areas are discussed below.

Firstly, there is a need to investigate how the Life Sciences as a subject could be used to foster behaviour transformation. The study showed that Life Sciences lacks a clear curriculum ideology that could foster behaviour transformation. However it remains imperative that Life Sciences contributes to student development and empowerment. Therefore it is critical that research be conducted to determine how Life Sciences could be transformed into a social reconstruction subject, without losing its rigour as a science subject that fosters concept understanding. This means there is a need to explore the possibility of integrating a scholar academic ideology with the social reconstruction ideology so that Life Sciences can teach content knowledge by developing skills that students need to reconstruct social norms and values that are perpetuating the spread of HIV and AIDS.

Secondly, the study showed that there are some HIV and AIDS concepts, for example immunity, that are not well understood by students. The impact of individual concepts (rather than academic or functional HIV and AIDS knowledge as a whole) on behavioural preferences however was not explored. With that there is also a need to investigate how students' knowledge of concept related to HIV and AIDS could be improved. In this regard research is needed to determine some effective teaching and learning strategies that could be employed in Life Sciences to ensure that students have a better understanding of HIV and AIDS related concepts.

Thirdly, the study showed that the content of the two Life Sciences textbooks was not standard. There is therefore a need to investigate the impact of this variation on students' concept understanding, especially in schools where there are textbook shortages. To this end research may extend to compare South African textbooks with other international textbooks in Life Sciences to determine if the standard in South Africa is comparable with that of other countries. This could also help determine which concepts should be covered in the textbooks and which ones should be optional.

Fourthly, the study found that there may be local (school-specific) factors related to the formal curriculum that seem to affect students' behaviours. These factors were however not identified. Given their apparent impact on students' behaviours, the researcher believes that research is needed to identify these factors and also to determine the extent to which they inform students' behaviours. This will ensure that HIV and AIDS education is able to address the specific needs of students.

Fifthly, the study showed that students' subjective norms were of greater concern than their attitudes and perceived behavioural control in relation to behaviour transformation. This is in the context of the theory planned behaviour (Guo *et al.*, 2007; Ajzen, 1991). However the study could not quantify the significance of subjective norms in relation to the other factors in determining students' behaviour. Therefore research is needed in this regard to determine the definite role that subjective norms would play in influencing behaviour.

7.4 Recommendations for Life Sciences curriculum development and HIV and AIDS education

The study attempted to provide an examination of the impact of Life Sciences on behaviour transformation. While new knowledge was generated, the challenge was that the Life Sciences curriculum does not fall within any one curriculum ideologies explored in Chapter 2. As indicated in Chapter 5 Life Sciences was found to overlap between various curriculum ideologies. However as argued in the same chapter, this overlap limits the subject's ability to be rigorous and thorough in meeting its ideological objectives particularly in relation to HIV and AIDS. The researcher therefore recommends that Life Sciences should adopt a clear curriculum ideology that will inform the integration and presentation of HIV and AIDS related content. Such an ideology must provide clear and attainable objectives for HIV and AIDS related behaviour transformation. Furthermore content knowledge, the instructional process and assessment strategies must be informed by such a curriculum ideology. Furthermore HIV and AIDS experts must be consulted so that suitable content is correctly integrated. The researcher also recommends that thorough present-situation analysis and target-situation analysis should be conducted in order to ensure that HIV and AIDS content knowledge integrated into Life Sciences responds to the needs of students and relevant societies (Kırkgöz, 2009; Songhori, 2008; Long & Crookes, 1992).

With respect to HIV and AIDS education, the researcher recommends that each programme should respond to a specific epidemic in relation to the epidemic of HIV infection, the epidemic of AIDS, and the epidemic of social, cultural and economic response. This means factors that affect each epidemic must be addressed concisely.

7.5 Conclusion: there is a need for social reconstruction

The researcher believes that there is a need for social reconstruction through education. As stated in the previous section it appears that students, who themselves are at risk of contracting HIV do not take ownership of their risk of infection. Instead they view their societies and fellow students as being at risk of HIV infection. Findings also indicate that there may be a lack of critical knowledge regarding HIV and AIDS among students since such knowledge is not presented in the textbooks even though recommended in the curriculum statement. All of the above are some of the reported factors that are responsible for the spread of HIV and AIDS in South Africa (Francis, 2010; Parker & Aggleton, 2003; Stein, 2003). By inference therefore the researcher believes that both students (irrespective of whether they are Life Sciences or non-Life Sciences students) and their communities remain at risk of HIV infection and consequently there is a need to reconstruct social norms that are facilitating the spread of HIV and AIDS.

Because of the HIV risk reported in literature, the researcher believes that the survival of society remains threatened by unsafe behavioural preferences that put members of the society at risk of contracting HIV. Furthermore the study has shown that Life Sciences, a mechanism developed by the society to provide knowledge regarding HIV and AIDS (Schiro, 2008), is not effective in achieving this goal. Therefore a different strategy that is informed by the current findings is required.

As stated in Chapters 1 and 2 social reconstructionists believe that education and learning are a process of interpreting the past, present social situations and envisioning the future (Schiro, 2008). The study however shows that Life Sciences is not able to do this effectively. Therefore there is a need to adapt Life Sciences so that undesirable aspects of social culture, norms, attitudes and beliefs that are responsible for the current behavioural preferences can be eliminated. In other words if behaviour transformation is the objective, then Life Sciences should follow a social reconstruction ideology. This means Life Sciences should prepare students to confront social norms in a reflective manner so that students could understand that they are part of an unhealthy society that needs to transform its behaviour by reconstructing values, norms, attitudes and beliefs using knowledge. The researcher also agrees with Shimbira *et al.* (2007) that students should be trained to become agents of change who will take ownership of their reconstruction role in society.

In conclusion the researcher agrees with Barak Obama[20] that “change will not come if we wait for some other person or some other time. We are the ones we've been waiting for. We are the change that we seek. It is time to fundamentally change the way that we do business in [education]. To help build a new foundation for the 21st century, we need to reform our

[20] http://www.brainyquote.com

[curriculum] so that it is more efficient and more creative. That will demand new thinking and a new sense of responsibility." To this end, the researcher believes that education should be used to address the challenges faced by humanity today.

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APPENDICES

Appendix 1: Construction of Instruments for document analysis

Section A: Pool of questions designed by researcher and assessed by panel of experts

[Questions 1 to 4 were used to analyse the Life Sciences curriculum statement. Questions 5 to 9 were used to analyse the Life Sciences textbooks].

