

***STARTING WITH OURSELVES:***  
**ADDRESSING HIV AND AIDS EDUCATION**  
**THROUGH INTEGRATION**  
**IN A SOUTH AFRICAN PRE-SERVICE TEACHER**  
**MATHEMATICS EDUCATION CURRICULUM**

BY

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## ABSTRACT

The purpose of this study was to initiate integration of HIV and AIDS curriculum in mathematics education and to explore the possibilities of this innovation in pre-service teacher education. This study focuses on how a mathematics teacher educator who teaches at the faculty of education at a university in KwaZulu-Natal, South Africa responded to the HIV and AIDS pandemic by implementing curriculum changes in primary mathematics education module using a *Starting with ourselves* approach. Drawing on a review of policy related work in South Africa and studies in the area of HIV and AIDS education, the researcher saw the need to take on the challenge of seeking appropriate ways of taking on interdisciplinary action in a poorly researched area. Few in depth studies at initial teacher education intuitions are available where the focus has been on integration of HIV and AIDS in a discipline.

The study made use of questionnaire responses, interactions with an experienced teacher-researcher, a colleague, focus group discussions/workshops, metaphor drawings, mathematics lesson observations and reflective journal entries. Statistical analysis of the data from the questionnaire was situated in a quantitative/technical paradigm but qualitative/interpretive and qualitative/critical paradigms were used to understand data obtained from a variety of social settings that include one-to-one interactions with a teacher researcher and a colleague and focus group discussions. Observations and interactions during focus group discussions, classroom observations and reflective journal entries are intertwined to understand the integration process. The study describes the

lecturer's involvement in integration of HIV and AIDS education in mathematics at three different levels: integration in a mathematics education module with a large group of pre-service teachers; working with a focus group of seven pre-service teachers preparing for integration with young learners during practice teaching; exploration of my involvement by situating myself in a self-study paradigm. In the first level the quantitative analysis of pre-service teachers' responses to a questionnaire indicated that pre-service teachers see the need to become 'multiskilled' teachers. In the second level, the qualitative/interpretive analysis of the theory of integration of focus group participants, through metaphor work and the 'theory in action' in mathematics classrooms of young learners, showed that integration of HIV and AIDS education is possible. The third level was situated in a qualitative/critical paradigm and analysis revealed the importance of my life experiences in the integration initiative. The collaborative autobiographical work with an experienced teacher-researcher and a colleague, focus group participants' interaction and self-reflection facilitated further investigation of the integration process. This study provides pedagogic suggestions for action by pre-service teachers and teacher educators using mathematics education to address HIV and AIDS.

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## **PREFACE**

Ethical clearance was granted for this project by the University of KwaZulu-Natal Research Office. The Ethics Clearance Approval number is HSS/05119A.

The research described in this thesis was carried out in the Faculty of Education, University of KwaZulu-Natal, under the supervision of Professor Claudia Mitchell and co supervision of Professor Relebohile Moletsane.

This study represents original work by the author and where use has been made of the work of others it is duly acknowledged in the text.

Linda van Laren

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### **Dedication**

This thesis is dedicated to children who are affected by HIV or AIDS.

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## **CHAPTER ONE**

### **INTRODUCTION: HIV AND AIDS IN THE SOUTH AFRICAN SCHOOLING SYSTEM**

Human immunodeficiency virus (HIV) influences the lives of more than 250 000 South African children below 15 years (AVERT, 2004) who are living with HIV. According to Shisana et al (2005, p. 33), in South Africa the HIV prevalence in the age group 2 years to 14 years is approximately 3.3% and the HIV prevalence in KwaZulu-Natal is one of the highest in South Africa (Shisana et al, 2005, p. 35). It is impossible to quantify the number of people infected or affected by HIV and Acquired Immunodeficiency Syndrome (AIDS). An analysis by Barnett and Whiteside (2002) shows the far reaching effects that occur at various levels of society as a result of HIV and AIDS<sup>1</sup>. The levels are at individual, family, community and macro-level. Barnett and Whiteside (2002) suggest that at each successive level the effects are felt on a larger scale by a greater number of people.

Further statistics from a local newspaper article where Joan van Niekerk (cited in Leeman, 2004) made public the results of research at the 9<sup>th</sup> International Conference of the South African Association of Marital and Family Therapy that involved 283 000 learners from high schools in all nine South African provinces. Van Niekerk revealed that by the age of 10, one out of every three children polled had already had sexual intercourse and she believes that youth educational programmes on HIV and AIDS prevention and responsible sexual behaviour are not succeeding.

## **CHAPTER SEVEN**

### **SUMMARY, DISCUSSION AND IMPLICATIONS**

#### **INTRODUCTION**

Statistics published by AVERT (2007) estimated that by 2005 already over five and a half million South Africans were living with HIV and AIDS and that almost one and a quarter million children aged under 18 had been orphaned (had lost one or both parents) as a result of deaths from AIDS-related illnesses. As I have noted in earlier chapters, this includes large numbers of children who are of school-going age, who, as a result, tend to suffer distress, decline in motivation, morale and performance and probably are ‘grappling with survival, death and fear’ (Malcolm, 2002, p. 73). In addition, such children are likely to suffer health problems themselves, including HIV infection, nutrition-related and other illnesses. Because of the increasing number of child headed families, and the related burdens for an increasing number of learners, particularly those infected or affected by HIV and AIDS, teachers have a vital role to play in the lives of children as well as in schools and communities generally. For young learners infected and affected by the pandemic, teachers may be the only contact they have with adults. In this context, teachers need to acquire new types of knowledge, skills, attitudes and values if they are to successfully educate and intervene in the lives of such children. Teachers will have to become multi-skilled through being HIV-aware, HIV- competent, and HIV-safe.

Functioning at the centre of the HIV and AIDS pandemic, however, has serious consequences for UKZN to prepare such multi-skilled teachers. As mentioned in Chapter One, UKZN has a responsibility to prove that it is the ‘premier University of

African Scholarship' (UKZN, 2007) by 'making a difference' to educational needs of its students and the community as a whole. The modules provided to assist pre-service teachers with the teaching and learning of HIV and AIDS education cannot be the sole responsibility of one or two individuals or small groupings within the education faculty. In order to address the possibility of integration of HIV and AIDS education into the mathematics curriculum, this research sought ways to deliberately encourage discussion and action through compulsory integrated activities in mathematics education modules for pre-service primary school teachers.

Although I am not medically trained and not a trained counselor, none the less I decided to 'do something' as a mathematics teacher educator in one of the provinces with the highest prevalence rates. Using self-study research model advocated by authors such as Loughran (1999) and Mitchell et al (2005) in the mathematics education modules that I teach at a higher education institution in KwaZulu-Natal, I took control of what I felt able to do in addressing the educational impacts of HIV and AIDS. In the mathematics education modules that I teach I made a choice to think and ask myself questions about why I do teaching and learning activities as I do and what I could do differently. Through a self-study approach I was able to consider why I am the way that I am and how I go about the teaching of HIV and AIDS education in mathematics education.

Policy document analysis (See Chapter Two.) has shown that although South African politicians and educational managers have produced volumes of eloquent and compelling legislation regarding provision for HIV and AIDS education, little of this is translated into action in schools. In the field of teacher education, in particular,

provision is made for stand alone HIV and AIDS education modules and/or integration of HIV and AIDS education in disciplines. However, to my knowledge, in-depth studies of these aspects of teacher education are scant. Informed by literature on the importance of teacher self-study, as well as the policy intentions of integrating HIV and AIDS content in the teacher education curriculum, I decided to study my own practice in mathematics education, with the aim of developing strategies of my own and with my mathematics education students.

Thus, this study aimed to explore possibilities of integration of HIV and AIDS in mathematics education; to contribute to the debate about integration of HIV and AIDS across disciplines such as mathematics education; and to improve my ability to assist pre-service teachers with the teaching and learning of mathematics amidst all the educational challenges caused by HIV and AIDS.

Because of the widespread devastation of HIV and AIDS, it permeates all social, economic and political arenas in South Africa that include teacher education. Teacher education, however, has a particularly important role because we indirectly, through the pre-service teachers in our charge, have a responsibility towards learners. As a teacher educator I wanted to contribute to the battle against HIV and AIDS but lacked particular know-how.

Before I attempted the curriculum intervention by integrating HIV and AIDS education in mathematics education in 2005 (See Chapter Five.), I reviewed current practice at our higher education institution by asking all the third year pre-service teachers to complete a questionnaire (See Chapter Four.). This served as a needs

survey to ascertain whether or not pre-service teachers saw the need to increase their knowledge about HIV and AIDS education and particularly using mathematics education modules. I identified that my area of specialization, mathematics education, could be an aspect to explore. The use of a high-status discipline or learning area may then be seen by pre-service teachers as an alternative means of extending HIV and AIDS education and the importance of HIV and AIDS education was emphasised.

## **SUMMARY AND DISCUSSION**

Here I reflect on the findings explained in the previous chapters. The summary and discussion will commence by highlighting the significance of the action research component through the ‘getting started’ mobilization plan. A discussion of the questionnaire responses of the pre-service teachers who were registered for PME 210 will follow. Thereafter the work with the focus group involved in the *HIV/AIDS Mathematics Education Project* will be reflected upon. Lastly ‘my research experience’ describes my perspective as a self-study researcher using a *Starting with ourselves* approach whilst ‘making a difference count’.

### ***Mobilization action plan***

As a mathematics teacher educator who aspired to ‘making a difference’ through my discipline, it was necessary to gain recent, relevant information about HIV and AIDS as well as HIV and AIDS education. Initially I felt that ‘I know I should do it, but I want somebody to tell me that I have to’ (Lubben & Campbell, 2006, p. 486) because I lacked a simple structure or support to get started. This became possible through reading widely in the area of HIV and AIDS education and by attending workshops

organized by Dr Sutinen. (See Chapter Three.) The step by step ‘mobilization plan’ suggested by Dr Sutinen provided an achievable entry mechanism for action during the teaching of the primary mathematics education module. Using the basic steps in the plan it was possible to prepare a starting strategy and simultaneously dispel the myth ‘Nothing we can do’ about HIV and AIDS.

My work with developing HIV and AIDS education in the Data Handling section of the PME 210 module with third year pre-service teachers formed one of the ‘prongs’ in my ‘Naming of the Challenge’ step of the mobilization plan. By developing, reflecting and refining mathematics education activities for the generalist pre-service teachers it was possible to commence with developing multiskilled teachers who need to be HIV-aware, HIV-competent, and HIV-safe.

Naming the challenge provided me with an entry point for my integration endeavours that were within my reach. I then devised/supplemented or adjusted learning activities for the pre-service teachers registered for PME 210. Authentic HIV and AIDS data was used to prepare activities that included aspects of SCK in mathematics and SCK in HIV and AIDS for prospective teachers. I aimed at ‘interdisciplinary richness’ (Nissani, 1995) through development of a unique ‘compound’ (See Chapter Five.) for the integration of HIV and AIDS education in mathematics. The activities that were used during the PME 210 module presentations may, however, need to be extended and supplemented through an ‘observe-reflect-act-evaluate-modify-move in new directions’ process for further action to achieve the desired unique properties of this ‘compound’.

An important aspect required before naming a challenge and acting upon the challenge is the need to be motivated to initiate and persevere with a challenge. The saying 'where there is a will there is a way', aptly describes the need for motivation to make a difference. Before the mobilization process can commence there needs to be a willingness to take action. Perhaps the lack of 'willingness' is one of the reasons for the lack of initiatives in taking up the challenge of integrating HIV and AIDS education in many HEIs in South Africa. Unfortunately the mobilization plan does not include a guide or step to encourage motivation that is required before the naming and taking up of a challenge. Other strategies will be required to persuade teacher educators, in particular, to see the urgency of the HIV and AIDS pandemic.

### ***Questionnaire responses***

In order to 'evaluate' what was presented during the PME 210 module and survey the opinions of the pre-service teachers a questionnaire was administered. In the survey that I conducted (See Chapter Four.), over the three years of study, I questioned all third year pre-service teachers who were taking a compulsory primary mathematics education module as I was interested surveying their responses to questions relating to HIV and AIDS education at the Edgewood Campus. Inferential statistical analysis of the responses to the eight statements on the questionnaire, however, showed that for half of the statements analysed there were differences in opinions along ethnic group lines.

On closer examination of how ethnic groups expressed these differences in opinion it seems as if:

- the black, Coloured and Indian respondents were more in favour of paying more attention to HIV and AIDS education than were the white respondents
- the black, Coloured and Indian respondents were more in favour of having a more active HIV and AIDS education policy than were the white respondents
- the black respondents were more in favour of having making use of Data Handling in HIV and AIDS education in mathematics modules to provide personal knowledge than were the white, Indian and Coloured respondents.
- the black respondents were more in favour of making more use of HIV and AIDS statistics to provide personal knowledge than were the white, Indian and Coloured respondents.

In general, black pre-service teachers' responses indicated that they are in favour of:

- paying attention to HIV and AIDS education
- having a more active HIV and AIDS education policy
- making use of Data Handling in HIV and AIDS education in mathematics modules to provide personal knowledge
- making more use of HIV and AIDS statistics to provide personal knowledge

Some ethnic groups in South Africa have experienced greater losses of loved ones through the AIDS pandemic than others. It is, however, not prudent to think that only one group is susceptible to the HI virus. Teachers cannot think that if 'low prevalence' is reported in a particular ethnic group that this situation is a timeless condition (Irwin, Millen & Fallows, 2003). Statistics that show the distribution of HIV and AIDS in the

various regions of the world are probably the cause of automatically associating the disease with African people, particularly black African inhabitants. It will, however, be up to each South African and particularly teachers of young learners to halt the stronghold of the pandemic so that what may be seen as 'low prevalence' does not escalate into 'high prevalence' by denial, paralysis, silence, ignorance (Malcolm, 2002), indecisiveness and perhaps even prejudice.

There are many debates about who is an African and who is not an African but these will not be considered. There are probably other far more philosophical and theoretical arguments about the definition of being 'African' but in my opinion I am an African because I am who I am because of being born in Africa and having lived my whole life teaching and learning in Africa; all my life experiences are centered in Africa. Since before the fall of 'apartheid' in 1994, there has been a different reason for the 'Crying of *my Beloved Country*' as HIV and AIDS has emerged as a critical health crisis for Africa. By 2005 already, it was estimated that AIDS claimed more than 800 South African lives every day (UNAIDS/WHO, 2006).

South Africans are still, after more than a decade of democracy, classified according to ethnic categories even in statistics provided by in the *South African National Household Survey, 2005* (cited in Noble, Berry & Fredriksson, 2005). We are classified in terms of being black, Coloured, Indian or white instead of being South Africans. Since 1994, all Apartheid divisions, including the 'Immorality Act' that legislated against inter race sexual relationships, have been demolished. In South Africa sexual transmission of the HI virus is probably far more prevalent than drug

usage transmission. Surely this means that strict categorization of people along racial appearances holds no sway when it comes to transmission of the HI virus.

The information listed in the *South African National Household Survey, 2005* (cited in Noble, Berry & Fredriksson, 2005) estimated percentage HIV prevalence among South Africans (aged two years and older) as: white, 0.6%; Indian, 1.6%; Coloured, 1.9%; African, 13.3%. Perhaps this gives some South Africans the false impression that the HI virus is not 'colour blind' and thus selective in targeting certain South Africans. During *The South African National Household Survey, 2005* (cited in Noble, Berry & Fredriksson, 2005), white and Indian South Africans were pointed out as being less co-operative when asked to test for HIV status. It thus appears that attitude towards testing and other issues regarding HIV and AIDS are perhaps seen differently by the various ethnic groups.

As a South African teacher educator I am concerned that pre-service teachers also believe that being of a particular ethnic group is 'safer'. Furthermore, the relative ease of mobility of people through every region of the world cannot safeguard the restriction of HIV and AIDS to being an 'African problem'. Many South African pre-service teachers have aspirations of teaching 'overseas' and foreign agencies for teacher recruitment are always lurking around our African Education Faculty waiting to 'snap up' newly qualified teachers. These agencies provide many attractive 'opportunities' for teaching in foreign countries and presumably pre-service teachers across all South African ethnic groupings are required. The opportunity to work in a

foreign country is often seen as a way of earning a good income as a teacher and is seen as a prospect for upward social mobility.

From the ethnic differences in responses it appears as if the myth 'Aids is an African Problem' was commonplace amongst pre-service teachers at Edgewood. Hopefully this myth is not also interpreted as yet another myth 'HIV infection is something that happens to people from other ethnic groups' (Berry, 2007, p. 5).

Inferential statistical analysis of the responses to the eight statements on the questionnaire also showed that for five of the statements analysed (See Chapter Four.) there were differences in opinions expressed by female and male pre-service teachers.

On closer examination of how females and males expressed these differences in opinion it seems as if female respondents were more in favour of:

- paying more attention to HIV and AIDS education
- having a more active HIV and AIDS education policy
- having HIV and AIDS teacher education being informed by discipline specialists in Life Orientation or Sex Education
- having HIV and AIDS teacher education being informed by specialists across disciplines
- making more use of HIV and AIDS statistics to provide personal knowledge.

South Africa is known to have one of the highest rates of sexual violence (AVERT, 2007). This violence takes on many forms. Most pre-service teachers are women and women often bear the brunt of sexual violence. Women are quite likely to have their

first sex experience through being forced or coerced. Even practising sexual abstinence until marriage and remaining faithful to a husband will not guarantee safety from becoming infected with the HI virus as in South Africa multiple partners is acceptable for husbands of some women. Mothers too are often not considered as important as the child's life at childbirth. Sometimes mother-to-child transmission is prevented by drugs but insuring that the child does not become an orphan does not receive the deserved prioritisation; mothers are thus not rightfully recognised as one of the most important people in the life of the whole family.

Another form of 'violence' against women occurs at antenatal clinics in South Africa where mandatory testing for HIV status occurs. Although it is good practice to test women before the birth of their children so that appropriate retroviral drugs can be used as a precautionary measure for the new born children, **both** parents of a newborn children should be tested. It would, however, be difficult to enforce a law that requires both parents to be tested but perhaps there would be less prejudice against women if both parents are tested. Furthermore, this would reinforce in importance of HIV status of both females and males. Perhaps the testing of both parents would also dispel the myth that 'HIV is spread by females'.

It is not surprising that female pre-service teachers are more in favour of the extension of HIV and AIDS education. It is, however, also important for male pre-service teachers to see HIV and AIDS education as important. Only over the last century girls and women have had freer access to mathematics education (Smith, 1996, p. 195). The field of mathematics is still considered by many to be a 'male domain'. Perhaps making use of a high-status discipline, such as mathematics, may go some

way towards changing the opinions of male teachers as all teachers have vital roles to play in the teaching and learning of HIV and AIDS education. All pre-service teachers may 'take notice' of what is offered in the high-status discipline modules so HIV and AIDS education will benefit if it is integrated with the mathematics in a meaningful way.

Issues of sex<sup>1</sup> and gender<sup>2</sup> warrant some attention when it comes to looking not only at who is affected but also who is going to do something. The *South African National Household Survey, 2005* (cited in Noble, Berry & Fredriksson, 2005 ), listed the estimated percentage prevalence among male and female South Africans as: male, 8.2%; female, 13.3%. In the survey questionnaire (See Chapter Four.) I was also interested in seeing whether the sex of the pre-service teachers mattered in terms of different opinions to statements. Most teachers of young learners are female but it is necessary to see if and how the opinions of female and male teachers differ in relation to HIV and AIDS education by analysing the pre-service teachers' responses. Furthermore, my focus group of volunteers was all females and I wondered why no males volunteered. (Initially one Congolese male pre-service teacher expressed an interest in working on the HIV and AIDS education in Mathematics project but he changed his mind about participating.)

Currently mathematics still appears to be a 'male dominated' discipline. For example, in 2007 the first elective mathematics module (Mathematics for Educators 210) for pre-service teachers at the Edgewood Campus who wish to become mathematics teachers consisted of more than 60 % males. Sixty percent may not seem to be an indication of 'male domination' but in the predominantly female profession, this does

indicate that mathematics teaching does attract male pre-service teachers. This interest of pre-service teachers in mathematics should be explored so that the teaching and learning of HIV and AIDS education through mathematics could be furthered. During the past three decades there has been much research into gender and mathematics, but there appears to be no conclusive answers to research questions about gender and mathematics and furthermore, 'nothing to do with gender is simple' (Fennema, 2000, p. 14).

I used 'sex' of respondent as a variable in my research because I was interested in exploring and quantifying if and how responses of the different sexes varied in the survey questionnaire; I was not attempting to find out why there were differences in responses. Perhaps the differences in responses are linked to males and females interpreting the world differently (Fennema, 2000, p. 12). Female pre-service teachers appear to be more sympathetic toward the suffering caused by HIV and AIDS and considerate of others' needs and see that there is a need to learn more about assisting learners. This raises important questions about how to engage all teachers in addressing HIV and AIDS education in their classrooms.

Possibly male pre-service teachers see mathematics as a discipline that only works on 'faceless' numbers and is thus devoid of emotionality but simultaneously is associated with achievement and success (Fennell, 2006). Unfortunately these are both misconceptions about the nature of mathematics but perhaps these perceived characteristics of the 'high-status' discipline may facilitate the integration of the 'soft' discipline in teacher education.

If teacher education curricula are considered to be overcrowded, the integration of HIV and AIDS education in a 'high-status' discipline appears to be one solution to the problem. The questionnaire responses showed that pre-service teachers are of the opinion that HIV and AIDS education can be further developed. By integration of HIV and AIDS education, pre-service teacher education modules provided by the specialists in Life Orientation or Gender Education will be supported.

### ***Working with the focus group***

The other 'prong' in my 'Naming of the Challenge' step of the mobilization plan included encouraging, assisting and working with a volunteer group of pre-service teachers to develop and devise integrated classroom mathematics activities. Together with a volunteer group of seven final year BEd pre-service teachers, I embarked on a journey towards developing a possible model to integrate HIV and AIDS education in mathematics classrooms of young learners. I gained support from the pre-service teachers who volunteered to work with me in our *HIV/AIDS Mathematics Education Project*.

Ongoing assessment of our progress in the *HIV/AIDS Mathematics Education Project* made it possible to constantly evaluate and modify our actions. Our focus group developed to a level where individual contributions were encouraged and acknowledged. In our focus group we moved forward as a social group where we progressed from some of the pre-service teacher participants not knowing each other's names to a social grouping where interpersonal relationships changed. All the participants engaged in critical conversations, took charge and ownership of activities and learnt as partners to form a collaborative working group.

It was interesting to note that none of the pre-service teachers chose to use the HIV and AIDS education in mathematics activities that I prepared during focus group discussions for in their practice teaching classrooms. Usually they chose the activities that they developed themselves or they adapted other pre-service teacher's activities to use. We were 'equal' in the sense that individual choices were made and acted upon. This provided the pre-service teachers with the necessary autonomy to 'do, talk and record' using their own professional expertise. There was emphasis on the individual and what suited the individual participant. The pre-service teachers were thus able to decide on their own criteria for judging what was required in their specific practice teaching context.

The chief resources we used were 'human resources' in terms of time and effort we put into the project. We prepared what we considered to be mathematics activities for young learners that also extends and includes HIV and AIDS education. In preparation for practice teaching the volunteer group of pre-service teachers went about preparing their own teaching materials and piloted their own activities or other activities developed by another focus group member. We took stock of what could happen in a mathematics classroom and we have identified necessary modifications in the light of what we tried and observed during the 2005 practice teaching session. I monitored progress by means of videos, audio recordings and observations and transcribed documents were used to inform review, evaluation and modified action (McNiff, Lomax & Whitehead, 1996).

During the development of our HIV and AIDS education in mathematics activities,

we used the group discussions to inform our learning about the topic. It was easy to problematise and engage with issues, as each member of the group did not know what the outcomes of our *HIV/AIDS Mathematics Education Project* would be. We constantly questioned what was possible when teaching young learners but we knew why we needed to become involved and we knew what our investigation should focus on. We knew that the materials we had prepared were of draft quality but we made attempts at improving what we had developed. We were, however, reasonably certain that we could do something about the issue that was identified as problematic. We made contributions by extending the knowledge of the learners in the seven mathematics classrooms in the Durban area of KwaZulu-Natal and at the same time we communicated our desire to bring about change in HIV and AIDS education through mathematics to seven teachers and five headmasters of primary schools (three of the pre-service teachers did practice teaching at the same school).

Furthermore, I believed in making sure that each member of the group was given the opportunity to show how they went about teaching the HIV and AIDS education in their practice teaching classrooms. The teaching of each lesson was seen as a contribution to the overall aim of ‘making a difference’; each in its own unique way. Each member of our focus group made different contributions towards the solution of our problem of including HIV and AIDS education in the mathematics classroom and each member’s contribution was celebrated. We succeeded in putting our strategy into operation and we saw a way forward in continuing to extend and develop what we achieved.

There were unequal power relationships that existed in our focus group. I initiated the self-study exploration but during our interactions the pre-service teachers became more open and confident and participants in their own rights. At times, however, the pre-service teachers were even willing to openly comment and judge the way in which I conducted mathematics education modules. As our project developed, the pre-service teachers came to realise that there were differences in responsibilities and professional expertise but everyone's contributions was of equal value. We became more skilled in the development of appropriate activities to be used in the mathematics classroom; we moved towards becoming knowledgeable and skilled at integrating HIV and AIDS education in mathematics.

The beliefs of the participants were explored by making use of self-drawn metaphors of how the integration of HIV and AIDS education ought to occur in mathematics. It was interesting to see the clear links between life experiences and the metaphors chosen for illustrations. Each participant drew a different picture and these showed how important family circumstances and influences guide our visions in innovations such as the integration of HIV and AIDS education in mathematics. Despite the different visions displayed in the illustrations, each participant attempted to integrate HIV and AIDS education in mathematics classrooms of young learners and it was possible to see how theories were enacted in classroom practice.

By using multiple data sources in each of the seven cases, I explored the contributions of the participants to gain a greater understanding of the importance of life experiences came to the fore. Not only was I able to get a glimpse of how the

multiple meanings, represented in their metaphor drawings, may be used as entry points for further new experiences but also how deepened meanings are conveyed in the drawings.

By encouraging the use of a 'visual form' to express the innovation where HIV and AIDS education is integrated in mathematics, I was able to better understand aspects of experiences that are often silent. The sharing occurred in an enjoyable fashion during focus group discussions where it was possible to fuse creativity with lived experiences through unique, personal drawings. I was able to dare to disrupt the status of a 'high stake' discipline by the inclusion of a 'lower status' discipline using a simple diagram.

The use of drawings allowed for my vision of integration of HIV and AIDS education in mathematics by providing a medium for my tentative vision to be exposed in a simple two dimensional model. Although the drawing should not be seen as the inflexible, unalterable representation of a belief, it is a form that is easily portrayed and does not necessarily require sophisticated language to convey its meaning. The use of the metaphor drawing proved to be an easy yet effective way of making experiences and aspirations visible.

The drawing and exploration of the metaphor was seen as a starting point for the journey where more than beliefs are required to 'make a difference'. The connections between beliefs and actions played an important role in preparing the participants to engage in showing the prospect of integration in a classroom situation. The participants' integration methods in the classrooms were by no means flawless but the

integration of HIV and AIDS education experiences gained allow for further reflection and improved action.

Furthermore, I made use of focus group discussions to assist pre-service teachers with the development of the required knowledge, skills, attitudes and values to integrate HIV and AIDS in the teaching and learning of mathematics and made inroads into preparing multiskilled teachers.

### ***My research experience***

Since inception of *Starting with ourselves* I wanted to make some inroads into ‘making a difference’ and what constantly at the back of my mind was ‘How do I improve my teaching of mathematics education modules so that the knowledge about HIV and AIDS of pre-service teachers and young learners can be extended?’ I wanted to start with making changes at my higher education institution because it is these pre-service teachers who have a significant influence in the mathematics classrooms of young learners. I believe that everyone has the right to knowledge about HIV and AIDS and the responsibility to act appropriately by being aware of their rights and the rights of others in society. Unfortunately far too many young learners in South Africa have their rights violated in the many appalling ways, but these learners too should be considered in terms of what strategies are available when their rights have been sullied.

I gathered various forms of data using a variety of research instruments to gauge how we went about improving the teaching and learning of HIV and AIDS through mathematics activities. Data from a wide variety of sources were used for analysis.

This data was used to see where, what and how the teaching and learning of HIV and AIDS education in mathematics classrooms is possible and how we have influenced the situation. I have gathered, as much data as I feel is appropriate and 'right' to be able to reflect and react upon in my next cycle of 'do, talk and record'.

The working criteria I used to make judgments are linked to my values that include believing that each learner has the right to be educated about HIV and AIDS and the right to accurate knowledge about HIV and AIDS. I have thus looked to see where, what and how the pre-service teachers contributed to the teaching and learning of HIV and AIDS education in the mathematics classrooms of young learners. My data turned into evidence as I showed how the data met my nominated criteria.

By analyzing the frequency and content of my interactions during the focus group discussions (See Chapter Six.) I was able to explore my contributions in a more systematic manner. The self-study showed that almost half the total number of interactions during all focus group discussions were concerned with addressing and affirming confidence in the integration process; approximately one third of the number of interactions included organizing the structure of the integration project; the remaining fraction of the interactions were devoted to extending the knowledge, skills, attitudes and values by extending Pedagogical Content Knowledge (PCK) and Subject Content Knowledge (SCK), in both HIV and AIDS education and mathematics education, and investigating beliefs about how HIV and AIDS education may or ought to be integrated into mathematics.

Using a self-study (See Chapter Six.) to interrogate my interactions during focus

group discussions, I was able to make use of the approach to gain insights into pedagogical strategies that I could use to further the teaching and learning of HIV and AIDS in a pre-service teacher institution. The concept that ‘self-study defines the focus of study and not the way the study is carried out’ (Loughran, 2004, p. 18) was gainfully employed in my research methodology. In my *Starting with ourselves* approach, I was able to use a variety of quantitative but mainly qualitative methodological approaches to address HIV and AIDS in mathematics education at a HEI in KwaZulu-Natal. Furthermore, by working collaborately with Dr Lesko, who is an experienced teacher-researcher, deep insight into my thinking and motives for becoming determined to ‘make a difference’ through my discipline became apparent.

### **IMPLICATIONS FOR TEACHER EDUCATION**

Many policy documents dictate that teachers and teacher educators should provide education about HIV and AIDS but very little information is provided about ‘how’ this may be facilitated. Furthermore, it is only when the theory provided in a policy becomes transformed into actions that it is possible to improve or reflect on action for improvement. This self-initiated study may be seen as an exploration of an integration theory in action.

‘Top down’ enforcement of policy document implementation, in my opinion, can never be as effective as ‘bottom up’ implementation of policy directives. It may, however, be difficult for an individual teacher or teacher educator to explore an attempt at including, for example, HIV and AIDS education in a discipline such as mathematics. It is important to gain the support and collaboration of colleagues or a ‘like-minded’ team of people for discussion and interaction. It is thus necessary for teacher educators and pre-

service teachers to work together and interact with each other at a faculty of education so that experiences can be shared.

In South Africa we can no longer be afforded the luxury of deciding whether or not teacher educators at a faculty of education should or should not become responsible for including HIV and AIDS education. Each teacher educator must take the necessary action steps to include HIV and AIDS education as one specialized module **and/or** integrate HIV and AIDS education across disciplines if the benefits of HIV and AIDS education are to be realized. Van Manen (1999, p. 19) notes 'Whether we like it or not, in all our actions we set examples for what we think teaching is' and 'literally every little thing we do or do not do in our interactions' has significance. So, if we avoid considering issues around HIV and AIDS education in our lecture rooms we are indirectly sending out the message to pre-service teachers that we consider HIV and AIDS education to be unnecessary in the classroom situation.

Furthermore, according to Loughran (2007), the best way to study articulation between potential theories and practice is by exploring possibilities through self-study but these self-studies must be disciplined, systematic, research based enquiries that aim at understanding the intricacies of teaching and learning; particularly for an innovation that is trans-disciplinary. By systematically exploring interactions in focus group discussions in this self-study, I gained insight into my role in the integration process. The identification of themes of interactions allowed me to explore my actions in a context in which I am familiar. Here reflections on my actions were possible in specific demarcated areas that I was able to identify and understand. I was able to learn about my practice and simultaneously answer my research question. Self-study may thus be used as a conduit

for exploring studies that aim at integrating HIV and AIDS education in teacher education.

When writing about principles for science and mathematics teacher educators, Rosenthal and Howes (2006, p. 330), emphasize that teachers and teacher educators should become acquainted with the communities in which they work and we need to 'put our actions where our mouths are'. Making use of self-study fulfills these requirements perfectly. By making use of self-study methodology, teacher educators in all disciplines would benefit by working with pre-service teachers in their own disciplines to improve praxis through 'teaching ourselves'. Like Rosenthal and Howes (2006, p. 332), I am sure that conceptual mathematics and science knowledge can and should be used in the service of learning about HIV and AIDS, and vice versa. Through self-study, science and mathematics teacher educators will be able to teach themselves appropriate ways of integrating HIV and AIDS education in teacher education at their own institutions and in so doing encourage pre-service teachers to do likewise when they qualify as teachers.

### ***Is integration effective?***

According to a UNESCO (2006) manual for integrating HIV and AIDS education into school curricula, 'There is ...disagreement about the best way of including it [HIV and AIDS education] in the curriculum' (p. 3). Furthermore, available literature shows that the terms used to describe the different approaches vary and are not conceptually clear. For example, Bennell, Hyde and Swainson (2002) consider the 'integration and infusion' approach to take place when HIV and AIDS topics are included in carrier subjects (p. x). It appears that these authors consider integration and infusion to require a 'carrier subject'. This, however, is not what other studies describe as the 'infusion' curricular

approach. The UNESCO (2006) manual emphasizes that integrating within a given curricular structure is challenging in existing curricula that are considered to be 'crowded' but provide four main approaches for the inclusion of HIV and AIDS education in a curriculum. The four approaches are listed as:

- HIV and AIDS as a new **stand-alone subject**, clearly labeled and including all core aspects of HIV and AIDS education.
- HIV and AIDS, integrated in **one already existing main carrier-subject** containing most of core aspects of HIV and AIDS education.
- HIV and AIDS as a **cross-curricular issue**, integrated in a few existing subjects clearly defined and containing most of core aspects of HIV and AIDS education, in a complementary and coordinated approach.
- HIV and AIDS **infused throughout the curriculum**, integrated in most/all subjects included in the curriculum, with, or without any specific mention of HIV and AIDS in subject areas. (UNESCO, 2006, p. 2)

The approach adopted in this study would probably be seen as using HIV and AIDS as a **cross-curricular issue** where an existing discipline contains some aspects of HIV and AIDS education. This approach to HIV and AIDS education could thus complement what is explored in other disciplines. To ensure appropriate management of the variety of aspects related to HIV and AIDS education, however, it would be preferable to adopt the **cross-curricular** approach within several disciplines with coordination across disciplines (UNESCO, 2006, p. 4).

The UNESCO (2006) evaluations of the integration of HIV and AIDS education

concluded that the **cross-curricular** approach is more cost effective than the **infusion** approach because of the number of teachers who would have to be trained to teach HIV and AIDS education across the entire curriculum. Furthermore, the PCK and the internalization of values and attitudes required for enthusiastic involvement in HIV and AIDS education make the infusion approach an extremely time consuming choice.

In some countries several approaches are used concurrently in schools (UNESCO, 2006) but within teacher education programmes, there does not appear to be a shared consensus and recognition of the importance of HIV and AIDS education. From the literature it is clear that education is an important factor in spread of HIV and AIDS.

Sileo and Sileo (2006, p. 127) point out that any pre-service teacher education institution is ideally suited to integrate prevention education initiatives into modules. Teachers may, using a discipline such as mathematics as a conduit, feel more comfortable to discuss issues related to HIV and AIDS. In this study I was privileged to the work with the seven volunteer focus group participants. These participants were from South African and Lesotho so a wide perspective of views relating to HIV and AIDS education could be communicated. I was grateful to be able to share and explore how their beliefs about the integration process that grew from hand-drawn pictures of metaphors to where their integration theories became actions in mathematics classrooms. In working with the participants I was able to hear the participants voicing their concerns as well as their successes.

I believe that the participants also gained confidence in their ability to take on new challenges that the integration presented. Furthermore, our interactions formed the

'back bone' of knowledge, skills, attitudes and beliefs about the integration process. Their contributions were central to seeing whether or not integration is feasible and effective. The participants showed that it is possible to integrate HIV and AIDS education in mathematics.

From this study with pre-service teachers integrating HIV and AIDS education in the mathematics classrooms with young learners, it is clear that important issues and misconceptions can be openly discussed with young learners in a sensitive manner by generalist teachers. The pre-service teachers were apprehensive at the commencement of teaching practice yet commented on how they were pleasantly surprised at the outcome of their integrated lessons.

The integrated material developed during the study do, however, still require improvement and adjustment so that learners can benefit from both the HIV and AIDS education and the mathematics education. The development of the learning materials served as a means of focusing attention on learner outcomes and may have boosted the confidence of the pre-service teachers because each participant was expected to plan and reflect on a mathematical aspect that they feel comfortable with to teach during an integrated mathematics lesson.

There does not appear to be any study that reports on particular 'pragmatic' knowledge, in terms of possible PCK, to develop suitable knowledge, skills, and attitudes for the integration process. In this study an effort was made to explore not only PCK but also beliefs of pre-service teachers about the integration of HIV and AIDS education in a discipline. I believe that the beliefs of teachers, regardless of the amount or quality of

preparation for integrating HIV and AIDS education in mathematics, are crucial for the success of any integration initiative. By addressing the pre-service teachers' beliefs in this study, it was possible to make inroads into assisting the pre-service teachers to *Start with themselves* to integrate HIV and AIDS education in mathematics.

### ***Broader contributions***

*Starting with ourselves* has made contributions that may be classified as being mainly 'Pragmatic' as I studied a single-site to improve local practice at a faculty of education. My contributions may, however, influence wider practice because the results and conclusions are systematically reported making use of both quantitative, qualitative and action research paradigms. This research has, however, also provided 'Emancipatory' knowledge (Habermas, 1974). I will now explain how my exploration has contributed to HIV and AIDS education, social justice education and mathematics education in teacher education.

There are age appropriate suggestions for the teaching of HIV prevention education across all ages of school going learners available (See, for example Brink, 2003; Sattler & Armmer, 2006) to guide school teachers. These guides could be explored by teacher educators when designing teacher education modules. In addition, it is suggested that 'Teaching and learning about HIV/AIDS prevention education can occur across the PK-12 curriculum in such areas as science [and] mathematics' (Sattler & Armmer, 2006, p. 81) but examples as to exactly how this integration can be facilitated is often lacking or inappropriate for young learners. For example, 'Design a mathematical model to show the potential spread of HIV infection resulting from unprotected intercourse and multiple partners.' (Sattler & Armmer, 2006, p. 82)

is certainly not a suitable example for incorporation of HIV information across the primary school curriculum. This *Starting with ourselves* study has explored practical ways of implementing integration of HIV and AIDS education in a mathematics discipline with primary school pre-service teachers as there appears to be a dearth of studies that document how integration may be achieved (See Chapter One.).

According to Rosenthal and Howes (2006, p. 330), however, it is most likely that ‘elementary school teachers will suggest that we [should] not teach about HIV/AIDS directly with children.’ but also caution that avoiding the topic of HIV and AIDS will support the repression of knowledge that encourages the spread of the disease. My research has shown that pre-service teachers were able to teach HIV and AIDS education through integration across a discipline such as mathematics. It is vitally important for teachers of young learners to be competent and simultaneously sensitive to provide learners with appropriate HIV and AIDS education and the pre-service teachers in this study showed that this was possible in a mathematics classroom.

More specifically in the field of mathematics and science teacher education, Rosenthal and Howes (2006, p. 17) comment on the fact that ‘although there are countless published studies on teachers’ content knowledge, particularly pedagogical content knowledge, we have found little empirical work on the deliberate use of mathematics and science methods as venues for subject-matter learning, either in elementary or in secondary schools.’ Rosenthal is a mathematician and Howes a biologist who admit that they lack the technical expertise to write ‘a how-to treatise on addressing HIV/AIDS-related issues in science and mathematics teacher education classrooms’ (Rosenthal & Howes, 2006. p. 313) because they are of the opinion that

teacher educators have limited contact with HIV and AIDS issues in their professional practices. Unfortunately this limited contact with HIV and AIDS issues does not apply to teachers and teacher educators in the South African context. My exploration has thus contributed to this field of research by providing possible ‘how-to’ strategies for addressing HIV and AIDS in mathematics teacher education.

Rosenthal and Howes (2006, p. 318) emphasize that there is a need to prepare ‘qualified teachers’ to teach appropriately about HIV and AIDS. These authors are, however, not surprised that publishers of textbooks for science and mathematics teacher education avoid controversy by not using authentic data that exposes alarming information about child-poverty rates and sexually transmitted diseases and textbook authors also shun examples that incorporate sociopolitical content and avoid using mathematics as a vehicle for learning about society. My study in teacher education made use of authentic HIV and AIDS statistics in Data Handling activities to provide examples for reflection on the current status of the pandemic in South Africa and the implications of these statistics for teachers. Furthermore, the misuse of HIV and AIDS statistics by politicians allowed for discussion to show how statistics may be used to deliberately mislead.

Perhaps some mathematics discipline specialists and textbook authors are still under the impression that mathematics is an apolitical discipline. Much has been written on the incorporation of social justice issues in the classrooms of learners but there appears to be little research on incorporation of social justice issues in pre-service mathematics teacher education. Gutstein (2003, p. 38) distinguishes between Functional literacy and Critical literacy. Functional literacy is defined as being able

to read and do mathematics and may be linked to SCK whereas Critical literacy is concerned with approaching knowledge critically, seeing social events in the interrelationships of their historical and political contexts, and acting in one's own interest as a conscious agent in and on the world. My inclusion of HIV and AIDS issues in pre-service mathematics education may be seen as using mathematics as a vehicle to evoke awareness of the real-life problem facing teachers and would fit the Critical literacy category. I have thus contributed to literature by showing that it is possible to integrate social justice issues in mathematics teacher education.

Gutstein (2003) notes that learners may use statistics as a tool to address social injustices so that learners can see themselves as agents of change. Gutstein (2005) points out that he uses the notion of *agency* in the sense in which Paulo Freire (cited in Gutstein, 2005, p. 1) spoke. According to Gutstein (2003), Freire considers social agency to mean to see oneself as a potential agent of social change. The notion of *agency* where pre-service teachers see themselves as potential agents of social change is a necessary aspect in the teaching and learning mathematics for social justice. Not only should the pre-service teachers see themselves as agents of social change but should be encouraged to develop in learners the ability to effect change. This study contributed to teacher education in general by showing that it is possible to 'make a difference' by becoming an agent of social change.

Furthermore, in the primary school curriculum, the teaching and learning of mathematics is encouraged to be interdisciplinary (DoE, 2002, p. 9) and theme centred. According to Braver et al (2005), social justice fits well into this kind of framework. It would appear that the interdisciplinary nature of HIV and AIDS

education proposed in my pre-service primary mathematics education module would be an appropriate approach to equip pre-service teachers for teaching and learning mathematics for social justice in schools.

By integration of HIV and AIDS education and mathematics education I have contributed to mathematics education by showing that mathematics is not an isolated, stand alone discipline. Using HIV and AIDS statistics my study has contributed to mathematics teacher education by creating a realistic context. Using this context I was able to show that mathematics is significant to the pre-service teachers as individuals as well as crucial to the lives of their prospective learners.

### **IMPLICATIONS FOR FURTHER RESEARCH**

Clearly there are many critical areas for further research in pre-service HIV and AIDS education. Some of the issues relate to motivation of pre-service teachers in a large lecture room situation, the preparation of worthwhile activities that benefit both HIV and AIDS education and mathematics, the forging of links between various disciplines who take on HIV and AIDS education in an appropriate **cross-curricular** approach, and the sustainability and effectiveness of teaching and learning about HIV and AIDS education

#### ***Motivation of pre-service teachers***

The interactions that took place during the focus group discussions formed an important aspect of the development of my integration vision. It would require further research to establish the most appropriate strategy to achieve the vision of integration of HIV and AIDS education into a discipline when there are large numbers

of pre-service teachers. This research would have to address the motivation aspect of pre-service teachers as they cannot be considered as volunteers who are interested in becoming involved in an innovative project.

By showing and explaining what the focus group of volunteers believed about the integration, it may be possible to inspire/convince generalist teachers to follow suit. Individuals within large groups of pre-service teachers will be exposed to positive insights by presenting them with the metaphors drawn by the focus group participants. Through the explanations and drawings of the metaphors it may be possible to illustrate how the integration process can become a reality. Each pre-service teacher in a whole class situation could then be asked to provide a drawing of a metaphor to explain how the integration may occur. Motivation of pre-service teachers may be enhanced by making use of positive beliefs displayed by the focus group of volunteers. Furthermore, when individuals are given the opportunity to express their views as well as listen to the views of others, the open engagement fosters sharing of ideas. Through conversations and reflections via metaphor drawing, it is possible to allow for disagreements and agreements in an open, debate-like forum.

A lecture style approach is probably not conducive to success when attempts are made to engagement in an innovation. In 2005, part of the continuous assessment task for the final year pre-service teachers enrolled for PME 310/311 (54 pre-service teachers) was to submit an assignment where each pre-service teacher was required to design a learner activity that involves integration of some aspect of HIV and AIDS education in a mathematics activity for young learners. The pre-service teachers were able to complete this assessment task but further guidance would be required to ascertain how

the integrated activity would be incorporated into a classroom lesson with learners and whether the activity is not merely using HIV and AIDS as a 'device' to teach mathematics because the activity has nothing to do with HIV and AIDS education. There is a need to see how the pre-service teachers would make use of their planned activity in the classroom situation.

### ***Preparation of worth while integrated activities***

Perhaps some teachers would be more willing to make use of professionally prepared textbook quality activities that integrate HIV and AIDS education in mathematics. Generalist pre-service teachers may devise and use HIV and AIDS inappropriately as a means to teach content that has little to do with HIV and AIDS so professionally prepared activities would be more suitable. A worthwhile study could include researching whether teachers of young learners would rather use a textbook with integrated activities or whether teachers teaching in their diverse contexts would prefer to use a self- devised activity.

The varieties of contexts in the South African schooling system are vast and difficult to categorize. Most of the pre-service teachers thus come from a wide range of school contexts. The composition of pre-service teachers at Edgewood is slowly changing from predominantly white pre-service teachers to a student population that is more in line with the correct demographics of South Africa. This change in student population should auger well for any innovations of integration of HIV and AIDS education. The life experiences of many pre-service teachers would probably be such that the motivation to 'make a difference' may be perceived as a worthy objective. It may thus be possible to develop and extend the use of HIV and AIDS education in

mathematics.

### ***HIV and AIDS education across disciplines***

All but a few pre-service teachers are generalist mathematics teachers. Most pre-service teachers do not choose to specialize in the teaching of mathematics. Valuable interdisciplinary knowledge and skills could be explored with the generalist teachers to develop appropriate teaching and learning programmes with the discipline specialists in Life Orientation and Gender Studies. Perhaps if a greater variety of 'media for the message' would allow for more wide-ranging learning experiences and the 'Sick of AIDS' (Mitchell & Smith, 2003) syndrome may become less prevalent amongst learners.

It would be interesting to research possibilities of integration of mathematics education with Life Orientation and Gender Studies specialists but also across other specialist teaching and learning disciplines. It may be possible to successfully integrate HIV and AIDS education across mathematics education and other specialist disciplines in a meaningful manner.

The statistical findings that indicate that there are differences in responses according to ethnic grouping and gender will require action. The pre-service teachers who are 'Sick of AIDS' (Mitchell & Smith, 2003) are perhaps less willing to engage in learning more about the teaching and learning of HIV and AIDS education. Further research will be required by teacher educators to consider HIV and AIDS education from a variety of different pedagogical standpoints so that topics can be approached in interesting, yet thought provoking ways. Perhaps teachers and teacher educators are

'harping' too much on a particular aspect of HIV and AIDS and not considering alternative strategies to address issues. If pre-service teachers are, for example, encouraged to develop cross curricular activities such as the making of memory boxes (Ebersöhn, 2007) there could be pastoral support for learners and also development of mathematical skills.

### ***Taking up of integration in school situations***

To establish whether or not the integration of HIV and AIDS education in mathematics could be sustained, it would be useful to explore how the focus group participants made use of what was achieved during their teaching and learning during focus group interactions and during classroom teaching in schools where they made use of the materials that we prepared. For example, the three focus group participants who returned to Lesotho as qualified teachers may have developed their own distinctive strategies to implement integration in their particular context. Valuable PCK could be gleaned by exploring how these newly qualified teachers extended their knowledge, skills and attitudes in the contexts of their own classrooms. Furthermore these teachers may be able to provide further suggestions to enhance integration. My integration of HIV and AIDS education in mathematics will be enriched by further research so that I can learn from these newly qualified teachers.

### ***Evaluation of HIV and AIDS education integration***

It will be necessary to evaluate the effectiveness of modules in faculties of education where HIV and AIDS education is integrated across a discipline or disciplines. It would be useful to compare the 'success' of modules that are dedicated to HIV and AIDS education with modules where integration of HIV and AIDS education occurs

across a discipline such as mathematics.

If the cross-curricular approach was to be chosen for pre-service teacher education, then it would be necessary to determine which disciplines could ‘complement’ each other so that the HIV and AIDS education remains ‘visible’ when presented with other topics within selected disciplines. Furthermore, overseeing the sharing of responsibility and coordination of teaching HIV and AIDS education across a variety of disciplines would be required. Motivated, competent teacher educators would need to be canvassed to take on the added responsibility of HIV and AIDS education within their disciplines. In addition, the assessment of appropriate integrated learning would also require alignment with agreed integrated learning outcomes that would benefit HIV and AIDS education as well as the particular discipline.

**...AND FINALLY**

I saw the need to commence with my research for better understanding of the concepts related to HIV and AIDS education through my ‘high-status’ discipline; it is possible to study one’s own teaching and learning to address personal and professional interests by *Starting with ourselves* to ‘make a difference’.

‘Vision without action is a daydream.  
Action without vision is a nightmare.’  
*Author unknown*

BUT

Planning with vision for action is potentially a dream come true.  
*Linda van Laren*

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Notes

1. 'Sex' refers to biologically determined differences between females and males (Fennema, 2000:2).
2. 'Gender' refers to social or environmental differences between females and males (Fennema, 2000:2).

## **CHAPTER SIX**

### **FINDINGS: PART 3**

#### **SITUATED WITHIN SELF-STUDY: MY EXPERIENCES, BELIEFS AND FOCUS GROUP INTERACTIONS**

##### **INTRODUCTION**

Chapter Six is the third chapter that describes the findings of the study. In this chapter my main focus is on reporting on the integration process using self-study as the lens. In Chapter One I describe how I situate myself in this research and I consider my professional experiences with pre-service teachers that have influenced my decisions and actions as a teacher educator. In this chapter, however, I reflect more on my family life experiences that are of importance in my concern for ‘making a difference’ in HIV and AIDS education through mathematics education.

As part of the project I worked with a focus group made up of a small group of pre-service teachers who had participated in integrating HIV and AIDS content into mathematics. I considered myself as one of the participants in the focus group discussions so I used the same methods of analysis as was described in Chapter Five to analyse my contributions in the focus group meetings. I have also presented my contributions in the form of ‘case’. Interviews with an experienced researcher-teacher, my reflections on teaching and learning, my hand-drawn metaphor for integration of HIV and AIDS in mathematics and focus group interactions also shed a light on how I ‘started with myself’ in the integration process. Here collaborative autobiographical as well as autobiographical work provided additional insights into how my life experiences are linked with my self-study. In addition to exploring my

contributions to the integration process during focus group discussions, I wanted to expose and interrogate my roles as a teacher educator that I played in focus group discussions.

### **METHODS USED TO ANALYSE MY INTERACTIONS**

In order to gain a deeper understanding of how self-study could contribute as a pedagogical and methodological ‘umbrella’ for addressing HIV and AIDS in pre-service teacher education I used the guidelines suggested by LaBoskey (2004; 2006) for my study. She outlines five essential characteristics for self-study methodology and these served as guidelines for my study design. She lists the five characteristics as the following: (1) self-initiated and self-focused, (2) improvement-oriented (3) employs multiple (mainly qualitative) methods, (4) interactive at one or more stages of the process, and (5) validation achieved through the construction, testing, sharing, and re-testing of exemplars of teaching practice. I used each of these characteristics to explain how my research that aimed at self satisfies these requirements.

Firstly, although there appears to be some controversy about whether integrated HIV and AIDS education is state-mandated or not, the integration in mathematics and this study was self-initiated. I saw the need to ‘make a difference’ by initiating an aspect of social change in the modules I am responsible for at a HEI that is situated at the centre of the HIV and AIDS pandemic. The research is self-focused because I explore the questions: ‘How can I better help pre-service teachers to learn about and to prepare mathematics lessons that take cognizance of HIV and AIDS and heighten awareness of the pandemic?’ and ‘How do I live my values of social justice more fully in my practice?’

Secondly, my research is aimed at improvement; I wanted to improve my teaching of mathematics education modules so that the knowledge about HIV and AIDS of pre-service teachers and young learners can be extended. I made use of empirical and theoretical considerations in both HIV/AIDS education and mathematics education to extend my knowledge, skills, attitudes, beliefs and values as well as those of pre-service teachers.

Thirdly, my self-study included multiple sources of data to facilitate and improve the shaping and informing of my instructional design choices whilst integrating HIV and AIDS education in mathematics. This necessitated the combination of quantitative, qualitative and action research paradigms to develop a unique ‘mixed-mode’ research design that is described in Chapter Three.

Fourthly, there were multiple opportunities of interactions, particularly during focus group discussions. The function of the focus group discussions was to promote interactions amongst a group of non-homogenous participants. Furthermore, my research has evoked much interest in colleagues and many mathematics education ‘corridor’ interactions include suggestions, advice, ideas and information about the teaching and learning of HIV and AIDS. Interactions with Dr Nancy Lesko from Columbia University, New York also provided insights into personal and professional experiences that were significant in highlighting conscious and reflective elaborations (Solas, 1992) of my learning experience during the self-study.

To analyse my contributions during focus group discussions, I examined my interactions in terms of the number of interactions as well as what the content of my initiatives during discussions. During focus group interactions with the pre-service

teachers (Netha, Celiwe, Kathy, Thembe, Nobunti, Londi & Keshni), I attempted to focus on my roles but more importantly I was interested in my thinking about the process of integrating HIV and AIDS education in mathematics. I used the transcripts of our video and audio recordings during the seven one and a half hour focus group sessions to observe and hear our interactions as interactions are recognized as an important component of self-study (LaBoskey , 2004; 2006).

To understand my roles during these interaction sessions I consulted research in the field of mathematics and science teacher education. I wanted to gain insight into how I assisted pre-service teachers with the development of the required knowledge, skills, attitudes and values to integrate HIV and AIDS education in the teaching and learning of mathematics.