1. Which skills (competences) does the document encourage Grade 11 students to attain regarding HIV/AIDS?
2. Which concepts does the curriculum foreground for Grade 11 students in relation to HIV/AIDS?
3. What are the expected learning outcomes of Life Sciences in relation to HIV/AIDS?
4. Which assessment strategy is the document endorsing?
5. Which HIV/AIDS related concepts have the highest page volume in the textbooks?
6. What is the textbooks' approach to HIV and AIDS related concepts?
7. What is the frequency of appearance for HIV and AIDS related concepts?
8. How does the document content relate to HIV/AIDS?
9. What assumptions underlie the textual discourse?

Section B: Questionnaire used by experts to assess researcher-designed questions

I have generated nine questions that I intend to use to perform document analysis. The purpose of document analysis is to answer the following main question:

"How does the Life Sciences curriculum address HIV and AIDS for safe behavioural preferences among students?"

Study the nine questions and answer the following questionnaire, indicate your response by crossing the appropriate box and justifying your choice in the space provided. *[All questions had the same "agree – disagree" option as in the example given below]*

1. The question is relevant to answer the main question.

Agree	Disagree

....

2. The question is not repeated unnecessarily.
3. The question is operationalisable.
4. The question can be responded to through document analysis.
5. The question can be responded to through the analysis of the curriculum statements (or Life Sciences curriculum statement; or life sciences textbooks).
6. It is important to have this question in the instrument.
7. This question must be eliminated from the instrument.
8. This question must be rephrased.
9. Do you have any other comments on the questionnaire?
   ....

Section C: Percentage agreements from experts

Researcher generated item	Questions from assessment questionnaire (Q1 to Q9) and proportion choosing the "agree" option (e.g. 5/6)							
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8
1. Which skills (competences) does the document encourage Grade 11 students to attain regarding HIV/AIDS?	5/6	6/6	6/6	6/6	6/6	6/6	0/6	0/6
2. Which concepts does the curriculum foreground for Grade 11 students in relation to HIV/AIDS?	5/6	6/6	6/6	6/6	6/6	6/6	0/6	0/6
3. What are the expected learning outcomes of Life Sciences in relation to HIV/AIDS?	6/6	6/6	6/6	6/6	6/6	6/6	0/6	0/6
4. Which assessment strategy is the document endorsing?	4/6	6/6	6/6	6/6	6/6	6/6	0/6	0/6
5. Which HIV/AIDS related concepts have the highest page volume in the textbooks?	5/6	6/6	6/6	6/6	6/6	6/6	0/6	0/6
6. How does the document content relate to HIV/AIDS?	6/6	6/6	6/6	6/6	6/6	6/6	0/6	0/6
7. What is the textbooks' approach to HIV and AIDS related concepts?	4/6	5/6	6/6	6/6	6/6	6/6	0/6	0/6
8. What is the frequency of appearance for HIV and AIDS related concepts?	5/6	5/6	6/6	6/6	6/6	6/6	0/6	0/6
9. What assumptions underlie the textual discourse	3/6	6/6	3/6	3/6	5/6	3/6	2/6	2/6

Appendix 2: Interview schedule with teachers for identifying textbooks

(The interview starts by requesting the respondents' consent for the interview and data collection. Details of such consent are explained to the interviewee).

1. Do you teach Life Sciences in Grade 11?
2. For how long have you been teaching Life Sciences in Grade 11?
3. How many textbooks do you use for your teaching?
4. Which textbook do you most rely on for selecting content knowledge to be taught? Explain.
5. Which textbook do you use for teaching HIV/AIDS related concepts?
6. Briefly describe the textbook you use for teaching HIV/AIDS related concepts, with respect to type of representations used.
7. Who recommended these textbooks to you?
8. Do students have textbooks?
9. Are these textbooks (which students use) recommended by you?

Appendix 3: Profile of students participating in the study

Student Profile				
School	**Research ID No.**	**Age**	**Gender**	**Academic background**
9	L001	15	Male	non-Life Sciences
9	L002	17	Male	non-Life Sciences
9	L003	16	Male	non-Life Sciences
9	L004	17	Male	Life Sciences
9	L005	17	Male	Life Sciences
9	L006	17	Male	Life Sciences
9	L007	17	Female	Life Sciences
9	L008	17	Male	Life Sciences
9	L009	16	Female	Life Sciences
9	L010	16	Female	Life Sciences
9	L011	17	Female	Life Sciences
9	L012	16	Female	Life Sciences
9	L013	16	Male	Life Sciences
9	L014	17	Female	Life Sciences
9	L015	17	Male	Life Sciences
9	L016	16	Female	Life Sciences
9	L017	17	Female	Life Sciences
9	L018	17	Female	Life Sciences
9	L019	17	Female	Life Sciences
9	L020	16	Male	Life Sciences
9	L021	17	Male	Life Sciences
9	L022	16	Female	Life Sciences
9	L023	17	Female	Life Sciences
9	L024	17	Male	Life Sciences
9	L025	17	Male	Life Sciences
9	L026	17	Male	Life Sciences
9	L027	17	Male	Life Sciences
9	L028	18	Male	Life Sciences
9	L029	17	Male	Life Sciences
9	L030	17	Female	Life Sciences
9	L031	16	Female	Life Sciences

9	L032	16	Female	Life Sciences
9	L033	16	Male	Life Sciences
9	L034	17	Female	Life Sciences
9	L035	17	Female	Life Sciences
9	L036	17	Male	Life Sciences
9	L037	17	Male	Life Sciences
9	L038	17	Female	Life Sciences
9	L039	17	Female	Life Sciences
9	L040	16	Male	non-Life Sciences
9	L041	16	Female	non-Life Sciences
9	L042	16	Male	non-Life Sciences
9	L043	16	Male	non-Life Sciences
9	L044	17	Male	non-Life Sciences
9	L045	15	Female	non-Life Sciences
9	L046	16	Male	non-Life Sciences
9	L047	17	Male	non-Life Sciences
9	L048	18	Female	non-Life Sciences
9	L049	17	Male	non-Life Sciences
9	L050	18	Male	non-Life Sciences
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9	L055	18	Male	non-Life Sciences
9	L056	16	Male	non-Life Sciences
9	L057	17	Male	non-Life Sciences
9	L058	18	Male	non-Life Sciences
9	L059	17	Male	non-Life Sciences
9	L060	17	Male	non-Life Sciences
9	L061	16	Not known	Life Sciences
9	L062	18	Male	non-Life Sciences
9	L063	16	Female	non-Life Sciences
8	L064	17	Male	non-Life Sciences
8	L065	17	Female	non-Life Sciences
8	L066	18	Male	non-Life Sciences