Many authors in mathematics teacher education (Gómez, 2002; Hobden, 1999; Manouchehri, 1997; McDiarmid, Ball, & Anderson, 1989; Rowland, Huckstep, & Thwaites, 2005; Shulman, 1987) have suggested areas of competence for curriculum designers for pre-service teachers. All authors concur that these competences are multifaceted but ultimately becomes unified in the classroom practice of the teacher. The work of Manouchehri (1997) speaks of a wide range of competences required by pre-service teachers and includes Mathematics Subject Content Knowledge (SCK), Pedagogical Content Knowledge (PCK), Pedagogical Reasoning and Beliefs.

I focused on how I integrated HIV and AIDS education in focus group discussions using the competences required of pre-service mathematics teachers. The central thrust of this exploration was to build an inclusion/integrated model that assists in the development of multiskilled teachers. I explored how I extended SCK (Mathematics

and HIV and AIDS), PCK (here I have included Manouchehri's (1997) 'Pedagogical Reasoning') and Beliefs during focus group interactions. In addition to this mathematical content knowledge (SCK), the integration of HIV and AIDS education in Mathematics education requires appropriate knowledge about HIV and AIDS content too. Lederman and Schwartz (2001) point out that both depth in SCK **and** understanding of the intervention as a background is required if an intervention is to be taught effectively.

According to Ball and Bass (2000, p. 86), PCK for the pre-service mathematics teacher is a 'unique kind of knowledge that intertwines aspects of teaching and learning with content' but is difficult to describe because PCK is complex, difficult to pin point and almost mysterious as it involves translation of known content in a form that assists others in gaining SCK (Rowland, Huckstep, & Thwaites, 2005). Lederman and Schwartz (2001) distinguish SCK from PCK by stating the SCK is 'knowledge of *what* one intends for students to learn – and pedagogical knowledge – knowledge of *how* to facilitate students' learning of desired instructional outcomes.' The classroom practice of teachers would also be strongly influenced by their beliefs about mathematics and the teaching and learning (Manouchehri, 1997; Thompson, 1992).

In addition to SCK and PCK in HIV and Mathematics education, what teachers believe about the inclusion of HIV and AIDS education in mathematics has a profound influence on the way they teach and facilitate learning. Manouchehri (1997, p. 198) states that 'research consistently shows that teachers translate their knowledge of Mathematics and pedagogy into practice through the filter of their beliefs.' Added to the informal intuitive personal theories which are a product of pre-service teacher's

own experience as learners and folk wisdom/knowledge (Mouton, 1996. p. 7) each pre-service teacher has her own beliefs about social justice and moral issues. These beliefs permeate the teaching of all disciplines that the generalist teaches. This personal belief system provides a theoretical framework for classroom decision making related to sequencing of work and choice of activities.

It is, however, not only the pre-service teachers' beliefs that are important considerations but also my belief about how HIV and AIDS education should/could be integrated within the mathematics discipline. For this reason I analysed my metaphor drawing and description as it gave clues as to how my personal theoretical framework as a teacher educator developed.

Furthermore, I analysed interactions in the focus group discussions to better understand my teacher education practices and to identify characteristics of my interactions. I analysed my spoken interactions by examining the frequency as well as the content of my communications with the participants during the seven focus group sessions. These quantitative and qualitative interpretations were used as a catalyst for personal reflection. My reflections on these findings are central to understanding my practices as a teacher educator who aims at 'making a difference' through extending the integration of HIV and AIDS education in mathematics. Kitchen (2006) stresses the importance of reflections in written responses to pre-service teachers but the significance of supportive and critical reflections can be extended to include spoken interactions too.

## **VALIDATION OF DATA**

To facilitate reflection on my actions and other research related issues, regular meetings with a group of critical friends occurred. The critical friends are all involved in higher

degree studies on the Edgewood Campus and using an action research paradigm. After each meeting with critical friends I recorded reflections on the topics of discussion and invited comments on my reflections. Furthermore, during collection and analysis of data, mathematics education colleagues at the Edgewood Campus were often consulted. On 2 March 2006, I audio recorded and transcribed one of my conversations with a mathematics education colleague. This conversation was used to inform my interpretations of drawn metaphors to explore the beliefs of HIV and AIDS education integration in mathematics. During 2006, when Dr Lesko from Columbia University in New York was on sabbatical and visited the Edgewood Campus, it was also possible to exchange ideas and engage in valuable personal communications about HIV and AIDS education.

I was able to make my knowledge claims public at a variety of different forums through presenting papers and a published article. In Chapter Three I described various concepts, such as validity, reliability, generalizability and legitimacy in relation to self-study but it is also necessary to acknowledge how subjectivity and family experiences influences research and findings (Kirk, 2005; Van Manen, 1990). Some of my important life experiences centre on my family life and schooling that are exposed in the following section.

Together with my life experiences are also the contributions I made to focus group discussions. My metaphor drawing and description of how I consider HIV and AIDS education ought to be incorporated in mathematics also focuses on my beliefs about the integration process. Finally I considered the contributions I made to focus group discussions by analysing interactions that took place during the meetings with the

seven participants.

### **MY LIFE EXPERIENCES EXPLORED THROUGH COLLABORATIVE AUTOBIOGRAPHY**

In using the term collaborative autobiography I draw specifically on the work of Penny (2002) who used the term to describe a methodology for self-study that relied on the participation of colleagues to help frame the questions and narrative. In Penny's case, he met regularly with four other male elementary teachers and through their narrative of what it meant to be a male elementary teacher he assembled his own self-study. In my case I embarked upon collaborative study in several different ways. I worked with an experienced researcher-teacher as well as with a focus group of pre-service teachers. In addition, I explore my reflections on an activity that was prepared by a pre-service teacher who was completing his Post Graduate Certificate of Education (PGCE).

I begin with a set of interviews with Dr Nancy Lesko who is a professor at the Teachers' College, Columbia University in New York. Dr Lesko enquired about why I initiated the teaching and learning of HIV and AIDS education in mathematics in an interview that took place on 30 March 2006. The following is an extract from the transcribed interview where I reflected on my initial reasons for becoming involved in the integration process.

Nancy:           And I remember from the last time we talked that that you also at some point in time, had a student who died that you were aware of?

Linda:           Yes. When I was we were still a College of Education, [A colleague] will remember his name, but we had small classes.

During practice teaching, we just heard that he had died. And I thought that was terrible. He had just sort of come round and his families were, you know, obviously had to give up a lot of things to send him to university, into a College then. And then he just died. I mean, nobody said it was HIV/AIDS, but it actually worried me. It worried me that people were dying right close to us as well. He wasn't particularly, you know, a friend who I'd visit or anything, but he was a student and he was a student for 2 years and I knew him well, so that is sad. And we have come across other students too, but this one student I must ask [a colleague] for his name again, because she also, and then they had the memorial service here at Edgewood. It was very, very sad.

Nancy: Well, a young person is so hard, not that any death isn't difficult but I think there's some sense of you're older and you know. It's more understandable. But someone's who's 18 or 20, it's very hard.

Linda: They said he was playing soccer, or something, and then he just passed away. Nobody said it was AIDS, but it was very strange.

Nancy: And do you just as an aside, have you sort of taken it on you've talked a couple of times about your two daughters. So have you had pretty explicit conversations with them?

Linda: Well, after I had the talk with Marge [Dr Marge Sutinen, University of Wisconsin Medical School], she sort of had a whole thing about condoms, and I sat the two [daughters] down - they were quite amazed. Sat the two down, and explained it all about, you know, definitely you don't do this, but you know if you have to have to you must know what to do what the proper thing to do is. And they were cringing and hiding under

the bed covers, but I thought, what's the point of me learning anything if I don't even tell my own children. So I do try to be open um but it's always more difficult, and I think maybe having the numbers is a kind of way of distancing yourself a little bit from the actual face. You know what I'm saying?

Nancy: Yes.

Linda: Working with the numbers is kind of a little bit more clean but a little bit less explicit than, uh I mean like, I did with my girls, facing them with a condom [in my hand] showing them how to use a condom.

Nancy: Right. Right. But they're totally related. Right? They're clearly related. Great. Okay. So, um difficulties that you've experienced in teaching about HIV AIDS?

Linda: I don't, I think that's because it's Maths it's kind of... I don't put it in people's face that it's actually the sex that I'm talking about. But I think they're all adults you know they should, and I would rather want them to reflect and give as much as they want to give rather than explicitly teaching them sex education, which I don't think really is my role for the students, and I don't know how they would feel about that, and I don't know maybe some of them are anti. But I haven't noticed any resentment. Only one student once wrote, 'I'm sick of AIDS', but all the other activities, I take it seriously, I mean for example the activity ['Working with bar graphs and pie charts' (See Appendix C.)] they had to do, it wasn't a frivolous thing, they took it seriously, and I did indicate it would be marked for participation. So I think it's your attitude as well, but nobody has come to me and complained, that I know of, to anyone that I am forcing uh HIV/AIDS down their throats, no-one has except that one student's response. But that's her if she wants

to think of it like that then that's fine. I've had no problems, but as I say maybe it's because it's kind of through the numbers not at the thing.

The interview may be seen as a 'post lesson interview' because Dr Lesko observed one of my tutorial sessions designed to integrate HIV and AIDS education in mathematics. The observed session occurred when the PME 210 pre-service teachers were asked to complete the activity 'Working with bar graphs and pie charts' during semester one of 2006 (See Appendix C.). The tutorial marks were used as part of their continuous assessment mark. Dr Lesko also read some of the pre-service teachers' responses to the activity and provided me with favourable input on the purpose of the activity.

Furthermore, the selected portion of the interview transcription shows that I have experienced personal loss of a pre-service teacher through the AIDS pandemic and this has probably been one of the motivating influences in my effort to 'make a difference' through mathematics education. In order to ensure that my efforts also have an influence in my home life experiences, I saw the need to extend what I considered to be important and spoke with my daughters about important life and death concerns related to HIV and AIDS when partaking in unprotected sex.

Later Dr Lesko prepared a report on her observations for her research project. In her summary I am referred to as the 'mathematics education professor'. The following is an unsolicited summary of what occurred in our interview and what she had observed.

*Math Education.* A mathematics education professor struggled with how to incorporate AIDS in her pre-service teaching of mathematics courses. She had

a student die from AIDS and she asked herself, What am I doing at the university if I'm not addressing what is happening to students and other South Africans? She was also inspired by a talk she heard at a conference on including HIV/AIDS in teacher education courses. As she's talked with colleagues about it, a science education professor also said, I should include this topic in science teaching methods, as well. She has found colleagues quite supportive of her efforts to address HIV/AIDS within the Faculty of Education. One of her dilemmas was how to balance teachers' need to know how to teach math with their need to know about HIV/AIDS. A second worry was whether her focus on HIV/AIDS was enough, was it sufficient to really educate her students. She focused the final course (module) assignment on HIV/AIDS and students had to read statistics and construct various graphs, do math calculations, and answer short-answer questions about why HIV/AIDS is such an issue in South Africa and what the epidemic means for teachers. I plan to do interviews with some of her former students.

**(Lesko, 19 July 2006)**

In Dr Lesko's reflection, the important dialectical issue of HIV and AIDS education in mathematics or the mathematics in HIV and AIDS education is raised. Furthermore, Dr Lesko suggests that the merging of a 'hard' discipline, such as mathematics, with a 'soft' discipline such as HIV and AIDS education is a widely accepted practice. This process of integration and the concept of 'context' in the teaching and learning of mathematics is, however, a contentious issue amongst discipline specialists. This contentious issue has already been discussed in Chapter Two where the meaning of the term 'context' is explored.

When I worked with Dr Lesko, the experienced researcher-teacher, I voiced my interests, opinions, experiences and aspirations during our interactions. In the one-on-one interviews with Dr Lesko, it appeared as if I was more willing to share more personal experiences and reflections that I have not recorded previously in writing.

These interactions provided useful information for reflection on my interest in the HIV and AIDS education integration. Furthermore, the interest and encouragement of Dr Lesko provided me with a sense of success in my integration endeavour. The intervention involved taking risks to bring about change in the mathematics education curriculum so the positive, professional encouragement by Dr Lesko was gratifying. I perceived Dr Lesko's interest and support as a validation of my intervention and this reinforced the importance of my efforts in the integration process.

In my reflection dated 24 March 2005, however, I pinpoint some of my insecurities about the integration of 'appropriate' teaching and learning material suitable for Grade 8 learners. In one of our corridor discussions in the mathematics education department, my colleague reflected on an activity that one of her PGCE pre-service teachers, Sizwe, had planned as a 'cross-curricular integration' lesson. In his lesson plan, Sizwe included Life Orientation and HIV and AIDS awareness. I recorded a brief description of Sizwe's activity and my reflection as:

In the development of the lesson, the second main activity that the teacher will use is described as follows:

*Teacher tells a story:*

*Assume that your brother is going on three days and two nights, holiday with his new girlfriend. And you want to tell him to condomise but you are afraid. Explain to learners that they should use the sheet of paper provided to make up the gift box to put in a condom for the brother. To reach the final product, learners will be exposed to different shapes with different number of sides. Learners will achieve this by following instructions on the worksheet. (Sizwe, March 2005)*

This description probably captures how HIV and AIDS is seen in the teaching and learning of HIV and AIDS. The Grade 8 learner is portrayed as 'afraid' to tell a brother about the need to make use of a condom. This is a problem in HIV and AIDS education, as it appears as if all talk about making use of a condom should be done

unobtrusively. Even the use of an elaborate container to ‘conceal’ the condom is recommended in this activity.

When [my colleague] and I read this activity we were a bit perturbed and taken aback because of the obvious change in moralities reflected in this activity. The brother’s girlfriend is seen as ‘new’ but nonetheless going on an extensive ‘three days and two nights holiday’. This would appear to be seen as what newly acquainted boyfriends and girlfriends find acceptable.

As part of the folding activity to name and generate a gift box the last step of the Space and Shape worksheet was described as:

*Insert a condom and close your gift box with adhesive tape. Then decorate with ribbons.* (Sizwe, March 2005)

The gift consists of a single condom that would presumably be sufficient for a three-day holiday. Perhaps this is merely a mathematical miscalculation but nonetheless this present consisting of a single condom would seem to be far from adequate.

I came to realise that what I would think is an acceptable activity for Grade 8 learners is no longer what is realistic. If my Grade 9 daughter had been asked to do the activity described by the PGCE student [Sizwe], I may have been shocked. This year my 14-year old completed a similar task but she was asked to design a toothpaste container. To me, as a parent, this appeared to be appropriate but I can now see that asking 13-year old learners to prepare a gift box for a condom is probably in keeping with real life demands. I will need to rethink my naïve perception of school going children and learn to face the fact that children, by the age of 10, may have had sexual intercourse (*Van Niekerk, cited in Leeman, 2004*).

Furthermore, there needs to be openness about the morality of young teenagers. I need to understand the necessity to discuss the use of condoms in the mathematics classroom. No longer is the use of condoms something that should be avoided. If this PGCE student considers this mathematics activity to be realistic for 13-year olds, then perhaps this is the type of activity that should be included in mathematics teaching and learning. The need to be ‘sensitive’ about moral issues appears to be impractical and perhaps young newly qualified teachers are what are needed in HIV/AIDS education. From this mathematics activity I can see that I need to change

by learning from young teachers what is acceptable and important in the teaching and learning of sex education. I need to be unafraid to speak about use of condoms and morality issues.

**Source: Reflection by L. van Laren recorded on 24 March 2005**

My reflection shows that I have become persuaded to be more willing to teach about the use of condoms to reduce the spread of HIV infection. Furthermore as a white teacher educator I should heed the advice of Simbayi et al (2005, p. xviii) who note that 'white educators themselves will need to be protected against HIV infections if the low prevalence ... [of white educators] is to remain below 1%'.

It is possible to extend my exploration my beliefs about the manner in which HIV and AIDS education ought to be integrated into mathematics by examining my drawn metaphor and description that I prepared during the focus group discussions. Here I was not working with an experienced researcher-teacher or a colleague but with a group of pre-service teachers. During focus group discussions we all grappled with the concept of integration of HIV and AIDS education in a 'high-status' discipline.

I chose to draw 'The Journey' as the metaphor to illustrate how teaching and learning of HIV and AIDS education in mathematics may be integrated.



### The journey

The Teacher: In the drawing the teacher pointing is showing the learner the direction to follow. She is only one of many teachers who have already indicated to the learner where the journey needs to lead to. Along the way there will undoubtedly be many more teachers who advise and assist the learners along their journey. The mathematics teacher needs to be assisted by other teachers too to guide the learner along a suitable path.

The learner: The learner is the person who is walking along the path. Previous experiences and people shape the mathematics gained by the learner. Knowledge, skills, attitudes and values from parents and family, religion, school and peers shapes and extends the learners' attitude towards mathematics and HIV/AIDS education. Only one learner is shown walking along this path in the drawing, as each learner has to be considered in the development of HIV/AIDS education through the learning of mathematics. The journey of each learner in the mathematics classroom would, however, need to be considered and the journey would need to be appropriately extended.

Mathematics: The path represents the mathematics. Many factors influence the mathematics learnt. In the drawing there are many people who play a role in the learning of the mathematics. The mathematics knowledge and skills needs to be further developed, as the path never appears to end. The learning of mathematics is never smooth and easy and the curved path indicates this. There are also a few branches leading into the path showing the many ways of gaining mathematical knowledge. The learners at the school appear to be a little distant from the mathematics gained by the learner on her/his path but they nonetheless have an influence on the mathematical and HIV/AIDS education indicated by the path.

HIV/AIDS education: On the path there are dotted lines that assist the learner and guide the learner so that acceptable knowledge of HIV/AIDS education is obtained whilst doing mathematics. The learner needs to know how to follow the guidelines and accept the advice of significant others. The significant others may be parents, guidance from religions or teachers. HIV/AIDS is considered to be a 'Social condition' so learners need to be willing to accept guidance from as many knowledgeable people as possible. Mathematics teachers must be able to provide the learner with appropriate assistance to guide the learner in HIV/AIDS education. The dotted lines must be firmly and clearly indicated in the path that represents the mathematics knowledge. These dotted lines are placed in a central position on the path. Problem centered mathematical learning allows for focusing on the teaching and learning of HIV/AIDS education.

**Figure 23: The metaphor I drew during the second focus group discussion (2 April 2005) and my written explanation of what each part of the drawing represents**

My metaphor drawing shows a long and winding path with people placed close to or on the path. There are larger people and smaller people drawn. One small person is drawn on the path. The larger people are close to the path whereas a clump of smaller people are slightly back from the path. The path is large and drawn through the centre of the page. One of the larger people points out the direction that the smaller person, who is on the path, is to follow. There is no end to the winding path. A church and a school are in close proximity to the path. The church is closer to the path than the school. The drawing is unbounded and open. In the description of the metaphor the learner is represented by the small person walking in the middle of the road. I pointed out that the path represents the mathematics to be learnt and the dotted line running down the middle of the path is the HIV and AIDS education. The larger people (parents and teachers) guide the learner. The larger people guiding the learner are not alone; there is support from a spouse or colleague who is standing close at hand. The learner is walking the path alone because it is the individual who needs to be guided whilst learning about HIV and AIDS whilst doing mathematics. The school peers and particularly the religion and parents of the learner are also 'in the picture' and significant in the learning process. The clear dotted line (HIV and AIDS education) is embedded in the path (mathematics knowledge and skills).

My metaphor drawing shows that the learning of mathematics is a broad, wide road whereas the HIV and AIDS education is only represented by a 'dotted line' that represents a barrier line. The barrier/dotted line forms a small part of the wide path. This 'dotted line' does, however run down the centre of the path indicating that HIV and AIDS education is important in the learning of mathematics. In a road the 'dotted

line' is essential as this imaginary barrier line divides the directions that pedestrians, cyclists or vehicles take. Keeping to the correct side of the road is an important function of the lines marked in a road. The drawn line is not a solid as there is often no single, correct option but incorrect decisions may be fatal. When learners take 'unsafe' risks or when coming into contact with body fluids of other people, there may be the deadly consequences of contracting the HIV. In my metaphor I see the teaching and learning of HIV and AIDS education as a part of mathematics.

On re-reflection I noticed that the metaphor that I drew during the second focus group discussion, together with the interview with Dr Lesko, gives inkling into what are important aspects of my being. In my drawing, 'The Journey', I singled out and drew parents and religion indicating that these are important aspects of my life experiences (See Figure 23.). The teachers too are indicated in the drawing as showing the way and exerting an influence on the path the journey takes. The teacher is not alone but has the support of a colleague. My corridor discussions often centred on HIV and AIDS and mathematics and my colleagues willingly provided suggestions and advice. The importance of education is thus highlighted in my drawing. I also included a picture of a school with peers standing outside the building. The school and peers are, however, drawn slightly back from the main road and probably indicates that I am of the opinion that the importance of the school and peers in my life experiences is a little less than that of my parents, religion and teachers. In my drawn metaphor I have placed these aspects that contribute significantly to my life experiences in a prominent position on the verge of the road.

## **MY EARLY LIFE EXPERIENCES EXPLORED THROUGH AUTOBIOGRAPHY**

The work with Dr Lesko also takes me back to earlier experiences in my family.

Because of my family experiences, I think I am able to understand some of the emotional harshness that children who are labelled as ‘orphans and other vulnerable children’ as a result of HIV and AIDS. While I acknowledge the social and political context surrounding orphans and other vulnerable children in South Africa, children’s experiences of loss in my own family date back to an earlier time.

I recall many family conversations being centred on my parents’ first hand experiences of being ‘orphans’. On the one hand my mother, who was born in 1926, did not ‘lose’ her parents to death but, because of extreme poverty caused by the 1930s depression, my mother along with three of her six siblings, went to an orphanage in the Western Cape province. My mother was seldom ‘sent home’ from the orphanage because her parents lived in the Eastern Cape province and her parents could not afford transportation for all four children from the orphanage in Paarl to Bizana. At the age of ten my mother started living far away from her parents as an orphan. Her first three years at the orphanage was devoid of family life and my mother only visited her parents twice a year from the age of 13. My mother harbours no bitter feelings about her years at the orphanage and constantly justifies her parents’ decision of sending her to an orphanage by frequently reminding me that ‘at least I received a good education’. Many of her stories about orphanage life are, however, clear indications that growing up away from parents is emotionally stressful and an unenviable, unhappy experience.

On the other hand, my late father also experienced life as an orphan because both his parents passed away due to illness in 1928 when he was five years old; first his mother died and six months later his father. He was not sent to an orphanage but he and his four siblings were taken in by ‘willing’ family members. The five orphaned children were each selected by different relatives. My father was always grateful to his mother’s sister for providing him with a place to live and work on her farm in the George district in the Eastern Cape Province. Unfortunately his aunt was poor and managed to eke out an existence through subsistence farming but being with an aunt and cousins appeared to soften his blow of being an orphan.

As an only child, I often was reminded by my parents of what it is to be an orphan. These stories are ones that have been with me throughout my life. My mother, who is now in her eighties, still frequently retells her vivid memories of having to fend for herself as a young child and how she knitted articles for teachers to earn some pocket money. I interpret such stories as illustrations of deprivation and neglect where she had to rely on her own inexperienced devices to survive emotional and physical onslaughts. The experiences I gained through listening to my parents’ accounts may have made me more aware of the plight of the thousands of orphans and vulnerable children just in our province alone. These children may experience far more unhappiness and stress than my parents ever suffered—I don’t know .. but nevertheless I do have an inkling of what it means to grow up without a special bond between parents and their children. It is because I know what an orphan experiences that I constantly ask the question: What can I do to address these effects of AIDS?

Although I was not born as a Roman Catholic Christian, I attended a Catholic school

for eleven of my twelve years of schooling. Religion has thus also played an important part in my life. I respect the principles of Christianity that includes respecting the lives of others, empathising with others who are less fortunate and the long tradition of Christian 'care and compassion' (De Gruchy, 2006, p. 2). However, the ethical issues related to abstinence, being faithful and using condoms (ABC) that are suggested as 'cure all' remedies by some Christians cause a tension in what I believe and see as the 'solution' to the problems surrounding HIV and AIDS. When will all women and children, particularly in South Africa, be given the opportunity or right to choose to make use of these 'simple' remedies to the dreadful disease?

These family life experiences with 'orphans' probably influenced my initiatives in 'starting with myself' to make a difference by teaching and learning of HIV and AIDS education in mathematics. In addition to personal family life experiences, my experiences, contributions and interactions during focus group discussions also shaped my vision for integration.

### **SELF-STUDY AND FOCUS GROUP INTERACTIONS**

Interactions are recognized as an important component of self-study (LaBoskey, 2004; 2006). To explore the role that I played in focus group discussions, I analysed interactions in the discussions to better understand my teacher education practices and to identify characteristics of my interactions. I analysed my spoken interactions by examining the frequency as well as the content of my communications with the participants during the seven focus group sessions. These qualitative interpretations were used as a catalyst for personal reflection. My reflections on these findings are central to understanding my practices as a teacher educator who aims at 'making a

difference' through integrating of HIV and AIDS education in mathematics. Kitchen (2006) stresses the importance of reflections in written responses to pre-service teachers but the significance of supportive and critical reflections can be extended to include spoken interactions too.

I thus made use of quantitative and qualitative analysis of our interactions during focus group interactions. Quantitative analysis involved counting the frequency of the spoken interactions. Here I could track the changes that occurred in the number of contributions made by each member of the focus group.

The average of the percentages over the 7 focus group discussions also indicates the roles played by the participants as a whole in all the focus group discussions. If the average percentages are written in descending then they are ranked as follows: Linda (researcher) (43%), Kathy (17%), Londi (16%), Netha (7 %), Thembe (6%), Keshni (4 %), Nobunti (4 %) and Celiwe (3 %). In other words, during focus group discussions my interactions accounted for nearly half the total number of interactions. I took charge of the interaction process and I often reminded the participants of what I thought would be an important outcome of the focus group meetings. For example, during Focus Group 3, I said:

My vision for our project is that, when we go to the Intermediate classroom for practice teaching, we will have a maths booklet that we can try with the learners.

**(Linda, 3 May 2005)**

I guided the participants by doing much of the talking and explaining about what I thought was a possible way of integrating HIV and AIDS education in mathematics topics. Furthermore, I stressed that preparing suitable materials was not a trivial task and

I tried to model the amount of effort required for learner activity development. During Focus Group 3 I told the participants that ‘it’s very difficult to prepare good material’ so, during Focus Groups 4, 5 and 7, I presented modified versions of an integrated learner activity that I devised called ‘The Red Ribbon’. During these three sessions we discussed, scrutinized, improved and modified my integrated learner activity.

I had taken the initiative to explore how I, together with focus group participants, could ‘make a difference’ by developing integrated authentic learner materials that were suitable for mathematics classroom use in the South African context. My interactions accounted for almost half of the total number of interactions because I initiated and orchestrated the meetings. Perhaps a more appropriate way of describing ‘focus group discussions’ would be ‘focus group workshops’ as our interactions explored how pre-service teachers could integrate HIV and AIDS education in mathematics in an intensive, outcome orientated, experiential manner.

### ***Content of interactions***

I reviewed my transcribed interactions and analysed the approximately 865 interactions during focus group discussions by looking for themes. I identified five broad themes of types of interactions whilst coding six of the seven focus group discussions. The number of times each of the themes occurred is summarized in Table 50. The poor quality of the audio recording of Focus Group1 made transcriptions of conversation details impossible. For each interaction I coded according to one main theme rather than assign more than one theme to an interaction. These interactions were of different duration; some involved a one word answer whilst others were longer, more detailed responses. Usually my responses were longer than those of the other participants. Each of the five themes I

identified will be described and illustrated by way of example.

Focus Group Discussion	Themes identified				
	Addressing confidence	Organisational aspects of the project	PCK	SCK	Beliefs
2	7	21			
3	78	25	7		29
4	112	23	20	8	
5	111	51	61	37	
6	2	9		27	
7	50	146	18	21	
<b>Totals</b>	<b>359</b>	<b>275</b>	<b>106</b>	<b>93</b>	<b>29</b>

**Table 50: Table showing number of my interactions in each of the five themes spread over the six focus group discussions**

The two most common themes of interactions were when I addressed confidence by encouraging, acknowledging or clarifying (42 %) and when I considered technical/practical or organizational/operational issues (32 %) related to explaining my vision of the HIV and AIDS education integration in mathematics. The other themes of my interactions may be ranked as follows: PCK (12 %); SCK (11%); beliefs (3 %).

***Theme 1: Addressing and affirming confidence in the integration process***

The most common type of response was when I interacted with participants to affirm, confirm, acknowledge, encourage or clarify aspects whilst I addressed the participants’ questions or contributions about the integration process. For example, during Focus Group 5, I encouraged participation by speaking about the integrated ‘Red Ribbon’ classroom activity that I had redrafted. I wanted the participants to consider further suggestions to improve on the activity and I showed that I valued their opinions by saying:

...I have made it a bit more user friendly. So I want you to have a look and see. The idea is when we go to the schools we have something to use with the classes. It’s no good if you don’t think it’s going to be useful... can you read this for me

again? You know, when a person does it you think its perfect until someone else...  
(Linda, 3 May 2005)

After this request, the participants engaged in purposeful questioning of the activities that I prepared for the 'Red Ribbon' theme. For example, for activity Number 4 I originally included the following questions:

As a fund raising activity for the Golden Acres (an AIDS orphanage in Cato Ridge) you decided to make Red Ribbons to sell. Find out:

- what materials are required to make a Red Ribbon,
- how much a Red Ribbon would cost to make, and
- how many ribbons you would need to sell to make a **profit** of R100,00?

During the discussion that followed my request for suggestions, Kathy asked:

...Wouldn't you ask them to include how much they would charge for one Ribbon?

(Kathy, 16 May 2005)

In the next revision of the 'Red Ribbon' I included the following question to take heed to Kathy's advice and added:

- how much will you need to sell each Red Ribbon for?

I was thus able to encourage participation and at the same time reap benefits for my vision for our integration project. The participants were able to use their experience as final year pre-service teachers to gain from our interactions as well as provide insight into possibilities for integration HIV and AIDS education in mathematics classrooms.

Apart from Keshni, the participants had not chosen mathematics as a major elective.

This means that most of the participants do not have a flair for mathematics but gained confidence from the affirming, acknowledgement, encouragement during the focus group interactions. Perhaps this is the reason for having almost half my interactions centred on addressing and confirming confidence in the integration process.

***Theme 2: Organising the integration project***

In most of the focus group discussions I attempted to guide the participants so that the structure of the project remained goal directed. At times this involved, completing the ethical clearance request forms, organising contact details, negotiating focus group discussion times, and speaking about practice teaching arrangement. For example, in Focus Group 3, I reminded the participants about what was required for the practice teaching component of the project. I wanted the pre-service teachers to teach an integrated HIV and AIDS education lesson during practice teaching. I said:

Well, maybe at least once a week they [the teachers] will allow you to do something...Remember we are guests at the school so we can't just say I'm going to do it and we must speak to the teachers about it ... You know we have to play it by ear but we are going to be sensitive about this...

**(Linda, 3 May 2005)**

The organisation of the observation during teaching practice was a particularly important aspect of the integration process as it was here that the theories of the participants would be practised in the mathematics classroom. It was necessary to meticulously organise the observation of the integrated lessons so the arrangements to meet with the participants at their practice teaching schools in and around the Durban region. The participants would not be able to meet as a group during practice teaching as the schools they had selected for practice teaching were far apart. Furthermore, the participants also

required reassurance about what was required of them during the lesson observations.

During Focus Group 6, Kathy emphasised the need to have a final meeting before the practice teaching session. Kathy asked:

...Can we not meet once more like? When are we finishing exams, you guys?

...I finish my last exams on the eleventh of June.

**(Kathy, 23 May 2005)**

Initially I organised all the focus group activities but as the focus groups drew to a close before practice teaching, Kathy became more actively involved in the organisation of the Focus Groups. It was Kathy who arranged for Sister Johanna (the HIV and AIDS counsellor at St Mary's hospital) to speak to us during Focus Group 6 and it was also Kathy who negotiated a suitable time for our last focus group meeting. The involvement of the participants had taken a further positive turn in that it appeared as if my vision had become internalised by the participants; the interactions during the focus group discussions had developed from a vision that I initiated to an extended shared vision.

### ***Theme 3: Addressing Pedagogical Content Knowledge (PCK)***

PCK statements during focus group discussions were interactions related to materials development, mathematics education or HIV and AIDS education. For example, in Focus Group 3 we were deciding about the classroom activities that would be suitable for young learners. I was referring to the Grade 0 – 9 school curriculum document for learners whilst suggesting:

...I think it's easier to adapt something from a textbook because it's very difficult for the correct language and ... So ...how we could adapt anything

from this grade nine into a simple enough activity for what we want to do? For example, in grade four, let's just have a look at what kinds of things ... We must be a bit sensitive to this whole issue because in the classroom there may be learners who are HIV positive....Right, for example, in grade four they've got to collect data, they've got to organize the data into tallies and tables...Maybe we can get some data ... Use Picto graphs, bar graphs, and then in grade four, reads and interpret, compares things that will certainly happen and so on. Counts the number of possible outcomes – so that is a little bit of probability, and so on. When they are doing this we need to be aware of what kinds of graphs and what they could be expected to do in the Intermediate Phase.

**(Linda, 3 May 2005)**

Of the three categories that made up this theme, I interacted slightly more on topics related to mathematics education issues (6 %) and materials development (5 %) than on HIV and AIDS education (1 %). The greater number of interactions and contributions during focus groups are due to my teaching experiences; as a mathematics teacher educator I am far more likely to feel confident about providing guidance and assistance in the area of mathematics education than in HIV and AIDS education. During the focus group discussions I learnt about some aspects of HIV and AIDS education from Londi and Celiwe. These participants had chosen Guidance as their major elective which covered aspects of teaching and learning HIV and AIDS education. Through interactions with these pre-service teachers I saw the need to extend my confidence, knowledge and skills in the area of HIV and AIDS education.

***Theme 4: Addressing Subject Content Knowledge (SCK)***

SCK statements were subdivided into categories that addressed mathematical knowledge (6 %) or HIV and AIDS knowledge (5 %). The percentages of interactions for these two categories were thus more or less the same. For example, in Focus Group 5, we

discussed the activity that Kathy had drafted for drawing graphs using HIV and AIDS statistics and the question of how to plot a range, such as 20 - 140, using a bar graph. Whilst discussing the mathematics SCK required for the activity, I read Kathy's activity and said:

Everyday approximately 300 people in South Africa become newly infected with AIDS; about 20 to 140 women, 110 to 130 men and about 10 to 20 babies. All right now, when you are working with a range like that...so you are going from 20 to 140. If you were to plot a graph, how would you do that?

**(Linda, 16 May 2005)**

Londi, Thembe, Netha and Kathy gave suggestions as to how to deal with the scale of the bar graph. Later Kathy suggested:

You see if you are plotting the graph, now usually graphs have these like grids that are quite small. So, if you are plotting in 10, like 10; 20; 30; 40 going up to 140, they don't cover a whole sheet.

**(Kathy, 16 May 2005)**

In addition, the manner in which the statistics was presented in Kathy's problem as a range (for example, 20 – 140 women) also lead to a discussion of how this would be indicated on the graph. I provided two possibilities to deal with plotting data that is given as a range when I said:

But now it is a range. Maybe we will go up to the lowest number, then up to the highest number, and shade and say its anywhere in between there. Otherwise we could, I suppose, use the midpoint.

**(Linda, 16 May 2005)**

This graphing activity devised by Kathy was difficult as the participants struggled to provide a graphical representation solution. The activity was not appropriate for young

learners. It was, however, only after Kathy attempted to use the activities during teaching practice that Kathy realised that the activities were not suitable for Grade 3 learners. In Kathy's post lesson reflection she commented:

The activities I had prepared for them were a bit tough... Overall, this lesson was also a success, because I know that I left the Grade 3s with quite a lot to digest and think about.

**(Kathy, 4 August 2005)**

It was thus important for the participants to prepare and use the activities with learners to see the shortcomings for themselves. Perhaps I should have directly told Kathy that the subject content of the activity was unsuitable but it was not my aim to stifle any initiatives. In the reflection Kathy mentioned that the lesson as a whole was successful in that the learners were able to discuss, ask questions, share stories and learn about HIV and AIDS in a mathematics lesson but also realised that the mathematics was too challenging.

During the focus discussions, however, the interactions in SCK in general was limited and, in my opinion, insufficient. I should extend the necessary SCK to insure that the confidence of the pre-service teachers is not compromised by using learning material that is inaccessible to young learners. The learners gained from HIV and AIDS opportunities provided but I should extend the benefits to mathematics education too by including appropriate mathematics activities.

***Theme 5: Considering beliefs***

These interactions related to the development of the participants' beliefs about the integration possibilities of HIV and AIDS education in mathematics. I only explored

this category during Focus Group 2. Here I attempted to initiate thinking into this new concept and allowed the participants to explore the possibility of integration using self drawn pictures of metaphors. I explained the drawing aspect by saying:

What we try to do with a metaphor is to make a visual picture, a drawing of a metaphor, to show how we think teaching and learning of HIV and AIDS and maths may occur in a classroom.

**(Linda, 25 April 2005)**

We explored the self-drawn pictures during Focus Group 2 and during the post lesson interview I asked the participants to link their drawn metaphor to the manner in which they taught their integrated lesson by asking:

How does the way you approached the lesson link with the metaphor you described in our focus group discussions to show how HIV/AIDS may be used in a mathematics lesson?

**(See Appendix G)**

I consider the participants' beliefs about the possibility of integration to be extremely important yet I only interacted with the participants on their beliefs during the second focus group. Furthermore, I only explored this crucial aspect of the integration process for a limited percentage of the interactions. In Thembe's reflective journal entry after the metaphor activity she wrote:

I never thought HIV/AIDS could be taught in integration with mathematics. But I was aware that drawings can be interpreted in various ways and makes interesting stories.

**(Thembe, no date)**

I did not make sufficient use of the interest shown and displayed whilst we drew and interpreted our drawn metaphors. It would be purposeful to revisit the metaphor drawing activity after the teaching of the integrated lessons to extend, enhance or rethink the beliefs expressed in the initial metaphor drawings.

It must be noted, however, that these five themes, and related categories, with selected examples that I highlighted cannot be seen as evidence to indicate that my interactions generally or in of the themes of interactions were effective in developing the integration of HIV and AIDS education in mathematics. The interactions serve as a means for my reflection on the process of integration and how I might go about developing and furthering my aim at ‘making a difference’ by studying these interactions for future initiatives.

### ***Importance of interaction analysis for self-study***

Because the ‘central purpose in self-study is uncovering deeper understandings of the relationship between teaching about teaching and learning about teaching’ (Loughran, 2007, p. 12), I examined the number of interactions and content of interactions to decide how I could improve my practice. The purpose of the analysis of interactions was not an attempt to rationalize or self-justify what I did during focus group discussions to prepare the participants for integration of HIV and AIDS education in mathematics. My motivation was to investigate how I supported the participants and how I attempted to align my theories of how to go about implementing integration of HIV and AIDS education in mathematics by exploring my ‘theory in action’ in a hypothetical situation.

I would have preferred to take a less dominant role in the discussions. During the discussions I spoke for almost as much as all the other participants put together. The number of interactions of the pre-service teachers did increase as the focus group sessions progressed. The participants became more focused on how they would implement the integration of HIV and AIDS education in a mathematics classroom during practice teaching and perhaps my vision of integration became more of a shared vision amongst participants. I do, however, agree with Kathy's reflection:

Our time was also too short because of the demands of our studies. Personally, I think we should have started this project earlier and gone on with it for a little longer. **(Kathy, June 2005)**

Kathy's suggestion would permit further development of the knowledge, skills and attitudes of the pre-service teachers so that they can become more confident in their ability to devise and use appropriate classroom materials to integrate HIV and AIDS education in mathematics.

During focus group discussions I obviously made my intention to prepare classroom materials for HIV and AIDS education integration in mathematics clear and organised the participants to achieve my objective. I dedicated almost three-quarters (42%+32%) of the interactions to making my plans clear. Perhaps I should have allowed the participants to develop their own ideas and perspectives and encouraged the participants to extend their own personal theories and beliefs about how the integration process may unfold.

I believe that in teacher education there should be a balance between developing the pre-service teachers' PCK, SCK and Beliefs but most of our interactions during focus

group discussions were concerned with addressing confidence and organising how I perceived the HIV and AIDS education integration in mathematics. Despite the fact that the participants were volunteers, it was nonetheless necessary to confirm, acknowledge, encourage or clarify various aspects of the innovation. This in agreement with what Van Manen (1999, p. 22) calls critical pedagogical power as 'being encouraging, believing in the students, and giving students recognition' facilitates collaboration and co-operation.

Unfortunately I only explored the participants' beliefs about the integration process for 3% of the interactions yet I believe that the motivation to want to integrate HIV and AIDS education in mathematics is a powerful incentive that is necessary before attempting this innovation. I should have explored why these seven pre-service teachers in particular volunteered to be part of this HIV and AIDS education in mathematics. However, I am concerned about why there were so few pre-service teachers willing to become involved in the HIV and AIDS education in mathematics project. Furthermore, why were there no white pre-service teachers willing to volunteer for the focus group discussions? Do white South Africans consider HIV and AIDS as a problem for certain racial groupings and not for other racial groupings?

This self-study inquiry, in which my interactions during focus group discussions explored, was an attempt at taking on the responsibility of initiating the development of my professional capacity so that I could understand how I addressed a curriculum innovation with pre-service teachers. This initial step came about because of my interest in what Coombe (2003a) describes as a shift from a limited 'HIV education' curriculum towards a wider 'HIV and education' paradigm. I confronted the

pandemic by making use of my different perspective and experience as a mathematics teacher educator to include HIV and AIDS education. I am able to reflect on the themes that I identified in the analysis of my interactions during focus group discussions. My reflections on these themes will provide me with meaningful ways of reviewing my interactions with pre-service teachers to enhance the quality of future interactions.

Through my reflections of the self-study I examined how I practiced my integration vision. The analysis of my reasons for initiating the vision and my involvement served as a pedagogical and methodological ‘umbrella’ to scrutinize my contributions and shortcomings whilst I considered my work as a ‘case’. Using self-study I was able to reflect on my ‘starting with ourselves’ strategy by examining my curriculum initiative as an ‘insider’ rather than an ‘outsider’. My reflections could then be used as manageable suggestions for self-improvement.

By identifying my strengths, as well as weaknesses, I could take charge of progress in my integration initiative. On the one hand, the actions that contributed to positive encouragement could be explored to ascertain how I facilitated the positive outcome. On the other hand, the actions that I identified as not so successful I could decide what actions were possible or necessary. In future initiatives in the integration process it will thus not be necessary for me to rely solely on obtaining directions as to how to proceed with my vision.

### **REFLECTIONS ON THE SELF-STUDY**

Successful use of self-study is considered to be able to ‘shift the boundary of knowledge

in professional inquiry' (Mitchell, 2007). According to Mitchell (2007), the purpose of self-study is to understand and improve one's own practice and to understand the professional and personal aspects of 'self' where links to critical reflection and autobiography are often imbedded in self-study. Mitchell (2007) identified features that are central to self-study methodology. These particular features of self-study include:

- Systematic, deliberate and focused exploration of a particular topic;
- 'Making public' of the findings;
- Demarcation of the topic into a 'beginning, middle and end'.

Mitchell (2007) also points out that self-study is a critical tool for professional development in teacher education. This feature falls in line with what Sachs (cited in Day, 1999) refers to as "A Model of Reflective Professionalism' because there are core values in a responsible approach to professional development. These core values are listed as:

1. Learning in which teachers are seen to practise learning individually with their colleagues and students;
2. Participation in which teachers see themselves as active agents in their own professional worlds;
3. Collaboration in which collegiality is exercised within and between internal and external communities;
4. Co-operation through which teachers develop a common language and technology for documenting and discussing practice and the outcomes;
5. Activism in which teachers engage publicly with issues that relate directly or indirectly to education and schooling, as part of their moral purposes. (Sachs, cited in Day, 1999, p. 228)

My contributions to the project were considered in the form of a self-study 'case' that may be tested against these core values. As a teacher educator I learnt from and with colleagues who are discipline specialists in a variety of fields of study; I developed

my praxis by engaging in an interdisciplinary exploration. Furthermore, I extended my knowledge, skills, attitudes and values by engaging in this interdisciplinary work in a variety of contexts. This collaboration was facilitated by learning from colleagues and experienced researchers within mathematics education and HIV and AIDS education. The work developed by the focus group was extended into school communities outside the HEI when the pre-service teachers acted on their beliefs and prepared and taught integrated lessons in classrooms with young children. During our focus group interactions we moved towards developing a common vision. These interactions were systematically documented and analysed for further reflection.

The HIV and AIDS education in mathematics commenced with an examination of my practice in the South African HIV and AIDS context. The ‘middle’ part of the study was concerned with learning more about how I addressed and affirmed confidence, organized and extended PCK, SCK and beliefs with a group of volunteers. The ‘ending’ occurred in mathematics classrooms where theories of integration were tested and reflected upon.

I have also made public my finding at a variety of forums where I have explained how it is possible to ‘make a difference’ by openly communicating authentic outcomes. By using multiple data sources, I explored my reasons for initiating the HIV and AIDS education in mathematics initiatives to gain a greater understanding of my involvement and subsequent actions. The autobiographical and collaborative autobiographical work with the experienced teacher-researcher clearly linked with my drawing and explanation of the metaphor to expose the importance of my life experiences in initiating the integration of HIV and AIDS education in mathematics.

My vision for this integration was then developed with the participants during focus group interactions.

Although there were unequal power relationships during focus group workshops, the participants appeared to be comfortable enough to voice their opinions freely and openly and make personal decisions about their involvement. For example, when I asked the participants to make transcripts of verbal exchanges during interviews and observed lessons close to a half of these final year volunteers decided not to do the transcriptions. I did not construe this decision as indicating a poor attitude towards the project. It was during the final semester of their BEd degree that this transcription was required and therefore understandable that some of the participants saw the need to focus on the final examinations as more important.

Interactions during focus group discussions indicated that I did not merely interact as an 'equal' partner in the interactions. The number of interactions indicated that I directed and guided the discussions. This, however, is understandable as this research project was a result of my vision in trying to 'make a difference'. I did try to 'market' (Flick, 2002) the concept of integration of HIV and AIDS education in mathematics and used the preparation of activities as a form of 'media' enhancement. The integrated HIV and AIDS education in mathematics activities served as a way of involving the participants in a way that provided observable, usable tools to use in the classrooms with young learners. The analysis of the interactions gave me further detailed information for reflection on my methods of integration.

The analysis of my interactions highlighted the importance of addressing the confidence

of the participants and drew attention to the amount of explanations required for initiating the integration of HIV and AIDS education in mathematics where general organizational issues needed to be considered. Furthermore, the interactions that required essential development of the participants in terms of PCK, SCK and beliefs appeared to be neglected. Nonetheless, the analysis of the content of the interactions provided invaluable insight into possibilities of improvement to develop multiskilled where the integration of HIV and AIDS education in mathematics may be realized. The analysis indicates that the integration process may benefit by focusing more on the necessary PCK, SCK and beliefs of pre-service teachers.

### ***Satisfying methodological expectations***

Self-study methodology does not prescribe one ‘correct’ way of doing research. Some critics of self-study methodology consider such a non-prescriptive approach as problematic and a limitation for ‘effective’ research. It is, however, precisely the non-prescriptive feature of self-study that allows for customizing research to fit a particular researcher in her or his research context. For ‘quality’ self-study methodology research there are, however, some research expectations. Here I discuss some of the expectations of self-study methodology in relation to my research.

In using self-study there is always the concern that being the researcher and simultaneously the practitioner is a limitation. The tension is, however, not unique to self-study methodology. When using other methodologies, additional forms of ‘tension’ exist between the researched and the researcher. More complicated ethical tensions may occur when researching the actions and intentions of other people.

Furthermore, when observing and reporting on the work of other people, the researcher cannot be considered to be impartial and objective. All research, where observation is reported, occurs through the researcher's 'lens' and from the researcher's perspective. There is thus an inevitable tension between researcher and practitioner no matter which methodology is selected.

In using a self-study methodology I have selected 'concrete' evidence to show that I know what I claim to know about improving my practice as a teacher educator. The manner in which I recorded the evidence that I presented is detailed. The detail includes not only how I sought to include HIV and AIDS education in a mathematics curriculum but also why I examined my practice during the integration process.

During the integration process I used acceptable research methods and I have not 'favored private over public theory' (Loughran, 2007, p.13). The outcomes of this self-study can have value for other teacher educators. I demonstrated how I gathered and analysed data using transparent recognised methods in order to extend my knowledge and praxis and also to influence the larger teacher education community. Using appropriate methods I have circumvented the issue that this self-study was a way of doing research only for rationalizing or self-justifying purposes. I took great care to extend teaching and learning in teacher education beyond my own personal research interests. Throughout this piece of research I have made the purpose clear and obvious whilst using a *Starting with ourselves* approach. During the process of integrating HIV and AIDS education in a pre-service teacher mathematics curriculum the emphasis was on using a self-study methodology to focus on going beyond a *Starting with myself* approach.

According to Loughran (2007, p. 15), in self-study methodology there is a ‘continual interplay between research and practice within the practice setting’ that allows for fluid possibilities of refinement and adaptations during the research process. During my research, I used selected interactions in many settings to show the fluidity that was possible. The particular selection may seem to be an ‘arbitrary’ selection of data and this may result in possible skepticism about the validity of this self-study. LaBoskey (2004), however, points out that in self-study the validation process should rather be judged in terms of ‘trustworthiness’. She suggested that through particular methodological features of self-study, it is possible to report whether a piece of self-study research may be recognized as being trustworthy. I have contended with my claim to trustworthiness by making use of rigorous methodological procedure that is documented in explicit detail (See Chapter Three.). Furthermore, I have demonstrated the internal validity of my claim to knowledge production by placing my claims into the public arena during meetings with colleagues from the Education Faculty of UKZN and at a variety of conferences and symposia (See Chapter Three.).

I answered the research question ‘How can self-study contribute both as a pedagogical and methodological umbrella for addressing HIV and AIDS in pre-service teacher education?’ by using the five guidelines suggested by LaBoskey (2004; 2006) Each of these five characteristics of self-study (Self-initiated and self-focused; Improvement-oriented; Employment of multiple methods; Interaction at one or more stages of the process; Validation achieved through the construction, testing, sharing, and re-testing of exemplars of teaching practice) were considered to show possible pedagogical and methodological processes in self-study that can be used to address

HIV and AIDS.

Furthermore, I was also able to make use of interactions to achieve my personal research goals. Through particular characteristics and opportunities provided by self-study methodology (LaBoskey, 2004; 2006) I was able to consider the emerging question ‘How can I assist pre-service teachers with the development of appropriate beliefs, knowledge, skills, attitudes and values to integrate HIV and AIDS in the teaching and learning of mathematics?’ (See Chapter Three.). The analysis of my interactions during focus group workshops allowed for careful examination of my theories in relation to my practice of integration. The answering of this particular question was possible as self-study using action research allowed me to investigate and evaluate my own work. The five interaction themes that I described (Addressing and affirming confidence in the integration process; Organizing the integration project; Addressing pedagogical content knowledge; Addressing subject content knowledge; Considering beliefs) provides practical measures that I am able to act on to assist pre-service teachers with the integration process. I consider each of these themes important means of supporting the integration innovation so the analysis of my interactions gives practical guidelines where possible modifications in my ‘observe-reflect-act-evaluate-modify-move in new directions’ can occur.

The analysis of the interactions during focus group workshops emphasized the importance of addressing and affirming confidence in assisting pre-service teachers for the integration process. The analysis highlights potential for further extension of my practice in the areas of Pedagogical Content Knowledge (PCK), Subject Content Knowledge (SCK) and beliefs required for the integration of HIV and AIDS

education in mathematics.

The examination of my interactions with an experienced researcher-teacher and a colleague gave further insights into the role that I played in the *Starting with ourselves* approach to integrate HIV and AIDS education in a discipline. By examining my interactions with focus group participants it was possible to 'hear' the voices of pre-service teachers and simultaneously reflect on my actions that took place during focus group discussions. Through my reflections it was possible to systematically explore where I could and should support pre-service teachers through addressing the five interaction themes that I described. By linking the practice and research whilst examining my interactions with pre-service teachers, I used self-study methodology to make full use of an 'observe-reflect-act-evaluate-modify-move in new directions' approach.

By using interactions at various levels, I was able to explore a variety of integration strategies. Each level of interaction, with the experienced researcher-teacher, with a colleague and with the focus group participants, provided valuable insight into the integration process. The diverse variety of interactions selected for consideration shows that my reporting was not only a private and personal matter to recognise and document my particular problems in practice. I became motivated to explore views that were beyond my own perspectives but nonetheless within my 'reach'. The views of many interested (and also disinterested) 'participants' played a significant role in shaping this self-study. In the presentation of my experiences as a self-study researcher I provided evidence of the nature of collaboration that took place amongst members of the teacher education community.

Loughran (2007, p. 18) argues that teacher educators who make use of a self-study methodology are ‘indeed serious about seeking to better understand the complex nature of teaching and learning about teaching’. It was thus prudent, I believe, to make use of self-study methodology to address HIV and AIDS education as a mathematics teacher educators situated at the centre of the HIV and AIDS pandemic, in order to explore how articulation between theory and practice may be facilitated.

## **SUMMARY**

In this chapter I show how I drew on my own life experiences through collaborative autobiography and my early life experiences through autobiography to understand how this *Starting with ourselves* approach emerged. In this chapter I attempt to explore links and balances between private experiences, experiences as a mathematics teacher educator and the data that I collected during focus group discussions. The focus on my practice as a mathematics teacher educator integrating HIV and AIDS education was explored to understand my process of implementation. Furthermore, I discuss how I gained insight into the integration process by using a self-study approach for pedagogical and methodological purposes.

In the following chapter, Chapter Seven, I summarise and discuss the findings of the three findings chapters. In addition, I consider how the findings relate to more general implications for teacher education as well as possibilities for further research in integrating HIV and AIDS education in pre-service teacher education.

## **CHAPTER FIVE**

### **FINDINGS: PART 2**

#### **WORKING WITH A SMALL GROUP OF BEGINNING TEACHERS: BELIEFS AND CLASSROOM PRACTICE INTEGRATION**

##### **INTRODUCTION**

Chapter Five is the second chapter that describes and analyses the findings of the study. Here I integrate the metaphor drawings and descriptions by the pre-service teachers, lesson observations during practice teaching together with post lesson interviews to explore their beliefs about integration of HIV and AIDS education in mathematics. Qualitative, interpretive approaches are used to explore the data.

##### **METHODS USED TO ANALYSE THE INTEGRATION PROCESS**

Robinson (1998) argues that in order to maximize the contribution of research to the understanding and improvement of classroom practice, educators (teacher educators and teachers) need to undertake practical classroom inquiries into their own practice. For this reason, the project involved a practical classroom inquiry (Robinson, 1998) into participants' beliefs about the integration of HIV and AIDS content in the mathematics curriculum. The practical inquiry gave participants the opportunity to express their beliefs about the integration of HIV and AIDS education in mathematics. The exploration was informed by the work of Johnston et al (1990) who see metaphors as an imaginative way of describing a situation to give a vivid and interesting picture, and Hobden's (1999) notion of drawing and describing metaphors as a novel, interesting and appropriate manner of articulating personal beliefs, the participants were asked to use drawings as metaphors for exploring and expressing their beliefs about the integration of HIV and AIDS in mathematics education. This

was meant to facilitate reflection, introspection and interrogation of personal understandings about the inclusion of HIV and AIDS in mathematics education (Sfard,1998, p. 4) rather than the usual solving of mathematical problems and ‘getting the right answer’.