8	L067	16	Female	non-Life Sciences
8	L068	17	Male	non-Life Sciences
8	L069	17	Female	non-Life Sciences
8	L070	17	Male	non-Life Sciences
8	L071	16	Male	non-Life Sciences
8	L072	16	Male	non-Life Sciences
8	L073	17	Male	non-Life Sciences
8	L074	17	Male	Life Sciences
8	L075	16	Female	Life Sciences
8	L076	Not known	Male	Life Sciences
8	L077	15	Male	Life Sciences
8	L078	16	Female	Life Sciences
8	L079	16	Female	Life Sciences
8	L080	16	Female	Life Sciences
8	L081	17	Female	Life Sciences
8	L082	16	Female	Life Sciences
8	L083	17	Female	Life Sciences
8	L084	Not known	Not known	Life Sciences
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8	L086	16	Female	Life Sciences
8	L087	16	Female	Life Sciences
8	L088	Not known	Female	Life Sciences
8	L089	17	Female	Life Sciences
8	L090	17	Female	Life Sciences
8	L091	17	Male	non-Life Sciences
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8	L093	16	Female	Life Sciences
8	L094	17	Male	Life Sciences
8	L095	18	Male	Life Sciences
8	L096	17	Male	Life Sciences
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7	L098	15	Male	non-Life Sciences
7	L099	17	Male	non-Life Sciences
7	L100	17	Male	non-Life Sciences
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7	L105	17	Male	non-Life Sciences
7	L106	16	Male	non-Life Sciences
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7	L131	16	Female	Life Sciences
7	L132	17	Not known	Life Sciences
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1	L449	18	Male	non-Life Sciences
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1	L470	15	Female	non-Life Sciences
1	L471	19	Female	non-Life Sciences
1	L472	16	Female	non-Life Sciences
1	L473	16	Female	non-Life Sciences
1	L474	18	Female	non-Life Sciences
1	L475	16	Female	non-Life Sciences
1	L476	16	Female	non-Life Sciences
1	L477	15	Female	non-Life Sciences
1	L478	15	Female	non-Life Sciences
1	L479	15	Female	non-Life Sciences
1	L480	17	Female	non-Life Sciences
1	L481	17	Male	non-Life Sciences
1	L482	17	Female	non-Life Sciences
1	L483	Not known	Male	non-Life Sciences
1	L484	18	Male	non-Life Sciences
1	L485	18	Male	non-Life Sciences
1	L486	17	Female	non-Life Sciences

1	L487	18	Female	non-Life Sciences
1	L488	17	Female	non-Life Sciences
1	L489	17	Female	Life Sciences
1	L490	17	Female	Life Sciences
1	L491	17	Female	Life Sciences
1	L492	18	Female	Life Sciences
1	L493	18	Male	Life Sciences
1	L494	16	Female	Life Sciences
1	L495	17	Female	Life Sciences
1	L496	16	Female	Life Sciences
1	L497	16	Male	Life Sciences
1	L498	19	Female	Life Sciences
1	L499	17	Male	Life Sciences
1	L500	17	Female	Life Sciences
1	L501	16	Female	Life Sciences
1	L502	15	Female	Life Sciences
1	L503	17	Female	Life Sciences
1	L504	16	Female	Life Sciences
1	L505	17	Male	Life Sciences
1	L506	16	Male	Life Sciences
1	L507	17	Female	Life Sciences
1	L508	17	Female	Life Sciences
1	L509	16	Female	Life Sciences
1	L510	18	Male	Life Sciences
1	L511	12	Female	Life Sciences
1	L512	15	Male	Life Sciences
1	L513	18	Male	Life Sciences
1	L514	17	Male	non-Life Sciences
1	L515	18	Male	non-Life Sciences
1	L516	18	Male	non-Life Sciences
1	L517	17	Male	non-Life Sciences
1	L518	18	Male	non-Life Sciences
1	L519	18	Male	non-Life Sciences
1	L520	18	Female	non-Life Sciences
1	L521	20	Female	non-Life Sciences

1	L522	18	Male	non-Life Sciences
1	L523	Not known	Male	non-Life Sciences
1	L524	16	Female	non-Life Sciences
1	L525	18	Male	non-Life Sciences
1	L526	15	Male	non-Life Sciences
1	L527	16	Male	non-Life Sciences
1	L528	17	Female	non-Life Sciences
1	L529	21	Female	non-Life Sciences
1	L530	15	Female	non-Life Sciences
1	L531	17	Female	non-Life Sciences
1	L532	19	Female	non-Life Sciences
1	L533	19	Male	non-Life Sciences
1	L534	18	Female	non-Life Sciences
1	L535	18	Female	non-Life Sciences
1	L536	18	Male	non-Life Sciences
1	L537	18	Female	non-Life Sciences
1	L538	17	Male	non-Life Sciences
1	L539	Not known	Female	non-Life Sciences
1	L540	17	Male	non-Life Sciences
1	L541	17	Female	non-Life Sciences
1	L542	17	Male	non-Life Sciences
1	L543	17	Female	non-Life Sciences

Appendix 4: Consent letters

100
1908 - 2008

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

FACULTY OF EDUCATION
DEPARTMENT OF SCIENCE, MATHEMATICS AND TECHNOLOGY EDUCATION
Groenkloof Campus
Pretoria 0002
Republic of South Africa
Tel: +27 12 420 –5572
Fax: +27 12 420-5621
http:// www.up.ac.za

Dear Student,

I am inviting you to participate in a research project entitled "*exploring the effects of scientific knowledge on Grade 11 students' behaviour towards HIV/AIDS in KwaZulu-Natal, South Africa*." Accompanying this letter is a questionnaire that asks a variety of questions about your understanding of HIV/AIDS as well as your views on some behavioural patterns related to HIV/AIDS.

The study might be very sensitive and emotional especially if you are directly affected by HIV/AIDS. Because of this the study is treated with sensitivity as respondents will be expected to provide amongst other things, their opinion on sexual behaviour. As you respond to the questions, you might experience strong feelings.

I am asking you to look over the questionnaire and, if you choose to do so, complete it and give it back to me. It should take you about 30 minutes to complete.

The results of this project will be submitted as a report for my doctorate for which I am studying at the University of Pretoria. Through your participation I hope to understand the following:

- Grade 11 students' level of understanding of prerequisite knowledge required for a successful understanding of HIV/AIDS,
- Grade 11 students' understanding of HIV/AIDS, and
- Behavioural patterns of Grade 11 students related to HIV/AIDS.

The results of this study will be published in scientific journals and presented at conferences as well as on the internet.

Should you decide to participate, **the following terms will apply**:

1. You should not write your real name on the test and/or questionnaire as related to this research.
2. Real names will not be used in any report(s); instead, pseudonyms (unreal names and codes) will be used in all spoken and written records and reports.

3. Your responses will be treated in a confidential manner and will only be accessed by you (the respondent), the researcher (Mr Lindelani Mnguni) and the supervisor (Dr Mia Abrie).
4. Nothing that you say or write in relation to this study will be revealed to other persons in a manner that will reveal your identity.
5. Participation in this research is voluntary. You have the right to withdraw at any time for any reason, and without any prejudice, and the information collected and records and reports written will be discarded.
6. At your request, the summary of the findings will be made available to you.
7. No direct benefits will be given to you or your school.

If you have any questions or concerns about completing the test and the questionnaire or about being in this study, you may contact me at the given contact address. The Faculty of Education at the University of Pretoria has approved this study. We are also seeking permission from the Provincial Department of Education, the school and your parent/guardian. Only after all, including you yourself have given permission, will we proceed with the study.

If you agree to participate in the study under the above stated terms, please fill in the details below and return separately, NOT with the test and questionnaire.

Date of birth (DD/MM/YY): ____
Place of birth: ____
Signature:____
Date:____

Witness:____
Date:____

Any questions regarding this consent letter and the research can be directed to me at the following address:

Mr Lindelani E Mnguni
School of SMTE
University of Pretoria
Groenkloof Campus
Pretoria
Tel: 084837 4423
Email address: lindelani@up.ac.za

Yours truly,
Lindelani E Mnguni

……………………………… ……………………………..
Signature Date

FACULTY OF EDUCATION
DEPARTMENT OF SCIENCE, MATHEMATICS AND TECHNOLOGY EDUCATION
Groenkloof Campus
Pretoria 0002
Republic of South Africa
Tel: +27 12 420 –5572
Fax: +27 12 420-5621
http:// www.up.ac.za

Dear Sir/Madam,

I hereby request your child to participate in my research. This is part of my PhD project entitled "*exploring the effects of scientific knowledge on Grade 11 students' behaviour towards HIV/AIDS in KwaZulu-Natal, South Africa*." I am doing this research at the University of Pretoria. Participating students will respond to an HIV/AIDS knowledge questionnaire (see attached) that asks a number of questions about students' understanding of HIV/AIDS as well as their behavioural patterns related to HIV/AIDS.

The study is very sensitive and emotional and is being treated with sensitivity. In addition the questions in the questionnaire will ask students to give information about their understanding of HIV/AIDS and how they behave in this regard. As they respond to the questions, they might experience strong feelings.

Willing students will be requested to look over the questionnaire and, if they choose to do so, complete documents and send or give them back to me. It should take students about 30 minutes to complete.

Through the students' participation I hope to understand the following:

- Grade 11 students' level of understanding of prerequisite knowledge required for a successful understanding of HIV/AIDS,
- Grade 11 students' understanding of HIV/AIDS, and
- Behavioural patterns of Grade 11 students related to HIV/AIDS.

I hope that the results of the study will be useful for the development of informed response strategies against HIV/AIDS. The results of this study will be published in scientific journals and presented at conferences as well as on the internet.

Student participation will be governed by the following terms:

1. Students do not need to write real names in the test and/or questionnaire as related to this research.
2. School names, from which participating students enrol, will be treated in a confidential manner.
3. Real names will not be used in any report(s); instead, pseudonyms (unreal names and codes) will be used in all verbal and written records and reports.
4. Responses will be treated in a confidential manner and will only be accessed by the participating student (the respondent), the researcher (Mr Lindelani Mnguni) and the supervisor (Dr Mia Abrie).

5. Participation in this research is voluntary. Students have the right to withdraw at any time for any reason, and without any prejudice, and the information collected and records and reports written will be discarded.
6. At the respondents', schools' and government's request, the summary of the findings will be made available accordingly.
7. No direct benefits will be given to students or schools.

Should you have any questions or concerns about the study, you may contact me at the address given in this letter. The Faculty of Education at the University of Pretoria and the KZN Department of Education have approved this study.

If you approve of your child's participation in the study under the above stated terms, please fill in the details below and return the form to the school.

Parent/legal guardian's Signature:____
Date:____

Any questions regarding this consent letter and the research can be directed to me at the following details:

Mr Lindelani E Mnguni
School of SMTE
University of Pretoria
Groenkloof Campus
Pretoria
Tel: 084837 4423
Email address: lindelani@up.ac.za

Yours sincerely,
Lindelani E Mnguni

……………………………… ……………………………..
Signature Date

FACULTY OF EDUCATION
DEPARTMENT OF SCIENCE, MATHEMATICS AND TECHNOLOGY EDUCATION
Groenkloof Campus
Pretoria 0002
Republic of South Africa
Tel: +27 12 420 –5572
Fax: +27 12 420-5621
http:// www.up.ac.za

Dear Sir/Madam,

I hereby request your permission to collect data at your school. This is part of my PhD project entitled "*exploring the effects of scientific knowledge on Grade 11 students' behaviour towards HIV/AIDS in KwaZulu-Natal, South Africa*." I am undertaking this research at the University of Pretoria. Participating students will respond to an HIV/AIDS knowledge questionnaire (see attached) that asks a number of questions about students' understanding of HIV/AIDS as well as their behavioural patterns related to HIV/AIDS.

The study is very sensitive and emotional and is treated with sensitivity as respondents will be expected to provide amongst other things, their sexual behaviour details. In addition, the questions in the questionnaire will ask students to give information about their understanding of HIV/AIDS. As they respond to the questions, they might go experience strong feelings.

I will only be working with Grade 11 students. Willing students will be requested to look over the tests and questionnaire and, if they choose to do so, complete documents and send or give them back to me. It should take students about 30 minutes to complete.

Through the students' participation I hope to understand the following:

- Grade 11 students' level of understanding of prerequisite knowledge required for a successful understanding of HIV/AIDS,
- Grade 11 students' understanding of HIV/AIDS, and
- Behavioural patterns of Grade 11 students related to HIV/AIDS.

I hope that the results of the study will be useful for the development of informed response strategies against HIV/AIDS. The results of this study will be published in scientific journals and presented at conferences as well as on the internet.

Student participation will be governed by the following terms:

1. Students do not need to write real names in the test and/or questionnaire as related to this research.
2. School names, from which participating students enrol, will be treated in a confidential manner.

3. Real names will not be used in any report(s); instead, pseudonyms (unreal names and codes) will be used in all verbal and written records and reports.
4. Responses will be treated in a confidential manner and will only be accessed by the participating student (the respondent), the researcher (Mr Lindelani Mnguni) and the supervisor (Dr Mia Abrie).
5. Participation in this research is voluntary. Students have the right to withdraw at any time for any reason, and without any prejudice, and the information collected and records and reports written will be discarded.
6. At the respondents', schools' and government's request, the summary of the findings will be made available accordingly.
7. No direct benefits will be given to students or schools.