More importantly, I believed that through our drawings, we could begin exploring the ways in which we might tackle the difficult and taboo subject of HIV and AIDS in the mathematics classroom. My reasons for using drawings were informed by the work of Mitchell and Weber (1999, p. 131) which suggests that drawings are revealing as they can ‘point to things we may not yet be able to put into words’ and may disclose what we hope will materialize whilst simultaneously exposing our fears, disappointments and/or frustrations. The authors contend that drawings allow for presentation of what we see as new directions to pursue. In an unthreatening, static form we are able to express our imagination. Drawings thus allow for making public our dreams and visions in a format that we are able to control and able to identify with. Further, what we make known by way of a drawing is, however, often couched in a design that we have experienced. We are best able to reveal in a diagram that is compatible with the ingrained social context in which we live. Our lived experiences play a significant role in the subjects/objects that we choose to represent diagrammatically. It is thus possible to make use of our past beliefs and experiences in the drawing of a metaphor to show how teaching and learning of HIV and AIDS education in mathematics should take place. Here the drawing of a teaching and learning metaphor was used as a tool for directing attention to how we believe HIV and AIDS education inclusion in the Mathematics Learning Area may occur. This means that the drawings and the metaphors produced by the participants were not

meant to depict the actual mathematics education lessons. Rather, they were meant as entry points into discussions about possible strategies for the integration of HIV and AIDS content into the Mathematics Education and Mathematics curriculum.

Using the metaphors each participant drew the ways in which the teaching and learning of HIV and AIDS through mathematics might occur. During focus group interactions, each pre-service teacher was given the opportunity to record who or what represented the teacher, the learner, the mathematics and the HIV and AIDS education in her drawn metaphor and share her interpretation of her metaphor. This discussion was audio-taped for later transcription and analysis.

The metaphor presentations were then explored in relation to the classroom observations, where I observed the participants' 'theory in practice' (Vithal, 2004, p. 92), when they taught Mathematics lessons that integrated HIV and AIDS education to young primary (elementary) school learners. The aim of this was in part, through observation and discussions, to understand the links between the participants' metaphors (reflecting their beliefs about HIV and AIDS in mathematics) and their classroom teaching. Each observed lesson was audio taped for later transcription and analysis. The lesson plans prepared by the participants for these lessons were collected and after each lesson a post lesson interview was conducted with each of them.

To analyse the above data, I have used the classification suggested by Sfard (1998) who describes Acquisition and Participation metaphors. Sfard's (1998) two categories are concerned with whether the learning is the end point or whether

learning is part of an ongoing process. I used these two categories to identify the variety of possible personal theories of teaching held by the participants in the group. I did not use the metaphors to classify the types of theories in a hierarchical manner or judge the metaphors in any way. I wanted to explore the variety of personal theories of teaching and learning, and in particular, the ways in which these relate to the inclusion of HIV and AIDS education in mathematics as envisaged by the participants.

As participants in the project, my assumption was that our volunteering to be part of the HIV and AIDS education in Mathematics project meant that all of us saw a need to integrate HIV and AIDS education in mathematics. It was not my intention to try to change the pre-service teachers' beliefs or theories they held but rather to explore the beliefs or theories about the integration of HIV and AIDS education.

### **VALIDATION OF DATA**

From the inception of the project I was aware of the need to address ethical issues so I carefully explained to the pre-service teachers that my interest in HIV and AIDS education in mathematics is an integral part of my Higher Degree research. I obtained informed consent from the small volunteer group of pre-service teachers with whom I worked closely (See Appendix B.) and have made concerted efforts not to 'pre-service teacher bash' or exploit participants but rather value the contributions of each member of the group.

To obtain authentic transcriptions I asked the participants to transcribe their own interviews and teaching sessions that I observed during practice teaching so that each pre-service teacher was given the opportunity to scrutinize their viewpoints after

transcription. I attempted to work *with* the pre-service teachers in my research. Three of the participants did not choose to transcribe their interviews or observed lessons because of work pressures in their final year of study so I asked these participants to read through the transcriptions prepared by a professional transcriber to verify the written text (See Appendix K.).

### **METAPHORS, CLASSROOM PRACTICE AND INTERVIEWS**

To illustrate the variety of visions and beliefs about integrating HIV and AIDS content in mathematics among the participants, I have used all seven pre-service teachers' metaphors, classroom lessons and post lesson interviews. Instead of selecting the work of some of the participants, I have chosen to use the work of each participant as a way of acknowledging the valuable contributions that they made to my vision for HIV and AIDS education in mathematics.

The drawings of the metaphors were not intended to be polished pieces of art but rather sketches to illustrate how each participant's beliefs and experiences may merge to show how teaching and learning of HIV and AIDS education in mathematics classroom ought to occur. The descriptions of the metaphors recorded below each drawing use a variety of 'formats'. These formats are close replications from the participants' work and the descriptions are thus not presented in a standardized format.

To explore how the participants translated their beliefs of integrating HIV and AIDS education in the mathematics curriculum, they agreed to develop lesson plans and implement them in various primary schools during their practice teaching session. Aspects of the observed lessons presented by each participant will be used to illustrate

what and how the participants interpreted the integration process to put their beliefs of integration into practice. Each participant's contributions to the project are considered separately in the form of 'cases'. Although we all worked together at the integration project, each participant approached and developed her own style of integration in a unique manner and this will be highlighted by presenting each participant's work in depth as a 'case'. Furthermore, in learning about each case separately I was able to 'look for meaning and try to construct understandings' (Knight, 2002, p. 41).

To link the metaphors to the teaching experiences of the participants, I asked the participants about their metaphors in the post-lesson interviews. One of the questions I posed in the post-lesson interviews was "How does the way you approached the lesson link with the metaphor you described in our focus group discussions to show how HIV and AIDS may be used in a Mathematics lesson?" Each interview took place immediately after teaching the lesson(s) or during a convenient time in the practice teaching period. The response(s) of each participant will illustrate their views on the possible link between their teaching experiences and their metaphors.

In order to make each participant's involvement more 'person centred', I included a drawn picture of each participant to introduce her contribution. The participants' photographs could not be used to 'introduce' them as this would jeopardize their anonymity. Drawn pictures of the participants were used as a way of identifying the participant so that links between comments, names and 'faces' of participants can fuse to explore the written text descriptions and drawings. The pictures serve as a way of becoming acquainted with the participants. The order in which I introduce the participants as individual 'case studies' is of no significance.

Together with the diagrammatic representation of the person, I give a brief introduction to each person and include the age of the participant so as to give an indication of life experiences. Other relevant information about the participant's teaching and learning experiences, which have already been mentioned in Chapter Three, are included in the introduction to summarize and focus on the individual. The contributions of each participant used in this chapter include her metaphor drawing with her interpretation of her drawing; her lesson(s) presented where HIV and AIDS education is integrated into a mathematics lesson; her responses to the post lesson interview; and her reflections during and on the focus group interactions.

I have chosen to introduce Keshni's work first, followed by the work of Thembe, Nobunti, Londi, Netha, Celiwe and Kathy.

### ***The seven participant cases***

#### ***Case1. Keshni***

Keshni is South African and is 23 years old. Her home language is English. Keshni lives with her parents in an urban setting where a number of her close family members are nurses; her family often has interactions with HIV and AIDS patients. Keshni and her family follow the Christian religion.

Keshni matriculated in 1999 when she gained a good mark (62%) in mathematics. Keshni completed several modules in Biological Science in the Faculty of Science at UKZN before registering for a BEd degree in 2002. During the first year of her undergraduate BEd degree she elected to take the 'Diversity and Learning' module

and chose mathematics as her elective. Keshni completed four elective modules in mathematics education at the Edgewood Campus and she gained good results in her three primary mathematics education modules. Keshni completed her degree and qualified as a Foundation/Intermediate Phase teacher at the end of 2005 with a lower second class pass average (65%).



**Keshni**

Keshni chose to draw 'The hospital' as the metaphor to illustrate how teaching and learning of HIV and AIDS education in mathematics classroom may be integrated.



**The hospital**

**Building Hospital** → Can represent a place of education/centre of learning

**Light** → People can come in to be enlightened about HIV/AIDS

**Open door** → everyone is welcome to learn about HIV/AIDS

**Patient** →Learner

**Drip** → Mathematics teaching about HIV/AIDS

**Illness** → Ignorance about HIV/AIDS

**Educator** → Doctor

**Nurse** → represents anybody else involved in the fight against HIV/AIDS from the community

**Windows are also open** to allow fresh new ideas about HIV/AIDS. Open to new knowledge

**Holding hands** → People at schools must be united in educating learners about HV/AIDS, integration of subjects

**Figure 12: The metaphor drawn by Keshni with her written explanation of what each part of the drawing represents**

'The hospital' (See Figure 12.) metaphor shows a drip that transfers the medicine to the patient. The doctor, with the support of the nurse, is able to remedy the problem. People from the community and the hospital are able to join forces to cure the malady. The doctor and the nurse are at the centre of the drawing and together with the patient are situated inside the hospital. The description of the metaphor points out that the teacher provides the HIV and AIDS and mathematics teaching. The teacher and other members of the school and community transfer the new knowledge. Learners should be made to feel welcome and supported to gain knowledge about HIV and AIDS.

When Keshni described her metaphor drawing of the hospital and how integration of HIV and AIDS ought to take place she symbolized the integration of HIV and AIDS education in subject disciplines by showing the role players at a hospital holding hands. The integration of HIV and AIDS education in mathematics is depicted by the drip where AIDS education occurs during mathematics. Keshni described her concept of integration in the focus group discussion and she mentioned that integration of HIV and AIDS education in disciplines is a new idea. She explained this by saying that:

Then I also have windows here. This shows that we are also open to new ideas and knowledge about HIV and AIDS ... These people are holding hands here and I say that people at school must be united in educating learners about HIV and AIDS - that's an integration of subjects.

**(Keshni, 3 May 2005)**

During Keshni's first integrated lesson that I observed, she introduced her mathematics lesson to a Grade 3 class of 29 learners by considering symmetry in geometric shapes. She then moved on to using a Red Ribbon shape to discuss symmetry and prepared a worksheet where one half of the Red Ribbon was drawn and

the learners were asked to complete the other half of the symmetrical Red Ribbon shape. The learners were thus encouraged to complete a symmetrical shape that had one line/axis of symmetry. Whilst introducing the Red Ribbon shape, Keshni explored the meaning of the Red Ribbon shape by asking:

Keshni: Look like this, a line of symmetry right through . I want to hand out this worksheet to you. OK, have you come across this Red Ribbon before?

Learners: Yes.

Keshni: And what does it stand for? What does it mean to you personally?. Yes...

Learner 1: HIV.

Keshni: HIV you say, somebody else...

Learner 2: Means you care about people who got HIV.

Keshni: You care about people with HIV and AIDS. Somebody else...

Learner 3: Support people with HIV and AIDS

**(Keshni, 5 August, 2005)**

At the close of the lesson, Keshni used a questionnaire that she devised entitled 'Myths & Facts'. This was used to discuss topics that centre round HIV and AIDS and to gauge the learner's knowledge of HIV and AIDS issues. The questionnaire required yes or no answers but also required open ended responses. There were nine closed questions/statements on the questionnaire. The questions/statements posed were, for example, 'Do you think HIV/AIDS exist?' and 'HIV is the name of the virus, AIDS is the disease caused by HIV.' These questions were read and carefully explained by Keshni whilst the young learners were given an opportunity to decide whether they wanted to respond 'yes' or 'no' to the particular question/statement. The learners were attentive and co-operative throughout the lesson and keen to participate in all the interesting variety of integrated activities.

During the second post lesson-interview with Keshni, I asked about a possible link between the ways she approached the lesson and the metaphor described by her in our focus group discussions to show how HIV and AIDS may be used in a Mathematics lesson. Keshni spoke about the nurse trying to assist the learners but her reflection was tentative. Keshni said:

The knowledge. I think I'm..., I mean..., I'm like the nurse trying to help those people know about AIDS. The doctors are being compassionate to the HIV and AIDS patients. So that will link to the... But I don't know.

**(Keshni, 12 August, 2005)**

In Keshni's response she did not focus on the use of HIV and AIDS education in mathematics but considers the role of the nurse (teacher) in disseminating knowledge about AIDS. Keshni mentioned that the doctors should be empathetic towards HIV and AIDS sufferers. In "The hospital" metaphor, the doctor was described as being the teacher and the nurse represents other members of the community assisting in the fight against HIV and AIDS. In the above response, however, the role of the teacher is likened to that of the nurse in a hospital. The teacher appears to be given a less important role in the teaching about HIV and AIDS as the status of a doctor in a hospital is far greater than that of a nurse.

### ***Case 2. Thembe***

Thembe is from one of South Africa's neighbouring countries, Lesotho. Thembe is a friend of Londi and Celiwe. Thembe is 39 years old and has a wealth of experience as a teacher of young learners. She took study leave for four years from her teaching position as a primary school principal in Lesotho to further her studies and obtain a BEd degree in South Africa. Thembe lives with her husband and children in a rural

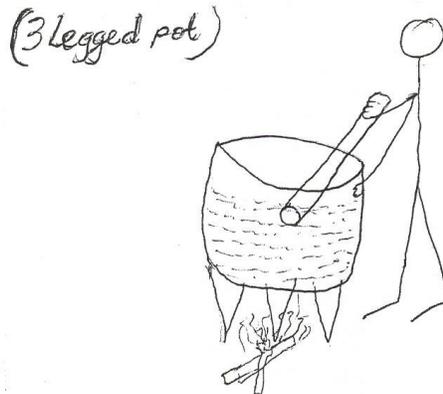
setting in Lesotho where her home language is Sotho. Lesotho, like South Africa, is severely afflicted by HIV and AIDS and has one of the highest prevalence rates, 23.2% (AVERT, 2007) in the world.

Thembe completed her secondary schooling in Lesotho. Thembe completed a Primary Teachers' Certificate in Lesotho from 1985 to 1987 and a Diploma in Education from 1989 to 1990 before registering for a BEd degree in 2002. During the first year of her undergraduate BEd degree she elected to take the 'Diversity and Learning' module. Thembe completed five elective modules in School Guidance at the Edgewood Campus and she gained distinctions in each of her three primary mathematics education modules. Thembe is truly a 'life long learner' and completed her degree qualified as a Foundation/Intermediate Phase teacher at the end of 2005 with a first class pass average (76%).



**Thembe**

Thembe described her vision of how HIV and AIDS education should be integrated into mathematics by using a drawing of a three-legged pot: an appliance that is probably still frequently used for open fire cooking in Lesotho.



- Man** .....teacher
- Stick**..... new knowledge of mathematics & HIV concepts
- Pot** .....learner
- In the pot**.....prior knowledge of mathematics & HIV
- Three legs** ...teacher (1), learner (2), parent (3) working together as a team
- Fire**.....teaching & learning skills & techniques, curriculum and teaching & learning materials

**Figure 13 : The metaphor drawn by Thembe with her written explanation of what each part of the drawing represents**

In the ‘Three legged pot’ (See Figure 13.) metaphor, the pot might suggest the learner as a central, large and significant part of the drawing whereas the cook is represented by a thin stick figure. The mixing stick is prominent and is used to connect the cook to the contents of the pot. From the description of the metaphor it is clear that the teacher combines new knowledge with existing knowledge of mathematics and HIV. The knowledge is transferred to the learner who is supported by other learners and the parent. The teaching and learning of mathematics and HIV is activated using the Pedagogic Content Knowledge (Manouchehri , 1997) of the teacher.

The prior knowledge of HIV and mathematics is simultaneously developed by ‘adding’ new knowledge of HIV and mathematics. Thembe explained that:

Now the pot itself is the learner or learners. What is in the pot now? The previous knowledge and the prior knowledge about maths. The prior knowledge about AIDS... The three legs of the pot is the collaboration system of developing the maths. We have the learner here; this is the parent here; the teacher there. If together, they [are] working here [and through] collaboration then the learner will grow. So what you see there is the fire. The fire is the teachers, skills, techniques. The curriculum that is effective; the teaching materials; all these things. They will develop the prior knowledge... You know what is coming out of the stick - the new knowledge of HIV and maths adding to the previous one.

**(Thembe, 3 May 2005)**

Thembe integrated HIV and AIDS education into a mathematics lesson using graphical representation. In an introduction to the lesson, Thembe's 39 Grade 2 learners were reminded of precautions to take when assisting friends who have bleeding wounds. During the lesson a chart showing a pictograph with paper cutouts of people was used. The heading of the pictograph was 'People living with HIV & AIDS' and the columns were labeled 'Mothers', 'Children' and 'Fathers'. During the lesson these young learners were encouraged to count cutouts on the pictograph. The learners also compared the number of cutouts in the various columns. The integrated individual learner activity that Thembe used was an example of a pictograph and the learners were asked to complete the worksheet by counting the number of pictures drawn in the columns of the pictograph. The columns on the pictograph were labeled 'TB', 'TB & HIV', 'Flu & HIV' and 'Flu'. The columns in the pictograph where a red cross was shown indicated that the HI virus was present. Thembe explained how some people may have tuberculosis (TB) and influenza (flu) and not necessarily be infected with the HI virus by saying that:

Some people have TB but they don't have the HI virus some of them... have TB and also the virus.

Whilst referring to the worksheet with the pictograph, Thembe explained to the learners that:

Some people have flu but do not have the virus, OK. So if you see someone with TB or flu don't say that person has the HI virus. Some have flu but they don't have the HI virus. There are some who have flu but do not have the HIV virus. There are some who have flu and the virus in their blood. So what you're going to do here is you read ...people have flu and HIV ...then you count the people who have flu and the HIV 'red cross' then you count and write the number here where you see the dotted lines here. ...People have flu just flu there is not HIV virus. You count how many then you fill in.

**(Thembe, 28 July 2005)**

The learners then attempted the worksheet whilst Thembe moved round the class and assisted individual learners.

During the post lesson-interview with Thembe I asked about a possible link between the ways she approached the lesson and the metaphor described by her in our focus group discussions to show how HIV and AIDS may be used in a Mathematics lesson.

Thembe responded:

Yes, mine is a three legged pot, the man had a stick and is stirring the pot. The link is there in a sense, I said the pot is the child and what is still there is the maths because the pot is the child, now I have noticed that my children already know about the pictograph and I said that the man is the teacher which was me and the stick that stirred is the adding of the HIV information then what I did was ask learners to look at the pictograph and added the information on HIV and AIDS.

**(Thembe, 11 August 2005)**

In Thembe's response she confirms the concept of adding to the knowledge of the learner. The learner is seen as having some previous mathematical knowledge. HIV information is then added to the mathematical knowledge already acquired. In the metaphor diagram the teaching and learning of HIV and AIDS appear to be transferred simultaneously but in the post lesson interview the knowledge of HIV is added by making use of previously acquired mathematical concepts.

*Case 3. Nobunti*

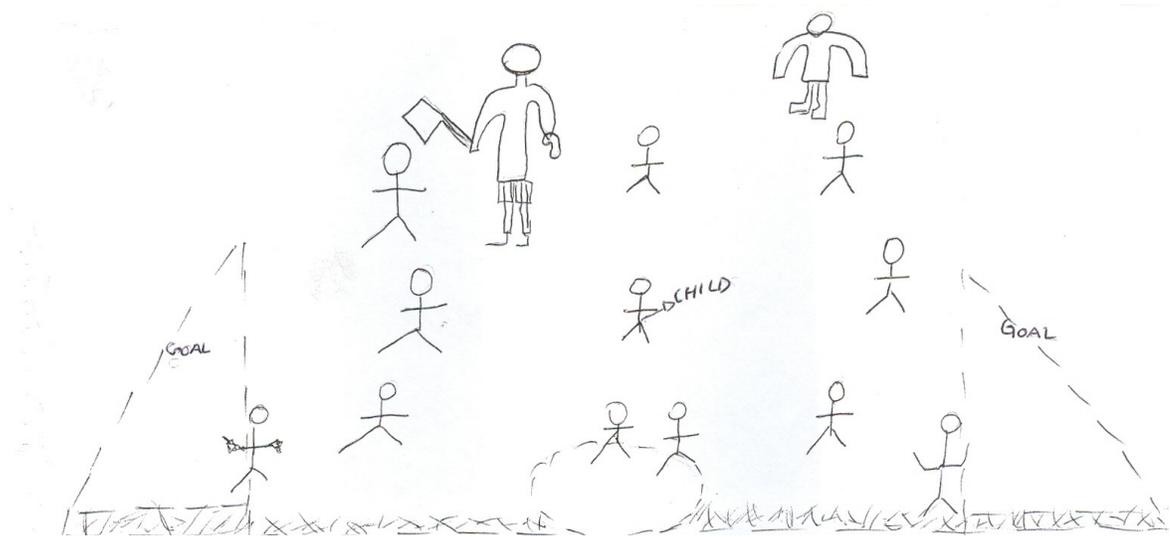
Nobunti is South African and is 26 years old. Nobunti's home language is isiZulu. Nobunti is a staunch Catholic who is actively involved in her religion and is a volunteer teacher at one of the local Catholic schools. Nobunti often spoke about the coming 2010 soccer world cup that will take place in South Africa and often voices her concern about the fact that many South Africans will not witness this prestigious event because of the HIV pandemic.

Nobunti matriculated in 1997 and did not elect to take mathematics as a matriculation subject. During the first year of her undergraduate BEd degree she did not elect to take the 'Diversity and Learning' module. Nobunti did not elect to take School Guidance at the Edgewood Campus but majored in Technology Education. Nobunti found mathematics challenging but passed each of her three primary mathematics education modules. Nobunti completed her degree and qualified as a Foundation/Intermediate Phase teacher at the end of 2005 with a lower second class pass average (62%).



**Nobunti**

Nobunti named her metaphor that she used to explain how HIV and AIDS education should be integrated into mathematics, 'The soccer play ground'.



#### **The soccer play ground**

**Teacher (s)** – Referee trying to guide the learners of what they are expected to do from this ground of knowledge and AIDS

**Learner** – The players represent learners who have to work at their level best in order to win – but as for learners they will rather work harder to help the community they live in, tell them about the disease they have got enough information from the soccer play ground.

**Mathematics** – The action that takes place in the playground is the knowledge of maths the learners gain during the process of playing.

**AIDS** – The playground which affects everyone whether you are mid-fielder or goal keeper or referee but this knowledge of AIDS has to be announced to everyone.

**Figure 14: The metaphor drawn by Nobunti with her written explanation of what each part of the drawing represents**

In the drawing of the metaphor the soccer playground is scattered with stick figures. The referee is larger in stature than the stick figures. The referee is placed in the centre of the playground and he wields a flag to guide the players. The players can learn the rules by taking part and being guided during the soccer games. There are two

goalposts drawn at either sides of the drawing. The drawing is unbounded and open. In the description of the metaphor, the referee (teacher) is tasked with guiding the soccer players (learners) using what they already know about HIV and AIDS. The teacher is expected to disseminate the knowledge to everyone in the community via the learners.

Nobunti described the 'goals' of education as coming together on the soccer playground that represents the education system. The separated, different goals of mathematics and HIV and AIDS education are seen to come together in the educational setting. Nobunti's vision of how the integration of HIV and AIDS education and mathematics might occur was qualified when she stated that:

The playground is the education system because you have this ground and the goals. So we've got maths on the other side and we have HIV and AIDS education on the other side and these come together to this centre..

**(Nobunti, 3 May 2005)**

During her practice teaching, Nobunti was not given any mathematics lessons to teach to her Grade 4 learners but adapted a Technology lesson to integrate HIV and AIDS education. During the lesson I observed, she spoke some English to the learners and code-switched to IsiZulu to elaborate on concepts.

Nobunti introduced the technology lesson by reading a poem in isiZulu that was written by a nine-year old learner from another class. The poem was later translated by Nobunti as:

Poem in IsiZulu	Translation of poem
Hayibo ngizwani ngezindlebe zami	Hey, what do I hear with my ears?
Maye ngibonani ngamehlo ami	What do I see with my eyes?
Kuthiwa abantu bayafa	It is said that people are dying.
Ngibona abantu bephela	I see people disappearing.
Ngibona isizwe sikaShaka sibhuqabhuqeka	I see Shaka's people being taken away,
Sibhuqwabhuqwa ingculazi	Taken by this pandemic HIV/AIDS.
O'hhe lafa elikamthaniya madoda.	Oh God, what a tragedy!
Yayikuphi ingculazi ngezikhathi zo-Shaka	Where was HIV/AIDS during Shaka's time?
Wawukuphi ngculazi ngezikhathi zobandlululo	Where were you, HIV/AIDS during the apartheid regime?
Hhayi ndoda yamadoda uyibekile induku ebandla	Hey, you're man among men.
Ugingqe izinkinsela nezimpofana	You have showed us your mysterious powers. You take both the rich and poor alike. They try to stop you this side and you find other directions.
Bathi bakhona oManto nama ART	
Uthi nawe ula	Even Manto Shabala came with ARTs,
Athi akhona ama Nevarapin	But you say I am here to stay.
Uthi lala lulaza ngizokwengula	They introduce Nevirapine,
Angazi nokuthi ngingakuthopha ngithini ngoba	You say wait until you see.
Unezibongo eziningi	I do not know what praises I should give you,
Abanye bakubiza qhok's	Because you have plenty.
Abanye bakubiza zifo zonke.	Others call you high hill. Others call you three-legged pot. Others call you master of sicknesses.
Sesithi khumu manje kanti i-world cup	
Ka 2010 iyofica bani uma wenza nje	We surrender now, By the time the 2010 world cup comes, who will it find?
SHWELE NGCULAZI SHWELE NKOSI	
YEZIFO XOLA MANJE SEKWANELE.	

Nobunti discussed the meaning of 'ARTs' by pointing out that they are tablets used for treating HIV positive patients but medication, such as Nevirapine, does not cure the patient.

She went on to speak about the Red Ribbon symbol by saying that:

Nobunti: ...OK, as I said the ribbon is so important.  
Learners: Yes, teacher  
Nobunti: What is it...important? Yes, it is important and special. It was made specially, isn't it?  
Learners: Yes, teacher  
Nobunti: It was made specially for us to respect it because we have to handle people with what...we have to handle with respect and care because it shows that we care for them we respect them we love them and we protect them. Who does not do that to people who have got AIDS?

**(Nobunti, 11 August, 2005)**

Nobunti explained to learners about the Red Ribbon symbol and referred to the large Red Ribbon signboard that was outside the school grounds. The learners were then asked to complete a worksheet where a Red Ribbon that was drawn on squared paper had to be enlarged by doubling its dimensions. The meaning of the Red Ribbon was thus adapted to be integrated with scale drawing requirement for technology education. The learners in the class of 49 learners contributed to the lesson presentation in a positive manner by willingly offering responses to questions posed by Nobunti. The learners were keen to tackle the scale drawing worksheet.

In the post lesson-interview with Nobunti I asked about a possible link between the ways she approached the lesson and the metaphor described by her in our focus group discussions to show how HIV and AIDS education may be used in a Mathematics lesson. Nobunti said:

I think it links very much because in my in my metaphor I stated that um , I said something about the children being more , being the messengers because they are , they are the ones who can be ambassadors for us in the schools.

Who can go out and say something. I mean if you teach them, you teach the nation. So that's what I mentioned before. If you teach the young ones, you educate the society. Because children, it's so easy for them to discuss what they have been doing in class with their parents and there outside whereas if you teach adults they keep it to themselves but young one's are excellent.

**(Nobunti, 11 August, 2005)**

Nobunti's response reiterates the importance of teaching the learners so that the learners can convey what they have learnt to the community. Young learners are seen as being able to transmit the subject matter to their parents and others outside the school easily. It appears as if the learners are not the main focus of the teaching and learning but rather the learners may be messengers of information that needs to be transferred.

#### ***Case 4. Londi***

Londi is from Lesotho. Londi is 31 years old and has experience as a teacher of young learners. She took study leave for four years from her teaching position as a primary school teacher in Lesotho to further her studies and obtain a BEd degree in South Africa. Londi lives in a rural setting in Lesotho where her home language is Sotho.

Londi completed her secondary schooling in Lesotho 1991. She then went on to study for a Primary Teachers' Certificate in Lesotho from 1993 to 1995 before registering for a BEd degree at UKZN in 2002. During the first year of her undergraduate BEd degree she elected to take the 'Diversity and Learning' module. Londi completed five elective modules in School Guidance at the Edgewood Campus and she gained distinctions in two of her three primary mathematics education modules. Londi

completed her degree and qualified as a Foundation/Intermediate Phase teacher at the end of 2005 with an upper second class pass average (74%).



**Londi**

Londi described her vision of how HIV and AIDS education should be integrated into mathematics by drawing a pot of dough on the fire.



### **Metaphor**

My message here indicates that the dough is raising, and soon will be put into the pot to become bread, so ingredients that make the dough are the heads of people coming together to fight for the disease HIV/AIDS using Mathematics as integration. I left the pot open showing that integrating HIV/AIDS Education and Mathematics is still on the process, so we have to fight together to pass the knowledge of HIV/AIDS in Mathematics, so the fire will help the knowledge to grow as the yeast does to the dough so when all people have the knowledge, they will be able to teach others about it, in all learning areas and verbally.

**Figure 15: The metaphor drawn by Londi with her written explanation of the drawing**

No people appear in the drawing. The open container showing the dough takes a central and prominent part of the diagram. The ingredients yeast and baking powder are labeled. The stove with the fire is also centrally placed. The drawing is

unbounded and open. The metaphor description does not specifically demarcate the teacher or the learner but rather the importance of making use of innovations in teaching and learning, such as HIV and AIDS education in mathematics, to spread knowledge of the disease.

Londi integrated HIV and AIDS education in a Number Pattern mathematics lesson. The Grade 4 learners were encouraged to discuss the meaning of the Red Ribbon symbol. She reminded the learners of the fact that AIDS is a fatal disease and tablets cannot cure the disease. Londi cautioned the learners on mixing of blood by saying:

- Londi: Yes, if you have it, you're HIV positive even whatever you take it can't get out of your body, that's why it's Human Immune Virus. How do we get that virus? How many of you have been to the clinics? Have you seen the syringes the doctors use?
- Learners: Yes.
- Londi: To give injections, do we have to share syringes?
- Learners: No.
- Londi: What happens if you do?
- Learner 1: We spread the disease and become HIV positive.
- Londi: You get the same sickness as the person who used it. OK, what else?
- Learner 2: You can spread HIV.
- Londi: OK, you can spread HIV by using the same syringe and what else?
- Learner 3: Another way of getting HIV is by using the same blade and sharing it with another person and if I use the same blade and cut with it and it means I got the virus through sharing blood.

**(Londi, 28 July 2005)**

Londi used a hand-drawn picture of the HI virus to show its structure to the learners. The drawing consisted of a circle with receptors around the circle. Londi then moved on to using a number pattern drawn on chart paper. Londi explained the pattern by saying that if in one day ten people are infected, in two days there would be twenty people infected and in five days there would be fifty people infected. The learners were asked to complete number patterns such as:

Complete the table below by showing how many people are infected in the given days:

Number of days	1	2		
Number of people	300	600		

The examples presented during the observed lesson were not prepared by Londi or any other participant during focus group discussions. Londi prepared these number pattern sequence activities because the teacher asked her to teach this topic.

In the interview, Londi did not say how she connected the way she approached the integrated lesson with the metaphor she described in focus group discussion. Londi appeared to be unsure about the link between her metaphor and the manner in which she incorporated HIV and AIDS education in mathematics. Londi, however, spoke about the integration of HIV and AIDS education and mathematics when she said:

They integrate with each other...I've seen that they can work hand in hand.

**(Londi, 1 August 2005)**

Londi also commented on the fact that she had learnt how the integration could work whilst preparing lessons during her teaching practice experience.

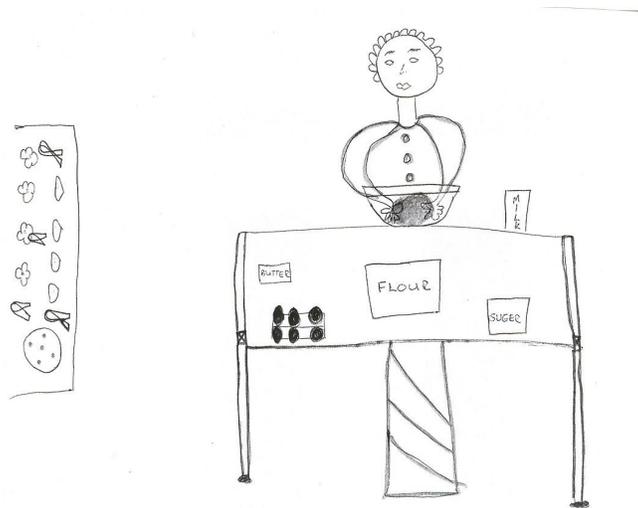
*Case 5. Netha*

Netha is South African and is 21 years old. Her home language is English. Netha lives with her parents in an urban setting. Netha often assists at her local primary school where her mother is also a teacher. Netha and her family follow the Hindu religion.

Netha matriculated in 2001 and she attempted mathematics but did not pass. Netha registered for a BEd degree in 2002. During the first year of her undergraduate BEd degree she elected to take the 'Diversity and Learning' module and chose Sports Science as her major elective. Netha gained good results in her three primary mathematics education modules. Netha completed her degree and qualified as a Foundation/Intermediate Phase teacher at the end of 2005 with an upper second class pass average (69%).



Netha's metaphor drawn to describe the integration process is a drawing of a lady baking.



### Metaphor

**Teacher** – The lady

**Learner** – The dough the teacher shapes and moulds learners learning

**Maths** – The ingredients is very important so maths is important for learners

**HIV/AIDS** – With the right knowledge and guidance, learners can and will blossom into knowledgeable citizens

**Figure 16: The metaphor drawn by Netha with her written explanation of what each part of the drawing represents**

The drawing of the metaphor shows the dough, which represents the learner, forming a small part of the drawing whereas the teacher is large and takes up a significant part of the drawing. The hands of the lady are shown whilst moulding the dough. The ingredients exist independently and are drawn alongside the bowl that contains the dough. The inert material has to be added by the baker and shaped by the baker to the required form. With the correct raw materials the baker is able to shape the dough. The drawing is unbounded and open. The description of the metaphor points to the teacher as the provider of appropriate knowledge required for the learners to grow. The learners have different understandings and knowledge bases from which they need to develop. The teacher is labeled as doing the shaping and moulding of the learners by providing the correct knowledge and guidance.

Netha used a measurement and money theme in her Grade 4 mathematics lesson to integrate HIV and AIDS education. At the start of the lesson she reminded the learners of the meaning of ‘AIDS’ and that there is no cure for AIDS. Netha asked the learners why people with AIDS would consult a doctor and explained that there are tablets that ‘help you live longer’. She used this as an introduction to speak about hospital accounts and the cost of medication. The worksheet questions were explained whilst the learners attempted the problems. During her lesson Netha used two worksheets that she had prepared during focus group discussions. One of the worksheets Netha used is shown in Figure 17.

**How much?**

When a person with AIDS becomes very sick, they need to be hospitalised, so doctors can monitor their condition and see to their needs.

In the following activity you are required to work out the patients account for the time spent in hospital.

<b>Patient</b>	<b>Days</b>	<b>Tariff per day</b>	<b>Amount due</b>
Mrs V. Thanda	6	R364,75	
Mr P. Sooliman	4	R364,75	
Baby B. Smith	3	R364,75	
Ms K. Mulusi	5	R364,75	
<b>Total</b>	<b>Days hospitalised</b>	<b>Total clinic income</b>	

1. Whose account was the highest? \_\_\_\_\_
2. Whose account was the lowest? \_\_\_\_\_

**Figure 17: Worksheet developed and used by Netha on 10 August 2005**

In the post lesson-interview, when asked about a possible link between the ways Netha approached the lesson and the metaphor described by her in our focus group discussions to show how HIV and AIDS education may be used in a Mathematics lesson, Netha said:

The metaphor I used was of a woman baking so she used dough and...  
The woman was the teacher and the ingredients was maths and the dough was the learners and then what I was trying to do here with my maths and HIV knowledge was trying to go about so they have an idea of what AIDS is at the same time they can do maths calculations...

**(Netha, 10 August 2005)**

Netha's response to the question indicates that learners may be required to gain/receive mathematics knowledge for extension. She pointed out that during her mathematics lesson attempts were made at informing the learners about AIDS whilst allowing the learners to do mathematical calculations. Netha does, however, not specify how HIV knowledge is developed in her metaphor. From the interview with Netha it is clear that Netha attempted to give the learners 'an idea of what AIDS is' whilst simultaneously doing mathematics calculations; Netha appeared to foreground the mathematical calculations.

#### ***Case 6. Celiwe***

Celiwe is from Lesotho. Celiwe is 45 years old and has experience as a teacher of young learners. She took study leave for four years from her teaching position as a primary school teacher in Lesotho to further her studies and obtain a BEd degree in South Africa. Celiwe lives with her husband and children in a rural setting in Lesotho where her home language is Sotho.

Celiwe completed her secondary schooling in Lesotho. She then went on to study for a Primary Teachers' Certificate in Lesotho from 1976 to 1978 and a Diploma in Education from 1991 to 1992 before registering for a BEd degree at UKZN in 2002. During the first year of her undergraduate BEd degree she elected to take the

'Diversity and Learning' module. Celiwe completed four elective modules in School Guidance at the Edgewood Campus and she passed all three primary mathematics education modules. Celiwe completed her degree and qualified as a Foundation/Intermediate Phase teacher at the end of 2005 with a lower second class pass average (62%).



Celiwe

Celiwe used a drawing depicting cows in the 'veld' as a metaphor for the integration of HIV and AIDS education in mathematics.



At the veld

**Teacher** is represented by a herd boy who is looking after the animals. He makes sure that they graze at the right place where they are going to get enough grass that will help them grow.

**Grass** represents knowledge, attitudes and values and skills that the teacher is presenting every day.

**Learners:** They are represented by the cows in front of a herd boy who leads them to good pastures every day.

**HIV and Education:** The four cows in different sizes represent HIV and AIDS Education

- The biggest cow represents many people who do not believe that HIV and AIDS pandemic is there.
- The second biggest cow represents many people who still do not believe that they can be infected by HIV and AIDS.
- The third biggest cow represents learners who are already infected but they do not know.
- The last small cow represents people who understand well about HIV and AIDS because they know that they are infected and affected.

**Figure 18: The metaphor drawn by Celiwe with her written explanation of what each part of the drawing represents**

The drawing of the metaphor shows a 'herd boy' facing a herd of cattle. He has a stick in his hand. The cattle are not grazing but looking at the herder. The cattle are of different sizes. The cattle on the veld take up most of the drawing while the herder is a slim figure to the left of the four cattle. The veld on which the cattle stand is covered with grass. The drawing is unbounded and open. In the description of the metaphor the 'herd boy' is responsible for the cows. He is required to lead the cows to appropriate pastures where they graze. It is the herder (teacher) who makes sure that the cows (learners) are presented with 'good' knowledge, attitudes, values and skills. The size of the cow represents categories of learners. The categories are described according to the number of learners and their knowledge of HIV and AIDS infection.

Celiwe, referred to HIV and AIDS education in general terms by emphasizing the various sizes of the cows in her diagram; the size of the cow being proportional to the number of learners who have knowledge about HIV and AIDS and knowledge of their HIV and AIDS status. In the focus group discussions, she explained her metaphor as:

... HIV and education: The four cows in different sizes represent HIV and AIDS education. The biggest cow represents many people who do not believe that HIV and AIDS pandemic is there. The second biggest cow represents many people who still do not believe that they can be infected by HIV and AIDS. The third biggest cow represents people who are already infected but they do not know. The last small cow represents people who understand well about HIV and AIDS because they know they are infected and affected...

**(Celiwe, 3 May 2005)**

Celiwe introduced her mathematics lesson by encouraging her 50 Grade 3 learners to

consider how HIV may be transmitted by body fluid contact. Celiwe moved on to making use of graphs to integrate HIV and AIDS education in mathematics by stating that:

- Celiwe: ..Now today in mathematics, you are going to learn about graphs. We are going to learn about...
- Learners: Graphs.
- Celiwe: It is only through the knowing of graphs that you can be able to see how many people are becoming infected by HIV almost every day. The number of people who are already affected and infected...

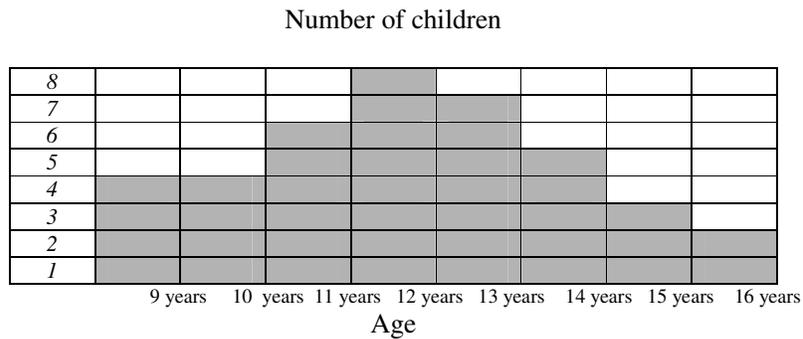
Celiwe displayed a chart with many different types of graphs and continued by stating that:

- Celiwe: Now. I have so many types of graphs here on the chart, but as for today, we are not going to use them all. We are going to focus only on the block ... on the...
- Learners: Block graph

**(Celiwe, 28 July 2005)**

Reading off a block graph was explained and demonstrated using one of the graphs on the chart. The learner activity used for this integration lesson was an activity that was prepared by Celiwe during our group interactions. The learners were given the following activity and together the whole class was coached through answering of the questions. The activity that linked block graphs to HIV and AIDS was:

This is a block graph showing the ages of children with the HI Virus in Leseli Primary School:



1. How many children aged 12 years are infected?
2. How many children aged 10 years are infected?
3. How many children aged 15 years are infected?
4. Which group has more viral load in the blood?
5. How many children are infected altogether in Leseli Primary School?

**Figure19: Worksheet developed and used by Celiwe in her lesson on 28 July 2005**

In the post lesson-interview, Celiwe suggested a possible link between her metaphor and teaching of the integrated lesson by saying:

The cattle and this one was the biggest one, was the HIV one.

They do link, I said, they do link cos I said it is the work in my metaphor, I said, it is the work of the teacher – the shepherd, to look after the cows – the children. To find them good pastures they need, they need for their own. By this good pastures, I mean the information ...

(Celiwe, 3 August 2005)

Celiwe's response emphasizes that the teacher is expected to ensure that the learners are provided with information. It is the teacher's responsibility to facilitate the growth and development of the learners' knowledge. In this response, no mention is made of the role that HIV and AIDS education plays in mathematics.

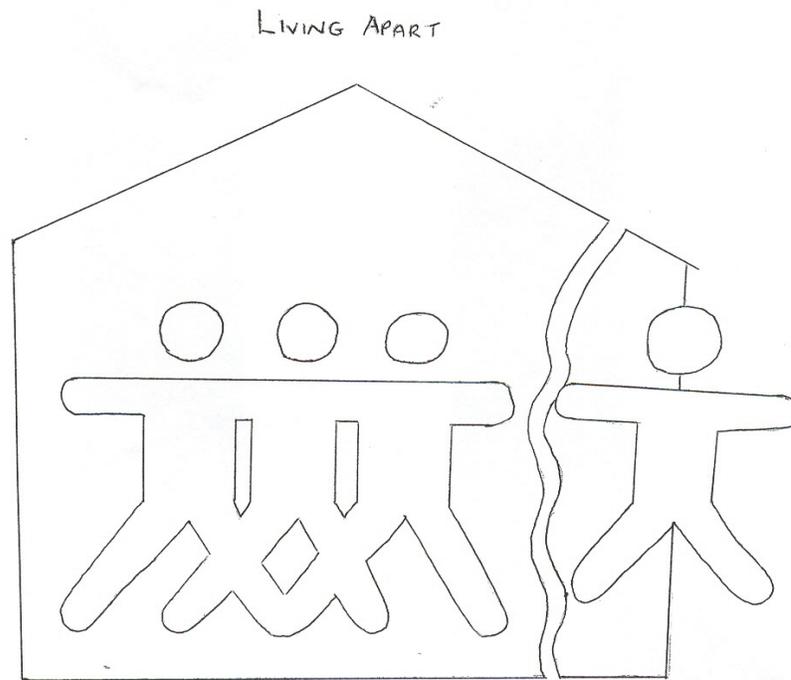
*Case 7. Kathy*

Kathy is South African and is 27 years old. Kathy's home language is English. In 2005 Kathy was a novice Catholic nun ready to take her vows.

Kathy matriculated in 1995 and chose mathematics as a matriculation subject. During the first year of her undergraduate BEd degree she elected to take the 'Diversity and Learning' module. Kathy did not elect to take School Guidance at the Edgewood Campus but majored in isiZulu instead. Kathy passed each of her three primary mathematics education modules. Kathy completed her degree and qualified as a Foundation/Intermediate Phase teacher at the end of 2005 with an upper second class pass average (71%).



Kathy named her metaphor, to explain how HIV and AIDS education should be integrated into mathematics, 'Living Apart'.



**Living apart**

**3 people** ...Mathematics → Having more than one partner will increase the spread of the virus. The more partners you have...

**1 person** ...HIV/AIDS Education → Abstinence → Stigma → Do not discriminate people infected/affected with HIV/AIDS

**Break (??)**..Teacher → Paves a way for knowledge and allows learners to pave their own way of accepting this knowledge or ignoring it

**House**.....Learner → Takes this knowledge and builds on it

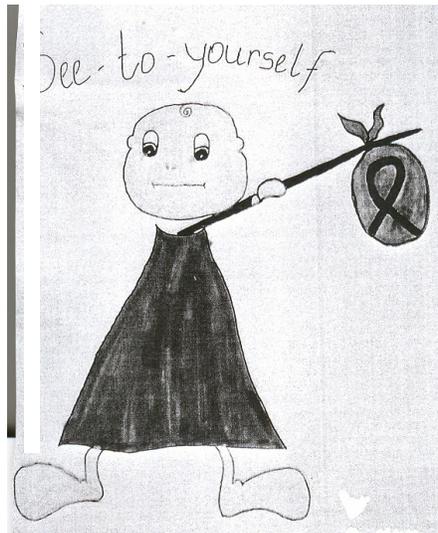
**Figure 20: The metaphor drawn by Kathy with her written explanation of what each part of the drawing represents**

In this drawing of the metaphor, the house contains the people but the break causes a separation of one person so that s/he is released from the other people. The people that were once enclosed in a house have been separated as the break occurs. Some people are left behind to live as they were. In the drawing the teacher is not drawn as a person as it is the knowledge imparted that is significant.

The description of the metaphor indicates that the teacher provides the new knowledge about HIV and AIDS by showing an appropriate approach. It is the responsibility of the learner as an individual to accept and develop this knowledge but

the learners need to make decisions as to what direction to take.

Kathy introduced her first observed Data Handling mathematics lesson to Grade 3 learners by telling them a story about a little orphaned girl whose parents who had died of AIDS. The little girl was drawn on the chalkboard and is called ‘See-to-yourself’. (See Figure 21.)



**Figure 21: Drawing of the little girl named ‘See-to-yourself’ used in Kathy’s integrated lessons**

Kathy spoke about the little girl called ‘See-to-yourself’ by saying that:

I am now 8 years old; and like my parents, I too have AIDS. The virus was passed on to me by my mother. So not only do I have no parents, but I know that I’m dying too. The saddest part of knowing that I have AIDS is knowing that I will die alone. People who know that I have AIDS won’t let their children play with me. They think that if their children touch me, they will contract the disease. They don’t realize that you do not get AIDS from touching a person with AIDS or from hugging them or even sharing a cup with them. You can get the virus if blood from an HIV positive person gets into your blood; or like in my case, when a pregnant woman who has HIV passes it onto her baby during pregnancy, birth or breastfeeding.

**(Kathy, 2 August 2005)**

Kathy answered learner initiated questions about contracting, curing the disease, what the disease is, the origins of HIV, the occurrence of the disease, the meanings of HIV and AIDS, the difference between HIV and AIDS, procedures for testing for HIV and the accuracy of the testing. The answers were clear, accurate and appropriate for the age group.

The worksheet 'HIV/AIDS Education using Numbers' was given to the learners and Kathy explained question by question what was required. The second part of the activity required learners to draw a bar graph. The concept of scale was required for the graph but Kathy improvised by asking the learners to draw the relative sizes of the bars that represent the number of infected men, women and children without an accurate scale. The learners were required to make use of a base line for their graph and labels for the columns of the bar graph. Kathy explained this by saying that:

Now you see this graph that I have here, this picture/... That's a bar graph. So what I want you to do – you're not using the same graph – you're going to draw your own one....you're going to estimate. Looking at these figures, which one has the highest?... So obviously when you're drawing your bar graph for the men...is it going to be bigger or smaller than the women?

**(Kathy, 2 August 2005)**

The learners then completed the worksheet entitled 'HIV/AIDS Education using Numbers' whilst Kathy assisted individual learners. The worksheet thus required interpretation, display and analysis of data that focused on HIV testing and the increase in the numbers of people infected with HIV. This learner activity used by Kathy was developed by her during focus group interactions. The worksheet used was:

### HIV/AIDS Education using Numbers

**In Hospital X, a count was done on the number of people who came for HIV testing and were found HIV positive during the first three months of this year. The count was done on men, women and children (below the age of six). These were the findings:**

- Of the 400 people tested in January 2005, 300 came back positive: 114 men; 174 women and 32 children.
  - Of the 426 people tested in February 2005, 310 came back positive: 126 men; 140 women and 44 children.
  - Of the 384 people tested in March 2005, 276 came back positive: 122 men; 134 women and 20 children.
1. Work out the total of HIV positive men, women and children separately over the three months. Which group out of the men, women and children tested over the 3 months is infected most?
  2. Now record your answers using a Bar Graph that will compare the total number of infected men, women and children.
  3. If in the year 1990, 100 000 people were infected with the AIDS virus, and in 1991, the number doubled; how many do you think would have been infected by the year 1993? Can you show your findings on the Bar Graph given below? Give this graph a suitable heading.

#### **Figure 22: Worksheet developed and used by Kathy on 2 August 2005**

In the second observed lesson presentation Kathy reminded the learners about the previously told story called ‘See-to-yourself’. The story included the way in which ‘See-to-yourself’ contracted HIV and how ‘See-to-yourself’ feels. In Kathy’s story ‘See-to-yourself’ did not become infected through irresponsible actions but was born with the condition. In the extract used below, Kathy discusses with learners how other learners should interact with ‘See-to-yourself’.

Kathy: We are going to do a bit of Maths again today like how we did on Tuesday. Remember what... What were we talking about on Tuesday in Maths? Yes, ...?

Learner 1: AIDS.

Kathy: AIDS.

Learner 1: ...and HIV.

Kathy: AIDS and HIV. And remember I told you ah...I read you a story. Remember the story I read to you?

Learners: Yes.

Kathy: What was it about? Don't shout at me! Hands up. What was it about? Yes, ...?

Learner 2: See-for-yourself.

Kathy: See-to-yourself. What can you tell me about See-to-yourself?

Learner 2: She had AIDS.

Kathy: She had AIDS. And how did she get AIDS? Where did she get it from? ...?

Learner 3: Her mother and father.

Kathy: Her mother and father. What else can you tell me about See, See-to-yourself? Was she a happy child?

Learners: No.

Kathy: Why not? ...?

Learner 4: Because uhm...she didn't have any friends and no one wanted to play with her... She knew she was going to die.

Kathy: She knew she was going to die. And why wouldn't the other children play with her? Don't shout out! Put your hand up. ...?

Kathy then spoke to Learner 5 about how the virus is contracted. They interacted as follows:

Kathy: And in the story I mentioned some ways in which you can get HIV. What are some of those ways? How can you get the virus?

Learner 5: But there are also some ways you haven't told us.

Kathy: Okay, let's hear from you.

Learner 5: I'm trying to tell you something. You also get HIV from drugs.

Kathy: Oh. Which kind of drugs are you talking about?

Learner 5: My father said that uhm, there's... that some drugs are... (not clear).

Kathy: Yeah. Because those, those are called... they usually have a needle. That's what I was talking about.

Learner 5: (not clear)

Kathy: No, 'cause you see what happens .... Just say I'm taking drugs. Put your hands down. Okay, I'm taking drugs; and you my best buddy and we're both sharing the needles and we both take drugs together. Now, now there's a certain form that you put into a like a sort of a syringe. Like a powder form, sometimes it's liquid stuff. And I inject myself. What is at the tip of that? Let me just draw it on the board. It looks something like this.

**(Kathy, 4 August 2005)**

In the post lesson-interview with Kathy I asked about a possible link between the ways she approached the lesson and the metaphor described by her in our focus group discussions to show how HIV and AIDS education may be used in a Mathematics lesson. Kathy spoke about a drawing of a little girl that she had used during the lesson presentation. The drawing she used in her classroom story was entitled 'See-to-yourself'. Figure 21 is the drawing Kathy used.

Kathy described her metaphor by saying:

Uhm, it was actually saying, you know, again going back to uhm discrimination and saying, uhm often you know, like with See-to-yourself, in the case of See-to-yourself, she didn't know her parents; you know, so she had no one she could really identify herself with. Apart from that she was also very alone – so very detached you know from society and detached even I can say like from her own body; uhm because of the virus... And uhm, I decided on that stick because it was more to say she was also like on a journey, and her journey towards death. Hence the stick with her little luggage and uhm the length of the stick could be any length depending on how fit or uhm, you know the child is – to say that if she's getting the proper nutrition she could still live a little while longer and uh, if not then obviously, uhm her lifespan shortens; and uh, the little package that she's carrying with the AIDS uhm sign on it is more- symbolic of yah, the, the, her burden, her grief almost – uhm (not clear) that load she's carrying and carrying alone.

**(Kathy, 4 August 2005)**

In this response Kathy spoke about the drawing of a child that she used during her classroom observation lessons. 'See-to-yourself' is a drawn child carrying her belongings in a small bag that is attached to a stick. The bundle she is carrying represents her life burdens that include being HIV positive. 'See-to-yourself' represents a child who is alone in dealing with her problem and she has to fend for herself. The metaphor that Kathy drew in the focus group discussions is extended to looking at one of the separated people called 'See-to-yourself'.

In describing 'See-to-yourself' to the learners in the classroom Kathy moves away from looking at the use of HIV and AIDS education in mathematics but focuses on the individual learner. Kathy does not mention any assistance from the teacher but considers other learners' reactions towards learners who have HIV and AIDS. 'See-to-yourself' is depicted as an 'explorer' who has new challenges to face on her own in a friendless, sad situation. At the same time Kathy fosters empathy amongst learners. The metaphor drawn and described by Kathy in the focus group discussion is closely linked to the 'See-to-yourself' story. The 'See-to-yourself' story is an extension of the 'Living apart' metaphor but in the metaphors, 'Living apart' and 'See-to-yourself', HIV and AIDS education is not developed as part of Mathematics.