Should you have any questions or concerns about the study, you may contact me at the given address. The Faculty of Education at the University of Pretoria and the KZN Department of Education has approved this study.

If you agree to participate in the study under the above stated terms, please fill in the details below and return separately, NOT with the test and questionnaire.

Date of birth (DD/MM/YY): ____
Position at school: ____
Place of birth: ____
Signature:____
Date:____

Witness:____
Date:____

Mr Lindelani E Mnguni
School of SMTE
University of Pretoria
Groenkloof Campus
Pretoria
Tel: 084837 4423
Email address: lindelani@up.ac.za

Yours sincerely,
Lindelani E Mnguni

……………………………… ……………………………..
Signature Date

Appendix 5: Questionnaire given to panel of experts for validation

Instructions

- *Answer as many questions as possible.*
- *Do not rewrite the questions.*
- *Where necessary, number the answers exactly as the questions are numbered.*
- *Write neatly and legibly.*

SECTION 1: Life Sciences Knowledge

For each of the following questions, select only one correct answer.

1. The smallest unit of life is a (an)
a) Atom
b) Protein
c) Single cell
d) Compound

2. Human bodies have
a) Billions of cells
b) Only five cells
c) No cells
d) One thousand cells

3. A typical body cell size is
a) 10 cm
b) 10 m
c) 10 mm
d) 10 µm

4. Eukaryotic cells are generally
a) Same size as prokaryotic cells
b) Larger than prokaryotic cells
c) Smaller than prokaryotic cells
d) None of the above

5. The nucleus has
a) A double membrane of the nuclear envelope

b) A single layer of nuclear membrane
c) No membrane
d) All of the above

6. In human cells, genetic material (DNA) is found in the
a) Nucleus
b) Chloroplast
c) Plasma membrane
d) Endoplasmic reticulum

7. The plasma membrane system of a cell consists of the
a) Endoplasmic reticulum
b) Golgi complex
c) Vesicles
d) All of the above

8. All Eukaryotic cells contain mitochondria, organelles that use…
a) Nitrogen
b) Phosphorus
c) Oxygen
d) Calcium

9. The plasma membrane isolates the cytoplasm from the
a) Cell
b) External environment
c) Water
d) Nucleus

10. The plasma membrane regulates the flow of materials into and out of the
a) Vacuole
b) Nucleus
c) Cell
d) All of the above

11. The plasma membrane consists of a bilayer of
a) Phospholipids only
b) Proteins only
c) Cellulose
d) Phospholipids and proteins

12. In human cells, the…. blocks most molecules from passing through
a) Phospholipid bilayer
b) Glycoproteins
c) Receptors
d) Cellulose

13. Larger molecules can cross the membrane only with the help of
a) Water only
b) Lipids only

c) None of the above
d) Glycoproteins

14. Recognition proteins serve as identification
a) Binding sites
b) Blocking sites
c) "Tags and attachment sites"
d) All of the above

15. Diffusion is the movement of particles from regions of
a) Higher concentration to regions of lower concentration
b) Lower concentration to regions of higher concentration
c) Higher concentration to regions of higher concentration
d) Lower concentration to regions of lower concentration

16. Osmosis is the diffusion of water across a selectively permeable membrane and
a) Down its concentration gradient
b) Up its concentration gradient
c) a) and b) above
d) none of the above

17. The circulatory system transports blood rich in
a) Dissolved nutrients and oxygen
b) Microbes and wastes
c) Hormones
d) All of the above

18. White blood cells or leukocytes
a) Fight infection
b) Are important for blood clotting
c) Carry haemoglobin
d) Have no function

19. Blood leaving the heart travels (in sequence) through
a) Arteries, arterioles, capillaries, venules, veins, and then back to the heart
b) Arterioles, arteries, capillaries, venules, veins, and then back to the heart
c) Capillaries, venules, veins, and then back to the heart arterioles, arteries,
d) Veins, venules, capillaries, arteries, arterioles, and then back to the heart

20. The human lymphatic system consists of
a) Lymphatic vessels only
b) Lymphatic vessels, lymph nodes, and the thymus and spleen
c) Lymphatic vessels, lymph nodes, and without thymus or spleen
d) Arteries, arterioles, capillaries, venules, veins, and then back to the heart

21. The thymus which is most active in young children produces
a) Red blood cells
b) Platelets
c) Erythrocytes

d) White blood cells that function in immunity

22. The spleen filters blood past white blood cells, which remove
a) Bacteria and damaged blood cells
b) Viruses
c) Germs
d) Salts and urea

23. The human body has three lines of defense against invasion by microbes:
a) The barriers of skin and mucous membranes
b) Nonspecific internal defenses, including phagocytosis, killing by natural killer cells, inflammation and fever
c) The immune response
d) All of the above

24. If microbes do enter the body, white blood cells travel to the site of entry and
a) Engulf the invading cells
b) Produce more microbes
c) Nourish microbes
d) None of the above

25. Natural killer cells secrete proteins that kill
a) Bacteria
b) Infected or cancerous cell
c) Viruses
d) Fungi

26. Injuries stimulate the inflammatory response, which
a) Attracts phagocytic white blood cells
b) Increases blood flow
c) Makes capillaries leaky
d) All of the above

27. High temperature from a fever inhibits bacterial growth and
a) Slows immune response
b) Accelerates the immune response
c) Stops immune response
d) None of the above

28. The following are cells of the immune system
a) Somatic cells
b) Gametes
c) B cells and T cells
d) Brain cells

29. Immune response has three steps
a) Recognition, attack and memory
b) Recognition, attack and digest
c) Recognition, reproduce and memory
d) None of the above

30. The following are responsible for recognizing antigens and triggering the immune system
- a) Antibodies on B cells only
- b) T-cell receptors on T cells only
- c) Antibodies on B cells and T-cell receptors on T cells
- d) All of the above

31. Antibodies
- a) Detect and actively destroy antigens
- b) Destroy body cells
- c) Cause sickness
- d) None of the above

32. Antibodies are
- a) Specific and selective
- b) Non-specific
- c) a) and b) above
- d) None of the above

33. The following region of the invaders binds to and activates only those B and T cells with the complementary antibodies or T-cell receptors
- a) Antigens
- b) Antibodies
- c) Plasma membranes
- d) Carbohydrates

34. Antibodies circulating in the blood destroy antigens and antigen-bearing microbes by
- a) Coating them,
- b) Causing them to clump together
- c) Promoting phagocytosis by white blood cells
- d) All of the above

35. Cytotoxic T cells bind to
- a) Antigens
- b) Microbes
- c) Infected and cancerous cells
- d) All of the above

36. Helper T cells stimulate both the
- a) B cell and cytotoxic T cell responses
- b) Somatic cells and B cells
- c) Gametes and cytotoxic T cells
- d) Helper B cells and Helper T cells