### **BELIEFS ABOUT INTEGRATING THROUGH METAPHORS**

From the metaphor drawings and their captions, participants in this inquiry expressed a variety of personal theories and beliefs about the possible integration of HIV and AIDS content in the mathematics curriculum and from these, identified strategies that might be used for such integration in hypothetical situations. One significant aspect of using drawings and metaphors is that this exploratory study suggested that it is

possible to reflect on our personal theories and possible strategies in a non-threatening, creative, interesting manner. The findings suggest that our lived experiences and the selected aspects each participant chose channeled the manner in which the HIV and AIDS education in mathematics metaphor was conceptualized and drawn and in exploring the ways in which the new content might be integrated. It is, however, possible that these theories and strategies might change as each participant gains further experiences and gains further knowledge and understanding about the AIDS pandemic. The metaphors allowed for an initial open discussion on how and where HIV and AIDS education ought to occur in the teaching and learning of mathematics. Furthermore, we enjoyed doing the drawing and reflecting on the metaphor activity that simultaneously allowed for a glimpse into our beliefs that may ultimately influence our theory in practice that will be enacted in mathematics classrooms.

According to Higgs (2000, p. 24), a 'metaphor is a commonly used term and in teaching it has been interpreted in a number of ways, from the teacher explaining the 'unknown' by comparing it with a 'known' to the use of drawings or images of one experience to represent abstract ideas and attitudes towards another experience.' The manner in which metaphors were used in this inquiry in our group may be seen as comparing the 'unknown' possibility of integrating HIV and AIDS education in the Mathematics Learning Area with a 'known' situation that one is familiar with in real life experiences. The South African as well as the Lesotho pre-service teachers in the focus group were able to communicate their life experiences in an uncomplicated drawing. In addition, we made use of drawings or images of a known experience to represent abstract ideas and attitudes towards the possibility of integration of HIV and

AIDS education in mathematics teaching and learning. By drawing a metaphor to develop a 'vision' to foster inclusion, we prepared our own unique versions of how integration may be attained. The metaphor activity with pre-service teachers provided a realistic starting point for appropriate development of competencies that are designed to recognize and address barriers, such as HIV and AIDS, to learning and to move towards the envisaged multiskilled model where we are HIV-aware, HIV-competent, and HIV-safe teachers or teacher educators. From the possibilities suggested for HIV and AIDS education in mathematics one can see that it is possible to accommodate the diverse range of needs of learners.

This is not to suggest that the integration of HIV and AIDS across the curriculum is an easy matter. On the contrary, while the high status of mathematics presents opportunities for this to happen, it is this very status that tends to present barriers against integration as teachers (together with learners, parents and fellow colleagues) tend to view such social issues as HIV and AIDS as the responsibility of the social sciences and languages. The participants in this study were also aware of these challenges. To illustrate, in Nobunti's written journal reflection of the metaphor activity she comments on the fact that she was unable to 'fully express' all her ideas using her metaphor drawing because of a 'language barrier' but she added:

Before doing this metaphor activity I knew very little about HIV and AIDS especially with the fact that I did not think that one can teach (integrate) maths with HIV and AIDS education to educate learners and caution them about this pandemic.

**(Nobunti, 3 May 2005)**

Before teaching practice was to commence, Nobunti appeared to be rather concerned about how the integration of HIV and AIDS education in mathematics would occur.

In her reflection she wrote:

Lastly I think and believe we still face many challenges that lie ahead of us such implementing this HIV and AIDS Maths Education in our classroom. Not forgetting that our deepest fear will be how to start and whether it will work.

**(Nobunti, 7 June, 2005)**

Obviously any new venture, such as integration of HIV and AIDS in mathematics, may be met with trepidation. However, the use of metaphors and drawings seems to have provided participants with opportunities for further reflecting on their beliefs and developing creative strategies to bring about something new in a classroom situation. The casual drawing of a metaphor representing a teaching situation appears to remove the intimidating prospect of implementing a novel/unfamiliar intervention. The metaphors drawn and later discussed, by each participant were unpolished and unrefined yet appeared to serve as a useful preparatory activity for understanding the variety of personal beliefs. The participants' beliefs about integration of HIV and AIDS in mathematics seemed to be unhampered by how the new knowledge was acquired. Some of the metaphors appeared to suggest that knowledge is acquired through transmission (Acquisition), while others suggested participation (Sfard, 1998), but nonetheless we were able to explore possibilities for integration of HIV and AIDS education in mathematics. What the metaphor activity permitted was making sense of the structure and the paradigms informing our beliefs and practice in a hypothetical situation in our focus group discussions. The pre-service teachers displayed a willingness to engage in giving meaning to a new situation by drawing and discussing some insightful processes of integration. The drawing of the metaphors

allowed us to decide on how initial involvement in an innovative venture could evolve.

Finally, by observing these successful initial attempts of pre-service teachers at integration of HIV and AIDS education in mathematics it is possible that not only HIV and AIDS education could benefit in the development of a ‘multiskilled’ teacher but also the ‘high stake’ subject, mathematics. To illustrate, in Keshni’s comment from her reflective journal, she alludes to the benefit that mathematics, as well as other disciplines, can gain from including HIV and AIDS education when she stated that:

I also think that with some brainstorming we can find other areas in mathematics that can be used in HIV and AIDS education. If HIV and AIDS is incorporated into all learning areas, learners will know that all teachers are concerned about their future. Mathematics is viewed by the majority as a subject not related or concerned with real-life but I think that through activities like this we will prove them wrong.

**(Keshni, 18 April, 2005)**

## **A SECONDARY ANALYSIS**

I drew on the work of Skovsmose (1994) in order to conduct a secondary analysis. As noted earlier (See Chapter Two.), Skovsmose is a Danish researcher who is particularly interested in the political facets of mathematics education. He describes six entry options to become a ‘reflective knower’ that are connected to democratic and critical competence. Superficially Skovsmose’s options do not appear to be obviously relevant to my study. Skovsmose was looking at the nature of critical mathematical literacy whilst developing problem solving in mathematics projects with school going learners and my project focuses on a project with pre-service teachers who are

integrating HIV and AIDS education in mathematics classrooms. His work, however, offers an alternate way of interpreting some aspects of the pre-service teachers' engagement in *HIV/AIDS Mathematics Education Project* as he suggests that the inclusion of democratic competence in mathematics may be realized by contextualization of school mathematics within a theme (Vithal, 2003).

Skovsmose (1994) describes the importance of the social context of mathematics and the role of mathematics through the development of 'mathemacy' (See Chapter Two.). He uses mathemacy to draw attention to the possibility of considering a 'critical' aspect in mathematics education (Skovsmose, 2005). An important competence for critical mathematical literacy is described by Skovsmose (1994) as 'reflective knowing'. The six entry points he suggests for reflective knowing are: Selecting the mathematics; executing the mathematics correctly; trusting the reliability of the solution found; appropriateness of using mathematics in a specific context; the consequences of the use of mathematics in a specific context; and reflecting on the results obtained after using the mathematics in a particular context.

The concept of mathemacy is used by Skovsmose (1994) to consider how learners develop critical mathematical literacy whilst doing project work. According to Skovsmose (1994), this project work should include the learner-directed solving of relevant societal problems through interdisciplinary mathematical investigation. The development of critical mathematical literacy through project work was thus a particular approach that was used within a Danish context to consider how mathematics education could assist learners to become more aware of social and political issues. The work of pre-service teachers in the *HIV/AIDS Mathematics*

*Education Project* was, however, not an interdisciplinary mathematics project where a real-life problem was investigated through mathematics with learners but a project where pre-service teachers engaged in developing appropriate knowledge, skills attitudes and values to facilitate the teaching of HIV and AIDS education within mathematics.

Making use of the six entry points suggested by Skovsmose (1994) to explore the reflective knowing required for mathemacy is not directly applicable in the *HIV/AIDS Mathematics Education Project* because the pre-service teachers were not contextualizing mathematics within a HIV and AIDS theme as a mathematics project to learn to become critical mathematics thinkers; the pre-service teachers were engaged in finding strategies for the teaching and learning of HIV and AIDS education in mathematics. During the project the participants considered possible strategies to explore integration of HIV and AIDS education to use in mathematics classrooms of young learners. It would be inappropriate to consider the pre-service teachers' reflective knowing by judging their personal critical thinking in this social and political issue. The participants in my study were required to select suitable and appropriate aspects of mathematics that they could use in the context of HIV and AIDS education to use for integration in the classrooms of learners. The execution of the correct mathematics procedures and the trusting of the reliability of the solutions to the mathematics problems required for reflective knowing for development of personal critical mathematical literacy are thus not appropriate assessment criteria for the *HIV/AIDS Mathematics Education Project*.

The pre-service teachers' reflections that were explored during and after the process

of integration were attempts at understanding the pre-service teachers' experiences in terms of the consequences of using HIV and AIDS education in mathematics and the product of the using mathematics in this particular context. These reflections elicited were aimed at gaining insights into their experiences as prospective teachers of young learners and not as students doing problem solving in mathematics. The focus was on the ability of the pre-service teachers to solve the 'problem' of integration of HIV and AIDS education in mathematics and the reflections were centred on this aspect of their experiences. The main research concern was thus not to develop mathemacy by developing the personal mathematical know-how of the pre-service teachers or by identifying how mathematical problem solving investigations can be useful or disadvantageous in the context of HIV and AIDS. It would, however, be possible to use the six entry points as criteria to assess reflective knowing of learners who were taught by the pre-service teachers if they were asked to solve learner-directed, relevant societal problems through interdisciplinary mathematical investigation.

In the interdisciplinary mathematics problems selected or devised by the pre-service teacher participants, the 'appropriateness' of the activities selected for integration need to benefit knowledge, skills and attitudes required for HIV and AIDS education and mathematics. At the same time attempts at integration need to include the use of elements of both HIV and AIDS education and mathematics. The 'merging' of the teaching about HIV and AIDS education and mathematics should 'flow' from authentic real-life problems related to HIV and AIDS. The addition of aspects of HIV and AIDS education or mathematics without appropriate well thought out 'links' would be superficial and artificial.

Nissani (1995) used criteria to rank 'interdisciplinary richness' as a means of

exploring the ‘richness’ of integration. He suggests that these criteria could be best approached by considering a metaphor where a mixture of fruit in a fruit salad is considered. I would, however, prefer to use an example from a science topic to consider the interdisciplinary richness of the learning experiences presented by the participants in their integration endeavours.

When teaching young learners doing science about mixtures and compounds, a distinction is made by looking at the properties of mixtures and compounds. The properties of a mixture maintain the distinct properties of each of the substances that are combined whereas the properties of compounds take on unique properties that are not identical to the substances that were combined. This development of a unique ‘compound’ is required in the integration of HIV and AIDS education in mathematics. It is, however, not a trivial exercise to select appropriate aspects to develop a suitable combination.

Perhaps Keshni and Thembe come closest to beginning to demonstrate this capacity to develop an appropriate ‘compound’ by using elements from both HIV and AIDS education in mathematics. The learning experiences that these two participants presented facilitated a ‘seamless flow’ from the knowledge, skills and attitudes from one discipline to the other to unite the two integrated areas of learning.

On the one hand Keshni started her lesson with Grade 3 learners by using an integrated mathematics activity. Her integration strategy involved using the Red Ribbon symbol in a mathematics symmetry activity that relates to properties of shapes in geometry. The connection between the mathematics and the HIV and AIDS

education was developed by discussing the meaning of the Red Ribbon symbol. The subsequent questionnaire explored HIV and AIDS knowledge, using yes or no answers, simultaneously extended the learners' knowledge of HIV and AIDS.

On the other hand Thembe started her lesson with a discussion about tuberculosis, influenza and the HI virus. Thembe's Grade 2 learners then extended this knowledge into a mathematics interpretation activity using a pictograph. The learners were required to count and record cutouts on a pictograph. The paper cutouts of people on the pictograph clearly linked the HIV and AIDS education to the mathematics content required in the data handling learning outcome. The only concern I have about using these particular illnesses is that young learners in Grade 2 may not be fully acquainted with the differences between these forms of maladies.

## **SUMMARY**

By using multiple data sources in each of the cases, I explored the contributions of the participants to gain a greater understanding of the importance of life experiences came to the fore. Not only was I able to get a glimpse of how the multiple meanings, represented in their metaphor drawings, may be used as entry points for further new experiences but also how deepened meanings are conveyed in the drawings.

By encouraging the use of a 'visual form' to express the innovation where HIV and AIDS education is integrated in mathematics, I was able to better understand aspects of experiences that are often silent. The sharing occurred in an enjoyable fashion during focus group discussions where it was possible to fuse creativity with lived experiences through unique, personal drawings. I was able to dare to disrupt the

status of a 'high stake' discipline by the inclusion of a 'lower status' discipline using a simple diagram.

The use of drawings allowed for my vision of integration of HIV and AIDS education in mathematics by providing a medium for my tentative vision to be exposed in a simple two dimensional model. Although the drawing should not be seen as the inflexible, unalterable representation of a belief, it is a form that is easily portrayed and does not necessarily require sophisticated language to convey its meaning. The use of the metaphor drawing proved to be an easy yet effective way of making experiences and aspirations visible.

The drawing and exploration of the metaphor was seen as *Starting with ourselves* on the journey where more than beliefs are required to 'make a difference'. The connections between beliefs and actions played an important role in preparing the participants to engage in showing the prospect of integration in a classroom situation. The participants' integration methods in the classrooms were by no means flawless but the integration of HIV and AIDS education experiences gained allow for further reflection and improved action.

The previous chapter considered my findings from teaching and learning HIV and AIDS education integration in a compulsory primary mathematics education module whilst this chapter explored work with a focus group of pre-service teachers who volunteered to be part of the *HIV/AIDS Mathematics Education Project*. In the ensuing chapter I will describe and analyse my involvement in integrating HIV and AIDS education in mathematics using a self-study approach.

## **CHAPTER FOUR**

### **FINDINGS: PART 1**

#### **THE QUESTIONNAIRE: INTEGRATION OF HIV AND AIDS EDUCATION IN MATHEMATICS EDUCATION**

##### **INTRODUCTION**

Chapter Four is the first of three chapters that describes and analyses the findings of the study. In this chapter I analyse the findings obtained from the responses to a selection of the statements from the questionnaire completed by pre-service teachers registered for PME 210 during 2004, 2005 and 2006. The questionnaire was designed to survey their opinions regarding their preparation to become HIV-aware, HIV-competent and HIV-safe, multiskilled teachers at the Edgewood Campus. When these pre-service teachers completed the questionnaires they had finished the teaching and learning material required for the PME 210 module and three and a half years of undergraduate study. As explained in Chapter Two, I analysed the responses that relate to my research questions by considering pre-service teachers' perceptions/opinions on the amount of attention paid to HIV and AIDS education at Edgewood, the activeness of HIV and AIDS education policy at Edgewood, the possible models for offering teaching and learning HIV and AIDS education at Edgewood, and the use of Data Handling and Statistics in mathematics education to provide personal knowledge. This analysis provides valuable information to assist with improvement of the process of integration of HIV and AIDS education in mathematics pre-service teacher education. Here I operate in a quantitative methodological paradigm.

The ‘Internal consistency’ (Durrheim, 2002a) of the questionnaire was estimated by determining the degree to which each item in the scale correlated with each other item. A Cronbach’s Alpha test was run using all the data together and each year separately to obtain estimates of internal consistency. Table 10 shows the Cronbach Alpha results.

<b>Data set tested</b>	<b>Cronbach Alpha result</b>	<b>Number of cases</b>	<b>Number of items</b>
All data over years 2004; 2005 and 2006	0.7948	242	32
2004	0.7922	69	32
2005	0.7377	97	32
2006	0.8260	76	32
All data over years 2004; 2005 and 2006 using statements 1a; 1b; 2a; 2b; 6a; 6b; 13a; 13b	0.554	242	8

**Table 10: Cronbach Alpha results**

For each data set, this reliability analysis for the questionnaire’s continuous variables, revealed a Cronbach’s Alpha value of over 0.7 when all the variables were used but approximately 0.6 for the statements that were selected for analysis in this chapter. This indicates that the research instrument (questionnaire) has internal consistency and reliability.

The questionnaire was completed by 365 pre-service teachers (110 in 2004; 135 in 2005; 120 in 2006). This corresponds with a response rate of 72 % (509 questionnaires distributed over the three years of study). This sampling ratio is far higher than the recommended rate of 30 % (Van Vuuren & Maree, 2002, p. 277) required for small populations. This high response rate allows for confidence in the representatives of the reactions to the statements.

Analysis of the questionnaire data made use of cross tabulation as well as comparisons of results across each of the years of study. In the cross tabulation tables the ‘whole’

used to calculate the percentages was **all** the responses obtained over the three years of study whereas the comparisons of results across each of the years of the study were compiled by calculating percentages using the responses for **each year**. Bar graphs were drawn to illustrate the comparisons of results across each of the years of the study. In the Bar graphs each year of study is shown as a separate bar and differentiated according to the given key.

When the trends displayed in the cross tabulation tables are discussed, the percentages were truncated (not rounded). For example, instead of using 43.9 %, only the whole number, 43% is used. This allowed for easy comparisons and reference to the table.

Another measure used to analyse the data involved considering the skewness. Although the standard deviation is the preferred measure of spread, this measure was not used for analysis. The standard deviation gives the spread around the mean whereas skewness indicates whether the distribution of the choices made by the pre-service teachers is symmetrical about the mean. This gives an indication whether the agree/strongly agree options or the disagree/strongly disagree options are favoured.

## **DESCRIPTIVE ANALYSIS OF RESPONSES**

### ***1. Demographic data***

#### ***Sex***

*What were the sex distributions of the respondents over the three years of the study?*

*How do these sex distributions of the respondents compare with the sex distributions of pre-service teachers registered for PME 210?*

		% of Total			
		Year research conducted			Total
		2004	2005	2006	
Respondent Sex	Female	29.2%	33.8%	27.2%	90.2%
	Male	2.6%	3.8%	3.5%	9.8%
Total		31.8%	37.6%	30.6%	100.0%

**Table 11: Respondent Sex: Year of conducted research Crosstabulation**

Over the three years of study, the percentage of female respondents compared to the percentage of male respondents for each year appears to be similar. A large percentage (90 %) of respondents is females. It is, however, necessary to compare this trend with the general female to male ratio of all the pre-service teachers registered for PME 210 to explain why most of the respondents are females. The module registers for PME 210 were used to compare the number of female pre-service teachers with the number of male pre-service teachers over the three years of study. Over the three years the module registers for PME 210 reveal an average female to male ratio of approximately 12:1. This shows that the numbers of pre-service teachers who are registered for PME 210 are mainly female and this trend is also reflected in Table 11. The female respondents therefore outnumber the male respondents in the ratio 10:1 because of the sex composition of the pre-service teachers registered for PME 210.

***Year of study***

*In which year of study were the respondents?*

*Why is it necessary to consider the year of study of the respondents?*

		% of Total			
		Year research conducted			Total
		2004	2005	2006	
Respondent year of study	3 rd year	31.5%	38.7%	26.6%	96.8%
	4 th year			3.2%	3.2%
Total		31.5%	38.7%	29.8%	100.0%

**Table 12 : Respondent year of study: Year of conducted research Cross tabulation**

Generally the respondents were in their third year of study. In 2006, however, a small percentage (3 %) of fourth year pre-service teachers responded. These pre-service teachers had thus completed more than three-quarters of the undergraduate degree and can be considered to be in a position to comment and provide informed opinions on HIV and AIDS and mathematics teacher education at their HEI.

***Ethnic groupings***

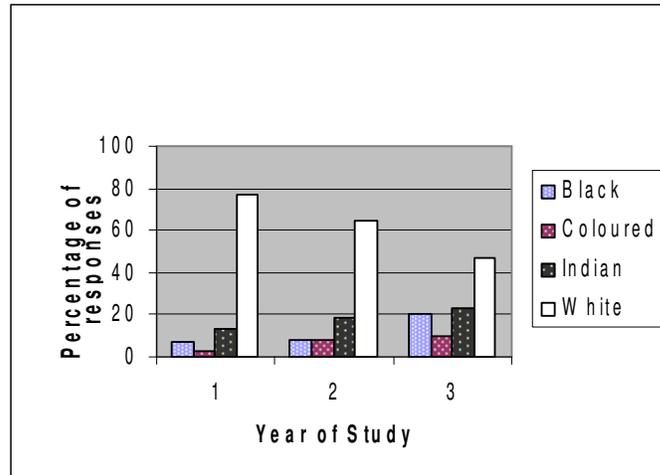
*What were the ethnic distributions of the respondents over the three years of the study?*

*How do these ethnic distributions of the respondents compare with the ethnic distributions of South Africa?*

% of Total		Year of conducted research			Total
		2004	2005	2006	
Respondent Ethnic grouping	black (African)	2.0%	2.9%	6.1%	11.0%
	Coloured	0.9%	2.9%	3.2%	7.0%
	Indian	4.3%	7.2%	7.0%	18.6%
	white (European)	24.6%	24.6%	14.2%	63.5%
Total		31.9%	37.7%	30.4%	100.0%

**Table 13: Respondent Ethnic grouping: Year of conducted research Cross tabulation**

Throughout the years of study the highest percentage of the respondents was white (European) pre-service teachers whereas the lowest percentage of respondents was Coloured pre-service teachers. Table 13 shows that over the years there was a slight increase in the percentage of Coloured and black (African) pre-service teacher respondents and a decrease in the percentage of white pre-service teacher respondents. The percentage of black and Indian respondents also increased as more black, Coloured and Indian pre-service teachers registered for PME 210. Over the three years, however, the percentage of white pre-service teacher respondents still represents more than half (63 %) of the total number of respondents. The racial composition of the pre-service teachers registered for PME 210 does not reflect the composition of the population of South Africa.



**Figure 3: Bar graph to show percentages of responses of ethnic groupings**

Figure 3 shows the racial composition of the respondents. The comparison of the three bars show that there was a steady decrease, over the three years, in the percentage of white respondents because of the decrease in the number of white pre-service teachers who enrol at Edgewood. Over the three years, the percentage of black, Indian and Coloured respondents increased.

The population of South Africa is, according to the 2001 census, approximately 75 % black and 13 % white, with about 9 % people of mixed white, Malay, and black descent (Coloured), and 3 % of Asian (mostly Indian) background (Index Mundi, 2006). This imbalance in racial composition of the pre-service teacher respondents is probably due to the fact that the former Edgewood College of Education that was established in 1966 was originally envisaged as a teachers' college exclusively for white trainee teachers. Since 2002, however, with the merger of the ex University of Natal and ex University of Durban-Westville to become UKZN, the racial composition of the pre-service teachers has become a more multiracial teacher education campus but has not yet achieved the appropriate proportion of racial groupings.

## 2. Opinions regarding the existing and desired situations of HIV/AIDS education

### *Attention paid to HIV/AIDS education at Edgewood*

*What are pre-service teachers' opinions, over the three years of study, about the attention paid to HIV and AIDS education at Edgewood?*

% of Total		Year of conducted research			Total
		2004	2005	2006	
1a : Pre-service teacher education at Edgewood pays sufficient attention to HIV/AIDS education	Strongly Disagree	3.6%	3.3%	5.3%	12.2%
	Disagree	9.4%	10.8%	10.8%	31.0%
	Neutral	9.4%	8.0%	7.8%	25.2%
	Agree	6.6%	13.6%	7.2%	27.4%
	Strongly Agree	1.1%	1.7%	1.4%	4.2%
Total		30.2%	37.4%	32.4%	100.0%

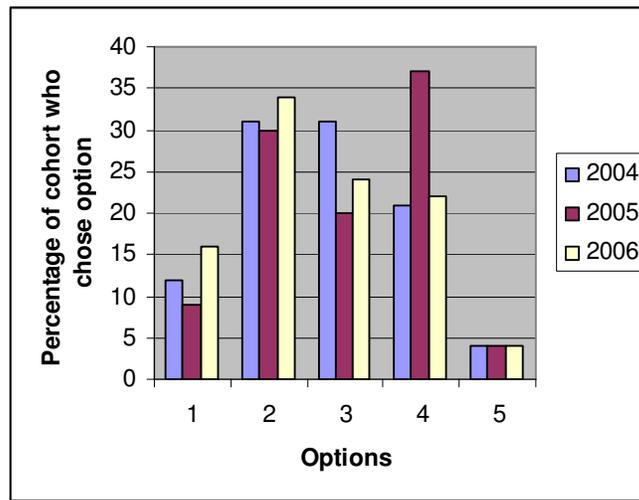
**Table 14: Cross tabulation results of opinions to following statement obtained over three years of study: Pre-service teacher education at Edgewood pays sufficient attention to HIV/AIDS education**

The trends represented in cross tabulation Table 14 indicate that the percentages of choices across years are similar over each of the three years of study. In 2005 there is, however, an interchange in the order of preferences. If the percentages of choices are ordered in descending order for 2004 and 2006, then the orders of the options chosen over these two years are the same, i.e. the least favoured choice in each of these two years was 'strongly agree', followed by 'strongly disagree', 'agree', 'neutral' and the most favoured 'disagree'. Over the three years, the least favoured (strongly agree) and the most favoured (disagree) remained constant. From the totals column it can be seen that approximately 43 % (12 % + 31 %) of the responses indicated that pre-service teachers are of the opinion that Edgewood does not pay sufficient attention to HIV and AIDS education whereas only 31% (27% + 4%) indicated that at Edgewood sufficient attention is paid to HIV and AIDS education. This shows that just under

half (43 %) of the responses indicated that Edgewood does not pay sufficient attention to HIV and AIDS education.

Percentages of respondents who selected the options in statement 1a						
Year of study	Strongly disagree (Option 1)	Disagree (Option 2)	Do not agree or disagree (Option 3)	Agree (Option 4)	Strongly agree (Option 5)	Total
	2004	12	31	31	21	
2005	9	30	20	37	4	100%
2006	16	34	24	22	4	100%

**Table 15 : Results of opinions to following statement obtained over each of the three years of study: Pre-service teacher education at Edgewood pays sufficient attention to HIV/AIDS education**



**Figure 4: Bar graph to show percentages of responses of opinions to following statement obtained over each of the three years of study: Pre-service teacher education at Edgewood pays sufficient attention to HIV/AIDS education**

The graphical representation (Figure 4) points to the trend that the most favoured response was ‘disagree’ whereas the least favoured response was ‘strongly agree’.

Year of study	Number of responses	Mean	Skewness
2004	109	2.73	0.11
2005	135	2.99	-0.11
2006	117	2.65	0.21

**Table 16: Skewness values for following statement obtained over each of the three years of study: Pre-service teacher education at Edgewood pays sufficient attention to HIV/AIDS education**

The skewness values in Table 16 indicate that in the 2004 and 2006 responses, there were fewer cases above the mean than below the mean which indicates that disagree/strongly disagree options were favoured. In 2005, however, there were more cases above the mean than below the mean and this indicates that the agree/strongly agree options were favoured.

***More attention paid to HIV/AIDS education at Edgewood***

What are pre-service teachers’ opinions, over the three years of study, about whether more attention needs to be paid to HIV and AIDS education at Edgewood?

% of Total		Year of conducted research			Total
		2004	2005	2006	
Ib: Pre-service teacher education at Edgewood should pay more attention to HIV / AIDS education	Strongly Disagree	2.8%	2.2%	0.0%	5.0%
	Disagree	3.1%	5.6%	1.4%	10.1%
	Neutral	5.6%	6.4%	4.7%	16.8%
	Agree	13.4%	14.8%	15.6%	43.9%
	Strongly Agree	5.3%	7.8%	11.2%	24.3%
Total		30.2%	36.9%	33.0%	100.0%

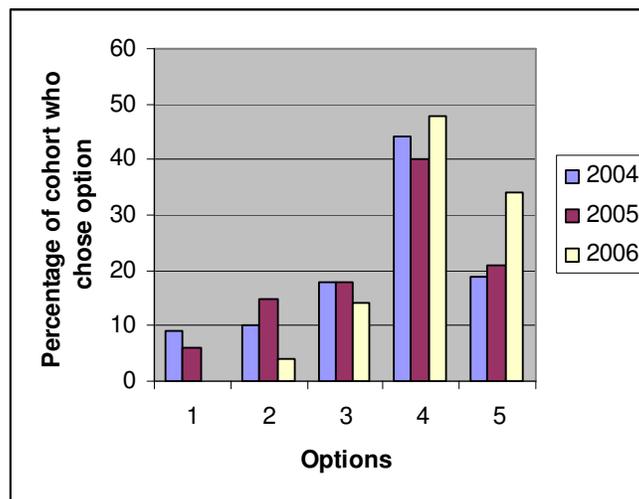
**Table 17: Cross tabulation results of opinions to following statement obtained over three years of study: Pre-service teacher education at Edgewood should pay more attention to HIV/AIDS education**

The trends represented in Table 17 indicate that the percentages of choices across years are similar over the three years of study. In 2004 there is, however, an interchange in the order of preferences. If the percentages of choices are ordered in descending order for 2005 and 2006, then the orders of the options chosen over these two years are the same, i.e. the least favoured choice in each of these two years was ‘strongly disagree’, followed by ‘disagree’, ‘neutral’, ‘strongly agree’, and the most favoured ‘agree’. Over the three years, the least favoured (strongly disagree) and the most favoured (agree) remained constant. From the totals column it can be seen that approximately 15 % (5 % + 10 %) of the responses indicated that pre-service teacher education are of the opinion that

Edgewood should not pay more attention to HIV and AIDS education whereas approximately 67 % (43 % + 24%) indicated that at Edgewood more attention needs to be paid to HIV and AIDS education. This shows that two thirds (67 %) of the responses indicated that more attention should be paid to HIV and AIDS education.

Percentages of respondents who selected the options in statement 1b						
Year of study	Strongly disagree (Option 1)	Disagree (Option 2)	Do not agree or disagree (Option 3)	Agree (Option 4)	Strongly agree (Option 5)	Total
2004	9	10	18	44	19	100%
2005	6	15	18	40	21	100%
2006	0	4	14	48	34	100%

**Table 18: Results of opinions to following statement obtained over each of the three years of study: Pre-service teacher education at Edgewood should pay more attention to HIV/AIDS education**



**Figure 5: Bar graph to show percentages of responses of opinions to following statement obtained over each of the three years of study: Pre-service teacher education at Edgewood should pay more attention to HIV/AIDS education**

The graphical representation (Figure 5) points to the trend that the most favoured responses were ‘agree’ and ‘strongly agree’ whereas the least favoured responses were ‘strongly disagree’ and ‘disagree’.

Year of study	Number of responses	Mean	Skewness
2004	108	3.50	-0.76
2005	132	3.55	-0.16
2006	118	4.11	-0.71

**Table 19: Skewness values for following statement obtained over each of the three years of study: Pre-service teacher education at Edgewood should pay more attention to HIV/AIDS education**

The skewness values in Table 19 indicate that, in all three years of study, the responses there were more cases above the mean than below the mean and this indicates that the agree/strongly agree options were favoured.

By studying the totals columns of both Tables 14 and 17 simultaneously, it is interesting to note that approximately 25 % of the responses were noncommittal in their opinion for statement 1a where it is suggested that sufficient attention is paid to HIV and AIDS education at Edgewood but in statement 1b where opinions on more attention to HIV and AIDS education is gauged, only approximately 16 % of the pre-service teachers indicated a neutral position.

Furthermore, responses to statement 1b revealed that two thirds (67 %) of the respondents agree that Edgewood should pay more attention to HIV and AIDS education and almost half (43 %) of the respondents disagree with statement 1a that states the Edgewood pays sufficient attention to HIV and AIDS education. Statements 1a and 1b reflect, as what would be expected, 'complementary' responses in that most responses for 1a (Attention paid to HIV and AIDS education at Edgewood) and most responses for 1b (More attention paid to HIV and AIDS education at Edgewood) are 'opposites', i.e. the most favoured response for 1a indicates that pre-service teachers are of the opinion that not enough attention is paid to HIV and AIDS education at Edgewood and the most

favoured response for 1b indicates that pre-service teachers are of the opinion that more attention should be paid to HIV and AIDS education at Edgewood.

***Active HIV and AIDS education policy at Edgewood***

*What are pre-service teachers’ opinions, over the three years of study, about the functioning of the HIV and AIDS education policy at Edgewood?*

% of Total		Year of conducted research			Total
		2004	2005	2006	
2a : There is an active HIV/AIDS education policy at Edgewood for pre-service teacher	Strongly Disagree	4.2%	1.4%	3.1%	8.8%
	Disagree	8.8%	10.2%	8.2%	27.1%
	Neutral	11.6%	14.7%	14.4%	40.7%
	Agree	4.2%	9.6%	6.8%	20.6%
	Strongly Agree	0.3%	1.1%	1.4%	2.8%
Total		29.1%	37.0%	33.9%	100.0%

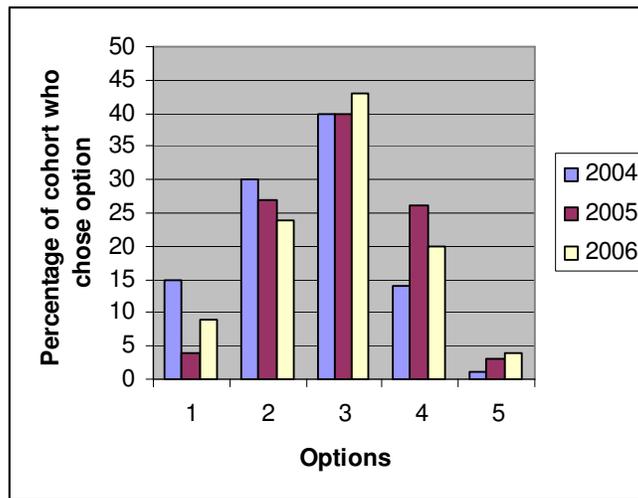
**Table 20: Cross tabulation results of opinions to following statement obtained over three years of study: There is an active HIV/AIDS education policy at Edgewood for pre-service teacher education**

The trends represented in Table 20 indicate that the percentages of choices across years are similar with some changes in choices over the three years of study. If the percentages of choices are ordered in descending order, then the orders of the options chosen over the three years are the same, i.e. the least favoured choice in each year was ‘strongly agree’, followed by ‘strongly disagree’, ‘agree’, ‘disagree’ and the most favoured, ‘neutral’. From the totals column it can be seen that approximately 35 % (8 % + 27 %) of the responses indicated that pre-service teacher education are of the opinion that at Edgewood there is not an active HIV and AIDS education policy whereas 22 % (20 % + 2 %) indicated that there is an active HIV and AIDS education. This shows that just over a third (35 %) of the responses indicated that Edgewood does not have an active HIV and AIDS policy in place.

**Percentages of respondents who selected the options in statement 2a**

Year of study	Strongly disagree	Disagree	Do not agree or disagree	Agree	Strongly agree	Total
	(Option 1)	(Option 2)	(Option 3)	(Option 4)	(Option 5)	
2004	15	30	40	14	1	100%
2005	4	27	40	26	3	100%
2006	9	24	43	20	4	100%

**Table 21: Results of opinions to following statement obtained over each of the three years of study: There is an active HIV/AIDS education policy at Edgewood for pre-service teachers**



**Figure 6: Bar graph to show percentages of responses of opinions to following statement obtained over each of the three years of study: There is an active HIV/AIDS education policy at Edgewood for pre-service teachers**

The graphical representation (Figure 6) points to the trend that the most favoured response is the central, neutral option. The ‘disagree/strongly disagree’ options appear to be chosen more often than the ‘agree/strongly disagree’ options.

Year of study	Number of responses	Mean	Skewness
2004	103	2.57	-0.04
2005	131	2.97	-0.00
2006	120	2.86	-0.04

**Table 22: Skewness values for following statement obtained over each of the three years of study: There is an active HIV/AIDS education policy at Edgewood for pre-service teachers**

The skewness values in Table 22 indicate that, in all three years of study, there were slightly more cases above the mean than below the mean. The means are, however, less

than 3 so that these results are not in complete contradiction with what is displayed in the bar graph (Figure 6) where the disagree option appears to be the favoured response.

***Desired functioning of HIV/AIDS education policy at Edgewood***

*What are pre-service teachers’ opinions, over the three years of study, about the desired functioning of the HIV and AIDS education policy at Edgewood?*

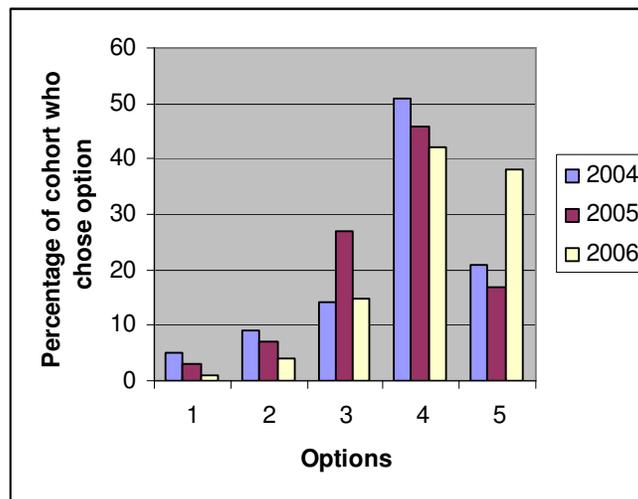
% of Total		Year of conducted research			Total
		2004	2005	2006	
2b: A more active HIV/AIDS education policy for pre-service teachers should be in place at Edgewood	Strongly Disagree	1.4%	1.1%	0.3%	2.8%
	Disagree	2.6%	2.6%	1.4%	6.6%
	Neutral	4.3%	10.0%	4.8%	19.1%
	Agree	15.4%	17.1%	14.0%	46.4%
	Strongly Agree	6.3%	6.3%	12.5%	25.1%
Total		29.9%	37.0%	33.0%	100.0%

**Table 23: Cross tabulation results of opinions to following statement obtained over three years of study: A more active HIV/AIDS education policy for pre-service teacher should be in place at Edgewood**

The trends represented in Table 23 indicate that the percentages of choices across years are similar with some changes in choices over the three years of study. If the percentages of choices are ordered in descending order, then the orders of the options over the three years are almost the same, i.e. the least favoured choice in each year was ‘strongly disagree’, followed by ‘disagree’, ‘neutral’, ‘strongly agree’ and the most favoured, ‘agree’. In 2005, however, the order is slightly different because ‘strongly agree’ and ‘neutral’ are interchanged. From the totals column it can be seen that approximately 8 % (2 % + 6 %) of the responses indicated that pre-service teacher education are of the opinion that at Edgewood there should not be a more active HIV and AIDS education policy whereas 71 % (46 % + 25 %) indicated that there should be a more active HIV and AIDS education policy at Edgewood. This shows that just under three-quarters (71 %) of the responses indicated that a more active HIV and AIDS policy should be in place at Edgewood.

Percentages of respondents who selected the options in statement 2b						Total
Year of study	Strongly disagree (Option 1)	Disagree (Option 2)	Do not agree or disagree (Option 3)	Agree (Option 4)	Strongly agree (Option 5)	
2004	5	9	14	51	21	100%
2005	3	7	27	46	17	100%
2006	1	4	15	42	38	100%

**Table 24: Results of opinions to following statement obtained over each of the three years of study: A more active HIV/AIDS education policy for pre-service teacher should be in place at Edgewood**



**Figure 7: Bar graph to show percentages of responses of opinions to following statement obtained over each of the three years of study: A more active HIV/AIDS education policy for pre-service teacher should be in place at Edgewood**

The graphical representation (Figure 7) points to the trend that the most favoured responses were ‘agree’ and ‘strongly agree’ whereas the least favoured responses were ‘strongly disagree’ and ‘disagree’.

Year of study	Number of responses	Mean	Skewness
2004	105	3.75	-1.01
2005	130	3.67	-0.70
2006	116	4.12	-0.95

**Table 25: Skewness values for following statement obtained over each of the three years of study: A more active HIV/AIDS education policy for pre-service teacher should be in place at Edgewood**

The skewness values in Table 25 indicate that, in all three years of study, the responses there were more cases above the mean than below the mean and this confirms that the agree/strongly agree options were favoured.

By studying the totals columns of both Tables 20 and 23 simultaneously, it is interesting to note that approximately 40 % of the responses were noncommittal in their opinion for statement 2a where the statement suggests that there is an active HIV and AIDS education policy at Edgewood but in statement 2b where opinions on a more active HIV and AIDS education policy at Edgewood is gauged, only approximately 19 % of the pre-service teachers indicated a neutral position to the statement.

Furthermore, responses to statement 2b revealed that more than two thirds (71 %) of the respondents agree that Edgewood should have a more active HIV and AIDS education policy and more than one third (35 %) of the respondents disagree with statement 2a that states the Edgewood has an active HIV and AIDS education policy. Statements 2a and 2b reflect, as what would be expected, 'complementary' responses in that most responses for 2a (Active HIV and AIDS education policy at Edgewood) and most responses for 2b (A more active HIV and AIDS education policy should be in place at Edgewood) are 'opposites', i.e. the most favoured response for 2a indicates that pre-service teachers are of the opinion that there is not an active HIV and AIDS policy in place at Edgewood and the most favoured response for 2b indicates that pre-service teachers are of the opinion that a more active HIV and AIDS education policy should be in place at Edgewood.

***HIV/AIDS teacher education should be informed by specialists in Life Orientation or Gender Education***

*What are pre-service teachers' opinions, over the three years of study, about whether HIV and AIDS education should be informed by Life Orientation and Gender Education specialist at Edgewood?*

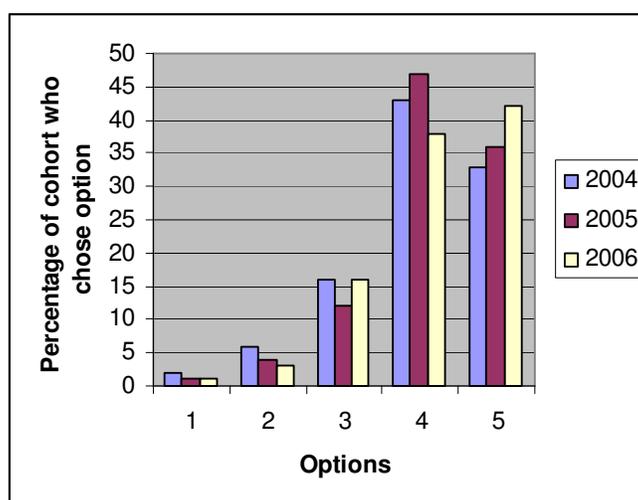
% of Total		Year of conducted research			Total
		2004	2005	2006	
6a : Pre-service teachers at Edgewood should be informed by the discipline specialists	Strongly Disagree	0.6%	0.3%	0.3%	1.1%
	Disagree	1.7%	1.7%	0.8%	4.2%
	Neutral	4.7%	4.4%	5.3%	14.4%
	Agree	13.0%	17.7%	12.5%	43.2%
	Strongly Agree	10.0%	13.3%	13.9%	37.1%
Total		29.9%	37.4%	32.7%	100.0%

**Table 26: Cross tabulation results of opinions to following statement obtained over three years of study: HIV/AIDS teacher education should be informed by discipline specialists in Life Orientation or Gender Education**

The trends represented in Table 26 indicate that the percentages of choices across years are similar with some changes in choices over the three years of study. If the percentages of choices are ordered in descending order, then the orders of the options over the three years are almost the same, i.e. the least favoured choice in each year was 'strongly disagree', followed by 'disagree', 'neutral', 'strongly agree' and the most favoured, 'agree'. In 2006, however, the order is slightly different because 'agree' and 'strongly agree' are interchanged. From the totals column it can be seen that approximately 5 % (1 % + 4 %) of the responses indicated that pre-service teacher education are of the opinion that at Edgewood HIV and AIDS teacher education should not be informed by discipline specialists in Life Orientation and Gender Studies whereas 80 % (43 % + 37 %) indicated that pre-service teachers should be informed by HIV and AIDS discipline specialists. This shows that more than three-quarters (80 %) of the responses indicated that HIV and AIDS teacher education should be provided by Life Orientation and Gender Studies specialists.

Percentages of respondents who selected the options in statement 6a						Total
Year of study	Strongly disagree (Option 1)	Disagree (Option 2)	Do not agree or disagree (Option 3)	Agree (Option 4)	Strongly agree (Option 5)	
2004	2	6	16	43	33	100%
2005	1	4	12	47	36	100%
2006	1	3	16	38	42	100%

**Table 27: Results of opinions to following statement obtained over each of the three years of study: HIV/AIDS teacher education should be informed by discipline specialists in Life Orientation or Gender Education**



**Figure 8: Bar graph to show percentages of responses of opinions to following statement obtained over each of the three years of study: HIV/AIDS teacher education should be informed by discipline specialists in Life Orientation or Gender Education**

The graphical representation (Figure 8) points to the trend that the most favoured responses were ‘agree’ and ‘strongly agree’ whereas the least favoured responses were ‘strongly disagree’ and ‘disagree’.

Year of study	Number of responses	Mean	Skewness
2004	108	4	-0.96
2005	135	4.13	-1.01
2006	118	4.19	-0.95

**Table 28: Skewness values for following statement obtained over each of the three years of study: HIV/AIDS teacher education should be informed by discipline specialists in Life Orientation or Gender Education**

The skewness values in Table 28 indicate that, in all three years of study, the responses there were more cases above the mean than below the mean and this confirms that the agree/strongly agree options were favoured.

***HIV/AIDS teacher education should be informed by specialists across disciplines***

*What are pre-service teachers' opinions, over the three years of study, about whether HIV and AIDS education should be informed by specialists across disciplines at Edgewood?*

% of Total		Year of conducted research			Total
		2004	2005	2006	
6b: Pre-service teachers at Edgewood should be informed by specialists across disciplines	Strongly Disagree	0.6%	0.0%	0.3%	0.8%
	Disagree	1.4%	2.2%	0.6%	4.2%
	Neutral	3.9%	5.3%	5.0%	14.2%
	Agree	14.5%	17.3%	11.1%	42.9%
	Strongly Agree	9.7%	12.0%	16.2%	37.9%
Total		30.1%	36.8%	33.1%	100.0%

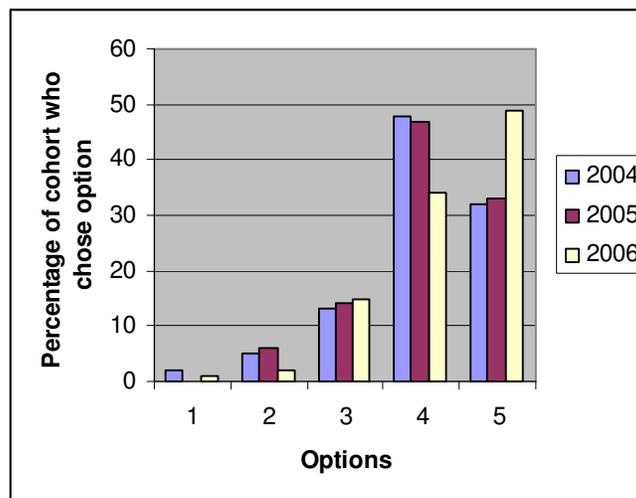
**Table 29: Cross tabulation results of opinions to following statement obtained over three years of study: HIV/AIDS teacher education should be informed by specialists across disciplines**

The trends represented in Table 29 indicate that the percentages of choices across years are similar with some changes in choices over the three years of study. If the percentages of choices are ordered in descending order, then the orders of the options over the three years are almost the same, i.e. the least favoured choice in each year was 'strongly disagree', followed by 'disagree', 'neutral', 'strongly agree' and the most favoured, 'agree'. In 2006, however, the order is slightly different because 'agree' and 'strongly agree' are interchanged. From the totals column it can be seen that approximately 4 % (0 % + 4 %) of the responses indicated that pre-service teachers are of the opinion that at Edgewood HIV and AIDS teacher education should not be informed by specialists across disciplines whereas 79 % (42 % + 37 %) indicated that pre-service teachers should be informed by specialists across disciplines i.e. by integration of HIV and AIDS education across disciplines. This shows that

more than three-quarters (79 %) of the responses indicated that integration of HIV and AIDS teacher education should be across disciplines.

Percentages of respondents who selected the options in statement 6b						
Year of study	Strongly disagree (Option 1)	Disagree (Option 2)	Do not agree or disagree (Option 3)	Agree (Option 4)	Strongly agree (Option 5)	Total
2004	2	5	13	48	32	100%
2005	0	6	14	47	33	100%
2006	1	2	15	34	49	100%

**Table 30: Results of opinions to following statement obtained over each of the three years of study: HIV/AIDS teacher education should be informed by specialists across disciplines**



**Figure 9: Bar graph to show percentages of responses of opinions to following statement obtained over each of the three years of study: HIV/AIDS teacher education should be informed by specialists across disciplines**

The graphical representation (Figure 9) points to the trend that the most favoured responses were ‘agree’ and ‘strongly agree’ whereas the least favoured responses were ‘strongly disagree’ and ‘disagree’.

Year of study	Number of responses	Mean	Skewness
2004	108	4.04	-1.10
2005	132	4.06	-0.73
2006	119	4.28	-1.08

**Table 31: Skewness values for following statement obtained over each of the three years of study: HIV/AIDS teacher education should be informed by specialists across disciplines**

The skewness values in Table 31 indicate that, in all three years of study, the responses there were more cases above the mean than below the mean and this confirms that the agree/strongly agree options were favoured.

***Data handling in mathematics education provides personal knowledge about HIV/AIDS***

*What are pre-service teachers' opinions over the three years of study about whether Data Handling in mathematics education provides personal knowledge for pre-service teachers?*

% of Total		Year of conducted research			Total
		2004	2005	2006	
13a: Data handling using HIV/AIDS statistics in Mathematics education modules provides personal knowledge	Strongly Disagree	3.2%	1.4%	1.4%	6.1%
	Disagree	4.3%	6.1%	2.3%	12.8%
	Neutral	10.1%	9.0%	9.3%	28.4%
	Agree	9.6%	17.7%	15.4%	42.6%
	Strongly Agree	2.3%	4.1%	3.8%	10.1%
Total		29.6%	38.3%	32.2%	100.0%

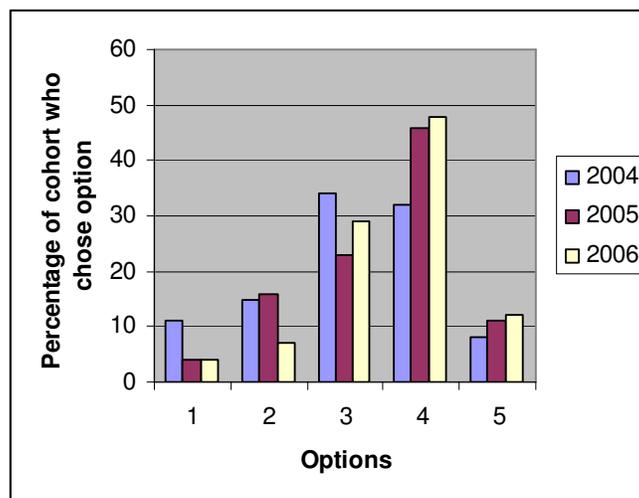
**Table 32: Cross tabulation results of opinions to following statement obtained over three years of study: Data Handling using HIV/AIDS statistics in mathematics education modules provides pre-service teachers with personal knowledge**

The trends represented in Table 32 indicate that the percentages of choices across years vary over the three years of study. If the percentages of choices are ordered in descending order, then the orders of the options chosen over the three years also vary. From the totals column, however, it can be seen that approximately 18 % (6 % + 12 %) of the responses indicated that pre-service teachers at Edgewood are of the opinion that Data Handling in mathematics education modules does not provide pre-service teachers with personal knowledge whereas 52 % (42 % + 10 %) indicated that Data Handling in mathematics education modules does provide pre-service teachers with personal knowledge. This shows that more than half (52 %) of the responses

indicated that use of HIV and AIDS statistics in mathematics education provides personal knowledge.

Percentages of respondents who selected the options in statement 13a						
Year of study	Strongly disagree (Option 1)	Disagree (Option 2)	Do not agree or disagree (Option 3)	Agree (Option 4)	Strongly agree (Option 5)	Total
2004	11	15	34	32	8	100%
2005	4	16	23	46	11	100%
2006	4	7	29	48	12	100%

**Table 33: Results of opinions to following statement obtained over each of the three years of study: Data Handling using HIV/AIDS statistics in mathematics education modules provides pre-service teachers with personal knowledge**



**Figure 10: Bar graph to show percentages of responses of opinions to following statement obtained over each of the three years of study: Data Handling using HIV/AIDS statistics in mathematics education modules provides pre-service teachers with personal knowledge**

The graphical representation (Figure 10) points to the trend that the most favoured responses was ‘agree’ and neutral whereas the least favoured responses was ‘strongly disagree’.

Year of study	Number of responses	Mean	Skewness
2004	102	3.11	-0.37
2005	132	3.44	-0.56
2006	111	3.55	-0.79

**Table 34: Skewness values for following statement obtained over each of the three years of study: Data Handling using HIV/AIDS statistics in mathematics education modules provides pre-service teachers with personal knowledge**

The skewness values in Table 34 indicate that, in all three years of study, the responses there were more cases above the mean than below the mean and this confirms that the agree option was favoured.

***Mathematics education modules should make more use of HIV/AIDS statistics to provide personal knowledge about HIV/AIDS***

*What are pre-service teachers' opinions over the three years of study about whether mathematics education should make more use of statistics to provide personal knowledge for pre-service teachers?*

% of Total		Year of conducted research			Total
		2004	2005	2006	
13b: Mathematics education modules at Edgewood should make more use of statistics to provide personal knowledge	Strongly Disagree	2.3%	2.6%	0.3%	5.3%
	Disagree	3.5%	6.5%	3.5%	13.5%
	Neutral	9.1%	10.6%	7.3%	27.0%
	Agree	10.3%	13.8%	14.1%	38.1%
	Strongly Agree	4.4%	4.4%	7.3%	16.1%
Total		29.6%	37.8%	32.6%	100.0%

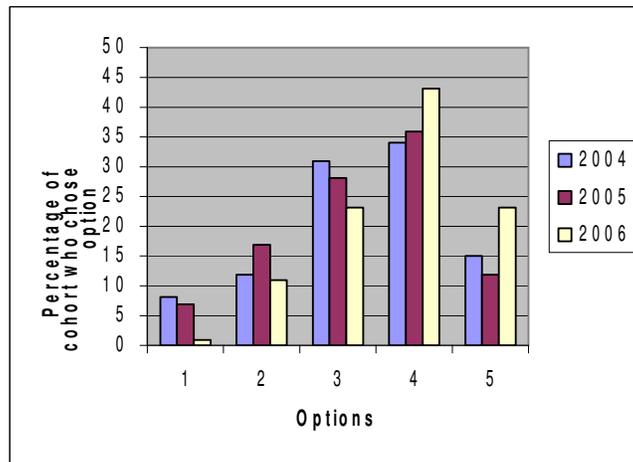
**Table 35: Cross tabulation results of opinions to following statement obtained over three years of study: Mathematics education modules should make more use of HIV/AIDS statistics to provide pre-service teachers with personal knowledge**

The trends represented in Table 35 indicate that the percentages of choices across years are similar with some changes over the three years of study. If the percentages of choices are ordered in descending order, then the orders of the options chosen over the three years are almost the same, i.e. the least favoured choice in each year was 'strongly disagree', followed by 'disagree', 'strongly agree', 'neutral', and the most favoured, 'agree'. In 2005, however, the order is slightly different because 'disagree' and 'strongly agree' are interchanged. From the totals column it can be seen that approximately 18 % (5 % + 13 %) of the responses indicated that pre-service teachers at Edgewood are of the opinion that Data Handling in mathematics education modules should not make more use of statistics to provide pre-service teachers with personal

knowledge whereas 54 % (38 % + 16 %) indicated that more use should be made of statistics in mathematics education modules to provide pre-service teachers with personal knowledge. This shows that more than half (54 %) of the responses indicated that more use should be made of statistics in mathematics education.

Percentages of respondents who selected the options in statement 13b						
Year of study	Strongly disagree	Disagree	Do not agree or disagree	Agree	Strongly agree	Total
	(Option 1)	(Option 2)	(Option 3)	(Option 4)	(Option 5)	
2004	8	12	31	34	15	100%
2005	7	17	28	36	12	100%
2006	1	11	23	43	23	100%

**Table 36: Results of opinions to following statement obtained over each of the three years of study: Mathematics education modules should make more use of HIV/AIDS statistics to provide pre-service teachers with personal knowledge**



**Figure 11: Bar graph to show percentages of responses of opinions to following statement obtained over each of the three years of study: Mathematics education modules should make more use of HIV/AIDS statistics to provide pre-service teachers with personal knowledge**

The graphical representation (Figure 11) points to the trend that the most favoured responses was ‘agree’ and neutral whereas the least favoured responses was ‘strongly disagree’.

<b>Year of study</b>	<b>Number of responses</b>	<b>Mean</b>	<b>Skewness</b>
2004	101	3.36	-0.45
2005	129	3.29	-0.38
2006	111	3.76	-0.51

**Table 37: Skewness values for following statement obtained over each of the three years of study: Mathematics education modules should make more use of HIV/AIDS statistics to provide pre-service teachers with personal knowledge**

The skewness values in Table 37 indicate that, in all three years of study, the responses there were more cases above the mean than below the mean and this confirms that the 'agree' option was most favoured.

## INFERENCEAL ANALYSIS OF RESPONSES

### 1. Relationships between sex and opinions to statements over three years of study

T-Test : Gender

		F	t	df	Sig. (2-tailed)
S1a	Equal variances assumed	2.623	-.483	340	.630
	Equal variances not assumed		-.548	41.964	.587
S1b	Equal variances assumed	.000	2.300	337	.022
	Equal variances not assumed		2.431	37.264	.020
S2a	Equal variances assumed	.904	-1.867	333	.063
	Equal variances not assumed		-1.968	40.405	.056
S2b	Equal variances assumed	.038	2.448	330	.015
	Equal variances not assumed		2.757	38.776	.009
S6a	Equal variances assumed	.252	3.688	340	.000
	Equal variances not assumed		3.686	40.626	.001
S6b	Equal variances assumed	.102	2.944	338	.003
	Equal variances not assumed		2.999	41.065	.005
S13a	Equal variances assumed	.746	-.355	328	.723
	Equal variances not assumed		-.375	40.612	.710
S13b	Equal variances assumed	.011	1.588	323	.113
	Equal variances not assumed		1.646	40.334	.107

Table 38: T-test results to show relationships between sex and opinions to statements over three years of study

*Is there statistically significant difference between sex groups (male and female), over the three years of study, regarding perceptions towards the study statements?*

From Table 38 it can be seen that males and females expressed differences in opinions when they were asked to consider:

- 1b: Pre-service teacher education at Edgewood should pay more attention to HIV/AIDS education
- 2b: A more active HIV/AIDS education policy for pre-service teachers should be in place at Edgewood
- 6a : Pre-service teachers at Edgewood should be informed by the discipline specialists
- 6b: Pre-service teachers at Edgewood should be informed by specialists across disciplines
- 13b: Mathematics education modules at Edgewood should make more use of statistics to provide personal knowledge

Evidence is provided in T-test results where the **p** significance values are less than 0.05.

Table 38 also reveals that statistically there is no significance between males and females opinions towards the following statements:

- 1a : Pre-service teacher education at Edgewood pays sufficient attention to HIV/AIDS education
- 2a : There is an active HIV/AIDS education policy at Edgewood for pre-service teacher
- 13a: Data handling using HIV/AIDS statistics in mathematics education modules provides personal knowledge.

Evidence is provided in T-test results where the **p** significance values are more than 0.05.

In order to examine how the responses of sexes differ, it is necessary to study the descriptive statistics where comparative results are listed according to pre-service teachers' choices to particular statements. It is, however, not possible to compare the percentages of female and male responses directly as there were far fewer male respondents. It is possible to observe trends in the responses. To analyse the differences between female and male responses it is necessary to analyse the distribution selections of females and males. Tables showing selections according to sex of respondents will now be examined to understand how the female and male responses differ.

***Differences in respondents of sexes regarding paying more attention paid to HIV/AIDS education***

*How do different sexes respond when considering whether there should be a more attention paid to HIV and AIDS education?*

% of Total		Respondent Sex		
		Female	Male	Total
1b: Pre-service teacher education at Edgewood should pay more attention to HIV / AIDS education	Strongly Disagree	5.0%	0.3%	5.3%
	Disagree	8.6%	2.1%	10.6%
	Neutral	14.7%	2.7%	17.4%
	Agree	39.8%	3.2%	43.1%
	Strongly Agree	22.7%	0.9%	23.6%
Total		90.9%	9.1%	100.0%

**Table 39: Different opinions expressed by respondents of different sexes obtained over the three years of study according to the following statement: Pre-service teacher education at Edgewood should pay more attention to HIV/AIDS education**

In Table 39 the female responses are more focused towards the ‘agree’ and ‘strongly agree’ whereas the male responses are proportionally more or less evenly distributed across the ‘disagree’, ‘neutral’ and ‘agree’ options. By locating where the highest percentages in each column occurs, it appears that the female respondents are more in favour of paying more attention to HIV and AIDS education than are the male respondents.

***Differences in responses of sexes regarding the need for a more active HIV/AIDS education policy***

*How do responses of sexes differ when considering whether there should be a more active HIV and AIDS education policy in place?*

% of Total		Respondent Sex		
		Female	Male	Total
2b: A more active HIV/AIDS education policy for pre-service teachers should be in place at Edgewood	Strongly Disagree	2.7%	0.3%	3.0%
	Disagree	6.0%	0.9%	6.9%
	Neutral	16.0%	3.0%	19.0%
	Agree	41.9%	4.8%	46.7%
	Strongly Agree	24.1%	0.3%	24.4%
Total		90.7%	9.3%	100.0%

**Table 40: Differences in responses of sexes regarding comparison results of opinions to following statement obtained over three years of study: A more active HIV/AIDS education policy for pre-service teacher should be in place at Edgewood**

In Table 40 the female responses are more focused towards the ‘agree’ and ‘strongly agree’ whereas the male responses are proportionately more across the ‘neutral’ and ‘agree’ options. By locating where the highest percentages in each column occurs, it appears that the female respondents are more in favour of having a more active HIV and AIDS education policy than are the male respondents.

***Differences in responses of sexes regarding being informed by discipline specialists***

*How do responses of sexes differ when considering whether HIV and AIDS education should be informed by discipline specialists in Life Orientation or Gender Education?*

% of Total		Respondent Sex		
		Female	Male	Total
6a : Pre-service teachers at Edgewood should be informed by the discipline specialists	Strongly Disagree	1.2%	0.0%	1.2%
	Disagree	2.3%	1.5%	3.8%
	Neutral	12.9%	2.0%	14.9%
	Agree	38.3%	5.6%	43.9%
	Strongly Agree	35.4%	0.9%	36.3%
Total		90.1%	9.9%	100.0%

**Table 41: Differences in responses of sexes regarding opinions to following statement obtained over three years of study: HIV/AIDS teacher education should be informed by discipline specialists in Life Orientation or Gender Education**

In Table 41 the female responses are more focused towards the ‘agree’ and ‘strongly agree’ whereas the male responses are proportionately more in favour of the ‘agree’ option. By locating where the highest percentages in each column occurs, it appears that the female respondents are more strongly in favour of having HIV and AIDS teacher education being informed by discipline specialists in Life Orientation or Gender Education than are the male respondents.

***Differences responses of sexes regarding being informed by specialists across disciplines***

*How do different sexes respond when considering whether HIV and AIDS education should be informed by specialists across disciplines?*

% of Total		Respondent Sex		
		Female	Male	Total
6b: Pre-service teachers at Edgewood should be informed by specialists across disciplines	Strongly Disagree	0.6%	0.3%	.9%
	Disagree	3.8%	0.3%	4.1%
	Neutral	11.8%	2.6%	14.4%
	Agree	38.2%	5.6%	43.8%
	Strongly Agree	35.6%	1.2%	36.8%
Total		90.0%	10.0%	100.0%

**Table 42: Differences in responses of sexes regarding opinions to following statement obtained over three years of study: HIV/AIDS teacher education should be informed by specialists across disciplines**

In Table 42 the female responses are more focused towards the ‘agree’ and ‘strongly agree’ whereas the male responses are proportionally more distributed across the ‘neutral’ and ‘agree’ options. By locating where the highest percentages in each column occurs, it appears that the female respondents are more strongly in favour of having HIV and AIDS teacher education being informed by specialists across disciplines than are the male respondents.

***Differences in responses of sexes regarding mathematics education modules making more use of statistics to provide personal knowledge***

*How do different sexes respond when considering whether mathematics education modules should make more use of statistics to provide personal knowledge?*

% of Total		Respondent Sex		
		Female	Male	Total
13b: Mathematics education modules at Edgewood should make more use of HIV/AIDS statistics to provide personal knowledge	Strongly Disagree	5.2%	0.3%	5.5%
	Disagree	11.1%	3.1%	14.2%
	Neutral	24.6%	2.2%	26.8%
	Agree	34.5%	4.0%	38.5%
	Strongly Agree	14.5%	0.6%	15.1%
Total		89.8%	10.2%	100.0%

**Table 43: Differences in responses of sexes regarding opinions to following statement obtained over three years of study: Mathematics education modules should make more use of HIV/AIDS statistics to provide pre-service teachers with personal knowledge**

In Table 43 the female responses are more focused towards the ‘neutral’, ‘agree’ and ‘strongly agree’ whereas the male responses are proportionally more distributed across the ‘neutral’ and ‘agree’ options. By locating where the highest percentages in each column occurs, it appears that the female respondents are more strongly in favour of making more use of HIV and AIDS statistics to provide personal knowledge.

**2. Relationships between race and opinions to statements over three years of study**

**ANOVA**

		Sum of Squares	df	Mean Square	Sig.
S1a	Between Groups	2.020	3	.673	.643
	Within Groups	405.969	337	1.205	
	Total	407.988	340		
S1b	Between Groups	52.190	3	17.397	.000
	Within Groups	360.288	335	1.075	
	Total	412.478	338		
S2a	Between Groups	.848	3	.283	.818
	Within Groups	300.888	330	.912	
	Total	301.737	333		
S2b	Between Groups	35.159	3	11.720	.000
	Within Groups	278.702	327	.852	
	Total	313.861	330		
S6a	Between Groups	3.374	3	1.125	.218
	Within Groups	254.825	337	.756	
	Total	258.199	340		
S6b	Between Groups	4.613	3	1.538	.104
	Within Groups	249.127	335	.744	
	Total	253.740	338		
S13a	Between Groups	10.811	3	3.604	.017
	Within Groups	338.067	324	1.043	
	Total	348.878	327		
S13b	Between Groups	21.189	3	7.063	.000
	Within Groups	358.613	319	1.124	
	Total	379.802	322		

**Table 44: ANOVA test results to show relationships between races and opinions to statements over three years of study**

*Is there statistically significant difference between ethnic groups (black, Coloured, Indian and white), over the three years of study, regarding perceptions towards the study statements?*

Table 44 shows that ethnic groups expressed differences in opinions when they were asked to consider:

- 1b: Pre-service teacher education at Edgewood should pay more attention to HIV/AIDS education
- 2b: A more active HIV/AIDS education policy for pre-service teachers should be in place at Edgewood
- 13a: Data handling using HIV/AIDS statistics in mathematics education modules provides personal knowledge.
- 13b: Mathematics education modules at Edgewood should make more use of statistics to provide personal knowledge.

Evidence is provided in ANOVA results where the **p** significance values are less than 0.05.

Table 44 also reveals that statistically there are no significant differences in opinions of the various ethnic groups towards the following statements:

- 1a : Pre-service teacher education at Edgewood pays sufficient attention to HIV/AIDS education
- 2a : There is an active HIV/AIDS education policy at Edgewood for pre-service teacher
- 6a : Pre-service teachers at Edgewood should be informed by the discipline specialists
- 6b: Pre-service teachers at Edgewood should be informed by specialists across disciplines

Evidence is provided in ANOVA results where the **p** significance values are more than 0.05.

In order to examine how the ethnic groups' responses differ, it is necessary to study the descriptive statistics where comparative results are listed according to pre-service teachers' choices to particular statements. It is, however, not possible to compare the

percentages of each racial group directly as there were different number of pre-services teachers from different racial groupings. It is possible to observe trends in the responses. To analyse the differences in ethnic group responses it is necessary to analyse the distribution selections of black, Coloured, Indian and white respondents. Tables showing selections according to ethnic group of respondents will now be examined to understand how the black, Coloured, Indian and white responses differ.

***Differences in ethnic group responses regarding the need for more attention to be paid to HIV/AIDS education***

*How do ethnic group responses differ when considering whether there should be a more attention paid to HIV and AIDS education?*

% of Total		Respondent Ethnic group				Total
		Black	Coloured	Indian	White	
1b: Pre-service teacher education at Edgewood should pay more attention to HIV / AIDS education	Strongly Disagree			0.6%	4.7%	5.3%
	Disagree	0.3%	0.3%	1.8%	8.3%	10.6%
	Neutral	0.6%	0.9%	1.8%	14.2%	17.4%
	Agree	2.9%	2.9%	8.3%	28.9%	43.1%
	Strongly Agree	6.8%	2.9%	6.2%	7.7%	23.6%
Total		10.6%	7.1%	18.6%	63.7%	100.0%

**Table 45: Ethnic group comparison results of opinions to following statement obtained over three years of study: Pre-service teacher education at Edgewood should pay more attention to HIV/AIDS education**

In Table 45 the white responses are more focused towards the ‘neutral’ and ‘agree’ whereas the responses from other ethnic groups are proportionally more focused towards the ‘agree’ and ‘strongly agree’ options. By locating where the highest percentages in each column occurs, it appears that the black, Coloured and Indian respondents are more in favour of paying more attention to HIV and AIDS education than are the white respondents.

***Differences in ethnic group responses regarding the need for a more active HIV/AIDS education policy***

*How do ethnic group responses differ when considering whether there should be a more active HIV and AIDS education policy in place?*

% of Total		Respondent Ethnic group				Total
		Black	Coloured	Indian	White	
2b: A more active HIV/AIDS education policy for pre-service teachers should be in place at Edgewood	Strongly Disagree	0.3%	0.3%	0.6%	1.8%	3.0%
	Disagree			0.6%	6.0%	6.6%
	Neutral	0.3%	1.2%	2.7%	14.8%	19.0%
	Agree	2.4%	2.4%	8.8%	32.9%	46.5%
	Strongly Agree	7.6%	3.0%	6.3%	7.9%	24.8%
Total		10.6%	6.9%	19.0%	63.4%	100.0%

**Table 46: Differences in responses of sexes regarding following statement obtained over three years of study: A more active HIV/AIDS education policy for pre-service teacher should be in place at Edgewood**

In Table 46 the responses of white pre-service teachers are more focused towards the ‘neutral’ and ‘agree’ whereas the responses from other ethnic groups are proportionally more focused towards the ‘agree’ and ‘strongly agree’ options. By locating where the highest percentages in each column occurs, it appears that the black, Coloured and Indian respondents are more in favour of having a more active HIV and AIDS education policy than are the white respondents.

***Differences in ethnic group responses regarding the use of Data Handling in mathematics education modules to provide personal knowledge about HIV/AIDS***

*How do ethnic group responses differ when considering whether data handling provides personal knowledge about HIV and AIDS?*

% of Total		Respondent Ethnic group				Total
		Black	Coloured	Indian	White	
13a: Data handling using HIV/AIDS statistics in Mathematics education modules provides personal knowledge	Strongly Disagree	1.5%		0.3%	4.3%	6.1%
	Disagree	1.2%	1.5%	0.9%	8.5%	12.2%
	Neutral	2.4%	2.4%	4.9%	18.0%	27.7%
	Agree	2.7%	2.1%	8.5%	29.9%	43.3%
	Strongly Agree	2.7%	0.9%	3.7%	3.4%	10.7%
Total		10.7%	7.0%	18.3%	64.0%	100.0%

**Table 47: Ethnic group comparison results of opinions to following statement obtained over three years of study: Data handling using HIV/AIDS statistics in mathematics education modules provides personal knowledge**

In Table 47 the white, Indian and Coloured responses are more focused towards the ‘neutral’ and ‘agree’ whereas the responses from the black group are proportionally more focused towards the ‘agree’ and ‘strongly agree’ options. By locating where the highest percentages in each column occurs, it appears that the black respondents are more in favour of having making use of Data Handling in HIV and AIDS education in mathematics modules to provide personal knowledge than are the white, Indian and Coloured respondents.

***Differences in ethnic group responses regarding extending the use of statistics in mathematics education to provide personal knowledge about HIV/AIDS***

*How do ethnic group responses differ when considering whether more use should be made of statistics to provide personal knowledge about HIV and AIDS?*

% of Total		Respondent Ethnic group				Total
		Black	Coloured	Indian	White	
13b: Mathematics education modules at Edgewood should make more use of statistics to provide personal knowledge	Strongly Disagree	0.6%		0.6%	4.3%	5.6%
	Disagree	1.5%	0.3%	1.2%	10.8%	13.9%
	Neutral	0.9%	1.5%	5.0%	19.2%	26.6%
	Agree	2.5%	4.0%	7.7%	23.8%	38.1%
	Strongly Agree	4.6%	1.2%	3.7%	6.2%	15.8%
Total		10.2%	7.1%	18.3%	64.4%	100.0%

**Table 48: Ethnic group comparison results of opinions to following statement obtained over three years of study: Mathematics education modules at Edgewood should make more use of statistics to provide personal knowledge**

In Table 48 the white, Indian and Coloured responses are more focused towards the ‘neutral’ and ‘agree’ whereas the responses from the black group are proportionally more focused towards the ‘agree’ and ‘strongly agree’ options. By locating where the highest percentages in each column occurs, it appears that the black respondents are more in favour of making more use of HIV and AIDS statistics to provide personal knowledge than are the white, Indian and Coloured respondents.

### 3. Relationships between opinions of statements over three years of study

Correlations

		S1a	S1b	S2a	S2b	S6a	S6b	S13a	S13b
S1a	Pearson Correlation	1	-.366**	.386**	-.282**	-.068	-.089	.134*	-.189**
	Sig. (2-tailed)		.000	.000	.000	.199	.093	.013	.000
	N	361	355	351	348	359	356	343	338
S1b	Pearson Correlation	-.366**	1	-.157**	.677**	.282**	.381**	.149**	.491**
	Sig. (2-tailed)	.000		.003	.000	.000	.000	.006	.000
	N	355	358	347	347	354	354	339	337
S2a	Pearson Correlation	.386**	-.157**	1	-.205**	-.043	-.077	.104	-.045
	Sig. (2-tailed)	.000	.003		.000	.423	.149	.057	.418
	N	351	347	354	345	351	349	335	331
S2b	Pearson Correlation	-.282**	.677**	-.205**	1	.260**	.368**	.115*	.463**
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.036	.000
	N	348	347	345	351	348	348	332	330
S6a	Pearson Correlation	-.068	.282**	-.043	.260**	1	.534**	.152**	.288**
	Sig. (2-tailed)	.199	.000	.423	.000		.000	.005	.000
	N	359	354	351	348	361	356	344	338
S6b	Pearson Correlation	-.089	.381**	-.077	.368**	.534**	1	.149**	.344**
	Sig. (2-tailed)	.093	.000	.149	.000	.000		.006	.000
	N	356	354	349	348	356	359	342	340
S13a	Pearson Correlation	.134*	.149**	.104	.115*	.152**	.149**	1	.229**
	Sig. (2-tailed)	.013	.006	.057	.036	.005	.006		.000
	N	343	339	335	332	344	342	345	333
S13b	Pearson Correlation	-.189**	.491**	-.045	.463**	.288**	.344**	.229**	1
	Sig. (2-tailed)	.000	.000	.418	.000	.000	.000	.000	
	N	338	337	331	330	338	340	333	341

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

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

**Table 49 : Pearson Correlation results to show relationships between opinions to statements over three years of study**

*Is there statistically significant correlation between responses to statements 1a and 1b, statements 2a and 2b, statements 6a and 6b, and statements 13a and 13 b over the three years of study, regarding perceptions towards these study statements?*

From Table 49 it can be seen that statistically significant correlation exists between each pair of statements because the **p** values are all 0.000 which is less than the required 0,05 that indicates that the relationship is statistically significant. Furthermore the negative sign of **r** values, that express the type of relationship between 1a and b and 2a and b, indicate that as the one variable increases the other variable decreases. This means that as the number of responses for options in 1b increases from ‘strongly disagree’ to

'strongly agree' then the number of responses for options in 1a decreases from 'strongly disagree' to 'strongly agree' (See Tables 14 and 17.). A corresponding relationship exists between 2b and 2a (See Tables 20 and 23.). The positive sign of  $r$  values, that express the type of relationship between 6a and b and 13a and b, indicate that as the one variable increases the other variable also increases. This means that as the number of responses for options in 6a increases from 'strongly disagree' to 'strongly agree' then the number of responses for options in 6b also increases from 'strongly disagree' to 'strongly agree' (See Tables 26 and 29.). A corresponding relationship exists between 13a and 13b (See Tables 32 and 35.). The Pearson product correlation coefficient  $r$  values indicate that a 'moderate' correlation exists between 1a and b, a 'weak' correlation exists between 2a and b, a 'strong' correlation exists between 6a and b, and a 'weak' correlation exists between 13a and b.

## **SUMMARY OF THE DESCRIPTIVE AND INFERENTIAL ANALYSIS**

Over the three years of study, the pre-service teachers were generally (varying from 35% - 80% of responses) of the opinion that:

- 1a. Pre-service teacher education at Edgewood does not pay sufficient attention to HIV/AIDS education.
- 1b. Pre-service teacher education at Edgewood should pay more attention to HIV/AIDS education.
- 2a. There is no active HIV/AIDS education policy at Edgewood for pre-service teachers.
- 2b. A more active HIV/AIDS education policy for pre-service teachers should be in place at Edgewood.
- 6a. Pre-service teachers at Edgewood should be informed by the discipline specialists in Life Orientation or Gender Education on how to manage the teaching and learning of HIV/AIDS education at the classroom and school level.

- 6b. Pre-service teachers at Edgewood should be informed by specialists across disciplines on how to manage the teaching and learning of HIV/AIDS education at the classroom and school level.
- 13a. Data Handling using HIV/AIDS statistics in mathematics education modules at Edgewood provides personal knowledge for pre-service teachers.
- 13b. Mathematics education modules at Edgewood should make more use of HIV/AIDS statistics to provide personal knowledge for pre-service teachers.

Over the three years of study, the female pre-service teachers were more in favour of the following ideas surveyed in the questionnaire than were male pre-service teachers:

- 1b. Pre-service teacher education at Edgewood should pay more attention to HIV/AIDS education.
- 2b. A more active HIV/AIDS education policy for pre-service teachers should be in place at Edgewood.
- 6a. Pre-service teachers at Edgewood should be informed by the discipline specialists in Life Orientation or Gender Education on how to manage the teaching and learning of HIV/AIDS education at the classroom and school level.
- 6b. Pre-service teachers at Edgewood should be informed by specialists across disciplines on how to manage the teaching and learning of HIV/AIDS education at the classroom and school level.
- 13b. Mathematics education modules at Edgewood should make more use of HIV/AIDS statistics to provide personal knowledge for pre-service teachers.

Over the three years of study, the black, Coloured and Indian respondents were more in favour of the following ideas surveyed than were white pre-service teachers:

- 1b. Pre-service teacher education at Edgewood should pay more attention to HIV/AIDS education.
- 2b. A more active HIV/AIDS education policy for pre-service teachers should be in place at Edgewood.

Over the three years of study, the black respondents were more in favour of the following ideas surveyed than were Coloured, Indian and white pre-service teachers:

13a. Data Handling using HIV/AIDS statistics in mathematics education modules at Edgewood provides personal knowledge for pre-service teachers.

13b. Mathematics education modules at Edgewood should make more use of HIV/AIDS statistics to provide personal knowledge for pre-service teachers.

There are teaching profession requirements that are set out in official Department of Education (DoE) policy documents in South Africa. In order to address the research question: ‘How do national, provincial and institutional curriculum policies shape pre-service teacher HIV and AIDS education at UKZN Faculty of Education Edgewood Campus?’ the necessary policy documents were analyzed in Chapter Two. Policies that govern schools, teacher education and higher education policies were scrutinized. The analysis highlighted that the legislation in these documents makes provision for HIV and AIDS education in pre-service teacher education but little research evidence of ‘shaping’ HIV and AIDS education appears to be available. There appears to be a lack of commitment to implement policy directives and higher education institutions are urged to take up the challenge to develop curricula and programmes for pre-service teachers in the area of HIV and AIDS education (Otaala, 2006; SAUVCA, 2000).

One of the suggestions provided by the DoE policy documents is the ‘integration’ model. Researchers such as Pattman and Chege (2003), in particular, emphasize the importance of equipping teachers of young learners to facilitate HIV and AIDS education. To implement inclusion of HIV and AIDS education by integration in a specific context, such as UKZN Faculty of Education, it was necessary to explore the question ‘What are the pre-service teachers’ perceptions/opinions of policy, curriculum and models of offering HIV and AIDS education?’ at the Edgewood Campus.

Researchers have noted that there is a trend among teenagers and young adults to be 'Sick of AIDS' (Mitchell & Smith, 2003). This sentiment is often expressed by learners who think that the HIV and AIDS education is over emphasized at school level. It was thus necessary to give the pre-service teachers at the Edgewood Campus an opportunity to express their opinions about the manner in which HIV and AIDS education should or could be provided. The questionnaire that was analysed in this chapter was used to canvas the opinions of the pre-service teachers who had experienced some integration of HIV and AIDS education during the mathematics education module that is specifically for pre-service teachers of young learners.

From the questionnaire responses and the multiple methods of analysis that I employed, it is clear that the pre-service teachers are of the opinion that teaching and learning about HIV and AIDS education at Edgewood can be extended. This needs survey has provided me with a clear mandate to continue extending the integration of HIV and AIDS education. This integration model that I implemented appears to be favourably accepted by pre-service teachers and they are also of the opinion that they should also be informed about HIV and AIDS education by specialists in Life Orientation or Gender Education. This supports the notion of preparing teachers to be 'multiskilled' in that they need to be prepared to be HIV-aware, HIV-competent, and HIV-safe teachers during their undergraduate years of study. In future mathematics education modules I will give the pre-service teachers insights into these results obtained from this survey that was conducted in 2004, 2005 and 2006.

The differences in the ethnic groups confirmed that black (African) respondents are more in favour of using Data Handling in mathematics education as a vehicle to extend

knowledge, skills, values and attitudes about HIV and AIDS education and are of the opinion that I should make more use of HIV and AIDS statistics to provide personal knowledge about HIV and AIDS.

The purpose of analyzing the responses of the questionnaire in this chapter was to survey the opinions of the pre-service teachers who were registered for primary mathematics education. In the following chapter, I present work with a small group of fourth year pre-service teachers who were registered for PME 210 during 2004. The work with the focus group participants, that is described and analysed in Chapter Five, considers interventions that were used in the mathematics classrooms of young learners. In Chapter Five a ‘participatory’ method (Chege, 2006), where pre-service teachers are assisted with the development of skills to convey HIV and AIDS education in an appropriate manner, are explored. After developing appropriate knowledge, skills, attitudes and values for lesson activities during focus group workshops, the focus group participants integrated HIV and AIDS education in mathematics classrooms during practice teaching.

## **CHAPTER THREE**

### **METHODOLOGY**

“Anyone who has never made a mistake has never tried anything new.”

Albert Einstein

#### **INTRODUCTION**

In this chapter I situate the views of knowledge of the action researcher within the general views of knowledge production espoused by sociologists. I describe what is offered in qualitative, quantitative and action research methodological paradigms and explain my mixed mode approach to *Starting with ourselves*: I describe my ‘hybrid’ self-study research design. I provide details of research designs that incorporate action research and discuss possible concerns and criticisms leveled at work in the field of action research. I introduce the participants that operated in three different settings and explain the data sources developed and drawn from to provide information about the settings. Lastly I explain how and why particular methods were used to analyse the data and validation processes that were established and thereafter I present a description of the organization of the findings provided in chapters four, five and six.

#### **VIEWS OF KNOWLEDGE IN EDUCATIONAL RESEARCH**

Research in education is undeniably set in a social context so it is necessary to consider how sociologists view knowledge development and where a self-study, that incorporates action research, is situated. It is thus important to consider the notion that teachers and teacher educators involved in self-study are able to take charge of knowledge development in their own practice. The manner in which knowledge is

developed needs to be seen as situated in a particular setting where epistemological and ontological assumptions are taken into account. A close relationship exists between methodological and epistemological dimensions (what constitutes knowledge) as choice of my methodological paradigm(s) is influenced by my epistemological ideal/interest that is particularly concerned with ‘making a difference’ by integrating HIV and AIDS education in a pre-service mathematics education setting.

Mouton (1996) classifies research in disciplines, such as education, as belonging to the body of knowledge that he describes as the ‘world of science’ where epistemic interest is concerned with attaining ‘true knowledge’ which is in opposition to obtaining knowledge that may be classified as ‘mere opinion’. He places ‘action research’ as a possible methodology in the ‘world of science’. One of the many possible interpretations of the nature of scientific inquiry is that research is a problem-solving social activity (the sociological model) where science is seen to be a collaborative social activity. Integrating HIV and AIDS education in mathematics may be envisaged as such a problem-solving social activity. Another possible interpretation is the search for truth (the epistemic model) where scientists typically apply the principles of deductive and inductive logic in the assessment of new hypotheses. Making use of, for example, questionnaires to survey the opinions of pre-service teachers on the possible integration of HIV and AIDS education in mathematics would fit comfortably in this epistemic model.

McNiff (1993), on the other hand, resists the notion that ‘Educational knowledge’ is a type of Scientific Knowledge but McNiff (1993, p. 46) distinguishes between

‘intrinsic’ and ‘extrinsic’ educational knowledge. If factors contribute to the improvement of knowledge are in the individual’s mind, the knowledge is termed ‘intrinsically educational’ whereas if the factors such as skills of pedagogy and management lead to an enhanced situation among persons then the knowledge is called ‘extrinsically educational’. McNiff is opposed to the fact that educational research and theory can be assumed to be related only to sociological or management factors as this view minimizes the importance of individual rationality. Furthermore, methodologies based on collectivism rather than individualism are too concerned with behaviour and control of behaviour rather than the state of consciousness of individuals. In McNiff’s view:

...the process of education is the self’s knowledge of the self, the workings of the organizational elements of mind that raise intuitive levels of mind to rational consciousness. The process of educating is essentially concerned with the development of one’s own rationality, with a view to enabling the development of another person’s rationality. (McNiff, 1993, p. 47)

Research, in McNiff’s opinion, should focus on showing how the researcher has come to know and how the researcher has ‘moved’ from a less satisfactory state of being to a more satisfactory state where values are in process of being realized. The dominant paradigm for educational research is seen to be too technicist as ‘Educational research is still seen in the light of the application of this body of knowledge, in terms of a clear process (know-how) of the application of a specific content (know-that).’ McNiff’s knowledge focus appears to be in opposition to research that centres on pedagogic content knowledge and subject content knowledge (See Chapter Five.). Instead McNiff (1993, p. 51) considers educational research to be a process of systematic enquiry that is made public. Here an individual’s life choices take the

form of steps where ‘trail and error’ occur in an iterative fashion and eventually success triumphs and leads to a more satisfactory situation when educational values are realized in practice. For example, the iterative manner in which I attempted to improve the manner in which I developed an integrated approach over the three years of including HIV and AIDS education in mathematics would be seen as working towards evolving an improved situation. It is the process that is envisaged as a journey towards realizing of values and the journey is the objective. So, although education occurs in a social context, educational research should be concerned with the process of development of individual rationality and not the construction of social status.

Although McNiff (1993, p. 53), acknowledges the fact that we need to achieve a community of creative practitioners where we need to agree upon the knowledge base for our practices so we are required to identify and agree upon the values that we share as teachers. The concept of acknowledgement by fellow practitioners is supported by the work of Wenger. Wenger (1998, p. 141) points out that knowledge ‘is not just a matter of local regimes of competence; it depends also on the orientation of these practices within broader constellations.’ He emphasizes that:

What we dare consider knowledge is not just a matter of our own experiences of meaning or even our own regimes of competence. It is also a matter of the positions of our practices with respect to the broader historical, social, and institutional discourses and styles (e.g., scientific, religious, political, artistic) to which we orient our practices in various ways and to which we can thus be more or less accountable. (Wenger, 1998, p. 141)

Wenger (1998) goes on to explain:

Our knowing – even of the most unexceptional kind – is always too big, too rich, too ancient, and too connected for us to be the source of it individually. At the same time, our knowing – even of the most elevated kind – is too engaged, too precise, too tailored, too active, and too experiential for it to be just of a generic size. The experience of knowing is no less unique, no less creative, and no less extraordinary for being one of participation. (Wenger, 1998, p. 142)

It seems that through an individual's experiences and knowing that innovative, creative, pedagogical imagination is possible in, for example, a mathematics education lecture room with pre-service teachers. Usually one lecturer addresses a group of pre-service teachers during a mathematics education module so the importance of an individual teacher or lecturer cannot be underestimated in the development of 'new' knowledge. The manner in which I decided to integrate HIV and AIDS education in pre-service mathematics education modules was based on my initiatives and interest in 'making a difference' in my teaching situation. The premise in self-study that educational research conducted by the individual researcher should be 'made public' does elevate and set the new knowledge in a social context. It is thus necessary to explain what 'types' of paradigms are appropriate for the development of educational knowledge.

## **METHODOLOGICAL AND EPISTEMOLOGICAL CONSIDERATIONS**

Quantitative, qualitative and action research paradigms give clues to the assumptions and values underlying a research project. McNiff (2006) describes a paradigm as a collection of ideas or theories appropriate to a specific context and she distinguishes three paradigms, namely: Technical (empirical), Interpretive and Critical Theoretic research.

McNiff (2006) describes each of the paradigms or approaches in terms of the different views about the nature of knowledge, how the knowledge is acquired and how it is used. Table 3 sets out assumptions made in each of these research paradigms and where each of these approaches is used.

<b>Name of paradigm</b>	<b>Technical (empirical)</b>	<b>Interpretive</b>	<b>Critical Theoretic</b>
<b>Assumptions</b>	<p>The researcher stays outside the research field to maintain objectivity.</p> <p>There is a cause and effect relationship present.</p> <p>Results are generated usually through statistical analysis, and always remain true.</p> <p>The results can be applied and generalized to other people's practices and are replicable.</p>	<p>Researchers observe people in their natural settings, and offer descriptions and explanations for what people do.</p> <p>Analysis of data tends to be qualitative, in terms of meanings of behaviours.</p> <p>People offer and negotiate their understandings of their practices with external researchers but the external researcher's story goes into the public domain.</p>	<p>It is important to understand a situation in order to change it.</p> <p>Social situations are created by people, so can be deconstructed and reconstructed by people.</p> <p>Taken for granted situations need to be seen in terms of their origins – particularly in terms of power relationships.</p>
<b>Uses</b>	<p>Technical research is used throughout scientific enquiry.</p>	<p>Interpretive research is used widely in social science and educational research.</p>	<p>Critical theory critiques existing forms of research on the basis that research is never neutral, but is used by a researcher for a specific purpose.</p>

**Table 3: Paradigm descriptions by McNiff (2006, pp. 40-41)**

Researchers may, however, choose to combine a selection of research methods and techniques in a 'mixed mode' methodology that uses multiple methods and techniques is one of the best ways to improve the quality of research (Mouton, 1996; Johnson & Onwuegbuzie, 2004). I will describe how I adapted and used ontologies (theories of being or realities), epistemologies (theories of knowledge and knowledge acquisition)

and methodologies (theories of conducting research) to explore how I developed my own practice and theory in HIV and AIDS education in a mathematics education module. My interest in HIV and AIDS education may be seen as an attempt to 'make a difference' in HIV and AIDS pre-service teacher education at my HEI.

Individual and collective human interest has played a role in educational research in many different ways. The work of the German philosopher Habermas (1972; 1987) and his classification of human interest have been used by a number of educational researchers (Grundy, 1987; Masters, 1995; McNiff & Whitehead, 2006; Placier et al, 2006; Smyth, 2004) to devise frameworks to discuss and analyse social activities. Habermas (1974) considers knowledge to be as a result of human interest in technical, practical or emancipatory interests. Technical knowledge is considered to generate procedural knowledge whereas practical knowledge is generated from the interpretive paradigm. Emancipatory knowledge, on the other hand, arises from the critical paradigm. The use of critical reflection allows people to identify and overcome ideological distortions. Habermas' critical social theory presents a theoretical model for understanding action research that promotes emancipatory praxis (informed doing-action) by promoting critical consciousness which is displayed in political as well as practical action to encourage change.

McNiff and Whitehead (2006) supplement the three interests defined by Habermas with a fourth interest that arises from an action research perspective, namely, educational interest. This interest 'focuses on establishing practices that are grounded in people's capacity and desire for relation, and self-government in communitarian work.' (McNiff & Whitehead, 2006, p. 250). By introducing HIV and

AIDS education in a mathematics education module, I had more than one interest in mind and attempted to harness the benefits of using a variety of paradigms to further my interests. I will show how I made use of selective ‘forms’ of the three paradigms to further my ideals using what is known as ‘mixed mode’ methodology.

When I pursued my ‘making a difference’ educational interest through statistical analysis in a quantitative/technical paradigm it did not necessarily mean that I considered reality to be stable and law-like and that the knowledge gained was objective and unbiased. According to Durrheim (2002b, p. 96), statistics are an extremely valuable tool in organizing a useful argument from quantitative evidence because statistics involve a set of mathematical techniques that permit the researcher to make knowledge claims using forms of principled argument. Quantitative methodology does, however, imply that an hypothesis is being tested in a deductive manner as the question posed does ‘lead’ the respondent to make a choice when, for example, answering closed questions or statements in a questionnaire. Furthermore, when statistical results are used in a case study situation, the results can often not be generalized to other practices and replication may be impossible to achieve. Making use of statistics can, however, allow for a large group of respondents to give their opinion on a specific matter. For example, if the 150 – 200 pre-service teachers in the mathematics education module were not given the opportunity, provided by a questionnaire, to say whether or not they consider HIV and AIDS education in mathematics modules to be important, then the pre-service teachers would not be given an opportunity to ‘voice’ their opinion on this specific matter. The knowledge I gained from asking the pre-service teachers to complete a questionnaire was not aimed at controlling the environment in an instrumental manner.

Results that I obtained by positioning myself in a qualitative/interpretive paradigm were aimed at understanding what is happening in a social situation where negotiated meanings were observed in a subjective reality. Qualitative methodology implies that an inductive method is used to analyse 'dense' data to obtain themes of common concepts. By developing knowledge from participant observation and analyzing meanings of behaviours it is possible for people in specific situations to offer and negotiate their own understanding of their practices with the interpretations of an external researcher. It is, however, the external researcher's narrative and point of view that is made public and not the participant's point of view. Knowledge gained in this manner in this research did nonetheless give insight for assessment of my actions. For example, if I did not make use of the opportunity to observe and interpret the actions of the pre-service teachers whilst they taught HIV and AIDS education in their mathematics classrooms during practice teaching, then I would not have been able to judge, inform and guide my pedagogical imagination, my pedagogical actions and organization or my pedagogical reasoning.

The information I gleaned by situating myself in a qualitative/Critical Theoretic paradigm was to understand human interest involved both in social settings and in the methods used to find out about the values and power relations in a dialectical reality. Unpacking my values and power relations during participatory action research was important to understand a situation so that I can bring about change to my practice. Here the importance of the social situations that were created and deconstructed by people was explored in my value laden research position. Using the Critical Theoretic approach I was able to understand the situation at my HEI that requires change. Knowledge developed here gave me insight into how I could organize my thinking in

terms of what I am experiencing at a HEI and the tensions I experienced whilst developing my curriculum initiative.

Atweh (2002) points out interesting relationships and tensions that show the dialectical nature of action research that are of value from a *Starting with ourselves* perspective. He lists the following relationships:

- Changing reality in order to understand it and understanding reality in order to change it.
- No individuation is possible without socialization, and no socialization is possible without individuation.
- Subjectivity of the object and objectivity of the subjective.
- Nothing is more practical than a good theory – the best theory is a good practice.
- Critical friend. (Atweh, 2002, p. 57)

It may be because of the existence of dichotomies, such as the ones listed by Atweh (2002), in a self-study that incorporates action research methodologies that my exploration catered for my technical, practical, emancipatory as well as educational interests. By making use of a mixed methods research design I ‘balanced’ the quantitative-qualitative dichotomy. Mixed methods probably suited my needs/interests as a mathematics teacher educator but at the same time I am committed to improvement in my practice in a social context that is eroded by the HIV and AIDS pandemic. To compound the difficulties in the dialectical tensions provided by Atweh (2002) I added yet another challenging tension – HIV and AIDS education in mathematics education.

In educational research, action research has been used for approximately 70 years and has often been linked with social change for social justice (Knight, 2002, p. 37; McNiff & Whitehead, 2006, pp. 36 & 38). According to Susman and Evered (1978), action research is considered to date back to the work of John Collier who acted as a commissioner for Indian affairs in the 1930s but the term ‘action research’ was coined by Kurt Lewin in 1946. Lewin sought methods to deal with social problems as traditional research methods were not assisting with the resolution of critical social problems.

Action research is also thought of as a ‘form’ of critical theory as the need to understand a situation is ‘extended’ into making way for possibilities of how I can change a situation. Whilst exploring integration of HIV and AIDS education in a mathematics education module that I taught, I studied the realities that exist at my HEI, considered the ways of knowing and knowledge developed and conducted research appropriately to position myself as a ‘practitioner-theorist’.

## **RESEARCH DESIGNS THAT INCORPORATE ACTION RESEARCH**

Authors in the field of ‘Action Research’ have developed a variety of defining characteristics of this methodological paradigm. From the literature, action research projects do, however, appear to have four common characteristics. Castello (2003, p. 6) points out that usually the common features in action research are that action research is practical, focuses on change, involves a cyclical process and is concerned with participation. The cyclical process may include ‘observe-reflect-act-evaluate-modify-move in new directions’ ongoing processes. From reading about the nature of action research, it is clear that the competing and complementary views exist as to

arguments, positions and theoretical perspectives advanced by local and international authors in this methodological field (Brink, 2003; Castello, 2003; Dawson, 2002; De Vos, 2002; Knight, 2002; Masters, 1995; McNiff & Whitehead, 2006).

There are undeniable benefits from making use of action research for self-study but Castello (2003, p. 40) points out that concerns and criticisms are leveled at this methodology when ethical, rigour and generalizability issues are targeted. As mentioned before, educational research is set in a social context so at times it is necessary to work with others so ethical considerations are vital. From the inception of my project, the pre-service teachers were made aware that our focus group work on *HIV/AIDS Mathematics Education Project* was part of my Higher Degree research. I obtained informed consent from the pre-service teachers with whom I worked closely (See Appendix B.) and made concerted efforts not to ‘pre-service teacher bash’ or exploit participants. I asked the pre-service teachers to transcribe their own interviews and teaching sessions so that each pre-service teacher was given the opportunity to scrutinize and reflect on their viewpoints after transcription.

Critics of action research label work in this field as operating in a ‘deficit’ model (Castello, 2003) i.e. research is often focused on noticing that ‘something’ is wrong and then research attempts to remedy the situation using some form of action. Self-study using action research does allow practitioners to investigate and evaluate their own work and undoubtedly action research is a response to the questions ‘What do I need to improve?’ and ‘How do I improve it?’ Perhaps seeking an improvement is not possible without finding that something is ‘lacking’ but having a vision of enhancement rather than deficit is nonetheless a more ‘positive’ stance.

Action research may be seen as a form of professional education which allows for a 'bottom up' as opposed to 'top down' form of teacher development. Teachers, according to Wragg (1994, p. 111), use action research to improve their teaching by 'reacting' or by being 'proactive'. I did not examine what was occurring in my mathematics education lecture venue to attempt to find what was lacking and then develop a programme to react to the problem. I saw a need to implement an intervention programme by integrating HIV and AIDS education in a mathematics education module and now I am working towards improving on my implementation strategies. By using action research I was able to use proactive methods that are appropriate to my professional context by advancing what I consider to be important in teacher education.

I have had the opportunity to study the work of various writers in the field of Action Research. It appears that practitioners are allowed to develop 'custom' made models to fit a particular research context. As a mathematics teacher educator there are other subsidiary advantages to doing action research. My primary interest in using an action research methodology is to 'make a difference' in HIV and AIDS education at a HEI through a mathematics education module but there are other important enabling factors that I have learnt from using action research in a self-study. Action research fosters reflective practice and studying my practice provides an excellent medium for reflection to take place. As a teacher educator I am able to model reflective practice and simultaneously benefit from critical analysis of my actions. By using action research I am afforded the opportunity to explore how I see the relationships between educational theory and practice in my discipline and extend this to an interdisciplinary approach through integration of HIV and AIDS education in a mathematics education module. The critical scrutiny of my practice has allowed me to 'make a difference' at

‘grass root’ level in pre-service teacher education. I have used the conduit provided by action research to explore my own self-study research interest. I have moved towards developing my teaching at a HEI by documenting a research process in a systematic manner. The research process is ongoing but I can describe the progress at any particular stage of the process. My HEI will benefit from this self-study and by dissemination of the knowledge that I gain the teaching community at large will benefit.

Often questions regarding the ‘trustworthiness’ of action research are loudly and clearly articulated (Knight, 2002). These questions centre round ‘validity’, ‘reliability’ and/or ‘generalizability’. These three terms were, however, originally designed to assess quantitative methodologies but qualitative methodologies are now often subjected to scrutiny using these benchmarks. The manner in which I addressed these questions are considered at commencement of Chapters Four, Five and Six.

### **SELF-STUDY**

The use of *Starting with ourselves* suited my interest in ‘making a difference’ at my teacher education institution. The model offered by Loughran (1999) and Mitchell et al. (2005) matched the requirements for my study with pre-service teacher educators because of the social orientation consideration in my integration of HIV and AIDS education in mathematics. I was concerned with how to improve my understanding of the integration process so I endeavored to increase the use of research approaches that are related to social and critical enquiry.

An essential consideration in self-study is the self examination of the researcher’s personal pedagogical beliefs as is portrayed in the researcher’s own teaching,

scholarship and results obtained from undertaking research. This self-study was designed to move towards integrating reflection of my teaching practice as a teacher educator and my theories of integration of HIV and AIDS education in mathematics. Through the mix of practice and theory, I attempted to connect my experiences and my theories and simultaneously extended the development of my theories.

Studying one's own practice is by no means simple and straight forward as often the purpose of self-study is to provoke, challenge and illuminate rather than confirm and resolve (Bullough & Pinnegar, 2001). One of the aims of self-study is, however to attempt to bring about changes to teaching practices in order to facilitate improvements to practice.

LaBoskey (2004; 2006) outlines five essential characteristics for self-study methodology and these served as guidelines for my study design. She lists the five characteristics as self-initiated and self-focused, improvement-aimed, employs multiple (mainly qualitative) methods, interactive at one or more stages of the process, and validation achieved through the construction, testing, sharing, and re-testing of exemplars of teaching practice. I will explain how my research that aimed at self and module renewal satisfies each of these characteristics.

Although the need to present integrated material is state-mandated by various policy documents (See Chapter Two.), the integration of HIV and AIDS education in mathematics and the study of it were self-initiated. I saw the need to 'make a difference' by initiating an aspect of social change in the modules I am responsible for at a HEI that is situated at the centre of the HIV and AIDS pandemic. The research is

self-focused because I explore the questions: ‘How can I better help pre-service teachers to learn about and to prepare mathematics lessons that take cognizance of HIV and AIDS and heighten awareness of the pandemic?’ and ‘How do I live my values of social justice more fully in my practice?’

My research is aimed at improvement. I made use of empirical and theoretical considerations in both HIV and AIDS education and mathematics education to extend my knowledge, skills, attitudes and values as well as those of the pre-service teachers who are registered for the PME 210 module. The research project has spanned over three years of study of my delivery of the PME 210 module and will continue for as long as I am responsible for this module. The details of what occurred in the facilitation of the integration process are summarized in the section entitled ‘The settings’ and further explained in the section entitled ‘The design of my study’.

My research included multiple sources of data to facilitate and improve the shaping and informing of my instructional design choices whilst integrating HIV and AIDS education in mathematics. This necessitated the combination of quantitative, qualitative and action research paradigms to develop a unique ‘mixed-mode’ research design. In my opinion there are no infallible sets of ‘truths’ and one form of research paradigm does not reign supreme over another. It is more the purpose for which a particular research paradigm is used that is of importance. By using quantitative, qualitative methods and action research paradigms it was possible to focus on many aspects in the research of my teaching and learning of HIV and AIDS education in mathematics. This facilitated the exploration of my curriculum initiative by using a ‘wide methodological lens’ to illuminate my particular context and situation. In using

a quantitative research paradigm, the unit of analysis is not the numbers obtained. Even in qualitative research words or phrases may be 'coded' and eventually words and/or meanings are treated as 'numbers' to develop themes. Many of my arguments are grounded in 'qualitative' reasoning, where my bias was visible. By focusing on a limited context for my self-study, however, I was able to give a sharp yet holistic perspective that may be seen as an illuminating, multifaceted view of my integration strategy in a mathematics education module at a HEI. Making use of a *Starting with ourselves* approach afforded me the privilege of developing a 'custom' made 'hybrid' mixed-mode model that fitted my particular research context and interests. I use words, pictures and narrative as well as numbers to produce a holistic view. For example, difficulties experienced in putting into words what cultural images and stereotypes have shaped us may be overcome by making use of a drawing. The work of Mitchell and Weber (1999, p. 131) shows that drawings are revealing as they can 'point to things we may not yet be able to put into words'. I have explored a combination of research methods to showcase how I can improve on my ability to 'make a difference' by informing theory and practice after observation, reflection, action, evaluation and modification.

There were multiple opportunities of interactions, particularly during focus group discussions. The function of the focus group discussions was to promote interactions amongst a group of non-homogenous participants. Furthermore my research has evoked much interest in colleagues and many mathematics education corridor interactions include suggestions, advice, ideas and information about the teaching and learning of HIV and AIDS.

Making use of HIV and AIDS education in the mathematics discipline has, however, been met with some surprise by other staff members in my HEI as during my initial proposal preparation one of my colleagues asked: ‘Why HIV in mathematics?’ It may be difficult to convince researchers that integration across a ‘high-stake’ discipline such as mathematics and other disciplines is essential to further HIV and AIDS education. Perhaps my approach may be interpreted by some researchers as an unsatisfactory merging of a ‘soft’ (Fals Borda, 2002, p. 47) discipline with a ‘hard’ discipline such as mathematics. According to Fals Borda (2002), researchers who integrate disciplines are able to ‘challenge established ways and rules with heterodox research and study techniques’ and this may prove to be unacceptable by colleagues at HEIs who do not see ‘the need to combine diverse disciplines to achieve social transformations’ (Fals Borda, 2002, p. 47). In *Leading in a Culture of Change*, Fullan (2001) identifies crucial mind and action sets that must be cultivated to foster acceptance by practitioners and researchers. He considers that more than a deep sense of moral purpose, knowledge of the change process, capacity to develop relationships across diverse individuals and groups, fostering knowledge creation and sharing to be required. An additional requirement Fullan (2001) mentions is the ability to engage with others in coherence making amidst multiple innovations.

The manner in which this piece of research is presented clearly exposes my pedagogical and study strategies so that they can be re-tested to investigate its ‘trustworthiness’. Feldman (2003) makes four useful suggestions to increase validity when presenting self-study for dissemination. Firstly, he highlights the need to provide clear and detailed descriptions of how data is collected together with research methods and what counts as data. Secondly, he points to the need to provide clear and detailed descriptions of how the representations are constructed from data.

Thirdly, Feldman (2003) considers it necessary to extend triangulation beyond multiples sources of data to include explorations of multiples ways to represent the same investigation. Fourthly, evidence of the value of the changes in our actions should be presented. Furthermore, to insure that the quality of representations is of value, the work presented should be well founded, just and trustworthy.

It is thus not a trivial matter to present self-study research for public scrutiny but I believe I have achieved what is required for self-study in the study description given below where I provide extensive explanations of what occurred during the PME 210 modules and during the focus group discussions together with full disclosure of the methods used to analyze the data obtained. Furthermore, the validation processes used are explored later in each of the three findings chapters under the heading 'Validation of data'.

### **THE STUDY: USING A SELF-STUDY RESEARCH FRAMEWORK**

As pre-service teachers will be expected to teach what is set out in the Revised National Curriculum Statement (RNCS) for Grades R-9 (DoE, 2002), they are required to comply with what is currently called for in the teaching and learning of the Mathematics Learning Area. The RNCS proposes critical and developmental outcomes that are derived from our South African Constitution. One of the critical outcomes for school-goers is to 'Collect, analyse, organise and critically evaluate information' whereas one of the developmental outcomes includes to 'Participate as responsible citizens in the life of local, national and global communities'. Furthermore, in the definition of mathematics, the RNCS states that 'Deliberate attempts must be made in the teaching and learning of Mathematics to incorporate

contexts that can build awareness of human rights, social, economic and environmental issues relevant and appropriate to learners' realities.' (DoE, 2002, p. 47). It is therefore appropriate to integrate HIV and AIDS education across learning areas in all the Mathematics Learning Outcomes but the Learning Outcome called Data Handling is particularly suited to integration of HIV and AIDS education. In Data Handling learners are expected to be 'able to collect, summarise, display and critically analyse data to draw conclusions and make predications and interpret' (DoE, 2002, p. 6).