37. The following cells are responsible for destroying antigens that reappear
- a) B cells
- b) T cells
- c) Memory cells
- d) Cytotoxic cells

38. The following are responsible for killing cellular microbes or slow down their production, thus allowing the immune system more time to respond and exterminate the invaders

a) Antibiotics
b) Tablets
c) Pills
d) Antigens

39. Autoimmune diseases arise when
a) The immune system destroys some of the body's own cells
b) Immune system is automatic
c) Diseases are not curable
d) A person is HIV positive

40. Immune deficiency diseases occur when
c) The immune system destroys some of the body's own cells
d) Immune system is automatic
e) Disease are not curable
a) The immune system cannot respond strongly enough to ward off normally minor disease

40. Non-cellular organisms that are infectious and can cause many human diseases are called
a) Viruses
b) Bacteria
c) Germs
d) Amoebas

41. Most viruses are about
a) 200 nanometres in diameter
b) 200 millimetres in diameter
c) 200 centimetres in diameter
d) 200 micrometres in diameter

42. The structure of a virus is composed of
a) An outer capsid
b) An inner core with nucleic acids
c) a) and b) above
d) None of the above

43. The following are examples of receptors on which viruses may bind before they enter host cells
a) Glycoproteins
b) CD 4
c) CCR5
d) All of the above

SECTION 2: HIV and aids knowledge

1. Answer the following questions, by crossing either TRUE, FALSE, SOMETIMES or DON'T KNOW in the correct box

1. HIV and AIDS are the same.	True	False	Sometimes	Don't Know
2. HIV can be transmitted from one person to another.	True	False	Sometimes	Don't Know
3. HIV can spread all over the body.	True	False	Sometimes	Don't Know
4. HIV can reproduce.	True	False	Sometimes	Don't Know
5. The body organs are equally susceptible to HIV infection.	True	False	Sometimes	Don't Know
6. HIV is visible to the naked eye.	True	False	Sometimes	Don't Know
7. HIV is a disease.	True	False	Sometimes	Don't Know
8. HIV is a bacterium.	True	False	Sometimes	Don't Know
9. HIV is a virus.	True	False	Sometimes	Don't Know
10. A virus is the same as a bacterium.	True	False	Sometimes	Don't Know
11. A person can do something to protect him/herself from getting HIV.	True	False	Sometimes	Don't Know
12. You can get HIV by eating food prepared by someone with HIV.	True	False	Sometimes	Don't Know
13. You can get HIV by being coughed or sneezed at by someone who has HIV.	True	False	Sometimes	Don't Know
14. People can get HIV because of witchcraft.	True	False	Sometimes	Don't Know
15. There are different types of HIV.	True	False	Sometimes	Don't Know
16. AIDS can be transmitted from one person to another.	True	False	Sometimes	Don't Know
17. A person can be infected by HIV more that once.	True	False	Sometimes	Don't Know
18. A person can do something to protect him/herself from getting AIDS.	True	False	Sometimes	Don't Know
19. You can get AIDS by eating food prepared by someone with AIDS.	True	False	Sometimes	Don't Know
20. You can get AIDS by being coughed or sneezed on by someone who has AIDS.	True	False	Sometimes	Don't

				Know
21. People can get AIDS because of witchcraft.	True	False	Sometimes	Don't Know

2. **Answer the following questions by writing the correct answer in the spaces provided.**

2.1. Where did you learn about HIV and AIDS?

2.2. What does HIV stand for?
2.3. What is HIV?

2.4. Where does HIV come from?

2.5. What is the difference/ similarity between HIV and AIDS

2.6. In which way(s) can HIV be transmitted from one person to another?

2.7. What does HIV do to body cells?

2.8. HIV infects which cells in the body?

2.9. Where does HIV stay?

2.10. How does HIV get spread in the body?

2.11. How does HIV reproduce?

2.12. How can you tell if you have HIV in your body?

2.13. How big or small is HIV?

2.14. How can people protect themselves from getting infected with HIV?

2.15. Would you rather not touch someone with HIV because you are scared of infection?

2.16. Which types of HIV do you know?

2.17. How many AIDS viruses can cause sickness?

2.18. When does HIV cause AIDS?

2.19. For how long can a person live with HIV?

2.20. What does AIDS stand for?

2.21. What is AIDS?

2.22. What causes AIDS?

2.23. What can a person do to protect him/herself from getting AIDS?

2.24. Would you rather not touch someone with AIDS because you are scared of infection?

2.25. Why does it usually take a long period for a person to die of AIDS?

2.26. What kills people with AIDS?

2.27. Why is AIDS associated with other diseases such as TB?

2.28. What can an HIV positive person do, to counteract the effects of HIV in his/her body?

SECTION 3: BEHAVIOURAL PREFERENCES

For each of the following statements, fill in the questionnaire by indicating your choice by means of crossing (X) the appropriate box. Give reasons for your choice in the space provided after each statement.

1.1. It is acceptable for a student of my age to have sexual intercourse.

Agree	Neutral	Disagree
……		

1.2. As a Grade 11 student, I would voluntarily have sexual intercourse.

Agree	Neutral	Disagree
………		

1.3. I would have sexual intercourse with someone whose sexual activities I do not really know.

Agree	Neutral	Disagree
………		

1.4. I would have unprotected sexual intercourse.

Agree	Neutral	Disagree
………		

1.5. If I had sexual intercourse, I would never use condoms.

Agree	Neutral	Disagree
………		

1.6. I would have sexual intercourse with someone I do not really know.

Agree	Neutral	Disagree
………		

1.7. I would have sexual intercourse with someone I just met.

Agree	Neutral	Disagree
………		

1.8. I would have sexual intercourse with someone who is not my boy/girlfriend.

Agree	Neutral	Disagree
………		

1.9. If I must use a needle to inject myself, I would use a needle that has been used by someone else.

Agree	Neutral	Disagree

……

1.10. I would sterilize the needle before using it.

Agree	**Neutral**	**Disagree**
……		

1.11. If I must use a razor blade to cut myself, I would use a blade that has been used by someone else.

Agree	**Neutral**	**Disagree**
……		

1.12. I would sterilize the blade before using it.

Agree	**Neutral**	**Disagree**
……		

1.13. If I had more than one boy/girlfriend, I would have sexual intercourse with each one of them.

Agree	**Neutral**	**Disagree**
……		

1.14. I think HIV really exists.

Agree	**Neutral**	**Disagree**
……		

1.15. I protect myself from HIV.

Agree	**Neutral**	**Disagree**
……		

1.16. If I found out that one of my friends is HIV positive, I would still be friends with them.

Agree	**Neutral**	**Disagree**
……		

1.17. If a family member became infected with HIV, I would prefer that he/she did not remain in the same house with me.

Agree	Neutral	Disagree
………		

1.18. I think an HIV positive student should be allowed to attend school.

Agree	Neutral	Disagree
………		

1.19. I would use the same cups, dishes etc., an HIV infected friend.

Agree	Neutral	Disagree
………		

1.20. Most students in Grade 11 have had sexual intercourse before.

Agree	Neutral	Disagree
………		

1.21. I am not scared of HIV/AIDS.

Agree	Neutral	Disagree
………		

1.22. I would use a condom only to prevent pregnancy.

Agree	Neutral	Disagree
………		

1.23. I would use a condom only with someone who is not my boy/girlfriend.

Agree	Neutral	Disagree
………		

1.24. In the past twelve months, I have had more than one boy/girlfriends

Agree	Neutral	Disagree

………

1.25. I use different ways to protect myself from HIV/AIDS.

Agree	**Neutral**	**Disagree**
………		

Appendix 6: Questionnaire used by experts to validate the questionnaire given to students

Study the questionnaire and **respond to the following evaluation questionnaire. After reading each statement indicate your response by crossing the appropriate box.**

1. The terminology used in the questionnaire is grammatically correct.

Strongly agree	**Agree**	**Disagree**	**Strongly disagree**
……………………………………………………………………………………………			

2. Some statements in the questionnaire are ambiguous.

Strongly agree	**Agree**	**Disagree**	**Strongly disagree**
……………………………………………………………………………………………			

3. The terminology used in the questionnaire is similar to that used in the Life Sciences (Life Sciences).

Strongly agree	**Agree**	**Disagree**	**Strongly disagree**
……………………………………………………………………………………………			

4. The questionnaire is easy to understand.

Strongly agree	**Agree**	**Disagree**	**Strongly disagree**
……………………………………………………………………………………………			

5. The questionnaire is appropriate for Grade 11 Life Sciences students.

Strongly agree	**Agree**	**Disagree**	**Strongly disagree**
……………………………………………………………………………………………			

6. There are special skills required to interpret the questionnaire.

Strongly agree	**Agree**	**Disagree**	**Strongly disagree**
……………………………………………………………………………………………			

7. The questionnaire is too long.

Strongly agree	**Agree**	**Disagree**	**Strongly disagree**
……………………………………………………………………………………………			

8. Section A of the questionnaire covers general Life Sciences knowledge

Strongly agree	Agree	Disagree	Strongly disagree
……………………………………………………………………………………			

9. Section B of the questionnaire covers HIV/AIDS knowledge

Strongly agree	Agree	Disagree	Strongly disagree
……………………………………………………………………………………			

10. Section C of the questionnaire covers attitudes towards HIV/AIDS related behaviour

Strongly agree	Agree	Disagree	Strongly disagree
……………………………………………………………………………………			

11. Section D of the questionnaire covers application of knowledge

Strongly agree	Agree	Disagree	Strongly disagree
……………………………………………………………………………………			

Do you have any other comments on the questionnaire?

……………………………………………………………………………………………

……………………………………………………………………………………………

Appendix 7: Pilot Questionnaire

SECTION A

Answer the following questions, by crossing either TRUE, FALSE, SOMETIMES or DON'T KNOW in the correct box

1. HIV and AIDS are the same thing.	True	False	Sometimes	Don't Know
2. HIV can be transmitted from one person to another.	True	False	Sometimes	Don't Know
3. HIV can spread all over the body.	True	False	Sometimes	Don't Know
4. HIV can reproduce.	True	False	Sometimes	Don't Know
5. The body organs are equally susceptible to HIV infection.	True	False	Sometimes	Don't Know
6. HIV is visible with a naked eye.	True	False	Sometimes	Don't Know
7. HIV is a disease.	True	False	Sometimes	Don't Know
8. HIV is a bacterium.	True	False	Sometimes	Don't Know
9. HIV is a virus.	True	False	Sometimes	Don't Know
10. A virus is the same as a bacterium.	True	False	Sometimes	Don't Know
11. A person can do something to protect him/herself from getting HIV.	True	False	Sometimes	Don't Know
12. You can get HIV by eating food prepared by someone with HIV.	True	False	Sometimes	Don't Know
13. You cannot get HIV by being coughed or sneezed on by someone who has HIV.	True	False	Sometimes	Don't Know
14. People can get HIV because of witchcraft.	True	False	Sometimes	Don't Know
15. There are different types of HIV.	True	False	Sometimes	Don't Know

16. AIDS can be transmitted from one person to another.	True	False	Sometimes	Don't Know
17. A person can be infected by HIV more that once.	True	False	Sometimes	Don't Know
18. A person can do something to protect him/herself from getting AIDS.	True	False	Sometimes	Don't Know
19. You can get AIDS by eating food prepared by someone with AIDS.	True	False	Sometimes	Don't Know
20. You can get AIDS by being coughed or sneezed at by someone who has AIDS.	True	False	Sometimes	Don't Know
21. People can get AIDS because of witchcraft.	True	False	Sometimes	Don't Know

SECTION B
Answer the following questions by writing the correct answer in the spaces provided.

1. What does HIV stand for?
2. What is HIV?
3. What is the difference/ similarity between HIV and AIDS
4. In which way(s) can HIV be transmitted from one person to another?
5. What does HIV do to body cells?
6. HIV infects which cells in the body?
7. How does HIV reproduce?
8. How can you tell if you have HIV in your body?
9. How big or small is HIV?
10. How can people protect themselves from getting infected with HIV?
11. Would you rather not touch someone with HIV because you are scared of infection?
12. Which types of HIV do you know?
13. When does HIV cause AIDS?
14. What does AIDS stand for?
15. What is AIDS?

16. What causes AIDS?

17. What can a person do to protect him/herself from getting AIDS?

18. Would you rather not touch someone with AIDS because you are scared of infection?

19. Why does it usually take a long period for a person to die of AIDS?

20. What kills people with AIDS?

21. Why is AIDS associated with other diseases such as TB?

22. What can an HIV positive person do to prolong the effects of HIV in his/her body?

SECTION C

1. Have you ever had sexual intercourse?

If you answered YES in question 3.1 above, please continue to answer questions 3.1.1 and onwards. If you answered NO in question 3.1 above, skip questions 3.1.1 to 3.1.13

1.1 When was the last time you had sexual intercourse?

1.2 In the past twelve months, how many people have you had sex with?

1.3 Do you never, sometimes, most of the time, or always use condoms for sex?

1.4 In what situations do you use condoms?

1.5 With whom do you use condoms?

1.6 What do you do to protect yourself during sexual intercourse?

1.7 When was the last time you had unprotected sexual intercourse?

1.8 Have you ever had sexual intercourse with someone you did not know?

1.9 Have you ever had sexual intercourse with someone you just met?

1.10 Have you ever had sexual intercourse with someone who is not your boy/girlfriend?

1.11 Do you use needles to inject yourself with drugs?

1.11.1 If yes, are the needles you use, used by someone else?

1.11.2 Do you sterilize the needles before using them?

1.12 Do you use razor blades to cut yourself?

1.12.1 If yes, are the blades you use, used by someone else?

1.12.2 Do you sterilize the blades before using them?

1.13 In the past twelve months, how many boy/girlfriends have you had?

1.14 Do you protect yourself from HIV?

1.15 How do you protect yourself from HIV?

1.16 If you find out that one of your friends is HIV positive, would you still be friends with them? Explain.

1.17 If a family member became infected with HIV would you prefer that they did not remain in the same house as you? Explain.