A three 'pronged' *Starting with ourselves* approach was devised. The one prong comprised of my work with developing HIV and AIDS education in the Data Handling section of the PME 210 module with third year pre-service teachers; the second prong explored work with a focus group of fourth year pre-service teachers and the last prong focused on me and my story as well as what I gained during this study. The research setting for each prong was different but my aim was to explore how generalist pre-service teachers could go about developing HIV and AIDS education in the mathematics discipline. On the one hand I developed, reflected and refined mathematics education activities for pre-service teachers and I asked the focus group participants to carry out and reflect and on the HIV and AIDS in Mathematics education activities that I considered suitable for pre-service teachers in the PME 210 module. On the other hand the focus group participants prepared, reflected and refined HIV and AIDS education in Mathematics activities that we considered appropriate for use in school mathematics classrooms with young learners in the Foundation or Intermediate Phase (5 – 11 years). In order to concentrate specifically on my involvement in the integration process, I analysed my interactions during focus group discussions. In addition I focused on how 'collaborative autobiographical'

(Butt & Raymond, 1989; Butt & Retallick, 2002; McIntyre & Cole, 1999) work with an experienced researcher-teacher furthered my vision of integration HIV and AIDS education in mathematics teacher education. This three pronged subdivision of my self-study gave me an opportunity to explore my involvement as a teacher educator together with pre-service teacher participation and this allowed for the necessary rigor that lead to a greater likelihood of positive influence on HIV and AIDS education in Mathematics.

***The participants***

The pre-service teacher participants in the research were all Early Childhood Development, Foundation, Intermediate or Senior Phase specialists. They were either third year or fourth year BEd undergraduates who were registered for a four-year degree at the Edgewood Campus.

<b>Year of study</b>	<b>Number of pre-service teachers registered for PME 210</b>
2004	145
2005	165
2006	199

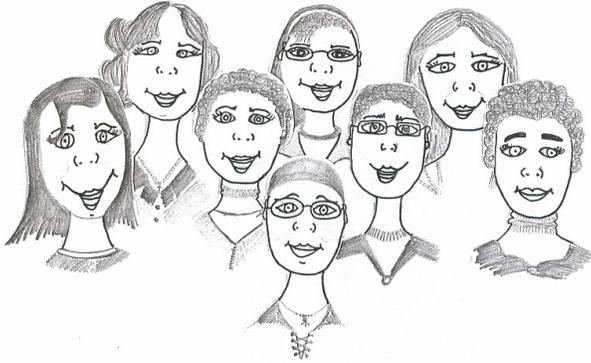
**Table 4: Summary of the number of pre-service teachers who were participants in the study**

Third or fourth year pre-service teachers were selected as, at the time of the study, they had completed more than half of their undergraduate degree. Pre-service teachers registered for PME 210 were mainly in their third year of undergraduate study whereas fourth year pre-service teachers who volunteered for the *HIV/AIDS Mathematics Education Project* had completed the PME 210 module. Table 4 shows

the number of pre-service teachers who were registered for PME 210. I assumed that the knowledge of the teacher education curriculum of third year or fourth year pre-service teachers was sufficient to comment and provide informed opinions on HIV and AIDS and Mathematics teacher education.

### ***HIV/AIDS Mathematics Education Project***

During 2005, in addition to working with PME 210 lecture groups. I worked with a group of seven volunteer fourth year pre-service teachers who had expressed an interest in working with me on the *HIV/AIDS Mathematics Education Project*. To ensure confidentiality each focus group participant was given a pseudonym. Because photographs of the focus group would risk confidentiality, I make use of drawn pictures of the focus group to show the composition of the group. Figure 1 is a diagrammatic representation of the focus group but the positioning of the drawn representations of participants is the same as for a photograph that was taken of the group. These volunteers were part of a cohort of one hundred and forty-five pre-service teachers who completed PME 210 in the first semester of 2004. I have called this group of seven participants the ‘focus group’ in my action research study. I considered myself as being a member of this focus group too.



**Figure 1: Diagrammatic representation of the focus group. The participants are named from left to right. Nobunti is in the front row; Keshni, Londi, Thembe and Celiwe are in the middle row; Linda (researcher), Kathy and Netha are in the back row (Diagram by Liska van Laren from a photograph of focus group)**

Londi, Thembe and Celiwe are mature, pre-service teachers from neighboring rural Lesotho that, like South Africa, is ravaged by the HIV and AIDS pandemic. They are also parents and have vast experience at teaching young learners in rural settings. Londi, Thembe and Celiwe studied at HEIs in Lesotho; Londi and Thembe gained Primary teachers' Certificates at the National University of Lesotho and Celiwe obtained certificates from the Lesotho College for teacher education. Before the *HIV/AIDS Mathematics Education Project* had commenced, Londi, Thembe and Celiwe had completed three modules in School Guidance offered at Edgewood. (School Guidance modules provide knowledge and skills related to HIV and AIDS education.)

Kathy, Keshni, Netha and Nobunti are South Africans from urban settings. Keshni's family members are nurses at their local hospital. According to Keshni, her family has constant interactions with HIV and AIDS patients. Kathy and Nobunti are staunch members of their local Catholic church and are highly involved in its activities. Nobunti's first language is IsiZulu and she often speaks about the coming

2010 soccer world cup in South Africa and her worry that because of the HIV pandemic, many people will die before the tournament. Only Nobunti had not registered for the Diversity and Learning module that was offered in their first year at Edgewood. (The Diversity and Learning module considers HIV and AIDS from a social justice perspective whilst examining social inequalities.)

<b>Name of participant</b>	<b>Basic Mathematics Semester 2 (2002)</b>	<b>Primary Mathematics Education 110 Semester 2 (2003)</b>	<b>Primary Mathematics Education 210 Semester 1 (2004)</b>
Keshni	Not required	72	78
Nobunti	55	62	53
Celiwe	51	54	58
Thembe	83	81	82
Kathy	Not required	68	55
Netha	59	64	65
Londi	80	70	76

**Table 5: Participants' marks gained for Basic Mathematics and Mathematics Education modules**

Table 5 shows the Basic Mathematics and Primary Mathematics Education achievement of each of the participants during their first three years as pre-service teachers at Edgewood. Keshni and Kathy were not required to take Basic Mathematics in their first year of study (2002) because they had chosen and passed Mathematics as a matriculation subject. Only Keshni had registered and passed four additional mathematics education modules. These mathematics education modules were electives.

Another 'participant', Dr Nancy Lesko, who is an experienced researcher-teacher, worked with me. Dr Nancy Lesko is from Teachers College, Columbia University in New York. Dr Lesko is interested in studying how faculty members at UKZN teach about HIV and AIDS. Before the interview, Dr Lesko observed how I made use of an

integrated HIV and AIDS education and mathematics tutorial (See Appendix C.) where pre-service teachers were asked to do mathematical calculations, draw graphs and interpret and reflect on HIV and AIDS information. I was interviewed by Dr Lesko where my work on HIV and AIDS education in the Mathematics discipline was discussed. I recorded a summary of my responses to Dr Lesko's interview and a transcript of the interview was prepared. This interview was not designed to be part of my research project but the interview formed part of her Fulbright New Century Scholars Program in Higher Education and Social Cohesion research. Dr Lesko also prepared a reflection of the interview that provides useful information so that I could re-reflect on my beliefs, achievement and intensions/aspirations for HIV and AIDS education in mathematics.

### ***The settings***

There are three separate settings in this study. The settings are distinguished through their different physical space, time and place constraints. The research of the integration process was thus located at three different implementation levels. The first two levels were situated at the Edgewood Campus of UKZN. The first level focused on the implementation in a PME 210 module, the second level was concerned with the focus group interactions where knowledge, skills, values and attitudes of the participants were extended for the implementation of HIV and AIDS education in mathematics in classrooms. The third level explored how the participants presented HIV and AIDS education in mathematics lessons during practice teaching with young learners at schools in the Durban area.

The physical spatial setting for the first level, the PME 210 module, is a lecture room where all the pre-service teachers were seated in rows facing me, their mathematics teacher educator. In these lecture rooms there are approximately seventy seats with rows of parallel seats running in straight parallel lines. Each row contains more or less 9 seats. The pre-service teachers who register for the PME 210 module are, according to the BEd requirements at the Edgewood Campus, required to complete and pass this module in order to become qualified graduate primary school teachers. The context for the PME 210 module is the teaching and learning of the Mathematics Learning Area in the Intermediate Phase and all Early Childhood Development, Foundation Phase, Intermediate Phase and Senior Phase pre-service teachers are required to register for this module.

In the module outline the pre-service teacher outcomes are listed as:

- demonstrate a personal competence in the knowledge and skills,
- develop pedagogic content knowledge, and,
- critically select and/or create appropriate classroom materials

The focus of the teaching and learning is in the context of:

Data handling  
Measurement  
Rational numbers (Fractions & decimals)  
History of mathematics  
Problem solving

**Source: Primary Mathematics Education 210/211 module outline developed by L. van Laren 2006**

The PME 210 module is usually taught by three different lecturers. The 145 – 199 pre-service teachers are divided into three groups of between 50 and 70 and each of three different lecturers are responsible for teaching particular sections on a rotation basis. The sections of the module that I have taught for the past three years is the

teaching and learning of Data Handling and Measurement. The time allocated to these two sections of the PME 210 module is one third of the 78 lectures allocated to the PME 210 module. Each PME 210 pre-service teacher would be exposed to the integration of HIV and AIDS in the PME 210 module for approximately 8 lectures. Each lecture is 45 minutes but double periods of one and a half hours are allocated to PME 210.

This is where my research on HIV and AIDS education in Mathematics Education is seated. It is particularly in the teaching and learning of Data Handling that aspects of HIV and AIDS education are explored. An overview of the activities taught in the PME 210 module, together with a more detailed description of the content of the lectures is provided later in this chapter under the heading 'The design of the study'. Because of the 'reflection on the reflection' (Mitchell, 2006) process used in self-study, every year from 2004 to 2006, the activities have been supplemented with more or different integrated activities.

The physical, spatial setting for the second level, the focus group, is a small, more informal seminar room where the seven focus group participants and I were seated round a table. The room was arranged to facilitate video and audio recording. The timing of this situation was seven one and a half hour sessions in the first semester of 2005. The participants offered to spend additional (out of formal lecture) time on the HIV and AIDS education in mathematics as volunteers who were interested in the *HIV/AIDS Mathematics Education Project*. The life span of the focus group interactions was designed to precede the teaching practice period that took place in July/August of 2005. The context for the focus group situation is the exploration of HIV and AIDS education

in mathematics. The focus group participants were interested in working towards implementing integration of HIV and AIDS education in mathematics lessons of young learners during practice teaching. An overview of the activities explored during the focus group discussions, together with a more detailed description of the content of the focus group sessions is provided later in this chapter under the heading ‘The design of the study’.

The physical spatial settings for the third level are mathematics classrooms of young learners in and around the Durban area. At UKZN Faculty of Education each pre-service teacher is permitted to choose a school for an annual four-week period of practice teaching. The school contexts chosen by the participants ranged from a state-aided Catholic school in an affluent area to a public school in an underprivileged area. In South Africa the number of learners in the class is usually an indication of whether a school is in an affluent area or not. The pre-service teachers were placed in grades 2, 3 or 4. I observed each of the seven pre-service teachers teaching at least one integrated lesson. During practice teaching I therefore observed how pre-service teachers dovetailed HIV and AIDS education with mathematics in an integrated (HIV and AIDS across the curriculum) model. Table 6 gives a summary of the classroom observations.

<b>Participant</b>	<b>Grade</b>	<b>No. of learners</b>	<b>No. of lessons observed</b>
Keshni	3	29	1
	4	19	1
Nobunti	4	49	1 (Technology lesson)
Celiwe	4	50	1
Thembe	2	39	1
Kathy	3	20	2
Netha	4	33	1
Londi	4	52	1

Table 6 : Summary of classroom observations during 2005 practice teaching

During classroom observations I observed the pre-service teachers' 'theory in practice' (Vithal, 2004, p. 92), as they taught mathematics lessons that integrated HIV and AIDS education to young primary (elementary) school learners. Each observed lesson was audio taped for later transcription and analysis. The lesson plans prepared by the participants for these lessons were collected and after each lesson a post lesson interview was conducted with each participant. The audio recordings of the lessons and the interviews were transcribed by the participants themselves.

Pre-service teacher educators are required to provide written reports for each lesson observed during teaching practice. As such, copies of my written comments/assessment were also available for analysis. In addition, for each lesson, an observation schedule was used to record general information about the school and the learning experience as well as any activities used during the lesson. On completion of the HIV and AIDS education in mathematics classroom lessons, my written comments of the lessons on the observation schedule were discussed with each participant, giving them the opportunity to confirm or correct my interpretations of the observed lesson.

### ***The instruments***

The existing and desired situation in terms of HIV and AIDS education at the Edgewood Campus was explored by considering what the third year pre-service teachers had experienced during their first three years of undergraduate study. This was surveyed and investigated using the pre-service teachers' responses to a questionnaire.

Using focus group discussions, that were audio and video recorded, my research is extended to examine how I introduced the participants to my vision of integration. This integration was then recontextualised when each participant was encouraged to integrate HIV and AIDS in a mathematics classroom using their own unique teaching strategies in primary school classrooms during practice teaching. I observed and audio-taped each classroom experience and prepared an observation schedule to record my observations. Post lesson interviews that were audio-taped served as an opportunity for the participants to reflect on the observed integrated lessons. Because of the variety of situations and settings presented in the study, a variety of instruments were designed.

### *The questionnaire*

I generated a questionnaire (See Appendix D.) that served as a needs survey. Each year for three years between 145 and 199 pre-service teachers were asked to complete the questionnaire. Questionnaires were completed by pre-service teachers on completion of PME 210 module during 2004, 2005 and 2006. The questionnaire provided data by using closed and semi-open questions for quantitative and qualitative analysis over a three-year period. By analyzing data collected over three years it is possible to compare the responses of cohorts.

The closed statements in the questionnaire were developed to explore pre-service teachers' grasp of HIV and AIDS issues and attempts were made at obtaining pre-service teachers' opinions on HIV and AIDS education that they gleaned during their first three and a half years of undergraduate study at the Edgewood Campus. The questionnaire was used to 'hear the voices' of the pre-service teachers responding to my questions of interest regarding HIV and AIDS education at Edgewood.

The closed questions consist of 35 items. The first 3 questions on the questionnaire elicit personal, demographic, information that facilitated categorisation in terms of year group, race and gender. The racial designations that I used do not refer to a biological concept of race but to the political system of racial classification that underpinned apartheid in South Africa. Currently, however, the South African political system still uses racial designations for equity purposes. Race and gender plays a role in the significance of HIV and AIDS perceived by South Africans. For example, when the AIDS Programme of UKZN organized a meeting on the Edgewood Campus on 26 May 2004, there was only one white person who attended the meeting. Perhaps white pre-service teachers did not consider the topic of the meeting that was 'The how's and where's and why's of getting to know your HIV status and accessing treatment' to be of importance or relevant to white people? By asking the pre-service teachers to indicate their racial designation, it may be possible to comment on the links between race and opinions regarding HIV and AIDS education. Furthermore, in South African even pre-service teachers are susceptible to violence against women, discrimination and gender-based inequalities. According to *The South African Nelson Mandela Study, 2002* (cited in Noble, Berry & Fredriksson, 2005, pp. 2 - 3) , white and Asian South Africans were the least co-operative when requests for samples were required for anonymous HIV testing. The results of *The South African Nelson Mandela Study, 2002* showed that the prevalence percentage amongst black (African) South Africans is the highest (13%), followed by whites (6%), Coloureds (6%), and lastly Asians (2%). The different percentages of prevalence of HIV in ethnic groupings may have an influence on the perceptions/opinions of pre-service teachers regarding HIV and AIDS teacher education.

Not only are ethnic groupings differently affected and effected by HIV and AIDS, but there are also gender distinctions in South Africa. In *The South African Nelson Mandela Study, 2002* (cited in Noble, Berry & Fredriksson, 2005, p. 3), the prevalence percentages amongst women (13%) was found to be greater than amongst men (10%). Women are considered to be the group of people that are most at risk of HIV infection (Andrews et al, 2001; Epstein et al, 2004). In South Africa pre-service teachers are mostly women and are likely to be susceptible to the same gender based violence, discrimination and gender-based inequalities as the broader South African female population. Women still have very narrow but crucial career options available to them (Berry, 2007) and it is therefore important to hear the voices of women who are about to become teachers. It may also be possible to find out whether gender links occur in responses to the questionnaire statements.

The remaining 32 items elicit information relevant to the pre-service teachers' perceptions of their preparedness to deal with HIV and AIDS issues with young learners. For example, Item 3a on the questionnaire asks pre-service teachers to decide whether or not they agree on the statement 'Pre-service teachers at Edgewood are equipped with the necessary knowledge, skills and attitude to contribute to HIV/AIDS education in society.'

In addition it was possible to gain, from the questionnaire, the pre-service teachers' opinions of what further experiences are required in HIV and AIDS teacher education. The pre-service teachers were invited to share their opinions of particular aspects of HIV and AIDS pre-service teacher education at Edgewood.

The closed questions used the modal strength technique, where the respondents are invited to select the response option, which matches their reaction to a value statement.

This incorporated a Likert (cited in Seliger & Shohamy, 1989, p. 173) scale that allowed pre-service teachers a choice of five response options ranging from strong agreement to strong disagreement. These were: 5 – Strongly Agree (SA), 4 – Agree (A), 3 - Do not agree or disagree (N), 2 – Disagree (D) and 1 – Strongly Disagree (SD). According to Clason and Dormody (1994), Likert (cited in Seliger & Shohamy, 1989) never intended for a scale to be on a specific number of points. To distinguish individual items from the scale that Likert intended, reference to the scale used for this study will be made to the individual items as ‘Likert-type’ items.

Apart from the first three questions that asked for personal particulars, four aspects of HIV and AIDS education were explored in items of the questionnaire: the policy at the Edgewood Campus (items 1, 2, 4), the content of the curriculum (items 3, 5, 7, 8, 10 – 14), the design of HIV and AIDS education (items 6, 9, 15, 16). All the questions were completed by the pre-service teachers after they had been introduced to the HIV and AIDS education integration in the PME 210 module but in this study only the responses to the following eight statements from the questionnaire were selected for analysis because these related directly to my research questions:

- 1a Pre-service teacher education at Edgewood pays sufficient attention to HIV/AIDS education.
- 1b Pre-service teacher education at Edgewood should pay more attention to HIV/AIDS education.
- 2a There is an active HIV/AIDS education policy at Edgewood for pre-service teachers.
- 2b A more active HIV/AIDS education policy for pre-service teachers should be in place at Edgewood.

- 6a Pre-service teachers at Edgewood should be informed by the discipline specialists in Life Orientation or Gender Education on how to manage the teaching and learning of HIV/AIDS education at the classroom and school level.
- 6b Pre-service teachers at Edgewood should be informed by specialists across disciplines on how to manage the teaching and learning of HIV/AIDS education at the classroom and school level.
- 13a Data handling using HIV/AIDS statistics in Mathematics education modules at Edgewood provides personal knowledge for pre-service teachers.
- 13b Mathematics education modules at Edgewood should make more use of HIV/AIDS statistics to provide personal knowledge for pre-service teachers.

Items 1 and 2 on the questionnaire relate to the pre-service teachers' perception of the general experiences of HIV and AIDS education at the Edgewood Campus. In Item 1 the opinions of the pre-service teachers is surveyed to explore the overall amount of attention that Edgewood pays to HIV and AIDS education in general whereas Item 2 surveys opinions regarding the implementation of an HIV and AIDS education policy at Edgewood. For Items 1 and 2 the existing situation at Edgewood is gauged and extended to the desired situation.

Item 6 explores opinions around whether HIV and AIDS education at Edgewood should be the responsibility of discipline specialists and /or across the curriculum by integration in disciplines. Item 13 focuses on the use of HIV and AIDS statistics to enhance personal content knowledge. This item focussed specifically on my aim of improving my practice as a mathematics teacher educator who deals with the teaching and learning of Data Handling in mathematics education modules at Edgewood.

The responses to the research questions that relate to the pre-service teachers' perceptions/opinions on the amount of attention paid to HIV and AIDS education at Edgewood, the activeness of HIV and AIDS education policy at Edgewood, the possible models for offering teaching and learning HIV and AIDS education at Edgewood, and the use of Data Handling and Statistics in Mathematics Education to provide personal knowledge are provided in the survey questionnaire. The analysis of responses to these questions also provides insights into how I can improve what I am doing to integrate HIV and AIDS education in mathematics pre-service teacher education. These responses are important because the opinions voiced by the pre-service teachers who were registered for the PME 210 module are voiced.

The semi-open questions in the questionnaire were developed to gain further information about the pre-service teachers' opinions and experiences round HIV and AIDS education at the Edgewood Campus. Here the pre-service teachers were asked for their opinions on how mathematics education modules assist with the development of knowledge, skills or attitudes in HIV and AIDS teacher education and given the opportunity to express their personal opinions on HIV and AIDS education. The pre-service teachers were also asked to list the names of modules where HIV and AIDS education was dealt with at the Edgewood Campus. This information was used to survey HIV and AIDS education offered at the Edgewood Campus. The questionnaire concluded with inviting pre-service teachers to volunteer to be involved in a *HIV/AIDS Mathematics Education Project*. The opinions expressed in the semi-open questions are, however, not analysed in this study.

### *The focus group discussions*

To foster a natural, linked to everyday social relations situation, focus group discussions were planned to promote interactions amongst the participants in the *HIV/AIDS Mathematics Education Project* (Flick, 2002). Focus groups are known as a means of simulating everyday discourses and conversations to study how social knowledge is generated by capitalizing on the varied life experiences that are combined. Together with the other methods of obtaining data, the focus group was useful to orientate myself to this new field of study so that it was possible to generate hypotheses that encompassed all the participants' insights. The focus group discussions allowed for exploration of the insights of the participants' interpretations of their experiences gained during their earlier studies of the PME 210 module in the previous year and other modules taken during their first three and a half years at Edgewood. Furthermore, the focus group interactions furthered the answering of my research question: 'How can I assist pre-service teachers with the development of appropriate beliefs, knowledge, skills, attitudes and values to integrate HIV and AIDS in the teaching and learning of mathematics?' It was possible to capitalize on the wide range of experiences offered during focus group discussions because the participants were not a homogeneous group.

The participants were not complete strangers to each other but the members of the group were acquaintances. This heterogeneity allowed for diverse interactions amongst the participants. Three of the participants, Celiwe, Londi and Thembe, are good friends because of their shared foreign citizenship (Lesotho) and home language (Sesotho) while the other five participants are South African. Only one of the South Africans, Nobunti, has isiZulu as a home language whereas, Kathy, Keshni, Linda (researcher) and Netha are English speaking but are from different cultural backgrounds. Although the group

did not consist of strangers, the collective ‘mix’ of participants allowed for purposeful interactions.

***The observation schedule and post lesson interview schedule***

During practice teaching, each pre-service teacher at Edgewood may choose the specific school where s/he wants to do practice teaching. The schools chosen by the participants were widely dispersed in the areas surrounding Durban. The school principals and mentor teachers of each participant were asked if the HIV and AIDS education in Mathematics activities could be used in their classroom. The pre-service teachers were asked to give a letter (See Appendix E.) explaining the aims of the *HIV/AIDS Mathematics Education Project* to ask for permission to use the HIV/AIDS education in Mathematics learner materials. A copy of the learner activities (clearly marked with the words ‘Draft’) accompanied the letter to the principal.

Each learning experience I observed during practice teaching, where HIV and AIDS education in mathematics was presented, by a focus group participant was audio taped. Photographs were taken of the focus group participants teaching young learners in their practice teaching classrooms to give an indication of the learner composition and the learning environment. Unfortunately the photographs cannot be displayed in this research as parental consent was not obtained from the learners.

The practice teaching period provided the opportunity to see if the theoretical ideas and practices for mathematics classrooms that were discussed with pre-service teachers in a lecture situation and during focus group discussions would be possible/feasible with young learners. As I observed prepared lessons, I was probably seen as an evaluator or assessor but the participants took on the integrated lessons as ‘extra’ additional observed

lessons during the teaching practice so other tutors also visited the pre-service teachers to assess general classroom practice. The pre-service teachers usually have teacher mentors as well as teacher educator tutors to oversee the practice teaching period. I asked the participants to gain permission from the school principals and their teacher mentors to explore the integration of HIV and AIDS education in mathematics but it was the knowledge and experience of the seven participants that was significant. The teaching made possible through teaching practice provided pre-service teachers with the opportunity to model their roles as 'multiskilled' teachers and I devised an observation schedule (See Appendix F.) so that I could focus on the observed lessons in a systematic manner.

The learning experience plans prepared by the focus group members for the observed integrated lessons were collected and after each lesson an interview was conducted with each focus group participant. The participants were given the interview schedule (See Appendix G.) before the interview to facilitate the interview process. The interview schedule was designed to allow the participants to reflect on their integrated teaching experience. The questions explored the link between what the participants had chosen to present during their integrated lessons and what was addressed during focus group discussions. The participants were invited to offer suggestions for future ventures to facilitate the integration process. The audio recordings of the classroom learning experiences and the interviews were transcribed by the participants.

As a pre-service teacher educator I am required to prepare written reports for each pre-service teacher on the lessons observed during practice teaching so I kept copies of my written comments of observed HIV and AIDS in Mathematics lessons. For each observed lesson I completed the obligatory teaching practice assessment report

required by my HEI. On completion of the HIV and AIDS education in Mathematics classroom lessons, my written comments of the learning experience from the observation schedule were privately read to the observed focus group member. The focus group member was thus given the opportunity to confirm whether or not what I had written in the observation schedule was a true reflection of the observed learning experience.

No interviews were conducted with the young learners in the classroom who were taught by the focus group participants. It would have been purposeful to gauge the knowledge, skills, attitudes gained by young learners during the HIV and AIDS education in mathematics but this would have required a lengthy process of obtaining individual consent from the parents of the minor learners in the seven classrooms. Furthermore, it was my preparation of the pre-service teachers to integrate HIV and AIDS in mathematics teacher education that was the focus of my study.

### ***Field notes***

My field notes were sources of data of my learning as well as evidence of transformations that occurred. It was possible to find ‘episodes of learning’ and ‘episodes of action’ (McNiff & Whitehead, 2006, p. 136) in my field notes that furthered my *Starting with ourselves* research strategy. I saw myself, the researcher, as part of the research and thus my reflections assisted with appraisal of my part in the research so my views have contributed to the ways in which I designed the study, collected the data and analysed them. (Knight, 2002, pp. 96 & 140). It is necessary to consider how my life, experiences and beliefs have coloured my views. I have thus often written in the first person as this is how my reflections develop and are presented in my field notes. These reflections contributed to addressing my research question: “How can self-study

contribute both as a pedagogical and methodological ‘umbrella’ for addressing HIV and AIDS in pre-service teacher education?”

The field notes I prepared served as notes to inform my unfolding analysis (Terre Blanche & Kelly, 2002). I made use of reflections to record ideas that assisted with the development of the integration of HIV and AIDS education in mathematics process that I was investigating.

Most of my field notes were documented from 3 March 2005 to 14 September 2005 and on 24 March 2006 and 25 August 2006. The 2005 reflections explained my impressions or interpretations of the planning, organising and running of the PME 210 module and focus group interactions. During this period of time, twenty written reflections were made immediately after PME 210 lecture presentations or focus group meetings. The reflections were used as a means of facilitating my ‘observe-reflect-act-evaluate-modify-move in new directions’ strategy as well as some of the tensions (for example, HIV and AIDS education verses mathematics education) that I experienced. I recorded reflections on theoretical, methodological and ethical issues as well as uncertainties and changes I made during the integration process. My reflections thus explored observations I made during my teaching of PME 210, my interactions during focus group discussions and observations when the participants taught the HIV/AIDS education in mathematics classrooms.

### *Participant reflections*

My field notes facilitated reflection on my perceptions and decisions throughout my observations but it was also important to understand how the other focus group

participants perceived and selected events for reflection. I asked the participants to prepare reflections after each focus group meeting. The pre-service teachers' reflections gave them a vehicle to express their feelings and frustrations about the project. Each pre-service teacher did not write a reflection after each focus group meeting but each participant prepared a written explanation of what they expected of the *HIV/AIDS Mathematics Education Project* during the first focus group meeting and reflected on the accomplishments/disappointments after the last focus group meeting (before the teaching practice observation). The recording of reflections allowed each participant to give their subjective views so that these positions and opinions may be included in the data and form part of accessible text for analysis (Flick, 2002).

In addition to the reflections of the focus group participants, it was possible to understand how my thinking directed my integration of HIV and AIDS education in mathematics by exploring my thinking processes too (Solas, 1992). Some of the reasons I offer for integration were explored by examining my comments during an interview with Dr Nancy Lesko. The opportunity to discuss and interpret my autobiographical substance with an experienced researcher, allowed me to make important links between my autobiographical reflections and discussions with the interviewer so some of the reasons for my HIV and AIDS intervention in mathematics became exposed.

The field report prepared by Dr Lesko was used to draw on the theoretical and methodological strengths of 'collaborative autobiography' (Butt & Raymond, 1989; Butt & Retallick, 2002; McIntyre & Cole, 1999). This approach to collaborative autobiography included the working together of an experienced researcher-teacher and me, the self-study researcher. During our interactions there were reflections on aspects of

my current experiences, as well as past personal and professional life experiences, that influenced my decisions on how and why I decided to integrate HIV and AIDS education in mathematics. Furthermore, I revealed professional, rational decisions and subsequent actions as well as observation of changes in trends over three years of the integration process. The reflections of Dr Lesko and my responses as an interviewee of Dr Lesko, together with analysis of my interactions during focus group discussions, provided information for interrogation of my research question “How can self-study contribute both as a pedagogical and methodological ‘umbrella’ for addressing HIV and AIDS in pre-service teacher education?”

### ***Limitations in the design of the instruments***

***The questionnaire:*** Throughout the time allocated to the pre-service teachers for completion of questionnaires, I was available to answer questions or clarify matters relating to the questions posed on the questionnaire. Some pre-service teachers asked for the meaning of ‘anthropological’ and the meaning of the word was discussed. The misinterpretation of statements on the questionnaire may thus have been a stumbling block for some of the pre-service teachers so I should interrogate each statement more systematically and rigorously with a group of pre-service teachers prior to future administration of the questionnaire. Rephrasing of some statements may be necessary to ensure better understanding.

***The focus group discussions:*** On reading the participants’ reflections of the focus group sessions, it is obvious that more focus group meetings should have been planned. Four out of the seven pre-service teachers mentioned that more focus group

sessions should have taken place. They suggested that the focus group meetings should have commenced at the beginning of the year instead of in mid semester. Reflections of two of the participants pointed out that they were a little apprehensive about the prospect of teaching the integrated lessons. More focus group discussion sessions would allow for more preparation of the HIV and AIDS education in mathematics learner materials and also build further participant confidence.

### **DESIGN OF THE STUDY**

Whilst preparing for the integration of HIV and AIDS education in mathematics education, I read widely in the area of HIV and AIDS education and I attended two afternoon tele-conference workshops at the American Embassy in Durban on 8 June and 22 June 2005. This was supplemented with a two-day workshop at the Edgewood Campus on HIV and AIDS by the same team of researchers from the University of Wisconsin Medical School. Dr Marge A. Sutinen led the team and at the workshop we were given opportunities to consider the facts about HIV and AIDS as well as consider teaching and learning about HIV and AIDS at high school level. Dr Sutinen also suggested a basic step by step plan to promote 'Community mobilization strategy'. The steps in this plan are: Step 1: Naming of the challenge; Step 2: Recruitment of people from the community; Step 3: Development of an action plan; Step 4: Identification of resources; Step 5: Becoming involved. I initiated and applied these steps to further my interest in 'making a difference' at my HEI through the teaching of mathematics. The steps provided a starting point for my vision of integration as follows:

**1. Naming of the challenge:** - My challenge was two-fold :

Firstly, I identified that HIV is a serious problem for pre-service teachers and learners. Based on the information I collected, little work or research with pre-service teachers had been done and documented. My teaching and learning of mathematics education needed to make pre-service teachers aware of the HIV and AIDS epidemic through mathematical activities. The focus behaviour was to be the preparation of integrated HIV and AIDS mathematical activities that provided accurate information about HIV and AIDS that is appropriate for young learners (Grades 3 – 7). Furthermore, I wanted all pre-service teachers to realize that many learners are affected and effected by the virus and as a result an appropriate classroom environment in terms of care, support, and understanding needed to be fostered.

Secondly, I aimed at encouraging, assisting and working with a volunteer group of pre-service teachers to develop and use classroom mathematics activities to promote awareness. The mathematics activities were to be used in the mathematics classrooms of young learners to promote open discussion, in a sensitive manner, about issues relating to HIV and AIDS.

**2. Recruitment of people from the community:** - A group of fourth year volunteers with an interest in helping me address the concern would be crucial to the mobilization strategy. These pre-service teachers would go to schools in their community during practice teaching where our concern about the issues relating to HIV and AIDS could be aired with headmasters, teachers and learners in mathematics classrooms.

**3. Development of an action plan:** - The volunteer participants would be challenged to learning more about how HIV and AIDS education can be included in mathematics teaching and learning. The participants development would include preparation of mathematical activities that could be used in their classrooms with young learners during practice teaching. Theories of how integration may take place could thus transformed into action in mathematics classrooms.

**4. Identification of resources:** - During practice teaching the teachers and principals at the schools in the community situated around Durban, South Africa would be asked for expert advice. Any comments or suggestions that addressed the challenge of integration would encourage discussion on HIV and AIDS education in the wider community.

**5. Becoming involved:** -To increase the success of the community mobilization effort, pre-service teachers would be required to teach the mathematical activities that included HIV and AIDS education. The observation of HIV and AIDS in mathematics lessons taught by the pre-service teachers would allow for reflection on the integrated activities. Records of our actions, reflections and improvements as well as what we have learned from our actions would be required to stimulate further action. During the process of integration I would formalized my learning through self-study to trace the 'path' of my research journey. Justification of my action choices would be recorded in reflection entries.

The study then evolved to consist of three interwoven sections; firstly, my integration of HIV and AIDS education during PME 210 modules with the third-year pre-service

teachers and their responses to particular questions of a questionnaire; secondly, the focus group activities with the fourth-year pre-service teachers and the observed HIV and AIDS education integration in mathematics classroom experiences; thirdly, I focus on self-study aspects of the study.

### ***The PME 210 module***

The PME 210 module is intended to prepare pre-service teachers for the teaching and learning of the Mathematics Learning Area as required by national policy documents (See Chapter Two.). Successful facilitation of mathematics learning takes cognizance of the pre-service teachers' pedagogical content knowledge, subject content knowledge together with theoretical knowledge of how teaching and learning occurs together with the pre-service teachers' beliefs of teaching and learning. In the Mathematics Learning Area, Learning Outcome 5 of the RNCS for school grades R – 9 in the General Education and Training Band (GET) deals with Data Handling. This Learning Outcome focuses on collection of data, summarising, displaying and critical analysis of data to draw conclusions and make predictions. It is in the preparation of pre-service teachers for the facilitation of Data Handling where HIV and AIDS education was extended across the Mathematics discipline in the PME 210 module. The following overview and description given in Table 7 shows the content of the sequence of lectures I devised for PME 210 to develop the concept of integration of HIV and AIDS education.

Lecture	Activities explored during the lecture
1 and 2	<ul style="list-style-type: none"> <li>I concluded the measurement section of the lectures by showing transparencies of the activity, ‘The Red Ribbon’ (See Appendix H.) and discussed the concept of integration of HIV and AIDS education in mathematics. The Red Ribbon is an integrated activity where the teaching and learning of HIV and AIDS education in mathematics is approached using the Red Ribbon symbol.</li> <li>The Data Handling section commenced with showing a transparency of the activity that was prepared and used by Keshni with a Grade 3 class (See Keshni’s <i>HIV/AIDS Survey</i>). I distributed copies of the learner responses (with learners’ names removed) amongst the pre-service teachers and used the data to explain the development of the research based stages of the teaching and learning of Data Handling.</li> </ul>
3 and 4	<ul style="list-style-type: none"> <li>I used authentic HIV statistics showing the number of deaths recorded in various age groups in South Africa from 1997 to 2002 (Noble, Berry &amp; Fredriksson, 2005, p. 4) to explain the use of broken line graphs.</li> <li>I explained when it is appropriate to use broken line graphs or other types of graphs (for example, concrete graphs, pictographs, bar graphs, pie charts etc) using the HIV statistics.</li> <li>I presented authentic HIV statistics, showing the number of HIV infections in the eight regions of the world, so that a pie chart using a protractor could be drawn. I asked the pre-service teachers to reflect on the implications of these statistics for teachers in the Sub-Saharan region.</li> </ul>
5 and 6	<ul style="list-style-type: none"> <li>An open book, self-study tutorial was completed (under test conditions) for continuous assessment purposes. Responses to ‘Working with bar and pie charts’ (See Appendix C.) using authentic data were assessed using a rubric that focuses on participation.</li> </ul>
7 and 8	<ul style="list-style-type: none"> <li>I invited pre-service teachers registered for PME 210 modules to complete a questionnaire (See Appendix D.) that explores the teaching and learning of HIV and AIDS education in modules offered at Edgewood and, in particular, the PME 210 module. The questionnaires were completed at the close of the PME 210 module.</li> </ul>

**Table 7 : Overview of the activities explored during PME 210 during 2004 – 2006**

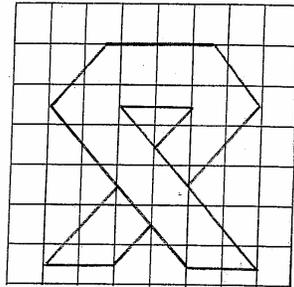
*Lectures 1 and 2*

I prepared the integrated activity entitled ‘The Red Ribbon’ (See Appendix H.) as an introductory example to show how I considered it possible to elicit discussion of HIV and AIDS in a mathematics classroom. In this activity I incorporated possible problems that would spread across the five different Learning Outcomes in the

Mathematics Learning Area (DoE, 2002). Examples of how HIV and AIDS education may be incorporated into a measurement lesson were discussed using the Red Ribbon as an entry point for discussion.

I suggested that the following mathematics activity could be preceded by a discussion about how the Red Ribbon symbol is the international symbol of HIV and AIDS awareness and that the symbol stands for Care and Concern, Hope and Support and that wearing the symbol does not indicate that you are gay, HIV positive or living with AIDS (Provincial HIV/AIDS Action Unit, no date).

I illustrated the possible use of the following Red Ribbon activity in the teaching and learning of the Learning Outcome, Measurement. The activity incorporates concepts relating to amount of surface covered (Area in Learning Outcome 4) and makes use of standard units (square centimetres) to measure the area of a given red ribbon shape.



1. Find the number of squares covered by the background of the Red Ribbon.
2. On the squared paper provided, design your own Red Ribbon with a background.
3. Find the amount of surface covered by the Red Ribbon you designed.
4. Find the amount of surface covered by the background of the Red Ribbon you designed.

During the teaching and learning of Data Handling topic we explored a questionnaire that could be used with young learners in a mathematics classroom. For example, the following questionnaire was devised and used by Keshni with Grade 3 learners on 5 August 2005.

**HIV/AIDS SURVEY**

Questionnaire: Myths and facts

Age: \_\_\_\_\_ Grade: \_\_\_\_\_ Girl [ ] Boy [ ]

Decide whether these statements are true or a myth by ticking ‘Yes’ or ‘No’.

		Yes	No
1.	Do you think HIV/AIDS exist?		
2.	HIV is the name of the virus, AIDS is the disease caused by HIV.		
3.	You can get HIV by hugging or kissing a person who has it.		
4.	Everyone infected by HIV gets AIDS.		
5.	You can get AIDS if a person with AIDS coughs, sneezes near you or by using the same toilet seat.		
6.	An unborn child can get AIDS if the mother is infected.		
7.	You can get HIV/AIDS if your blood mixes with the blood of someone who has the virus already.		
8.	Insects like mosquitoes can be carriers of HIV and give it to people.		
9.	Family members of a person with HIV/AIDS usually also has AIDS.		

10.) Have you, or someone you know, ever been horrible to someone who you/they think has HIV?

11.) Why did you/they do that?

12.) How do you think people get HIV/AIDS?

Thank you for answering this survey!!!!!!

I distributed authentic learner responses to the pre-service teachers and I discussed the various types of graphs (concrete, pictograph, bar graph) suitable for young learners to display the responses received from Keshni’s Grade 3 learners.

*Lectures 3 and 4*

Whilst considering the teaching and learning of Data Handling, I provided HIV and AIDS statistics and asked the pre-service to use HIV and AIDS statistics to draw graphs and reflect on the data given. For example, Table 8 from the AVERT (2005) website (Noble, Berry & Fredriksson, 2005, p. 1) was used to show how a broken line graph would be a suitable type of graph to show changes in the prevalence percentages for a particular province over the six years given for the statistics whereas a pie chart would be more suitable to compare the statistics of prevalence percentages over all the provinces in a particular year.

**Estimated HIV prevalence among antenatal clinic attendees, by province**

<b>Province</b>	<b>2000 prevalence %</b>	<b>2001 prevalence %</b>	<b>2002 prevalence %</b>	<b>2003 prevalence %</b>
KwaZulu-Natal	36.2	33.5	36.5	37.5
Mpumalanga	29.7	29.2	28.6	32.6
Free State	27.9	30.1	28.8	30.1
Gauteng	29.4	29.8	31.6	29.6
North West	22.9	25.2	26.2	29.9
Eastern Cape	20.2	21.7	23.6	27.1
Limpopo	13.2	14.5	15.6	17.5
Northern Cape	11.2	15.9	15.1	16.7
Western Cape	8.7	8.6	12.4	13.1
<b>National</b>	<b>24.5</b>	<b>24.8</b>	<b>26.5</b>	<b>27.9</b>

**Table 8: South African HIV statistics obtained from the AVERT (2005) website**

Furthermore, I used authentic statistics to compare the estimated number of adults and children newly infected with HIV in the various regions of the world. The statistics used for preparing these graphs were obtained from the AVERT.org website (AVERT, 2005, p. 5). After exploring the drawing pie charts using pencil, paper and protractor methods, I asked the pre-service teachers to reflect on the relevance of this

data to teachers in Sub-Saharan Africa and asked the pre-service teachers to ‘Give three different issues that would have an influence on you as a teacher.’

As an example of discrete (countable) data, the following bulleted steps required for a statistical survey were explored in relation to the HIV and AIDS data. I encouraged the pre-service teachers to apply the following bulleted extracts that were provided in the PME 210 lecture notes using the HIV and AIDS statistics:

**What are the steps involved in a statistical survey?**

- ❖ The purpose of a survey needs to be determined and this is usually based on an assumption or question.
- ❖ An appropriate, representative sample needs to be selected.
- ❖ Data needs to be collected.
- ❖ The data may be organised in a suitable manner.
- ❖ The display of the data needs to be eye-catching and easy to interpret. The type of graph chosen would depend on the type of data collected. The plotting of statistical graphs is a means of recording the correspondence between a set of figures and a set of visible marks on a set of axes.
- ❖ The graphical representation may be used to facilitate the analysis and interpretation of the data.

**Why do we represent data graphically?**

- ❖ Graphical representation allows for unification of mathematical ideas.
- ❖ Graphs simplify masses of numbers, statements and calculations.
- ❖ Graphs communicate.
- ❖ Graphs show relationships.
- ❖ Graphs may give further information that is not in the original data.
- ❖ Graphs provide data for computation practice.
- ❖ To mislead!

**Source: Primary Mathematics Education 210 unpublished lecture notes prepared by L. van Laren during 2004**

Whilst considering the application of HIV and AIDS statistics, I provided the pre-service teachers with a newspaper cutting by Venter and Brown (2005) (See Appendix I.) taken from a local newspaper and AVERT (2005) readings. I

photocopied the local newspaper cutting by Venter and Brown (2005) with caption 'No one dies of AIDS: Stats dodge issue of virus as cause of death' for the pre-service teachers to analyse. This was a front page article that claimed that South Africa has no reliable statistics on HIV and AIDS because of sampling and diagnosis difficulties. I explored the issue of sampling in data collection with the pre-service teachers in relation to the information presented in the newspaper cutting and the AVERT (2005) article. I asked the pre-service teachers to consider the HIV and AIDS statistics presented by politicians through the South African Health Department. I set an examination question based on this article in the final module examination. In the examination I provided the pre-service teachers with the AVERT (2005) reading as an appendix to the examination paper. The examination question on the PME 210 paper was:

Two of the steps required for a statistical survey are:

- An appropriate, representative sample needs to be selected, and
- Data needs to be collected.

Explain how it may be difficult to obtain reliable estimates for a HIV/AIDS prevalence survey. Refer to Appendix 1 (Noble, R., Berry, S. & Fredriksson, J., 2005). HIV and AIDS statistics for South Africa. Retrieved February 28, 2005 from <http://www.avert.org/safricastats.htm>).

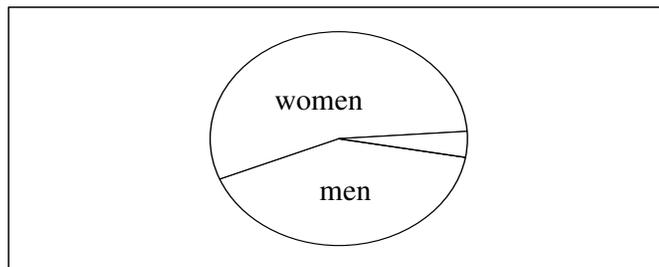
**Source: Question set by L. van Laren for Primary Mathematics Education 210 June 2005 examination paper**

### *Lectures 5 and 6*

I asked each pre-service teacher, who registered for the PME 210 module in 2004, 2005 and 2006, to complete a tutorial (See Appendix C.) called 'Working with bar and pie charts' under examination conditions. I used an 'open-book' policy for this tutorial as the pre-service teachers were allowed to ask me for assistance with mathematical problems and make use of whatever notes they deemed necessary. This

tutorial was completed in approximately one and a half hours. (In 2006, Dr Lesko observed the pre-service teachers completing this tutorial and she examined the pre-service teachers' responses to this tutorial.) I used the marks gained for this piece of work as part of their participation mark for the PME 210 module. Each year I revised the data so that authentic, current data from AVERT.org website was used. This tutorial includes some questions that require the pre-service teachers to perform mathematical calculations while other sections require reflection on the data provided. For example, part 5 of Activity 1 requires the following:

South Africa has the highest number of people living with HIV in the world. An estimated 5,3 million people are living with HIV in South Africa and 2,9 million of them women. The graph given below shows the data for infected men, women and children in South Africa. Use the graph (and a protractor) to find the number of infected children. Clearly show ALL working details.



**Chart to compare HIV in women, men and children in South Africa**

Whereas other parts of the tutorial require reflections. For example, parts 6 and 7 of Activity 1 in the tutorial require the following reflections:

In the light of these statistics and as a South African teacher, what challenges will you be required to face in the classroom? List at least three **different** challenges.

How could South African teachers go about addressing each of the challenges that you listed? Suggest sensible/appropriate strategies teachers could use in an Intermediate Phase classroom to address HIV/AIDS issues.

**Source: Question devised by L. van Laren for Primary Mathematics Education 210 tutorial entitled 'Working with bar and pie charts' (See Appendix C.)**

Over the years the tutorial ‘Working with bar and pie charts’ I ‘assessed’ the responses differently to provide marks for continuous assessment purposes. During 2004 my assessment of pre-service teachers’ work focused on mathematics content knowledge but during 2005 and 2006 I focused on ‘participation’. My change in assessment practices over the years shows that my focus changed from marking correctness of mathematical responses to engagement with the tasks and reflections on the issues that the data displays. For example, in 2005 I initially prepared the following rubric to assess their responses to the open book tutorial.

**Working with bar and pie charts: Rubric**

Good attempts at all questions and accurately drawn and labeled pie chart. Suitable solution to question 5.	5
Sensible attempts at all questions and accurately drawn and labeled pie chart.	4
Sensible attempts at all questions and accurately drawn but incorrect ordering and/or no labeling.	3
Attempts at all questions.	$2\frac{1}{2}$
Weak attempts.	0 - 2

**Source: Reflection by L. van Laren recorded on 8 March 2005**

This rubric emphasized the mathematical aspects of the worksheet and not the overall skills, knowledge, values and attitudes that were required for an integrated task. This rubric lacked rewarding of efforts where links of mathematical knowledge to HIV and AIDS aspects were attempted. I recorded the marks scored using the rubric shown above but was dissatisfied by the manner in which the rubric scored the overall performance of the pre-service teachers. The pre-service teachers attempted to engage with the HIV and AIDS aspects of the worksheet but failed to do the mathematics accurately and were penalized for this. What I observed and reflected

upon led to the rethinking and development of an alternative rubric. I therefore evaluated and modified the rubric used for assessing the tutorial.

I then redesigned the rubric given below to assess the tutorial and carefully explained to the pre-service teachers how they would gain their continuous assessment mark through ‘participation’ as follows:

**Rubric used to gauge participation by completing worksheet titled  
‘Working with bar and pie charts’**

Criteria	Mark allocated
All activities appropriately attempted.	5
All activities appropriately attempted but pie chart incorrectly annotated.	4
1 – 3 activities not attempted and pie chart incorrectly annotated.	3
More than 3 activities not attempted and pie chart incorrect.	2
Poor attempts at activities.	0 - 1

**Source: Reflection by L. van Laren recorded on 8 March 2005**

During focus group discussions in 2005, the participants pointed out the ‘facelessness’ of the statistics, so in 2006 I supplemented the use of statistics in PME 210 modules with a picture. I used a photograph to illustrate the number of people affected and effected by HIV and AIDS and gave the numbers a ‘face’. Together with the tables of statistics, I showed a transparency of a packed to capacity rugby/soccer/football stadium in Durban called the ABSA Stadium. When filled to capacity this stadium can hold 52 000 spectators. Whenever I spoke of the number of people in relation to HIV and AIDS statistics, I attempted to indicate the number of people in terms of number of ABSA stadiums full of people to bring home the enormity of the situation.

## *Lectures 7 and 8*

During the last lectures of the PME 210 modules in 2004, 2005 and 2006 that were allocated to the topics Measurement and Data Handling, I asked the pre-service teachers to complete the questionnaire (See Appendix D.). This was usually done when the pre-service teachers were asked to evaluate the sections of the module, Measurement and Data Handling that I had presented.

### ***Methods used to analyse the data obtained from the questionnaire***

The reasons why specific methods/tests/techniques were chosen for descriptive and inferential statistical analysis of the questionnaire responses, obtained from the pre-service teachers who had completed the PME 210 module, are described in Appendix J.

### ***Working with the focus group participants***

The following overview and description provided in Table 9 gives the content of the sequence of focus group discussions: *HIV/AIDS Mathematics Education Project*

<b><u>Date of focus group meeting</u></b>	<b><u>Activities explored during the focus group meeting</u></b>
18 April 2005	<ul style="list-style-type: none"><li>• We explored the purpose of the <i>HIV/AIDS Mathematics Education Project</i>.</li><li>• I suggested a reflection format.</li><li>• We shared reflections on an integrated activity ‘Working with bar and pie charts’ that was completed by the participants during semester one of 2004 when the participants were registered for the PME 210 module.</li></ul>
25 April 2005	<ul style="list-style-type: none"><li>• We investigated activities designed to explore beliefs using the drawings of metaphors for the integration of HIV and AIDS education in mathematics.</li></ul>

Date of focus group meeting	Activities explored during the focus group meeting
3 May 2005	<ul style="list-style-type: none"> <li>• Each participant presented and explained her own hand drawn metaphor.</li> <li>• We discussed my vision of the <i>HIV/AIDS Mathematics Education Project</i> that involved preparation of authentic classroom materials. The participants were encouraged to research and share possible learner activities for discussion during the following focus group meeting.</li> </ul>
9 May 2005	<ul style="list-style-type: none"> <li>• I presented a draft of an integrated young learner activity called ‘The Red Ribbon’ (See Appendix H.), for discussion and analysis.</li> <li>• We shared and explored ideas gleaned from textbooks and other sources collected by the participants.</li> </ul>
16 May 2005	<ul style="list-style-type: none"> <li>• I presented a second draft of the integrated activity, The Red Ribbon, to invite comments and suggestions.</li> <li>• We discussed an activity prepared by Kathy.</li> <li>• I explained how classroom observation of HIV and AIDS education in mathematics would take place during practice teaching.</li> </ul>
23 May 2005	<ul style="list-style-type: none"> <li>• Kathy arranged for Sr. Johanna, a counselor in the HIV testing and drug dispensing unit from the local hospital (St Mary’s Hospital), to address the focus group. Sr. Johanna explained biological and social aspects relating to HIV and answered questions posed by the participants.</li> </ul>
7 June 2005	<ul style="list-style-type: none"> <li>• We discussed the participants’ contributions to the HIV and AIDS education in mathematics booklet of learner activities.</li> <li>• I offered my third draft of the learner activity, The Red Ribbon.</li> <li>• Arrangements for the teaching practice visits were finalized.</li> <li>• I asked the participants to record reflections on achievements/frustrations experienced during the focus group discussions by re-looking at what they had written about the purpose of the <i>HIV/AIDS Mathematics Education Project</i> during the first focus group meeting.</li> </ul>

**Table 9: Overview of the activities explored by the focus group during each of the seven focus group interaction sessions**

### ***Reflective practice***

During our first focus group meeting I asked the participants to record what they think should be the purpose of the *HIV/AIDS Mathematics Education Project* and to include their expectations of the project. I asked the participants to do weekly reflections of our group discussions and suggested the following guidelines:

#### **Guidelines for weekly reflection:**

- What was my previous knowledge about HIV/AIDS before doing the activity?
- What knowledge/skills/values have I gained about HIV/AIDS through doing the mathematics? Why has the experience been gainful?
- What has been disappointing/frustrating about the knowledge/skills/values experienced by doing the HIV/AIDS mathematics activity? Why has the experience been disappointing/frustrating?
- What can I do about these disappointing/frustrating aspects that I experienced whilst doing the HIV/AIDS mathematics activity? Why will I chose these options?

**Source: Reflective diary/journal guidelines prepared by L. van Laren on 18 April 2005**

I asked the participants to experiment with the reflection guidelines by providing each participant with a copy of the tutorial ‘Working with bar and pie charts’. (See Appendix C.) This tutorial was completed by the participants during the previous year, 2004, when they were registered for PME 210 module. The participants recorded their reflections of the tutorial using the ‘Guidelines for weekly reflection’.

### ***Metaphors***

One of the initiatives prepared to include HIV and AIDS education in mathematics education was to explore pre-service teachers’ beliefs about HIV and AIDS education integration in the teaching and learning of Mathematics. The ‘belief’ component of a Mathematics education curriculum is considered to be an important aspect of pre-

service teachers' development. I gave the focus group participants an opportunity to express their beliefs about the integration of HIV and AIDS education in Mathematics by asking them to draw and describe metaphors for teaching and learning. My interest in using drawn metaphors was to elicit authentic pre-service teachers' beliefs on possibilities for HIV and AIDS education that could be integrated in the teaching and learning of Mathematics. I explored my belief and the beliefs of the seven participants using our drawings and metaphor explanations.