1.18 Do you think a school pupil with HIV should be allowed to attend school? Explain.

1.19 Would you drink from the same bottle of water as an HIV infected friend? Explain.

Appendix 8: Questionnaire given to students for data collection

Section A: Questions

Answer the following question by writing or crossing (X) in the correct box.

A	What is your age, as at your last birthday?		A1	

B	What is your gender?			
	a) Male	1	B1	
	b) Female	2		

C	In the following list, mark all the subjects that you are currently taking.			
	a) Accounting	1	C1	
	b) Business Economics	2	C2	
	c) Economics	3	C3	
	d) Geography	4	C4	
	e) History	5	C5	
	f) Life Orientation	6	C6	
	g) Life Sciences	7	C7	
	h) Mathematics	8	C8	
	i) Physics	9	C9	
	j) Other	10	C10	

D	In the following list, mark all the channels through which you learn about HIV/AIDS.			
	a) Billboards and notice boards	1	D1	
	b) Church	2	D2	
	c) Friends	3	D3	

d) Hospitals/doctors/nurses	4	D4	
e) Newspapers/magazines	5	D5	
f) Parents/family	6	D6	
g) Radio	7	D7	
h) School books	8	D8	
i) Teachers	9	D9	
j) TV	10	D10	
k) Internet	11	D11	
l) Other (*specify*)	12..............................	D12	

In the following questions write your responses by crossing (X) in the correct box, next to your answer. Choose only one answer.

1	A virus is a…		V1
	a) Non-cellular parasitic agent;.	1	
	b)Unicellular organism called Bacteria;	2	
	c) Prokaryote;	3	
	d) Eukaryote.	4	
2	The structure of viruses is composed of …		V2
	a) Mitochondria;	1	
	b) An outer capsid and an inner core;	2	
	c) Chloroplast;	3	
	d) A little organism called HIV.	4	
3	Bacteria are…		V3
	a) Viruses;	1	
	b) Not at all linked to AIDS;	2	
	c) The source of HIV and AIDS;	3	
	d) Unicellular organisms that may cause human diseases.	4	
4	The following are examples of opportunistic infections caused by harmful bacteria,		V4
	a) Tuberculosis (TB);	1	
	b) Pneumonia;	2	
	c) *a)* and *b)* above;	3	
	d) None of the above.	4	
5	Contaminated blood is the blood that contains…		V5
	a) Bacteria and viruses;	1	
	b) White blood cells;	2	

c) Red blood cells; 3
d) Antibodies. 4

6 Cells of the immune system such as CD 4 cells are found in… V6

a) Condoms; 1
b) Blood; 2
c) Lungs; 3
d) Antibiotics. 4

7 The following are responsible for recognizing antigens and triggering the immune system, V7

a) Antibodies only; 1
b) T-cells receptors only; 2
c) Antibodies and T-cell receptors; 3
d) None of the above. 4

8 The human body has the following line(s) of defence against invasion by microbes, V8

a) Natural killer cells; 1
b) Mucous; 2
c) The skin; 3
d) All of the above. 4

9 Immune deficiency diseases occur when V9

a) The immune system destroys some of the body's own cells; 1
b) The immune system is automatic; 2
c) A person has lost too much weight; 3
d) Diseases are not curable. 4

10 Which of the following slow down the metabolism of microbes thus allowing the immune system more time to respond and exterminate these microbes? V10

a) Antibiotics;	1
b) Bacteria;	2
c) HIV;	3
d) Sleeping.	4

State whether the following statements are true or false. Indicate your choice by means of crossing (X) the appropriate box.

		True (1)	False (2)		
11	AIDS is caused by HIV.			V11	
12	There are different strains (types) of HIV.			V12	
13	HIV cannot be transmitted through exchange of bodily fluid e.g. blood, between an infected person and another person.			V13	
14	People with AIDS cannot be infected with HIV.			V14	
15	People who have been infected with HIV do not show signs of infections immediately after infection.			V15	
16	HIV disrupts the immune system leading to immune deficiency.			V16	
17	People living with AIDS are highly vulnerable to many opportunistic infections that are easily cured in HIV negative people.			V17	
18	There is a vaccine that can stop people from getting HIV.			V18	
19	AIDS can be cured with antiretroviral drugs.			V19	
20	HIV can be eliminated from the body.			V20	

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For each of the following statements, fill in the questionnaire by indicating your choice by means of crossing (X) the appropriate box.

		Agree (1)	Disagree (2)	For office use only
21	In your opinion, is it okay for unmarried people to have unprotected sexual intercourse?			V21
22	In your opinion, is it okay for people to have many sexual partners?			V22
23	In your opinion, is it okay to use sterilized needles for injections?			V23
24	In your opinion is it okay to share one razor blade without sterilizing it before use?			V24
25	In your community is it okay for people to have multiple sexual partners?			V25
26	Do most students dislike condoms?			V26
27	Do young people in your community protect themselves from HIV infection?			V27
28	Would you have sexual intercourse with someone whose sexual activities you do not really know?			V28
29	Would you have unprotected sexual intercourse, e.g. without a condom with your boy/girlfriend?			V29
30	Are you at risk of getting HIV?			V30

THANK YOU FOR YOUR PARTICIPATION

Section B: Correct answers developed by researcher

Question	Answer
Item V1	a
Item V2	b
Item V3	d
Item V4	c
Item V5	a
Item V6	b
Item V7	c
Item V8	d
Item V9	d
Item V10	a
Item V11	True
Item V12	True
Item V13	False
Item V14	False
Item V15	True
Item V16	True
Item V17	True
Item V18	False
Item V19	False
Item V20	False
Item V21	Disagree
Item V22	Disagree
Item V23	Agree
Item V24	Disagree
Item V25	Disagree
Item V26	Disagree
Item V27	Agree
Item V28	Disagree
Item V29	Disagree
Item V30	Agree