The concept of a metaphor was explained to the group as 'an imaginative way of describing a situation to give a vivid and interesting picture. These descriptions do not exist in real life.' I indicated to the participants that 'Drawings assist in the understanding of metaphors. Pictures of metaphors are useful ways of visualizing and analyzing people's theories about teaching and learning.' We discussed six hand drawn pictures that I provided as examples of metaphors (Johnston et al, 1990). We decided what each part of the six drawings of metaphors represented by considering who or what represented the teacher, the learner, the mathematics and the HIV and AIDS education.

Each focus group participant then drew their own personal metaphor for the teaching and learning of HIV and AIDS through mathematics as each person thought it **ought** to be. This drawing of the metaphor had to show how teaching and learning might occur in their mathematics classroom. In the drawing of the metaphor we identified the teacher, the learner, the mathematics and the HIV and AIDS education. Each drawing was then described and how the teaching and learning of HIV and AIDS through mathematics may occur was explained. I suggested that each drawn metaphor should provide a means of informing how we go about integration of HIV

and AIDS education in mathematics lessons. The time that was spent on drawing the metaphor only permitted a spontaneous representation. Attention to detail in the drawing was not considered important as the concept of integration of HIV and AIDS education in Mathematics teaching and learning was the focus of the activity. The drawing of the metaphor served as a novel way of commencing discussions around HIV and AIDS education in Mathematics. By drawing on our beliefs of teaching and learning, we made public our ideas on integration of HIV and AIDS education in Mathematics.

In response to a need expressed by the focus group to learn more about the HIV virus, Kathy, invited a health professional to speak with our focus group. The health professional, Sister Johanna, nurses at St Mary's Hospital that is near the Edgewood Campus. At this hospital in Mariannahill, Sister Johanna is the leader of the team of HIV counselors and is closely involved with the counseling of patients who require anti-retroviral medication. Sister Johanna spoke to the focus group about the biological details as well as psychological aspects related to the treatment of the disease and answered any questions posed by the focus group participants.

The majority of the focus group meetings were devoted to the preparation and reflection of HIV and AIDS education in Mathematics teaching materials. The objective was to prepare classroom teaching material that is suitable for young learners. I prepared a theme activity entitled 'The Red Ribbon' (See Appendix H.) where I attempted to integrate aspects of problem solving, area measurement, fraction work and transformation geometry with HIV and AIDS education. During three of the group discussion sessions I modeled the preparation and reflection required for the

refinement of classroom materials development. During these sessions each focus group participant prepared at least one activity suitable for young learners. The activities were electronically recorded by me or by the focus group participant who prepared the activity. These were draft quality HIV and AIDS education in Mathematics learner activities that we considered to be suitable for use in primary school mathematics classrooms. By the end of our discussion group meetings, each participant had prepared and reflected on at least one activity that addressed HIV and AIDS education in Mathematics.

At the close of our focus group discussions I asked the participants to reflect on the whole seven week period of interactions on HIV and AIDS education in Mathematics. I asked each participant to re-read her purpose of the project and then write about what we originally proposed to do and what we accomplished and to suggest further work required to achieve our objective of integration of HIV and AIDS education in Mathematics.

### ***Classroom observation***

The second part of the project involved classroom observations, during which I observed the student teachers' 'theory in practice' (Vithal, 2004, p. 92), in which they taught Mathematics lessons that infused HIV and AIDS education to young primary (elementary) school learners. The aim of this was in part, through observation and discussions, to understand the links between the student teachers' metaphors (reflecting their beliefs about HIV and AIDS in mathematics) and their classroom teaching. At UKZN Faculty of Education each pre-service teacher is permitted to choose a school for an annual five-week period of practice teaching. The school

contexts chosen by the volunteer pre-service teachers ranged from a state-aided Catholic school in an affluent area to a public school in a underprivileged area. The pre-service teachers were placed in grades 2, 3 or 4. I observed each of the seven pre-service teachers teaching at least one integrated lesson. During this time, I therefore observed how the participants dovetailed HIV and AIDS education with mathematics in what might be called an integrated (HIV and AIDS across the curriculum) model. Each observed lesson was audio taped for later transcription and analysis. The lesson plans prepared by the participants for these lessons were collected and after each lesson a post lesson interview was conducted with each of them. The audio recordings of the lessons and the interviews were transcribed by the participants themselves.

Pre-service teacher educators are required to provide written reports for each lesson observed during teaching practice. As such, copies of my written comments/assessment were also available for analysis. In addition, for each lesson, I used an observation schedule to record general information about the school and the learning experience as well as any activities used during the lesson. On completion of the HIV and AIDS education in Mathematics classroom lessons, my written comments of the lessons on the observation schedule were discussed with each participant, giving them the opportunity to confirm or correct my interpretations of the lesson.

### ***General discussions***

During general conversations I learnt more about the participants. For example, some of the participants' religious orientations were discussed. These are recorded in the biographies of the particular participants but the issues around religion and HIV and

AIDS education were not explored as the information gained was incidental. Furthermore, during discussions the opportunity for each participant to speak about her religious beliefs was not deliberately provided.

### ***Validation of data***

From the inception of the project I was aware of the need to address ethical issues so I carefully explained to the pre-service teachers that my interest in HIV and AIDS education in mathematics is an integral part of my Higher Degree research. I obtained informed consent from the small volunteer group of pre-service teachers with whom I worked closely (See Appendix B.) and have made concerted efforts not to 'pre-service teacher bash' or exploit participants but rather value the contributions of each member of the group.

To obtain authentic transcriptions I asked the participants to transcribe their own interviews and teaching sessions that I observed during practice teaching so that each pre-service teacher was given the opportunity to scrutinize their viewpoints after transcription. I attempted to work *with* the pre-service teachers in my research. Three of the participants did not choose to transcribe their interviews or observed lessons because of work pressures in their final year of study so I asked these participants to read through the transcriptions prepared by a professional transcriber to verify the written text (See Appendix K.).

Measures were taken to consider the reliability and the validity of the questionnaire. In order to check whether the statements would elicit the same responses from particular pre-service teachers if the same statements on the questionnaire were considered at

different times, three pre-service teachers were asked to complete the identical questionnaire at different times. To ascertain the quality of the elements of knowledge that was tested by the questionnaire I considered the 'Construct validity' (Mouton, 1996, p. 128) of the statements. To ascertain Construct validity required gauging whether the statements in the questionnaire measured the construct that it was supposed to represent. The Construct validity of the questionnaire was measured by asking three pre-service teachers to engage in dialogues to explain and discuss the statements and comment on what they perceive as the meaning of each of the statements. I was not present during the pre-service discussions of the statements but the interactions between the pre-service teachers were audio recorded for transcription. The pre-service teacher discussion on statement meaning provided guidance as to which data should not be used for analysis as some of the constructs posed in the statements may not have been clear to all the respondents.

To facilitate reflection on action research/self-study and other research related issues, regular meetings with a group of my critical friends occurred. The critical friends are all involved in higher degree studies on the Edgewood Campus and using an action research paradigm. After each meeting with critical friends I recorded reflections on the topics of discussion and invited comments on my reflections. Furthermore, during collection and analysis of data, mathematics education colleagues at the Edgewood Campus were often consulted. On 2 March 2006 I audio recorded and transcribed one of my conversations with a mathematics education colleague. This conversation was used to inform my interpretations of drawn metaphors to explore the beliefs of HIV/AIDS integration in mathematics. During 2006, when Dr Lesko from Columbia University in New York was

on sabbatical and visited the Edgewood Campus, it was also possible to exchange ideas and engage in valuable personal communications about HIV and AIDS education.

I was able to make my knowledge claims public during four different instances. It was thus possible to test the validity of my claims against other professionals' claims and views. The first opportunity I used to present my interest in HIV and AIDS education in Mathematics was at the Kenton Khahlamba Conference that took place in the Drakensberg in KwaZulu-Natal from 30 September to 3 October 2004. I presented a paper entitled 'HIV/AIDS education in pre-service teacher education – make it count!' (Van Laren, 2004). The delegates at this conference were mainly South African teacher educators.

I read another paper at the 2<sup>nd</sup> Teacher Development Conference: *Developing Teachers for Rural Education*. My topic was entitled 'Making a difference count' (Van Laren, 2006). In this paper I described the basic mobilization strategy steps I used in bringing about 'making a difference' to further my interest in integrating HIV and AIDS education in mathematics education. This conference took place at UKZN, Edgewood Campus from 24 to 26 February 2006. The delegates were teachers and officials from the provincial education department of KZN.

I offered my research on making use of drawings of metaphors to explore how the focus group participants perceive the integration of HIV and AIDS education in mathematics during a forum discussion at the Centre of Visual Methodologies at the Edgewood Campus. This took place on 6 April 2006 and the use of drawings of

metaphors elicited interesting discussion amongst colleagues from the Education Faculty of UKZN. This forum discussion was audio taped for transcription.

During 2007 I presented my experiences of the focus group interactions using a self-study lens at *The Symposium on the Practices of Self-Study in Teaching and Learning and Researching for Social Change* that took place at UKZN from 3 to 4 July 2007. The title of the abstract that I submitted was: 'A self-study that counts on mathematics education at a higher education institution for HIV/AIDS integration' (Van Laren, 2007b). The delegates of this symposium ranged from post graduate students currently registered for degrees at UKZN to international delegates from Australia and Canada.

Another way of making my claims public was through the publication of a paper entitled 'Using metaphors for integrating HIV and AIDS education in a mathematics curriculum in pre-service teacher education: an exploratory classroom study'. This paper was accepted for publication (Van Laren, 2007a). In the article I explored the beliefs of the participants about integrating HIV and AIDS education in mathematics and linked these beliefs with how the participants taught integrated lessons in mathematics classrooms with young learners.

The validity of a claim made whilst doing action research in self-study generally requires an evidence base (McNiff & Whitehead, 2006, p. 259) to show the authenticity of your claim. Castello (2003, p. 45) suggests that credibility of research can be enhanced by prolonged involvement in a study, by using more than one method of data collection, by including negative case analysis to discover instances

which oppose your theory and by keeping a detailed record of your research in the form of an 'audit trail'. McNiff and Whitehead (2006, p. 157) suggest that the action researcher needs to make the knowledge claims public so that its validity can be tested against other professionals' claims and views. It is suggested that making use of 'critical friends' as well as 'validation' groups' for listening, scrutinizing and critical feedback of data and evidence be used to facilitate engagement. The importance of recording the comments/suggestions/criticisms is stressed in preparing cases for 'why others should believe you and acknowledge your credibility and the legitimacy of your research.' (McNiff & Whitehead, 2006, p. 161).

The reliability of a measure is dependent on seeing if an activity were to be repeated if the same result would be obtained but it would be impossible to duplicate any social events because of the transitive and complex nature of social contexts (Atweh, 2002, p. 57). The social context of my research has been detailed previously (See Chapters One and Two.) so it would be almost impossible to duplicate these exact contexts but similar contexts may exist at HEIs in South Africa.

The generalizability of findings requires seeking general application outside the situation that is being explored but this is often not the goal of a researcher who aims at improving her or his own practice. Atweh (2002, p. 57) suggests that in action research sufficient details about the context of one's practice allows for transferability (not generalizability) to other contexts. He also encourages researchers to:

Demonstrate the basis of their learnings as stemming from real observations about their practice ...

Argue that the learnings they obtained are useful to explain and predict changes in their practice.

McNiff and Whitehead (2006, p. 157) consider validity and legitimacy to be necessary when testing the validity of the action researchers' claims to knowledge. Legitimacy centres on ensuring that the work the researcher has produced is accepted in the public domain. This involves the researcher showing the value of their work so that others will attempt to implement or gain from your work. McNiff and Whitehead (2006) suggest that researchers should get recognized by the community of practitioners as well as researchers as action researchers contribute to practice and research whilst improving their practice. The onus appears to be on the researcher to disseminate the knowledge gained as widely as possible.

In traditional empirical accounts, validity may be seen as a measure of how well a study accurately mirrors or measures the particular topic that the research is attempting to gauge but for qualitative research other criteria have been developed to replace validity. For example, Guba (1981) suggests that 'trustworthiness' may be achieved by research strategies that call for credibility, transferability, dependability and confirmability using a variety of criteria. For quantitative and qualitative research it appears to be necessary and prudent to use different types of criteria to increase validity.

### ***The presentation of findings as seen through the 'windows of my mind'***

During the three years of this study, a great variety of educational practices and experiences provided possibilities for reflection and further actions. Because of the large volumes of data collected, selections from the data were necessary to build on or test the theoretical constructs that I have developed.

Obviously these selections will be a purposive sample of what is available. My 'vision' necessitated choices and these are by no means unbiased, impartial or value-free. It is through behaviours that theory in action can be observed but it is often difficult to observe and reflect on the theories held by other people. Even directly asking participants to explain their beliefs and behaviours does not guarantee authenticity. My explorations of what occurred during my integration of HIV and AIDS education in mathematics in PME 210 module, the focus group activities and the practice teaching experience have been used to demarcate the descriptions of my 'views'. Each of these three settings that occurred during specific times, places and spaces provided glimpses of the reality of the integration process.

In each of the three settings my role as a researcher was different. By using a mixed method research design I was required to take on different roles depending on the paradigm used. When the responses to the questionnaires were analysed using statistics, my role as a researcher may be described as tending towards an 'externalist' stance (McNiff, 2006). The Technical (empirical) paradigm connected with statistical analysis of data positioned me as an external observer. Here my role may be seen as being separate from the pre-service teachers registered for the primary mathematics education module. When I reflected on the work of the focus group participants during the workshop discussions and observed their teaching of mathematics in classrooms, I also took on the role of an 'externalist' researcher as I interpreted, in consultation with the participants, the particular integration strategy. Here I was interested in understanding what happened in social settings and worked in an Interpretive paradigm. Whilst researching my interactions with the focus group participants, however, I could not take on the role of an 'externalist' because I

deliberately positioned myself as a lecturer-researcher using an extension of the Critical Theoretic paradigm. When using action research for self-study my role obligated me to take on the responsibility of the other participants in their teaching and learning of the integration of HIV and AIDS education in mathematics. The variety of roles I assumed during the research cannot be seen as a limitation of the study but rather as allowing for a variety of research perspectives.

The three chapters that discuss the findings have **not** been separated according to the three different settings that were associated with the PME 210 module, the focus group discussions and the mathematics classroom settings at practice teaching schools. Other considerations have been used to demarcate the chapters. I offer the following reasons for my choices of combining and demarcating of certain aspects of the findings.

Before being able to reflect and analyse my observations, it was necessary to consider what has 'shaped' the phenomenon being viewed at a particular time, place and space. To obtain a glimpse of how I influenced the contexts in which the integration processes occurred in the PME 210 module, I used the findings and analysis of the survey to provide information of what HIV and AIDS education had been experienced by pre-service teachers at my HEI. To this end some closed statements on the questionnaire were selected to provide an inkling of the experiences of pre-service teachers at Edgewood. The results of the questionnaire were therefore described and analysed as this forms part of the context for the teaching and learning of the PME 210 module. The analysis of the questionnaire responses is presented in Chapter Four.

Chapter Five explores the beliefs of the participants together with their 'beliefs in action'. Here the drawings and interpretations of metaphors for integration of HIV and AIDS education in mathematics that were explored during the second and third focus group discussions are linked with practice teaching observations of the participants, responses from their post lesson interviews and their focus group reflections. During HIV and AIDS education in mathematics lessons, it was thus possible to 'observe' the participants' theories and beliefs where teaching experiences may be seen as 'theory in action'.

As interactions are recognised as an important feature of self-study, I analysed my interactions during focus group discussions, my responses as an interviewee with an experienced researcher-teacher, Dr Nancy Lesko, and discussions with a colleague. My interactions with pre-service teachers were significant as I aimed at 'making a difference' and these interactions influenced my theories and beliefs about the integration of HIV and AIDS education in mathematics. My actions are thus influenced by my theories that have, in turn been shaped by my beliefs about the integration of HIV and AIDS education in mathematics. Furthermore, my theories and beliefs have evolved through my life experiences that include the influences of the theories and beliefs developed during interactions with pre-service teachers during HIV and AIDS education in mathematics initiatives. In Chapter Six I analyse my interactions during focus group discussions and my beliefs about integration of HIV and AIDS education in mathematics using a drawing of a metaphor. Interactions with Dr Lesko that provided collaborative autobiographical contributions are also included in the next chapter.

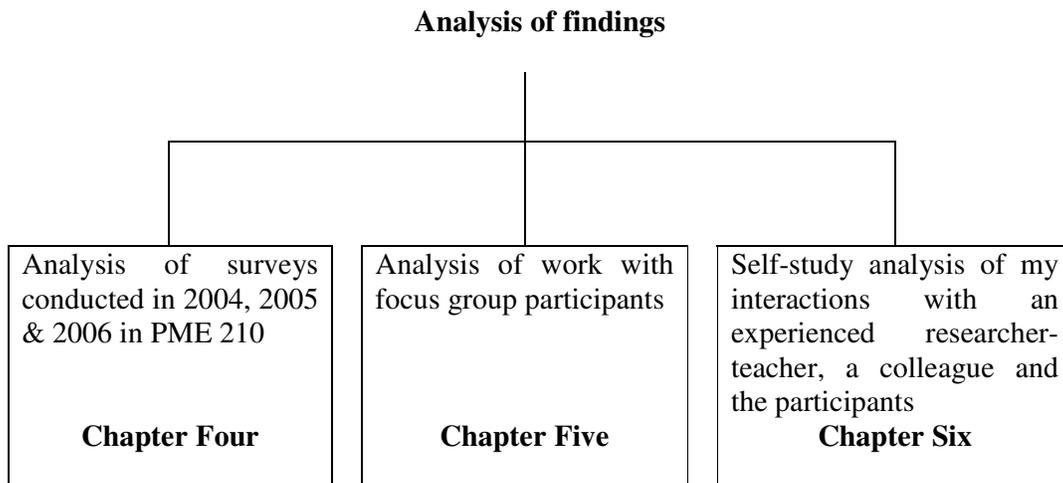
## SUMMARY

Making use of quantitative, qualitative and action research methods facilitated my *Starting with ourselves* study where my main aim was to ‘make a difference’ materialise in my delivery of HIV and AIDS education in mathematics. By recording full details of the research process I was able to explore the research questions that lay closest to my aim of the study, namely: ‘How can I improve my delivery of HIV and AIDS education in mathematics at my HEI to assist pre-service teachers with the realities of the classroom environment at the epicentre of the AIDS pandemic?’ and simultaneously ‘How do I live my values of social justice more fully in my teaching of mathematics education?’

Using a self-study *Starting with ourselves* approach I have been driven to track my research processes in a systematic manner by scrutinising my delivery of PME 210 modules over the three years of this study, my involvement in the focus group initiatives and experiences through autobiographical collaboration with Dr Lesko. From the extensive reflection required for this research I will be better equipped to plan and develop further improvements to my practice as I broaden the possibilities of integration of HIV and AIDS education in mathematics modules with pre-service teachers. Furthermore, the recording of the process will facilitate the dissemination of the information I have gained so that it is possible to reveal and expose my integration strategies and the recorded information in this self-study could provoke further discussion. By providing deep details of the integration processes I employed, other researchers may be able to challenge my strategies and these ideas may further debates about the merging of ‘soft’ and ‘hard’ disciplines in teacher education.

The description of the findings of the research is divided into three chapters. In Chapter Four the study that is centred on the PME 210 module with the third-year pre-service teachers and their responses to particular questions of the questionnaire is presented. The next chapter relates to the exploration of the beliefs about the integration model that was explored using the drawings of metaphors with the fourth-year pre-service teachers during focus group discussions and the links to their classroom experiences. Chapter Six presents ‘my story’ together with findings from interactions with focus group participants and collaborative autobiographical work with Dr Lesko.

Figure 2 is a diagrammatic representation of the demarcation of the next three chapters that are devoted to analyzing the findings.



**Figure 2: A diagrammatic representation of the demarcation of the three ‘prongs’ in the findings chapters**

## **CHAPTER TWO**

### **POLICY CONTEXT AND REVIEW OF LITERATURE**

#### **INTRODUCTION**

In this chapter, I review local and international literature on HIV and AIDS education in teacher education. I then review some of the pertinent international and national debates on what is required for HIV and AIDS education in teacher education and I discuss how HIV and AIDS education is interwoven through South African National Government directives, Higher Education Institution policies and models advocated for HIV and AIDS teacher education. I explore some theoretical and conceptual frameworks for an integrated model of HIV and AIDS education in mathematics. Finally I describe what has influenced my understanding of HIV and AIDS education by considering a variety of interpretations of ‘context’ in the discipline of mathematics education.

#### **HIV AND AIDS EDUCATION MODELS IN PRE-SERVICE TEACHER EDUCATION IN SOUTH AFRICA: THE POLICY CONTEXT**

HIV and AIDS education in pre-service teacher education is subject to expectations from National Government directives, Higher Education Institution policies, current research in pre-service teacher education and pre-service teacher expectations. Because of the teaching profession requirements, pre-service teacher education needs to comply with the South African Department of Education (DoE) expectations that govern school policies and teacher education policies.

The South African national policy document for teacher education specifies the *Norms and standards for educators* (DoE, 2000a) in training. This document sets out seven roles necessary for teachers. Here a 'role' is regarded as a character or part the teacher has to play as part of her or his work requirements. In the case of teachers, these requirements are understood as having occupational, academic and professional dimensions which are spelt out in the practical, foundational and reflexive competences associated with the roles. The roles define the curricula for state-funded pre-service teacher education programmes which are committed to developing proficiency in each role. Teachers must be competent in the roles of learning mediator; interpreter and designer of learning programmes and materials; leader, administrator and manager; scholar, researcher and lifelong learner; community, citizenship and pastoral supporter; learning area/subject/discipline/phase specialist. As a primary mathematics teacher educator, I am dedicated and obliged to development of proficiency in these roles in the context of teaching mathematics to young learners.

Furthermore, in the *Norms and standards for educators* (DoE, 2000a) policy document, 'barriers to learning' as well as 'integrated teaching programmes' are often mentioned. In this document HIV and AIDS is referred to in one instance and considered to be one of South Africa's current social and educational issues. Learners who are affected or effected through HIV and AIDS certainly experience barriers to learning. The policy document emphasises the need for teachers to understand the barriers to learning. The development of integrated subject material in learning programmes is also seen as an important requirement for teachers. This interpretation

of the policy document makes way for allowing and encouraging the integration of HIV and AIDS education in the Mathematics Learning Area.

Another South African government policy document, *Criteria for recognition and evaluation of qualifications for employment in education based on the norms and standards for educators* (DoE, 2000b), spells out criteria for the different roles for the recognition of teaching qualifications. In the primary school, the teaching specialisation is the phase specialisation since the national curriculum is premised on the notion of primary school teachers being generalists. This means that teachers are expected to teach all subjects or Learning Areas to a particular class of learners. In other words, the pre-service teachers who are registered for PME modules do not choose to teach mathematics but choose to be primary school teachers and thus are required to take and pass PME modules. This policy document (DoE, 2000b), prescribes a study of each learning programme (including mathematics) that includes the "disciplinary bases of content knowledge, methodology and relevant pedagogic theory" as well as "expertise in the development of numeracy" (p. 29). This research therefore extends and supplements what is required in these policy documents (DoE, 2000a; 2000b) that regulate teacher education in South Africa. Furthermore, there are Higher Education Institutional policies that also link to HIV and AIDS education. It is necessary to examine these influences as contexts that inform and guide my proposed model of integration of HIV and AIDS education in my discipline area, mathematics education.

### ***Models for HIV and AIDS education in National Government policies***

In the literature there are a variety of suggested models given for schools or institutions to respond to HIV and AIDS education. These models, described later in this chapter and in Chapter Seven, range from the integrated (HIV and AIDS education across the curriculum) model to one of a single subject area (Life Orientation and counseling) (UNESCO, 2006). The *National policy on HIV/AIDS for learners and educators in public schools, and students and educators in further education and training institutions* rules that:

Learners and students must receive education about HIV/AIDS and abstinence in the context of life-skills education on an ongoing basis. Life-skills and HIV/AIDS education should not be presented as isolated learning content, but should be integrated in the whole curriculum. It should be presented in a scientific but understandable way. Appropriate course content should be available for the pre-service and in-service training of educators to cope with HIV/AIDS in schools. (DoE, 1999, p. 9)

This policy document dictates that ‘In the primary grades, the regular educator should provide education about HIV/AIDS.’ (DoE, 1999, p. 10). The ‘regular educator’ refers to the generalist primary school teacher who is required to teach the Numeracy Learning Programme for 35 % of the school teaching time in the Foundation Phase (Grades 0 – 3) and teach Mathematics for 18 % of the time in the Intermediate Phase (Grades 4 – 6) (DoE, 2002, p. 32). In the primary grades the pre-service teacher would therefore need to be able to integrate HIV and AIDS education into the teaching and learning of Mathematics (known as Numeracy in the lower primary grades) as well as being able to teach HIV and AIDS education in the Life Orientation Learning Programme.

The DoE (1999) models suggested provide for pre-service teacher preparation of Life Orientation specialists who cover a range of health issues, including basic health and nutrition, the physiology of reproduction, reproductive and sexual health, family planning, sexually transmitted diseases (STD), and HIV and AIDS prevention but the Mathematics Learning Area teacher should be able extend an appropriate HIV ethos.

Subsequently the DoE (2000c) published a 'user friendly' booklet called *The HIV/AIDS emergency: Guidelines for educators*. This booklet is based on the National Policy on HIV/AIDS (DoE, 1999). Here schools or institutions are encouraged to 'develop their own policy on HIV/AIDS, in order to give operational effect to the national guidelines'. Schools or institutions are, however, warned not to contradict the national policy or the guidelines provided in the booklet (DoE, 2000c, p. 14). The particular perspective that I will be exploring in this study relates to the idea of integration of HIV and AIDS education in the teaching and learning required in the Mathematics Learning Area. This model falls in line with what is advocated by the DoE (1999; 2000c).

This integration model of inclusion, advocated in the South African document, *Education WHITE PAPER, Special needs education: Building an inclusive education and training system* (EWP6) (DoE, 2001), was envisaged for a primary school mathematics education module developed for pre-service teachers. The concept of Inclusive Education arose out of the need to facilitate change in the provision of education and training so that it is responsive and sensitive to the diverse range of learning needs. This was an attempt to move away from differentiation of schools into special and ordinary (normal) schools, and towards addressing barriers to learning for all in school. In the EWP6 document, particular mention is made of HIV

and AIDS and other infectious diseases. Teachers are required to develop an inclusive education and training system that takes into account the incidence and the impact of the spread of HIV and AIDS (DoE, 2001, p. 23). Furthermore, the EWP6 policy document proposes the expansion of professional capacity of all teachers in curriculum development so that teachers acquire competencies to recognize and address barriers to learning (DoE, 2001, p. 49). The expansion of the mathematics education of pre-service teachers to include HIV and AIDS education is the vision for this research exploration.

These barriers to learning are reiterated in the Southern African Development Community (SADC, 2001) *HIV/AIDS in education strategic framework* document. The HIV/AIDS educational requirements put forward in this SADC document echo the South African National policy document (DoE, 1999). The wider network of the SADC countries on HIV and AIDS education allows for collaboration between Angola, Botswana, Democratic Republic of Congo, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Seychelles, South African Swaziland, Tanzania, Zambia and Zimbabwe. This SADC framework (2001, p. 22) highlights, as a strategic objective, that primary school curriculum should be installed to provide HIV and AIDS education as integrated or as a separate part in life skills programmes. Four of the other strategic objectives in helping prevent the spread of HIV and AIDS are listed as:

- 1) Developing and using appropriate materials: promoting the use of contextually specific and relevant learning materials
- 2) Developing educator knowledge and skills: providing skills training for educators on dealing with affected and infected learners
- 3) Upgrading teacher educators: improving the skills, behaviours, attitudes and knowledge of those responsible for INSET<sup>1</sup> and pre-service preparation of teachers of life skills programmes
- 4) Evaluating curriculum interventions: assessing the content,

implementation and outcomes of life skills and similar curricula – at all levels from preschool to universities to determine if this is education’s most appropriate contribution to prevent AIDS. (SADC, 2001, p. 22).

From the DoE (1999; 2000c) and SADC (2001) documents it appears that an integrated and/or a stand alone offering of HIV and AIDS education is provided for. The integration of HIV and AIDS education in the teaching and learning of Mathematics would thus be a model that is approved by the DoE and in keeping with recommendations by the wider Southern African community.

### ***Models for HIV and AIDS education in Higher Education Institution policies***

In addition to DoE and wider Southern African requirements for HIV and AIDS education, it is necessary to consider the demands of South African Higher Education Institutions. The responses of South African universities to the DoE HIV and AIDS policies were documented in a report entitled *Institutionalising the response to HIV/AIDS in the South African university sector* (SAUVCA, 2000), which focused on the findings of an investigation by the South African Universities Vice Chancellors Association. The former University of Natal and the former University of Durban-Westville (now merged to form UKZN) were represented by Vice Chancellors who contributed to the formulation of this report. By mid 2000, according to the analysis of the responses of the University sector (SAUVCA, 2000, pp. 11 - 12) the following eight defining features existed in the management of South African higher education system: 1) Responses to HIV/AIDS are often driven by individuals and small groupings which have often committed huge efforts 2) Responses to HIV/AIDS are typically focused on prevention strategies and programmes 3) Responses to

HIV/AIDS take the form in many instances of ad hoc activities with no backing by an institutional framework or plan 4) There is a radically uneven spread across the sector – while some institutions have highly developed policy and programmes, others have neither in place 5) The context in which these responses occur is weakened by the absence of national policy or guidelines that are specific to higher education 6) National government had a temporary support mechanism in place which has yielded no results 7) There are no incentives to make HIV/AIDS an institutional priority or to keep it as such 8) In the absence of available models, some institutions are struggling to define their response to HIV/AIDS because of problems of capacity, resources or a lack of leadership (SAUVCA, 2000, pp. 11 - 12)

In the SAUVCA (2000) report, it was noted that the former University of Natal and the former University of Durban-Westville had prepared draft HIV and AIDS policy documents that had not yet been approved or adopted (SAUVCA, 2000, p. 15). One of the programme recommendations made by the report was the ‘The challenge to universities is to develop curricula and programmes that prepare their students for a new reality’ (SAUVCA, 2000, p. 24). This opens up the possibility for development of curricula that are acceptable and responsive to the HIV and AIDS context in which South African pre-service teachers will be required to teach.

### ***Integrated models for HIV and AIDS education***

An integrated, multidisciplinary model for tertiary education is described in a paper presented at the Bangkok, Thailand, *Our challenge HIV/AIDS* conference. The Jamaican, Trinidad and Tobago proponents (Bain et al, 2004) are in favour of a comprehensive effort to challenge the HIV crisis and state that few universities in the world have mounted an interdisciplinary response to HIV and AIDS among staff and

students. They describe a specially organised, multidisciplinary HIV and AIDS programme with the mandate to accelerate the institutional response to HIV and AIDS through research, training and strategic engagement with society, developing and monitoring HIV and AIDS policies.

In the area of HIV and AIDS education in teacher education, Otaala (2006, p. 247) notes that there is a 'litany of inadequacies in the current responses of tertiary institutions' but 'a number of examples of good practice do exist' in the pattern of present responses by African tertiary institutions to the HIV and AIDS epidemic. He located a number of courses, both voluntary and compulsory, where curriculum integration have been introduced but only cites three Southern African institutions where HIV and AIDS education has been incorporated in curricula (Otaala, 2006).

Firstly, at the University of Cape Town (UCT), HIV and AIDS materials have been developed by their HIV/AIDS unit for formal curricula. The UCT HIV/AIDS unit develops, teaches and evaluates courses that respond to HIV by considering personally and professionally as well as allowing students to become responsible members of the community. Workshops conducted by the HIV/AIDS unit offer staff members basic information, methods of communicating with children about AIDS, and living with HIV. Secondly, the University of Namibia has developed a compulsory examinable module for all first-year students. This module deals with gender, ethics, and HIV and AIDS. Thirdly, Kenyatta University offers a wide variety of HIV and AIDS- related courses as well as a compulsory core unit for all students.

The UCT model of integration draws on staff from various departments but Otaala (2006) provides no reference to specific research studies where possible links to research at the UCT Faculty of Education could be located and studied. The inclusion of topics such as communicating with children about AIDS and living with HIV, for example, may provide valuable suggestions for use in the field of teacher education.

Indeed, an exemplar of an integrated model that was suitable for teacher education was explained at the *HIV/AIDS and teacher education: Consultation on HIV/AIDS and teacher education in East and Southern Africa* Conference (Coombe, 2003a). At this conference a description of the kind of teachers that are required for HIV/AIDS education was given. ‘Multiskilled’ teachers are cited as a requirement of teachers who ‘save lives’. This teacher is seen as being HIV-aware, HIV-competent, and HIV-safe. Multiskilled teachers are necessary because not all teachers are able to do the specialist tasks of care and counseling for learners. In the light of these recommendations, multiskilled teachers may be interpreted as teachers who are able to teach a discipline, such as mathematics, be AIDS-competent as well as able to counsel learners. The synopsis of observations and principal conclusions of this conference find that effective pre-service education (PRESET<sup>2</sup>) HIV-Competence Programmes in teacher education is not keeping up with teacher needs. According to Coombe’s (2003b, p. 3) summary presented at this conference, ‘There have been no known evaluations of content, implementation and outcomes of HIV INSET programmes in any participating country. For the most part INSET provision from the centre has been superficial, ad hoc, unsystematic, and poorly funded and managed.’ This comment is related to HIV INSET programmes but rings true for HIV PRESET programmes too. To extend HIV-competence to teacher educators and teachers in training, the whole institution must be HIV-competent, -aware, and -safe.

This would mean that the HIV ethos must pervade and permeate each discipline taught in the institution, including mathematics education.

As noted before, there is by no means consensus on what the most appropriate response of schools in terms of models of addressing HIV and AIDS education. On the one hand is a model of integration as supported by the work of Skripak and Summerfield (1996) that relates specifically to HIV and AIDS pre-service teacher education in the United States of America. This work was presented more than a decade ago but their suggestions are still applicable. Skripak and Summerfield (1996) list six factors related to HIV and AIDS that make pre-service preparation critical.

The first relates to the fact that the number of children with HIV and AIDS who are attending school is expected to grow. Teachers need an understanding of the special educational, social, psychological, and medical needs of these students. The second is that HIV and AIDS has been the leading cause of death among 25 to 44 year-olds. With this, teachers may expect to confront educational and psycho-social issues among children whose parents have HIV disease. The third is that, to prevent the spread of any disease, teachers must be knowledgeable and skilled in using correct infection control guidelines in and around the classroom. The fourth relates to the fact that in some instances the teacher may be entrusted with information about a student's, parent's, or staff member's HIV status and must understand ethical and legal requirements for respecting confidentiality. The fifth factor is that teachers may be expected to provide HIV and AIDS education and to answer students' questions about HIV disease in a manner that is developmentally and culturally appropriate. Teacher attitudes affect their comfort with and capacity to teach specific subject matter. The sixth relates to the fact that the pre-service setting offers an opportunity

for future teachers to explore their own beliefs and biases toward the disease (Skripak & Summerfield, 1996). From looking at these factors it is obvious that teacher education institutions are presented with a daunting task that should not be the sole responsibility of the specialist Life Orientation learning area teacher.

Lubben and Campbell (2006, p. 482) call for 'Teaching for life' and believe that 'HIV/AIDS education must be the concern and responsibility of all teachers.' They developed a Namibian model for HIV and AIDS education for initial teacher training for primary and lower secondary schools. These authors provide a structure for a cross-curricular framework and they give suggestions for improving self-confidence of teacher educators in dealing with HIV and AIDS education.

Several South Africa initiatives demonstrate the ways in which HIV and AIDS education can become part of existing modules. Stuart (2006), for example, integrated a visual arts-based approach into HIV and AIDS education with pre-service teachers. The focus group selected were pre-service teachers who were registered for an elective guidance module. In Stuart's (2006) study drawings and photographs were used to make media messages that facilitated assessment of knowledge, attitudes and perceptions so that pre-service teachers could take action. This allowed the pre-service teachers to communicate what they wanted to say about HIV and AIDS from their own experiences and local socio-cultural contexts. The study by Stuart (2006) is one of a few projects that examine HIV and AIDS education in teacher education. Stuart's work effectively encouraged the pre-service teachers to become knowledge producers and disseminators by making use of activities that were visual arts-based to promote HIV and AIDS education.

Another action research project that uses integration is described by Ebersöhn, Ferreira and Mnguni (in press). The researchers successfully used memory-box-making to facilitate psychosocial support of learners and used the work on memory boxes described by Ebersöhn (2007) and Eloff, Ebersöhn and Viljoen (2007). These researchers worked with teachers to show how memory-box-making may have pastoral benefits. The memory boxes made by learners contained valued personal belongings of loved ones to remember a person's life in the event of death. This study focused on INSET but these researchers are of the opinion that the integration of memory-box-making strategies could be introduced in PRESET so that pre-service teachers can address the acquisition of psychosocial support skills in curricula. Furthermore the making of a suitable box could link with the teaching and learning of Space and Shape which is one of the outcomes in the mathematics curriculum for schools.

At the same time, UNICEF (no date), cites a study by Kann et al (1995) where an integration approach was not met with great success. This study at the Center for Disease Control in the United States of America shows that the model of integration in schools may simply mean 'watering down', diffusion and perhaps even confusion. Based on studying how a number of schools are addressing the issues, they concluded that there is a strong case against the integration model. UNICEF (no date) is encouraging countries to move away from the integration approach, and toward the "carrier" or separate subject approaches. They advocate teaching the necessary knowledge, attitudes, and skills together in one (existing) subject, in the context of other related issues and processes.

Kann et al's (1995) study showed that compared to 'health educators', 'infusion teachers' teaching HIV and AIDS prevention were unsatisfactory. The following eight inadequacies of the infusion model are listed by UNICEF (no date, p. 1) as:

- 1) teachers were less likely to be trained, and were trained on fewer of the relevant topics
- 2) the material was less likely to cover the necessary topics, especially the more sensitive and relevant topics regarding prevention
- 3) the content was more likely to cover the science and biology of HIV/AIDS than prevention elements
- 4) the topics were less likely to include family and community elements in their programs
- 5) less time was spent on the subject
- 6) the work was less likely to utilize recommended resources (including the formal curriculum)
- 7) the presentations used fewer interactive methodologies, and covered fewer of the skills and offered less practice of skills than "health educators"
- 8) a review of life skills-based programs in East and Southern Africa showed that infusion approaches did not have the expected impact, often because teachers were not sufficiently trained and do not implement the program properly. For example, teachers often overlooked sensitive issues and realistic situations that would personalize the risks of young people. Not having a specific allocation in the timetable was also a barrier to effective implementation, (Gachuhi, 1999). Gachuhi (cited in UNICEF, no date, p. 1) concluded that 'stand-alone life skills programmes or having one lesson a week entirely separate and on its own, or a special lesson within a subject like health education or biology, have a better chance of succeeding than those that are infused in the curriculum.'

There are a number of distinctions to be made in these interventions. One relates to the issue of integration vs. infusion. While it is difficult to find clear definitions, one might look to examples and note that in the case of integration the curriculum calls for ensuring that HIV and AIDS appears in all aspects of the course of module (so that,

for example, probability as a concept is taught using examples of HIV and AIDS rather than say flood statistics.). In the case of infusion, it may simply be that one component of a course or module is replaced by the new topic, in this case HIV and AIDS.

Another distinction needs to be made between what works in school classrooms and what the most appropriate model is for HIV/AIDS PRESET education. In South Africa the recent *Report of the public hearing on the right to basic education* (Kollapen et al, 2006) highlights the challenges facing HIV and AIDS education in the South African curriculum because of the lack of status of the Life Orientation programme. This supports the idea then of looking at how HIV and AIDS could be integrated into a learning area that enjoys high status. Indeed, in pre-service teacher education it is precisely the higher status of the mathematics discipline that would benefit HIV and AIDS education through integration.

### **HIV AND AIDS EDUCATION IN TEACHER EDUCATION**

There appears to be inadequate capacity development of teachers to provide instruction in HIV and AIDS education as well as aspects of caring for the learners who are affected or effected by HIV and AIDS. A number of years ago, a study by Skripak and Summerfield (1996), for example, found that there was generally limited planned instruction in teacher education regarding HIV education. In reviewing research in HIV and AIDS education in the 1990s in teacher education, these authors found that generally pre-service teachers did not understand protective procedures required when working with blood or bodily fluids and often pre-service teachers were not required to register for sexuality education courses.

If pre-service teachers lack personal knowledge about HIV and AIDS then teacher education has an obligation to provide ways of increasing the personal knowledge of teachers. Some researchers, however, point out that there is an assumption that increasing personal knowledge about HIV and AIDS brings about a change in behaviour that will reduce the possibility of HIV infection. Bennell et al (2002) and Varga and Makubalo (1996) point out that such knowledge is a necessary but not sufficient condition for positive behaviour change; a simple linear association between increased knowledge and reduced infection rate does not exist. According to these authors there is a complex relationship between knowledge and behavioural choices. Teachers are, however, required to have more than personal knowledge about HIV and AIDS in order to facilitate the teaching and learning in HIV and AIDS education. Teachers, as a minimum, need to have biomedical knowledge about HIV and AIDS together with some understanding of how to engage their learners in HIV and AIDS education.

While several authors of more recent studies (for example, Baxen & Breidlid, 2004; Kelly, 2002; Malcolm, 2002) suggest that one of the most important weapons against HIV is education, studies that examine pre-service teacher education internationally suggest a lack of HIV-specific training in pre-service teacher education. Furthermore, Baxen and Breidlid (2004) point out that it would seem that the assumption is made that if teachers are given the necessary knowledge about skills to teach the teachers will, can and will want to teach effectively. These authors found that researchers often focus on the teachers as the objects of study instead of taking into account how the teachers position themselves within the HIV and AIDS discourse. The necessary personal confidence of teachers to take on the task of

teaching about HIV and AIDS and issues of sexuality appears to be an overlooked in teacher education.

In an attempt to develop a focus that would address the needs of teacher education institutions attempting to implement HIV and AIDS education, in 2002, the American Association of Colleges for Teacher Education (AACTE), together with the American Association for the Advancement of Science (AAAS) initiated a forum called the 'Consensus Panel on HIV/AIDS and Teacher Education' to consult on recommendations for knowledge, skills and dispositions of teachers who work with young learners to engage with issues of HIV and AIDS (Consensus Panel on HIV/AIDS and Teacher Education, 2003). This forum concluded that barriers to HIV and AIDS prevention education efforts persisted in teacher education. The forum saw the need for the development of 'humanistic, socially appropriate, and non-technical models' (p. 4) that required teaching through a learner-centred approach.

This forum consisted of eighteen education, health and science professionals from across the United States. The issues they discussed included practical and theoretical applications in teacher preparation and teacher professional development. These panelists identified specific knowledge that was essential in teacher education and identified core information and skills required for HIV and AIDS education. The forum listed five essential components for professional development of teachers: Humanizing Pedagogy; The Science and Skill of Teaching Prevention; Diversity in Teaching and Learning; International Dimensions of Prevention and Transformative Action in Schools and the Community.

The 'Humanizing Pedagogy' (Consensus Panel on HIV/AIDS and Teacher Education, 2003, p. 7) requirement in teacher preparation was targeted by developing an anti-biased and caring approach to education. Here the cultural, political, legal and biological dimensions of the disease are seen as forming a significant consideration in teacher education. The forum suggested that teacher education should also prepare teachers who could provide general information on the science of HIV and AIDS using appropriate, non-scientific language (Consensus Panel on HIV/AIDS and Teacher Education, 2003, p. 7). A further recommendation was that commonly asked questions should be explored in teacher education and teachers should develop a sound knowledge of terms related to HIV and AIDS.

Furthermore, teacher education was tasked with extending understanding of the inherent value of diversity in teaching and learning (Consensus Panel on HIV/AIDS and Teacher Education, 2003, p. 8). The forum recommended that teacher education should consider specific themes related to HIV and AIDS education. Issues in sexuality, gender, disability, human rights, family values, expectations, culture, and language together with issues of power, access to information and equity are deemed important issues in teacher education. Teacher preparation was also tasked with developing a focus on understanding the global nature of HIV and AIDS. The worldwide behaviour change required for effective responses to issues surrounding HIV and AIDS education (Consensus Panel on HIV/AIDS and Teacher Education, 2003, p. 8) would thus be another important focus for teacher education. Not only was teacher education required to consider the global nature of HIV and AIDS, teacher educators were expected to facilitate good relationships between teachers and the local communities served by the schools. Teachers would also need to be sensitive to

social issues in the community. The Forum also tasked teacher preparation with facilitating the notion that teaching and learning about HIV and AIDS is compatible with co-existing factors in the wider community (Consensus Panel on HIV/AIDS and Teacher Education, 2003, p. 8).

Interestingly, members of the Consensus Panel on HIV/AIDS and Teacher Education convened to develop what they consider to be a knowledge base for HIV and AIDS prevention for teacher education and a collection of articles, edited by Macedo (2006), was produced for use in teacher education. The publication, *Humanizing pedagogy through HIV and AIDS prevention: Transforming teacher knowledge* identifies what these authors consider to be essential HIV and AIDS information and prevention knowledge and skills that all teachers require so that they can serve as catalysts for ‘humanizing pedagogy’. Grant and Summerfield (2006, p. xxix) claim that ‘this volume will be welcomed by teacher educators, teachers, and teacher candidates as a resource to help them learn about how to deal – personally and professionally’ with the issues concerning risks of contracting HIV.

In the light of the high prevalence rates in sub-Saharan Africa, there is a need to scrutinize teaching and learning about HIV and AIDS in this context. For example, Baxen and Breidlid’s (2004) research on HIV and AIDS education in sub-Saharan Africa explored gaps and challenges and suggest that new research should focus on ‘developing an understanding of where and how knowledge is produced and reproduced’ (p. 9) to assist teachers and learners with HIV and AIDS education. Their reviews showed that education ministries appeared able to provide HIV and AIDS education policies, but were disappointing in terms of suggestions for possible

actions for encouraging teachers at the chalk face in schools and classrooms. They suggest that it is necessary to interrogate research on HIV and AIDS by focusing on ‘*what* research and *how* research is conducted and by *whom*, using *which* methodological lenses’ (p. 11). They conclude that the prevailing emphasis on intervention and prevention programmes in the research in this region ignored the fact that more knowledge about HIV and AIDS is not necessarily directly linked to behaviour changes. According to them, teacher educators would therefore need to find ways and means of considering teaching and learning of HIV and AIDS education as imbedded in the complex social and cultural contexts of particular societies.

Similarly, Chege (2006) makes recommendations from her research in Eastern and Southern Africa (Botswana, Kenya, Rwanda, South Africa, Tanzania, Zambia and Zimbabwe). For example, she suggests that teacher training requires a tailor-made programme that assists teachers with the development of skills on how to construct HIV and AIDS education through social relations skills rather than through exclusive emphasis on sex education. She further suggests:

Training teachers in participatory pedagogic skills should be a key component for both the in-service as well as pre-service teachers for all subjects, including sexuality and HIV/AIDS education. (Chege, 2006, p. 41)

She also notes that the emphasis on secondary school learners as targets for sex education programmes is inappropriate as it is not just secondary school learners who show an interest in sexuality. For her, primary school contexts are important sites where young learners construct and/or reproduce sexual identity, a point that is confirmed in her work with Pattman (Pattman & Chege, 2003). For these authors, it

is important that teacher education programmes assist teachers of young learners so that appropriate HIV and AIDS education is facilitated in the lower primary school grades.

It appears that most of the work around HIV and AIDS education at pre-service institutions in sub-Saharan Africa is at the policy developing stage and the research literature around implementations of policies is somewhat silent. An example of the present state of implementation of HIV and AIDS education at a pre-service institution is a recent report prepared for the International Institute for Educational planning entitled *Planning for education in the context of HIV and AIDS: Mitigating the impact of HIV and AIDS in teacher training colleges in Kenya* (Nzioka, Korongo & Njiru, 2006). This report discusses the implementation stage of HIV and AIDS education at Colleges in Kenya but points out ‘The level of training of these tutors is also rudimentary which renders the tutors ineffectual in communication’ (Nzioka, Korongo & Njiru, 2006, p. 57). Some of the reasons given for problems experienced by the tutors are:

...there is need to recognize that HIV and AIDS education needs to be rights-based (including the rights of those infected and affected by HIV and AIDS), gender responsive, scientifically accurate, culturally appropriate and adapted to the age and group of teacher trainees and learners... (Nzioka, Korongo & Njiru, 2006, p. 57)

In South Africa there also appears to be a lack of commitment to implement policy directives regarding HIV and AIDS education in teacher education. Otaala (2006, p. 247) sums up his research findings of the present constraints of African universities in general to implement policies designed to address HIV and AIDS issues by concluding that ‘lack of institutional support and inadequate leadership commitment’

are the major hindrances. Other researchers (for example, Lindsay, 2006; Semali, 2006) also point out that further implementation difficulties are experienced by teachers and teacher educators because of the multifaceted nature of HIV and AIDS issues. These complexities in the teaching and learning of HIV and AIDS education are linked to cultural, social, political and economical factors that complicate and/or cloud teacher and learner responses to HIV and AIDS education.

Recently the Ministerial Committee on Teacher Education (MCTE) (DoE, 2005) in South Africa reviewed the field of Teacher Education. During the period March 2003 to December 2004, the review established the conceptual and theoretical landscape within which a *National framework for teacher education* (NFTE) for the South African context was developed. Attached to the report prepared by the MCTE is a compact disc (CD) that contains a file entitled 'Developing the Field of Teacher Education in South Africa' that documents selected aspects of the work of the ministerial committee on teacher education. The MCTE envisaged that this Framework will provide direction to the development of the interrelated policies that contribute to the qualitative transformation of the education system. The report explains its functions because it

... identifies some main difficulties that have emerged in the field of teacher education, which constitute barriers to the comprehensive transformation of education in South Africa, and it makes practical recommendations about how they can be overcome. It is conceived of not as a blueprint for teacher education – a new policy to replace those we have at present – but as an overarching Framework that will enable us to use the policies already in place to develop a coherent teacher education system, and to focus sharply on the decisive role of teacher education in the transformation of education. (DoE, 2005, p. 2)

The report also goes on to describe

The principal purpose of this Committee was to develop a National Framework for Teacher Education. Such a Framework was conceived of not as a new policy, but as an operational frame in terms of which current policies can be understood as parts of a unified system, and the various players in the field of Teacher Education can co-ordinate their efforts. (DoE, 2005, p. 3)

One of the concerns that the work of the MCTE highlights is the ‘increasing impact on schooling of problems of endemic poverty and the unfolding crisis of the HIV and AIDS pandemic (including the increasing number of orphans and children who are themselves heads of households).’ (DoE, 2005, p. 4). The Framework is, however, not conceived as a new policy document. (The recent policy framework document of the Department of Education (2007) that used these recommendations is discussed later in this chapter.) One of the recommendations that are made encourage HEIs in teacher education programmes to prioritise a definite focus on HIV and AIDS – including the development of an informed understanding of the pandemic and its impacts on schooling and community life, and the competences to cope responsibly with the effects of the pandemic in learning sites. The other is to look at pedagogical content knowledge. (DoE, 2005, p. 14)

The consultative documents which were created in the course of developing the NFTE are available on their CD. One of the three sections on the CD is entitled ‘Proposed Interventions’ and includes a file that elaborates on a proposal for HIV and AIDS to become a compulsory component of professional teacher education curricula. The CD document is dated 18 September 2003 and bears the title *Teacher education and HIV/AIDS* (No author, 2003) and was developed as a report to inform Deans of Education at HEIs.

This document acknowledges that many faculties of education have already developed modules and incorporated aspects of HIV and AIDS into their programmes but ‘despite the initiatives aimed at integrating HIV & AIDS into teaching, research and community outreach, guidelines have yet to be formulated and adopted for integrating HIV & AIDS into the training of teachers engaged in professional teacher training programmes at both pre- and in-service levels.’ (No author, 2003, p. 2). The report to Deans of Education proposes a compulsory core module for all professional teacher education programmes across all phases of schooling and all learning areas that will be required in **all** pre- and in-service professional teacher education qualifications. The proposed compulsory core module is seen as being specifically constructed around, although it is not limited to, the Community, Citizenship and Pastoral role of an educator as prescribed in the *Norms and standards for educators* (DoE, 2000a). Furthermore it is suggested that other modules in professional teacher education programmes should incorporate appropriate HIV and AIDS related issues. So, in addition to the compulsory core module, there should be integration of HIV and AIDS education in disciplines.

The outline of the compulsory core module for professional teacher education is provided and a list of seven components is given as: 1) Understanding HIV and AIDS in a broader context 2) Gender equity and respect for persons 3) Knowing basic facts about HIV and AIDS 4) Knowing key relevant policies and laws 5) Responding to HIV/AIDS in the classroom, school and community (*Personal Development, Competence in developing an appropriate response to the local HIV and AIDS epidemic, Care and support competences, Competence in methods and approaches in teaching about HIV and AIDS, Curriculum and lesson planning*) 6) Addressing

stigma 7) Links to Health Promoting Schools and Inclusive Education. (No author, 2003, pp. 6 & 7)

The content of this compulsory module proposed for pre-service teacher education in HIV and AIDS education in South Africa was proposed in 2003 and appears to be similar to what was considered as important by the United States panel (Consensus Panel on HIV/AIDS and Teacher Education, 2003). The South African module does, however, appear to be intended to give detailed assistance to teachers in classroom teaching and learning of HIV and AIDS education as competence in specific lesson planning is required for this compulsory module.

In the report by Chetty and Michel (2005), entitled *Turning the tide: A strategic response to HIV and AIDS in South African higher education, HEAIDS programme report: 2002 – 2004*, the authors point out that teachers are recognized as important to successful education and prevention strategies. This report states that targeting of children has been where national effort is focused so teachers who are already in the classrooms have been developed in the areas of teaching and learning HIV and AIDS. Preparing pre-service teachers in this area has, however, been neglected. Chetty and Michel (2005) note that despite 20 years of experience of HIV and AIDS in Africa, ‘evidence thus far tells us that understanding HIV and AIDS in the education context, generating the will to act on the epidemic, analyzing its implications and implementing a response has not always readily available skills in higher education’ (p. 60).

According to Chetty and Michel (2005), a compulsory module was developed to be included in all pre-service education curricula. This module, which at the time of

writing this thesis is in the testing phase, consists of a teacher guide, reader and facilitator manual for the lecturer. The four objectives given for this module are: 1) to provide educators with a basic knowledge of HIV and AIDS and how they impact on all aspects of our schooling and society 2) to develop competencies in the teaching approaches and styles appropriate to teaching about HIV and AIDS to learners 3) to develop the personal capacities and confidence needed by educators in coping with HIV and AIDS responsibility in the daily life in schools 4) to develop appropriate collegial attitudes and values so as to contribute to the maintenance of a caring and compassionate climate in the school and other setting of their professional activities. (Chetty & Michel, 2005, p. 59)

A learning guide for this module was prepared by Welch (2006) and consists of four units that consider the questions:

What do we need to know about HIV and AIDS?

Why are HIV and AIDS part of our lives?

What are HIV and AIDS doing to us in our school communities?

What can we do about HIV and AIDS in our classrooms and school communities? (Welch, 2006, pp.4; 21; 36; 49)

The units in the Learning Guide are activity based and developed in a 'cycle'. Content that precedes the activity is used to frame each activity. The activity usually requires comment and discussion of issues relating to the activity. New knowledge is then learnt by reflection on the activity. The next activity is then introduced. This activity based, prescriptive design appears to encourage active involvement in HIV and AIDS issues. To date, however, no evaluation or research on the implementation of this module is available.

The policy framework document, the *National policy framework for teacher education and development in South Africa* (DoE, 2007), drew strongly on the work of the MCTE (DoE, 2005). Interestingly, the framework document mentions ‘the debilitating effects of illness and premature death (especially as a result of HIV/AIDS, TB and other life-threatening diseases which thrive in conditions of poverty)’ (DoE, 2007, p.13) as among the important challenges faced by South Africa and the education system. The policy document, however, hardly refers to HIV and AIDS but suggests possible Continuing Professional Teacher Development (CPTD) programmes that should be part of the broader education provisions. One of these CPTD programmes describes promotion of the use of inclusive education to support learners (DoE, 2007, p. 21) but makes no specific mention of the HIV and AIDS pandemic; no direct provisions or directives are included so that teacher education can prepare ‘better teachers’ to assist with learners ‘who experience barriers to learning and development’ (DoE, 2007, p. 10) within schools. This policy document does not appear to have heeded the recommendations of the MCTE (DoE, 2005) that proposed a mandatory compulsory core module for all professional teacher education programmes.

## **MODELS OF INTEGRATION**

The recent policy framework document, the *National policy framework for teacher education and development in South Africa* (DoE, 2007), does not directly make provision for a stand alone compulsory module for teacher education programmes so it is prudent to consider some alternative methods of including HIV and AIDS education into the functioning of an educational organization. HIV and AIDS mainstreaming is considered to be such an alternative option.

According to the Inter-Agency Task Team (IATT) on Education (2008), one of the biggest barriers to HIV and AIDS mainstreaming is the many different understandings of the term. Definitions of 'mainstreaming' do, however, appear to point to a need for a comprehensive, in-depth examination of the organization or sector(s) as a whole. Mainstreaming is not defined as a goal in itself but an active, ongoing process. HIV and AIDS mainstreaming is considered to be a process of integrating HIV and AIDS throughout the functioning of, for example, an educational organization. HIV and AIDS mainstreaming relates to organizational attempts at including HIV and AIDS issues in all aspects of managing an organization. Included in these organizational efforts would be the integration of HIV and AIDS education in the curriculum of a higher education institution. The integration of HIV and AIDS education within curricula of disciplines would be required for successful mainstreaming of HIV and AIDS education in a higher educational institution. The notion of including one discipline, such as HIV and AIDS education within another discipline is, however, not a novel concept (Chettiparamb, 2007; DeZure, 1999; Klein, 2006; Mathison & Freeman, 1997).

Many advocates of interdisciplinarity stress the fact that it is using inputs from more than one discipline provides a deeper understanding of a problem (Chettiparamb, 2007; Klein, 2004; Nowacek, 2005). Klein (2004) points out that the complexity of health care issues necessitates the use of interdisciplinary collaboration. The issues related to HIV and AIDS education are complex and solutions of associated problems require more than the subject-knowledge of a single discipline. An interdisciplinary approach that explores HIV and AIDS education into a discipline, such as

Mathematics Education, provides possibilities of other viewpoints of the challenges presented by HIV and AIDS.

The notion of 'a discipline' has been explained by various authors in terms of scientific-epistemological, social and/or organizational considerations (Chettiparamb, 2007) but there are many understandings of the term 'interdisciplinary'. Nissani (1995), for example, uses four criteria to rank 'interdisciplinary richness', namely, the number of different disciplines that are combined, the distance between the disciplines, the novelty of the combination of disciplines, and the degree of integration of the disciplines. Nissani (1995) considers interdisciplinary richness to lie along a fluid continuum that is separated by the two imaginary poles of pure disciplinary work and he uses these four criteria to arrive at a working definition of interdisciplinarity.

Some of the terms used to describe teaching two or more disciplines deliberately in relation to one another are, for example, fusion, integrated, cross-disciplinary, correlated, integrative and trans-disciplinary (Mathison & Freeman, 1997). In addition, there is a multitude of meanings associated with each of these terms. Mathison and Freeman (1997) present these definitions along a continuum making use of 'levels' of integration. These authors provide a table to examine the different theoretical features that demarcate some interdisciplinary studies. Table 2 is a summary of the levels of integration.

<b>Level of integration</b>	<b>Theoretical features</b>
Intradisciplinary discipline-field	<ul style="list-style-type: none"> <li>• Enhances connections within disciplines</li> <li>• Promotes success for all students</li> </ul>
Cross-disciplinary correlated	<ul style="list-style-type: none"> <li>• Coordinated themes/content across separate subjects</li> <li>• Emphasis of certain skills across disciplines</li> </ul>
Interdisciplinary	<ul style="list-style-type: none"> <li>• Processes, concepts, skills, or elements of two or more disciplines together</li> <li>• Common themes or modes of inquiry form interdisciplinary connections</li> </ul>
Integrated	<ul style="list-style-type: none"> <li>• Inquiry skills and discipline content are enhanced</li> <li>• Disciplines lost in global perspective</li> <li>• Theme or issue oriented</li> <li>• Inquiry oriented</li> </ul>
Integrative	<ul style="list-style-type: none"> <li>• Disciplines lost in global perspective</li> <li>• Student/teacher negotiated themes and issues direct</li> <li>• Inquiry oriented</li> </ul>

**Table 2: Levels of integration described by Mathison and Freeman (1997, p. 8)**

In reviews of literature on interdisciplinary studies (Chettiparamb, 2007; Mathison & Freeman, 1997), the complex nature of integration is emphasized. Furthermore accounts of integration often lack analysis of the underlying factors which caused a particular combination of disciplines. In integration of disciplines there is also little evidence provided about what is integrated and how the integration occurs. Efforts to evaluate interdisciplinary studies are also hampered by covert motives for integration together with superficial self reflection on the process. Accounts of integration in the literature provide limited explanations as to whether the integration is internally or externally imposed.

The main factors that affect the integration of HIV and AIDS education into curricula are considered to be the stage of curricular reform, the structure or framework of the curriculum and whether the curriculum design is centralized or decentralized (UNESCO, 2006). The recent South African policy framework document (DoE, 2007) could allow for possibilities/opportunities for reforming pre-service teacher education. The manner in which the content at pre-service teacher institutions is

presently organized into separate subjects (for example, mathematics and mathematics education) or thematic blocks (for example, preparing pre-service teachers for teaching and learning of Life Orientation) would influence the manner and form in which HIV and AIDS education can be integrated. At the Edgewood Campus of UKZN the levels of integration could be in thematic blocks and at the subject level as both these structures presently exist in the curriculum. There is also sufficient flexibility in the decentralized design of the curriculum at the Edgewood Campus. Although these enabling factors to facilitate the integration of HIV and AIDS education into curricula at a pre-service teacher education institution may exist, it would be nonetheless challenging to decide on an appropriate approach.

Evaluations of integration of HIV and AIDS education into school curricula have also been classified into a variety of approaches for inclusion. The three main curricular approaches presented by UNESCO (2006) are integration in one already existing main carrier subject, as a cross-curricular issue and infusion throughout the curriculum. Although there are a variety of approaches to select for integration of HIV and AIDS into school curricula, the UNESCO (2006) manual highlights a number of common shortcomings when HIV and AIDS education is integrated into an official curriculum. Kelly (2007) separates challenges encountered by teachers when integrating HIV and AIDS issues into a school curriculum into two aspects: professional and personal.

Kelly (2007) notes that teachers consider their lack professional competence to be caused by lack of preparation in teacher training programmes. Furthermore, Kelly (2007, p. 70) considers the absence of a universally agreed curriculum framework for use in schools to hamper professional development of teachers in the area of HIV and

AIDS education. The overcrowded school curriculum causes marginalization of the HIV and AIDS education and the lack of appropriate teaching and learning materials are further professional hindrances. Teachers also point out that they are uneasy about taking on the sole responsibility for HIV and AIDS education and discussions with young people. Teachers often experience a lack of support from school management and other educational authorities and attitudes of parents towards discussions of sexuality and other necessary sexual matters complicate addressing HIV and AIDS issues.

Together with these professional challenges there are personal considerations that make teachers reluctant to consider HIV and AIDS issues in classrooms. Kelly (2007) lists cultural factors, fears and personal sensitivities as further complicating factors. It is, however, important to note that these professional and personal challenges are leveled after evaluating HIV and AIDS education programmes in school curricula; there do not appear to be any studies that report systematic evaluation of integration of HIV and AIDS education in pre-service teacher curricula.

Taking into account the various arguments for (and against) integration as noted above, I take the stance that systematic reporting of integration research in pre-service teacher education, where professional and personal challenges are considered, need to be developed and documented. If there is no provision made for a compulsory, stand-alone HIV and AIDS education module in pre-service teacher education then the 'already crowded' (UNESCO, 2006, p. 2) pre-service teacher education curriculum contents of existing curricula requires adaptation through selection of appropriate or acceptable models of integration. By interdisciplinary collaboration between or

among disciplines the possibilities for increasing the relevance of particular disciplines would further the preparation of teachers and teacher educators in the area of HIV and AIDS education so that the process of HIV and AIDS mainstreaming can be facilitated.

### **HIV AND AIDS AS A 'CONTEXT' IN MATHEMATICS EDUCATION**

One of the strategies this research explored in PME modules was to employ the HIV and AIDS context to embed the teaching and learning of mathematics. The intention is that such a context will give the teaching and learning of Data Handling (DoE, 2002) a sense of authenticity and a 'real life' setting for the pre-service teachers. Zevenbergen, Sullivan and Mousely (2002, p. 522), however, challenge this use of context to enhance learning in mathematics education. When this strategy is used simplistically, without considering socio-political dimensions within which the context is being used, potential problems may arise. These authors stress that these problems may occur because of mathematical, linguistic, political and ethical reasons.

The term 'context' has been given a variety of meanings within mathematics education. Zevenbergen, Sullivan and Mousely (2002) give examples of how research in 'context' have been used in three different ways but transferability of school mathematics to (and from) other contexts have been unsuccessful. Firstly, mathematics may be used in a cultural context, for instance, to explore the work of indigenous people to study the ways in which mathematics underlies indigenous activities like, for example, beadwork (Dabula & Scahafer, 2002) by indigenous people. Dowling (1998), however, criticizes these explorations as devaluing the indigenous activity. Beadwork may, for example, be an expression of a form of

cultural art and does not necessarily provide evidence of mathematical understanding of number patterns, tessellations or reflectional and translational symmetry. He holds the view that the practice of interpreting cultural practices and artifacts in terms of mathematical activity is a way of denying the value of these practices and artifacts. According to Zevenbergen, Sullivan and Mousely (2002, p. 523), 'These studies have sought to find school mathematics embedded in contexts outside of the school context – often under the guise to show transfer between the two contexts.' I have not used HIV and AIDS education to further mathematics in this manner. I did not actively seek 'patterns' in, for example, the HIV and AIDS statistics to show links between the two disciplines.

Secondly there are types of studies where 'context' is explored where learners are thought to be able to use non-school contexts in school mathematics contexts. These have posed serious questions about the difference between school and out-of school mathematics and how the contexts may produce different understandings. The use of HIV and AIDS statistics are, for example, related to the everyday lives of many South African pre-service teachers. Teachers too may be required to confront educational and psycho-social issues among learners whose parents have contracted the HI virus (Skripak & Summerfield, 1996). The integration of HIV and AIDS education in mathematics contexts is thus not outside the life experiences of many South African teachers and learners.

Thirdly studies of 'context' where everyday activities, such as shopping, are used to explore the reasoning behind the activity. These types of research also show a lack of relationship between what is used in school mathematics and what happens in the

non-school context. It was not my intention to use HIV and AIDS education in Mathematics education in any of the three ways described by Zevenbergen, Sullivan and Mousely (2002).

The manner in which I explored data handling with the pre-service teachers could be considered as using a thematic approach. By using HIV and AIDS statistics in preparing mathematics teachers to teach data handling I made deliberate attempts to incorporate a context that could build awareness of human rights and social issues. (DoE, 2002, p. 47). In Chapter Three I describe how I incorporated HIV and AIDS statistics in a PME module in a lecture room situation and in a focus group setting. Skovsmose (1994) gives four points to bear in mind which serve as guidelines for the contextualization in school mathematics using themes. I am of the opinion that these guidelines are also appropriate considerations when integrating HIV and AIDS education in mathematics education modules with pre-service teachers. Firstly, it is important to choose topics that are known to the pre-service teachers and that the pre-service teachers can engage in through everyday discussion. HIV and AIDS education is a topic that is the centre of many media and casual discussions in South Africa. Secondly, pre-service teacher must be able to make sense of the theme according to their level of ability. Pre-service teachers are able to engage in the HIV and AIDS debates at various levels, depending on their life experiences with infected people. Thirdly, the theme must be valuable in its own right and be used as a context not solely to demonstrate, develop and improve mathematics. The importance of HIV and AIDS education and awareness is clearly significant in the South African context. Fourthly, making use of the theme must permit development of mathematical concepts and ideas for using mathematics and developing mathematical skills. The

manner in which I used the HIV and AIDS education as a theme for preparing pre-service teachers in the teaching and learning of Data Handling was designed to extend and develop the understanding of mathematical concepts and skills.

Using mathematics in the broad critical mathematical literacy sense has been defined by Skovsmose (1994, p. 117) as 'mathemacy'. Here democratic competence and critical competency is integrated and the social context of mathemacy sets it apart from mathematics. Skovsmose describes an important process in society that relates to the formatting power of mathematics in society. A distinction between a 'formatter' and a 'critical formatter' is made. When dealing with HIV and AIDS statistics, for example, the 'formatter' would use data obtained from 'real-life', social contexts to draw graphs to illustrate or display the data but the 'critical formatter' would consider the social, ethical, political responsibility in the mathematical formatting process. A 'critical reader', in critical mathematic pedagogy, would have the competence to react critically to the formatting power of mathematics. According to Skovsmose (1994), the key that connects mathemacy to a democratic and critical competence is 'reflective knowing' and there are six entry options to reflective knowing. The first three options for 'reflective knowing' are related to mathematics. They are selecting the mathematics; executing the mathematics correctly; and trusting the reliability of the solution for the purpose. The second set of three options for 'reflective knowing' relate to the contexts. These are the appropriateness of using mathematics in a specific context; the consequences of the use of mathematics in a specific context; and reflecting on the product of the use of mathematics in a particular context. Zevenbergen, Sullivan and Mousely (2002), however, point to research that shows that contextualizing tasks in this manner, creates a further barrier

to success for some learners as the contextualization into another field creates a new set of unrecognizable demands on learners. The fact that South African pre-service teachers are generalists and not mathematics specialists (chosen mathematics as a major elective subject) further complicates the concept of mathemacy. Learners who find mathematics difficult are sometimes further confused by the addition of further deciphering tasks that often involve extra terminology or language. Furthermore, in South Africa there has been a great deal of controversy surrounding misleading reporting and presentation of HIV and AIDS statistics (Venter & Brown, 2005).

A number of deep seated, pervasive ‘myths’ (Irwin, Millen & Fallows, 2003) surrounding HIV and AIDS have social and even political clout in South Africa. According to Farmer (2003, p. xviii) ‘Amongst the greatest obstacles to a broad mobilization against HIV/AIDS is misinformation about the pandemic.’ ‘AIDS myths’ have evolved because of intellectual confusion and unsubstantiated theories amongst people of all walks of life. One of the goals of research should thus be to expose what is an incorrect interpretation about HIV and AIDS and replace it with a more positive, helpful or accurate response to the pandemic. Although AIDS myths are only part of the problems facing the HIV/AIDS pandemic it is possible to explore some common misconceptions such as ‘Nothing we can do’ and ‘AIDS is an African problem’ as well as address ‘the gender *thing* and who cares about HIV and AIDS anyway’ attitude in relation to the findings of this research (See Chapter Seven.).

In addition to social and political issues of HIV and AIDS interwoven with pervasive myths and distortions, there is the inevitable emotional aspect that distorts effective action against the pandemic. Likelihood exists that some of the pre-service teachers

being taught HIV and AIDS education in Mathematics Education modules would have recently lost loved ones in their close and/or extended family network or close circle of friends through deaths due to AIDS. There is also the possibility that one of the pre-service teachers has recently been diagnosed as being HIV positive and perhaps discussing the likelihood of death through AIDS is an emotional, distressing prospect for this young adult. Perhaps some of the pre-service teachers are, as my sixteen year-old daughter describes how she feels about HIV and AIDS education, 'Sick of AIDS' (Mitchell & Smith, 2003). Even though my values as a mathematics education lecturer may be moralistic and I want to 'make a difference', these are still my values of what is 'right' and perhaps I am riding roughshod over the attitudes, values and expectations of some pre-service teachers by exploring and emphasizing death aspects related to HIV and AIDS whilst teaching the Mathematics Education module.

In the mathematics education lecture room the pre-service teachers would need to be able to openly discuss the implications of HIV and AIDS and how the teaching environment may be influenced by the pandemic. Furthermore, it is necessary to work towards prevention of further infections but this would 'pronounce a death sentence' (Irwin, Millen & Fallows, 2003, p. 188) on the estimated more than five and a half million South Africans already living with HIV and AIDS. According to Irwin, Millen and Fallows (2003, p. 177) it is possible for ordinary people to become activists through education and 'We need to learn the facts, and to share and disseminate those facts as widely as possible.' These facts include knowledge, skills and attitudes that bring about prevention as well as provision of support for the infected and affected should thus, whenever possible, be shared and disseminated in

mathematics education. The possibility of integration of HIV and AIDS education in mathematics is an unexplored avenue that promises to benefit both disciplines.

In the wider South African society, much publicity stems from some HIV and AIDS myths that arise out of the actions and examples offered by high ranking political figures. The inaccurate knowledge about HIV and AIDS even filters through to DoE HIV and AIDS policies. For example, in the DoE (1999, p. 9), there appears to be a focus on ensuring that learners are receiving education about HIV and AIDS and ‘abstinence’. Abstinence is seen to be a matter of choice. Irwin, Millen and Fallows (2003, p. 20) point out that there are a series of factors that constrain human ability to make free choices regarding sexual behaviours that place them at risk. Their research shows that these factors include economic insecurity, gender and racial inequalities, labour migration and armed conflict. Other ‘realities’ behind the HIV and AIDS epidemic in poor communities may be overlooked if HIV and AIDS is considered to be only a result of ‘dangerous behaviours’. HIV and AIDS education has to be extended far beyond the call for ‘abstinence’ so that strategies can evolve that counteract the effects of socioeconomic constraints, inequalities, labour patterns and war.

Adler, Pournara and Graven (2000, p. 2), consider integration to be one of the driving principles of South Africa’s outcomes-based school curriculum and they describe integration as a ‘collapsing and blurring of boundaries’ around traditional subject areas. These South African authors question the meaning, desirability and feasibility of integration within and across mathematics as well as the demands integration makes on teachers. They observed difficulties experienced by pre-service teachers

whilst working within a theme, such as AIDS. Adler, Pournara and Graven (2000, p. 5) noted that 'students [pre-service teachers] generally had difficulty in addressing social, political, cultural and economic aspects' of themes. The theme lessons presented by pre-service teachers are described by these authors as "dressed up" word problems with a real-world veneer.' They suggest that integration should start with the mathematics and later proceed towards themes and integrated programmes as failure to work with the mathematics first will result in 'losing the mathematics within the theme and hence mathematical goals might not be achieved.' (Adler, Pournara & Graven, 2000, p. 5). The generalist teacher in primary schools should, however, not only have the goals of mathematics as the driving force in a mathematics classroom. I believe that it is the young learners who should be most important focus. Many of the generalist teachers do not choose mathematics as their chosen specialization but are none the less required to teach this discipline. It may be difficult for teachers who do not have a 'flair' for teaching mathematics to have mathematics as the starting point for an integrated lesson.

Adler, Pournara and Graven (2000, p. 10) concede that it is the 'high-status' of mathematics that makes mathematics teachers reluctant to collapse and blur boundaries between disciplines through integration. Perhaps it is easier for teachers who have a 'flair' for teaching mathematics to be 'an expert' and maintain confidence in a discipline and in control of the learning environment but it may be easier for generalist teachers to consider general social, political, cultural and economic issues through themes in a mathematics classroom.

Mathematics itself, however, is by no means an ‘apolitical’ activity. The work of Marilyn Frankenstein (1994) highlights the political nature of mathematics, particularly in the teaching and learning of Data Handling. She emphasizes the need to understand the politics of mathematical knowledge as an essential part of being numerate and made use of newspaper related activities to focus on social, cultural, economic or political issues. In lectures I was careful point out how politicians, particularly in the area of HIV and AIDS statistics, use numbers to mislead. I also used newspaper cuttings to highlight the tensions between statistics provided by politicians and ‘reality’.

By using HIV and AIDS statistics in mathematics it is possible to explore the personal and political relevance of mathematics beyond its usual narrowly defined field that operates only on numbers and shapes (De Freitas, 2004, p. 260). By using HIV and AIDS education in mathematics it may be possible to reveal links between everyday life and ‘number crunching’. By asking pre-service teachers to reflect on the HIV and AIDS statistics after the drawing of, for example a pie chart, it is possible to evoke emotions using a picture that dramatically emphasizes the HIV and AIDS problem in South Africa. Unfortunately it is not fiction but the inclusion of possible death and despair that I used to disrupt the status quo of mathematics.

In an open forum, such as a lecture room, there are ethical concerns about revealing emotions at the intersection between HIV and AIDS and mathematics. The pre-service teachers, particularly those who are or have been influenced by the pervasive disease, may find the context upsetting or painful. There is however, the need to address and face the reality of HIV and AIDS and through ‘making a difference’ in

mathematics. Faculties of Education need to make use of the full benefit possible by using each discipline for integration of HIV and AIDS education to ensure that future teachers can be developed as 'keys' to successful education and prevention strategies.

## **SUMMARY**

International as well as national literature provides some suggestions as to what models and modules are required for HIV and AIDS teacher education. The supply of suggestions does, however, not materialize into an abundance of implementation strategies for HIV and AIDS teacher education. National, Higher Education and institutional policies include directives that mandate the integration of HIV and AIDS education across disciplines as well as in a specific discipline such as the Learning Area called 'Life Orientation'. These directives are backed by current research in the area of HIV and AIDS education. However, mere visions are provided as no concrete suggestions are provided for integration of HIV and AIDS education in, for example, mathematics education.

Mathematics is considered to be a 'high-status' discipline and HIV and AIDS education (as well as mathematics) would benefit if an acceptable way of integration of HIV and AIDS education could be developed. The relinquishing of the 'goals of mathematics' is, however, a fear amongst some mathematicians. The issue of using the HIV and AIDS education as a context for the teaching and learning of mathematics is hotly debated amongst mathematics but, in my opinion, the life and well being of learners surpasses the goals of mathematics. This is not to say that the quality of mathematics teaching and learning should not be considered in the classrooms of young learners but there should be an acceptable way of preparing pre-

service teachers to teach mathematics in the age of HIV and AIDS pandemic. For this reason this project has explored possible ways to extend the visions for integration of HIV and AIDS education in mathematics into action by taking on strategies for integration by *Starting with ourselves* at a pre-service teacher education institution.

The following chapter details how a specific *Starting with ourselves* methodology evolved through harnessing a variety of methodological paradigms to explore how integration of HIV and AIDS education in mathematics was developed with pre-service teachers.

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#### Notes

1. In-service Training (INSET) is now referred to as 'Continuing Professional Teacher Development' (CPTD) (DoE, 2007).

2. Pre-service Training (PRESET) is now referred to as 'Initial Professional Education of Teachers' (IPET) (DoE, 2007).

In the South African context, HIV and AIDS is considered to be a barrier to learning as there are many facets of learners being 'unwell' or emotionally fragile that affect their education. Badcock-Walters (2002) notes the increased economic hardship, family care responsibilities, household tasks and chores, the need to seek employment, and deterioration of health due to poor nutrition, as some of the added burdens of learners in the context of HIV and AIDS. In addition to these causes of physical distress, the learners may face extreme levels of emotional deprivation too. These feelings probably result in high levels of insecurity and trauma; particularly when a parent dies and the learner becomes an orphan. When a learner is then labeled as an 'orphan', s/he becomes vulnerable as s/he is often left to her or his own inexperienced devices.

All South African teachers need to take cognizance of the recent *Report of the public hearing on the right to basic education* (Kollapen et al, 2006) that focused on the provision of education for learners aged between 7 and 15 years. The Public Hearing highlights key issues that require addressing for fulfillment of the right to basic education. One of the issues is HIV and AIDS and another issue is the fact that teachers are identified as the most important role-players within the education system. It would seem appropriate that the teaching and learning of HIV and AIDS should be occurring in the Learning Area named 'Life Orientation' in primary schools. Life Orientation is where teachers of young learners could support and equip them with life skills. The Public Hearing report, however, indicates that:

...experience shows that schools do not adhere to the life orientation curriculum, that specialist life orientation teachers are not used, that teaching is fragmented and often misunderstood, or that the time allocated to it is often regarded as a free period. Furthermore, many teachers are not comfortable

with the curriculum due to their own personal values and beliefs. Research indicates that life orientation is not achieving its objectives. In sum, it fails to be recognized as an important subject. (Kollapen et al, 2006, p. 15)

This lack of status for Life Orientation points to a challenge for HIV and AIDS education in the South African curriculum.

### **HIV AND AIDS EDUCATION IN S. AFRICAN TEACHER EDUCATION**

It is of critical significance to explore how faculties of education address the various barriers to learning caused by the HIV and AIDS pandemic. This is of particular importance in the Education Faculty of the University of KwaZulu-Natal (UKZN)<sup>2</sup>.

Located in the province of KwaZulu-Natal, one of the nine provinces in South Africa, UKZN services the province with the highest rates of HIV infections in the country (Shisana et al, 2005). As such, as a university and a Faculty of Education in particular, we need to scrutinize how we are managing the preparation of teachers who will have orphaned and/or HIV infected/affected learners in their charge. Currently there seems to be the notion that HIV and AIDS teaching and learning belongs to one or two separate HIV and AIDS specialists. HIV and AIDS education is usually seen as being located in the social sciences and maybe the languages. Other disciplines are often thought to be entitled to operate on the margins or worse, not at all, as legitimate entities separate from any HIV and AIDS related education responsibilities.

Recognising that a concerted effort is needed across disciplines, this research sought to pave the way for explorations into how and where **all** teachers and teacher educators can be responsive in the area of HIV and AIDS education.

This focus was informed by debates and developments in the area of HIV and AIDS education. For example, at the 'Consultation on HIV and AIDS and teacher education in East and Southern Africa' conference in Benoni/Johannesburg in October 2003, a

description of the kind of teachers that are required for HIV and AIDS education was given. Delegates at the conference agreed on a 'multiskilled' teacher as a requirement for education systems in this region who are charged with saving lives in the context of AIDS. This teacher is seen as being HIV-aware, HIV-competent, and HIV-safe. Multiskilled teachers are necessary because not all teachers are able to do the specialist tasks of care and counseling for learners.

Since 2005 the Education Faculty of UKZN, the site of this study, has resided at the Edgewood campus, in Pinetown near Durban, South Africa. Here the full-time, four-year Bachelor of Education (BEd) qualification is designed to provide pre-service teachers with practical, foundational and reflexive competence. The BEd programme also aims to prepare teachers to function within the diverse schools that constitute the South African schooling system. To achieve these aims, the modules offered to the BEd pre-service teachers are categorized as fundamental, core or elective. The fundamental and core modules are compulsory for all BEd pre-service teachers, while the elective modules are designed to prepare the pre-service teacher as a specialist for a particular phase. Within the BEd programme, the elective modules chosen define the specific purpose of the qualification. For example, the primary school teacher would be required to 'elect' a suite of modules developed for this phase (See Appendix A for the current BEd curriculum that was first implemented in 2003.).

In 2006, the Council on Higher Education (CHE), using the Higher Education Quality Committee (HEQC) Criteria and Minimum Standards developed for BEd National Review, reviewed the qualification at all higher education institutions in South Africa. At UKZN Faculty of Education, the focus of the review was on the Foundation-Intermediate phases track of the BEd programme. This covers grades 0 to 6. Ten

criteria were developed by the HEQC to evaluate the BEd programmes. The 10 criteria are: 1) The National, Institutional and Unit Context 2) Programme Design 3) Student Recruitment, Admission and Selection 4) Staffing 5) Teaching and Learning 6) Programme Co-ordination and Work-based Learning 7) Student Assessment 8) Infrastructure and Library Resources 9) Student Retention, Throughput Rates and Programme Impact 10) Programme Reviews. Of particular relevance to this study is Criterion 5, which considers ‘Teaching and Learning’ within the institution. In order to meet the Minimum Standards set out by the HEQC criteria, one of the requirements of a programme is that it should provide evidence of curriculum initiatives that focus on HIV/AIDS. The Minimum Standard is stipulated as:

Appropriate curriculum initiatives include a focus on HIV-AIDS, in order to develop an informed understanding of the pandemic and its impact on schooling, and to develop the competences to cope responsibly with the effects of the pandemic in learning sites. (CHE, 2006, p. 7)

Each Faculty of Education was required to develop and submit a self-evaluation portfolio illustrating how they meet (or not) the minimum standards under each criterion. The University of KwaZulu-Natal Self Evaluation Portfolio explained the inclusion of HIV and AIDS in the BEd curriculum as follows:

Currently there is no dedicated compulsory HIV & AIDS module but there is frequent reference within the overall content of some of the compulsory modules as they are currently constituted. In particular, students get introduced to HIV & AIDS in Professional Studies 120 [See Appendix A under column entitled ‘First Year’]. The HIV & AIDS pandemic is also referred to in the Education Studies modules wherever appropriate and necessary.

Students may also be exposed to aspects of HIV & AIDS in their elective modules. For example, in the Foundation module Diversity and Learning, students consider HIV & AIDS from a social justice perspective while discussing social inequalities. Although not compulsory, the majority of BEd students do elect to take this module. Furthermore, the School Guidance 220 and 320 modules focus on HIV & AIDS and related issues. Although these two modules form part of the School Guidance specialization, the modules are designed so that students who want to have relevant knowledge and skills related to HIV & AIDS can elect to take these two modules, without having to complete the 220 [210] or 310 modules. Since inception of these modules, several students who were not taking School Guidance as a major have done the two modules as electives. However, the limitation is that not all students are exposed to these important modules. (UKZN, 2006, p. 59)

The 'Diversity and Learning' module is a first year elective. Each year between 200 and 300 first year pre-service teachers register for this module. In UKZN Faculty of Education *Handbook for 2005*, the content of this module is given as 'Understanding diversity, sexism, racism and other forms of oppression, power, privilege, exclusion and inclusion in student life and teaching.' (UKZN, 2005a, p.135) with no mention of specific HIV and AIDS education.

'School Guidance 220' and 'School Guidance 320' are also electives in the BEd. The University of KwaZulu Natal Faculty of Education *Handbook for 2005* lists the aim and content of each module as set out in Table 1.

Module		Aim	Content
School 220	Guidance	To equip educators with adequate knowledge base which will enable them to implement sexuality education, HIV/AIDS and gender programmes in schools relevant to the senior and FET phases, to function as resource persons and fulfill a role as leaders in community, caregivers and mentors.	Sexuality Education, Reproductive Health and HIV/AIDS. Managing HIV/AIDS in education. Gender in education.
School 320	Guidance	To equip educators with skills so that they become sources of advice for individual/institutional problems relating to sexuality education and HIV/AIDS and initiators and facilitators of HIV/AIDS programmes which aim at reducing the epidemic	Teaching sexuality education in schools. Counseling skills. Managing HIV/AIDS in education. Gender and AIDS in education. Legal and ethical considerations e.g. confidentiality.

**Table 1 : UKZN Faculty of Education *Handbook for 2005* entries for School Guidance 220 and School Guidance 320 (UKZN, 2005a, pp. 133-134)**

The School Guidance 220 is designed to include relevant teaching and learning material for HIV and AIDS education but focuses on content appropriate for the Senior (Grades 7 – 9) and Further Education and Training (Grades 10 – 12) learners. Furthermore, very few pre-service teachers elect these modules. However, in 2006, no pre-service teachers elected to do School Guidance 220, while 16 pre-service teachers registered for School Guidance 320 and none registered to do these elective modules in 2007.

This state of affairs is in the context of UKZN Faculty of Education preparing teachers for the South African province that has the highest incidence of HIV and AIDS and yet, according to its Self Evaluation Portfolio (UKZN, 2006), no formal policies for teaching and learning about HIV and AIDS are in place. In the report tabled by the South African Universities Vice Chancellors Association (SAUVCA<sup>3</sup>) in 2000, it was noted that ‘Responses to HIV and AIDS are often driven by

individuals and small grouping which have often committed huge efforts' (SAUVCA, 2000, p. 11). This appears to be the type of response mentioned in UKZN (2006) improvement plan for the BEd as outlined in the self-evaluation report which proposes that

The AQC's [Academic Qualification Co-ordinators] will draw on the expertise of current staff to develop a dedicated HIV & AIDS module or infused throughout the BEd curriculum. This process had been started as part of the BEd review in 2003/4 but was put on hold...This planned module will be in line with requirements developed by the National Department of Education for all Initial Teacher Education programmes...(See "A National Framework for Teacher Education"(16 June 2006 [2005]), Ministerial Committee on Teacher Education.) (UKZN, 2006, p. 63)

But I would argue that the seriousness of the epidemic requires the faculty to go beyond drawing 'on the expertise of current staff' to develop a focus dedicated to HIV and AIDS education. The University of KwaZulu-Natal as a whole needs to collaborate to develop structured focus on HIV and AIDS education, not only for the pre-service teachers, but for all students and staff in the university. While weaknesses have been acknowledged and the urgency of the task appears to have been noted, in order to realize 'the premier university of African scholarship' vision (UKZN, 2007) all faculties, but in particular the Faculty of Education, need to be proactive in their efforts to address HIV and AIDS in their curricula. This thesis argues that to be effective, such efforts must permeate all subject areas and programmes and not just a select few as is usually the case. It is in the context of the rather disturbing 'voluntary' attitude to HIV and AIDS education at a higher education institution (HEI) that I initiated this research project examining the possible integration of HIV and AIDS in a mathematics education curriculum. In particular, this thesis seeks to illustrate how in

Mathematics, one of the high status subjects in the curriculum, educators can take up the challenge of integrating HIV and AIDS education.

### **THE NEED FOR HIV AND AIDS EDUCATION IN MATHEMATICS**

Why mathematics? A number of authors in the area of HIV and AIDS (for example, Clark, 2005; Deedat, 2005; Irwin, Millen & Fallows, 2003) have implored people in all walks of life to ‘do something’ about the AIDS pandemic. In an effort to address the devastating effects of HIV and AIDS, I explored the integration of HIV and AIDS education into the teaching and learning of the Mathematics Learning Area in the Faculty of Education at UKZN, where I am a lecturer. For me, in attempting to ‘make a difference’ the most obvious place to start ‘doing something’ was in my own modules in mathematics education. Considering the fact that as yet there is no cure for AIDS, one of the ways available to me to provide pre-service teachers with the necessary appropriate information and teaching skills was through the teaching and learning of mathematics. I decided to find ways and means of integrating HIV and AIDS education into as many aspects as possible in the mathematics education modules I teach at UKZN.

My attempts to do this are in keeping with national concerns as evidenced by deliberations at recent conferences in the country. For example, at two of the Southern African Association for Research in Mathematics, Science and Technology Education (SAARMSTE) conferences, Campbell and Lubben (2004) and Lubben and Campbell (2006) list research areas that they consider to be ‘worthy of attention’. Referring in particular to mathematics education, they note that researchers need to turn their attention to addressing the provision of appropriate mathematics, science and technology education for learners who may be ‘unwell, burdened by family

responsibilities (or have no family) and/or are emotionally fragile’ (Campbell and Lubben, 2004, p. 1). Amongst their listed items is the need for a ‘literature review of models of developing transferable pedagogic expertise’ (p. 16) in teacher education. Furthermore, they point out that learning and teaching to support HIV and AIDS education should focus on ‘integrating HIV/AIDS education into subject teaching’ (Lubben and Campbell, 2006, p. 484). Thus, using one mathematics education module for pre-service teachers, this research sought to contribute towards developing such an integrated model in the Faculty of Education at UKZN.

Furthermore, AVERT (2004) suggests that primary school teachers have a responsibility to ensure that appropriate knowledge, skills, attitudes and values are conveyed to the young learners in their charge. The integration of HIV and AIDS education in mathematics education modules in pre-service education may represent one way of modelling what is possible in mathematics classrooms of young learners. Furthermore, the integration of HIV and AIDS education in the Mathematics Learning Area<sup>4</sup> (school subject) one of the high status and high stakes subjects in the school curriculum could be a possible catalyst for other learning areas to follow suit.

The *Revised national curriculum statement* (RNCS) (DoE, 2002) provides guidelines for the development of Learning Programmes in schools. According to this document

Deliberate attempts must be made in the teaching and learning of Mathematics to incorporate contexts that can build awareness of human rights, social, economic and environmental issues relevant and appropriate to learners’ realities. (DoE, 2002, p. 47)

Themes are described as a means of providing integration with one of the examples listed in the RNCS as an important issue being HIV and AIDS (DoE, 2002, p. 46). In

the Mathematics Learning Area the integration of issues related specifically to HIV and AIDS is seen as suitable for the Senior Phase Grade 9 learners. An assessment standard for Grade 9 learners gives HIV and AIDS as an example of a possible social, environmental and political issue (DoE, 2002). Here learners would be expected to read and interpret data critically to draw conclusions and make predictions.

The national policy framework also requires mathematics teachers as Subject Specialists to be able to integrate subjects/disciplines. For example, the *Norms and standards for educators* (2000a) lists one of the reflexive competences for subject specialists as demonstrating the ability to integrate and reflect on the relations between subjects/disciplines and to make judgments on possibilities of integration. In addition to the Subject Specialist role, the Community, Citizenship and Pastoral role requires teachers to consider HIV and AIDS as a current social and educational problem that should be addressed whilst working in partnership with professional services.

Based on the above, it is obvious that more concerted efforts must be made to provide teachers of young learners with suitable teaching and learning strategies to influence the learners in their charge. If educational programmes in Life Orientation are deemed ineffective (Kollapen et al, 2006) in HIV and AIDS education then perhaps more emphasis should be placed on alternative intervention techniques. As a high-status discipline or learning subject (De Freitas, 2006), mathematics may be well placed as one of these alternatives that may be employed to benefit HIV and AIDS education. By integrating HIV and AIDS education in pre-service mathematics education modules, the urgency of the pandemic may be seen through a different lens.

According to Apple (1999), there is a relation between forms of knowledge and power and the status of mathematics. Mathematical and scientific knowledge are forms of high-status knowledge in society as a pass in mathematics is regarded as key to eliminating social and economic inequalities. This is also echoed in the South African *Revised national curriculum statement* (RNCS) (DoE, 2002) that considers the mathematics learning area as contributing to ‘mathematical knowledge, skills and values that will enable learners to participate equitably and meaningfully (with awareness of rights) in political, social, environmental and economic activities by being mathematically literate’ (DoE, 2002, p. 5). The learning of HIV and AIDS education through mathematics would thus be seen as developing knowledge in a discipline that can ultimately elevate social and economic status.

In the preparation of teachers for the primary grades it appears fitting that a ‘high-status’ subject, such as mathematics, be used to extend teachers’ and learners’ knowledge and attitudes in HIV and AIDS education. In the teaching and learning of mathematics, the learning about HIV and AIDS education should, however not be seen as replacing the function of Life Orientation but rather supplementing and extending learning. In this context, the required multiskilled (Coombe, 2003a) teachers may be interpreted as teachers who are able to teach a discipline, such as mathematics, but are knowledgeable about and are competent to teach and mediate the issues related to HIV and AIDS education to young learners. It is thus essential to consider the role that UKZN can play in the preparation of such multiskilled teachers in the mathematics education discipline.

### ***Mathematics Education within the BEd Curriculum at UKZN***

Mathematics Education at UKZN forms a vital, compulsory part in the professional training of pre-service teachers who become Grade R - 9 (5 - 14 years) teachers in the General Education and Training (GET) Band. As such, the BEd curriculum at UKZN is comprised of modules worth 16 credits each (with a few allocated 8 credits) and totaling 512 credits over the four years. One of these modules, Primary Mathematics Education 210 (PME 210) (Appendix A shows the location of the PME 210 module in the BEd curriculum.) is a 16 credit module that each pre-service teacher studying to teach in Grade R to 9 (i.e., Early Child Development, Foundation Phase, Intermediate Phase or Senior Phase) is required to pass. The PME 210 module is offered, primarily to third year pre-service teachers, in their four-year BEd degree. (Appendix A shows the Mathematics Education Curriculum for teachers of all the tracks and where the PME 210 module is situated in the Mathematics Education Discipline at UKZN.)

### ***The need for HIV and AIDS content in teacher education***

If we consider the fact that these Grade R – 9 learners will spend between a third and a fifth of their time at school learning Mathematics, and that in South African primary schools, teachers are generalists (i.e., they teach all subjects/Learning Areas across the primary school curriculum), then it is safe to conclude that the teachers we produce through our pre-service programme will have a profound influence on the learners in their charge. Teachers of young learners undoubtedly consciously or unconsciously impart knowledge, skills and attitudes about everyday living including issues surrounding HIV and AIDS. To perform this responsibility effectively, primary school teachers need to be equipped with the necessary knowledge and know-how to provide the essential, appropriate education related to HIV and AIDS. Writing in the context of Namibia, Lubben and Campbell (2006, p. 483), conclude that it is during

the age range of 8 – 12 years that learners’ awareness of sexuality develops. It is therefore, essential to prepare South African teachers for the important role that they will play in assisting learners to develop appropriate attitudes and values. Approximately one third of the teaching and learning time in the Foundation Phase is allocated to Numeracy and approximately one fifth in the Intermediate or Senior Phase is allocated to Mathematics. Because of this large amount of time allocated to mathematics in the primary school curriculum and the status of mathematics as a discipline, mathematics education for pre-service teachers should play a significant role in modeling and/or exploring ways of developing HIV and AIDS teacher education. As Mathematics is compulsory for all learners in the primary school, and as such, for all pre-service teachers, mathematics education offers teacher educators a fertile ground for integrating HIV and AIDS education. This is important if we are serious about producing teachers who are not only competent in their own subject areas, but are also competent and knowledgeable in the area of HIV and AIDS. Deliberate integration of HIV and AIDS education in a pre-service teacher mathematics education module, promises to model what is possible when pre-service teachers qualify as professionals and eventually have the opportunity to integrate HIV and AIDS education in their own mathematics classrooms.

In South African classrooms teaching and learning takes place in a wide range of contexts. The pre-service teachers at UKZN Faculty of Education thus also reflect a multitude of perspectives towards HIV and AIDS education. Challenges in teacher education are further compounded by the fact that teachers are expected to make use of creative ways, moving out of linear modes into more flexible ways of preparing teachers. Furthermore, there are statutory roles for educators set out in a document prepared by the Technical Committee on the Revision of *Norms and*

*standards for educators* (DoE. 2000a) that clearly defines the roles that pre-service teacher education programmes need to address. Teacher education programmes need to find creative ways of addressing HIV and AIDS education and this case study exploration is an attempt at using the mathematics teacher education modules to foster flexibility by preparing teachers who are multiskilled.

### **THE FOCUS OF THE STUDY: STARTING WITH OURSELVES**

The study reported in this thesis takes a *Starting with ourselves* approach, drawing in particular on the emerging body of work on self-study in teacher education (see for example, Loughran et al, 2004; Mitchell et al, 2005) which highlights (a) the significance of studying, as teacher educators, our own lecture rooms, and (b) facilitating with initial teachers a reflexive approach to self-study in their own classrooms. Nowhere is this area more critical than in rural and township classrooms in KZN where being infected and affected by AIDS is an everyday reality for many teachers and learners. While my own area of focus in terms of learning areas is mathematics, pre-service teachers with whom I work study a number of different learning areas where issues of HIV and AIDS can (and should) arise. Thus the purpose of this study is to pave the way for HIV and AIDS education in pre-service teacher education across disciplines in the Faculty of Education at UKZN, and to explore in particular the ways in which pre-service mathematics education modules may be used to promote personal and pedagogic HIV and AIDS education.

Self-study has been used as a descriptor in many papers and has more recently come to mean studying one's institution or own practice. In the 1970s literature, the 'self' is classified as an examination of one's own institution rather than of the individual (Loughran, 2004). In choosing to situate my research within a self-study or *Starting*

*with ourselves* framework, I am selecting my own teaching institution as the research site, and in particular, my own lectureroom within the teacher education programme. This approach is in keeping with qualitative studies in teacher education that draw on autobiographical work (see, for example, Connelly & Clandinin, 1988). By *Starting with [myself]*, I sought to examine the nature of existing policies and the enactment thereof. It may be that the ‘what, why and how’ of offerings for the teaching of HIV and AIDS education in the BEd curriculum at UKZN requires auditing. In this study, however, this aspect forms the context in which I teach mathematics education but is not the main focus of my self-study exploration. The main thrust of my study is my own practice: I sought to understand whether and how teaching, learning and the development of HIV and AIDS education may be facilitated through the mathematics education modules I teach. In other words I researched my own practice in relation to how I could integrate HIV and AIDS education in a ‘high-status’ discipline area such as mathematics.

While I recognize that this *Starting with ourselves* approach brings with it its own challenges in terms of validity and subjectivity, I drew on the work of Van Manen (1990), Kirk (2005) and others. According to these authors, this approach forges strong links between research and practice. But quality autobiographical self-studies must attend carefully to the researcher in their particular context or setting (Bullough & Pinnegar, 2001). In order to give insight into the context within which I, as a mathematics teacher educator, live and work, I have explained some of the connections of this piece of research to my lived experiences and the various contexts in which I teach and researched. These contexts are explored in Chapter Two.

In most qualitative research methods in education, ‘validity’ considerations have been transformed into concerns around trustworthiness or accuracy (Bullough & Pinnegar, 2001). These understandings of the nature of self-study research are developed in Chapter Three where issues of analyzing one’s teaching whilst answering research questions are considered.

Although I have steadily extended the integration of HIV and AIDS education in all the modules in the mathematics education curriculum for which I am responsible at my HEI, I focussed on the third year module: Primary Mathematics Education (PME) 210. While a self-study research approach may appear to be a ‘self-indulgent’ exercise, it is important to note that the ‘self’ aspect needs to be intertwined with other ‘selves’ in a variety of ways. For example, the self cannot exist in ‘real-life’ without considering the private, personal, public, social or political ‘self’ (Mitchell & Weber, 1999, p. 8). I have thus used my voice as well as the voices of many others in making a difference during mathematics education lectures at my HEI. In addition to voices from existing literature, in this study, I worked with a group of pre-service teachers who volunteered to participate in the research aspect and to trial the integration of HIV and AIDS education in primary school mathematics classrooms.

My ‘voice’ too, uses a multitude of ‘filters’ when I make my research findings public. My voice as, for example, a mathematics teacher educator, researcher, colleague, student, participant, wife, parent and daughter, all provides unique nuances to my reflections. My voice, together with the voices of all the participants in this self-study, contributed in particular ways to my research. This self-study research explored and recorded the voices of the pre-service teachers who completed the PME

210 module over three years (2004, 2005, & 2006), the volunteers in the focus group as well as my 'voice' in my attempts at making a difference by integrating HIV and AIDS education in the mathematics discipline.

### **THE AIM, FOCUS AND KEY QUESTIONS OF THE STUDY**

The purpose of the study reported in this thesis was to examine the ways in which the process of self-study can deepen an understanding of HIV and AIDS by integrating this content in the mathematics education discipline in the teacher education curriculum at UKZN. I wanted to gain 'useable, applicable, and informing' (Freese, 2006, p. 75) knowledge, skills and attitudes to assist me with furthering my attempts at extending the integration of HIV and AIDS in a high status discipline, such as mathematics. The question that my research endeavoured to answer was: How can I improve on my guidance of pre-service teachers so that they will be able to integrate HIV and AIDS in mathematics classrooms?

Thus, this study focused on how I, together with a group of volunteer fourth year pre-service teachers, learnt to integrate HIV and AIDS content in Mathematics education and in primary school mathematics. In particular, the study addressed the following questions:

1. How do national, provincial and institutional curriculum policies shape pre-service teacher HIV and AIDS education at UKZN Faculty of Education Edgewood Campus?
2. What are the pre-service teachers' perceptions/opinions of policy, curriculum and models of offering HIV and AIDS education at the Edgewood Campus?
3. How did I select and use HIV and AIDS education intervention to develop appropriate knowledge, skills, attitudes and values in the teaching and learning of mathematics?

4. How did pre-service teachers select and use HIV and AIDS intervention during practice teaching and/or during pre-service teacher workshops?
5. How can self-study contribute both as a pedagogical and methodological ‘umbrella’ for addressing HIV and AIDS in pre-service teacher education?

The intended outcomes of this self-study are: to further the integration of HIV and AIDS in mathematics education so that pre-service teachers may become ‘multiskilled’ primary school mathematics teachers who are HIV-aware, HIV-competent, HIV-safe, and AIDS-competent; to make public the debate about integration of HIV and AIDS across all disciplines; and to improve my ability as a mathematics teacher educator to equip pre-service teachers with the multitude of educational challenges caused by HIV and AIDS.

### **SITUATING MYSELF IN THE SELF-STUDY**

As Van Manen (1990), Kirk (2005) and others have suggested, it is necessary to acknowledge how my subjectivity and experiences have influenced this research and my findings. Furthermore, what has occurred in my professional life has inspired me to do this self initiated and self-focused research.

As I approached my thirtieth year of involvement in mathematics teacher education I realised that the disciplinary boundaries in mathematics cannot remain static and inert in a province that is at the epicentre of the AIDS pandemic. I became dissatisfied with the situation where the somewhat arbitrary boundaries of a ‘high-status’ discipline, such as mathematics is thought to be at a different intellectual position to other disciplines where critical life saving education is provided. For me, the changing nature of knowledge together with the availability of interdisciplinary fusions made it

possible to attempt alternative visions for teaching and learning and paves the way for integrated models.

Some of my important life experiences centre on my family life, schooling, and mathematics teaching. The more personal reasons for my concerns for orphans will be reflected on in Chapter Six. There are, however, also professional experiences with pre-service teachers that have influenced my decisions to critically self-reflect on my role as a teacher educator in South Africa.

To my knowledge, none of my close family or friends has died as a result of AIDS related diseases. I became a mathematics teacher educator in 1975 but have only since 2000 become aware of the untimely death of a number of pre-service teachers. The first young pre-service teacher who I knew who probably died of a disease related to AIDS was Siyabonga<sup>5</sup>. He died mysteriously and suddenly whilst I was employed as a lecturer of the then Edgewood College of Education<sup>6</sup>. He was a pre-service teacher, who was completing his final year of his three-year Diploma in Education. He chose Mathematics as his major subject and I lectured in half of the mathematics education modules that he attended. There were only a few pre-service teachers registered for the mathematics major modules and I came to know these pre-service teachers well. At the time I noticed that Siyabonga was becoming rather thin but thought nothing of this weight loss. During one of the practice teaching period, however, the sad news of Siyabonga's death was announced. The reason for his death was not disclosed. Siyabonga just suddenly died of heart failure whilst playing soccer. The memorial service held at the Edgewood College of Education was sad as it was obvious that his mourning family had invested a great deal of their money in

Siyabonga's education so that he would complete his diploma to become a high school mathematics teacher. I was extremely sad about the sudden loss of this spirited pre-service teacher whom I knew well and with whom I had spent a considerable amount of time during mathematics modules. Since Siyabonga's death a number of other young pre-service teachers have died without explanation (these have been unexplained perhaps because of HIV-related stigma). It is because I felt the loss of a pre-service teacher who I knew well that I feel the need to do something to address the devastating effects of AIDS.

Undoubtedly it is because of a number of my unique life experiences that I start with myself in this self-study. I have started with myself and my teaching of mathematics education modules at UKZN by scrutinising how I could 'do something' about the devastation caused by HIV and AIDS through my encounters with pre-service teachers.

## **OVERVIEW OF THE STUDY**

The teaching and learning of HIV and AIDS, which is presently primarily situated in the 'Life Orientation' Learning Area in primary schools, requires support from other subjects or learning areas to encourage a more pervasive onslaught against the AIDS pandemic. The novel concept of integration of HIV and AIDS education into a 'high-status' subject such as mathematics, is considered as a necessary form of support for the specialist Life Orientation teacher.

In this first chapter, I offer a conceptualization of my study, motivating for the need for integration of HIV and AIDS education in mathematics at a pre-service faculty of education in KwaZulu-Natal, South Africa, the province which is at the centre of the

pandemic. I have laid out the key research questions and introduce the idea of self-study in teacher education. Here I provide the context of my research focus and describe the mathematics education module that was the focus of my research.

The second chapter presents further contextualization of the study and includes a review of relevant literature. This involves establishing how the model of integration of HIV and AIDS education in a subject discipline such as mathematics, is placed in South African HIV and AIDS education policy documents together with recent research in HIV and AIDS teacher education. The requirements specified in HIV and AIDS education policy documents that relate to teacher education, schools and higher education institutions are discussed in terms of making provision for a model that accommodates the integration of HIV and AIDS education in mathematics.

Methodological issues are explored in Chapter Three. Reasons are provided for selecting a mixed mode approach for my self-study and how I addressed integration of HIV and AIDS education in a pre-service primary mathematics education module that I taught at a pre-service teacher institution. The model of integration that has evolved over three years (2004 – 2006) in a primary mathematics teacher education module is explored using qualitative, quantitative and action research methodological paradigms. In this chapter I explain the mixed mode approach to self-study that I employed to capitalize on the advantages offered by Empirical, Interpretive and Critical Theoretic research methods. Included in this chapter is a description of the setting, participants and the evolution of a model of integration in the primary mathematics education module. I also include a description of the research instruments used for data collection (for example, the questionnaires, the focus group discussions, lesson observations, post lesson interviews and field notes (reflections))

as well as data sources. Each of the methods selected to analyse and interpret the data collected is also explained.

The findings of the study are presented in Chapters Four, Five and Six. The three chapters reflect different levels of interaction. Chapter Four is concerned with curriculum integration with a large group of pre-service teachers who were registered for a compulsory mathematics education module. The chapter considers the opinions of the pre-service teachers who have completed the module where HIV and AIDS education was integrated into mathematics. The responses to closed statements on the questionnaires served as a needs analysis survey and were analysed using empirical research methods. This chapter describes the predominantly quantitative methods used to analyse the findings obtained from the responses from particular statements of the questionnaire.

Chapter Five focuses on how integration was explored with a small group of volunteers pre-service teachers. It explores integration work with a group of pre-service teachers who volunteered to be part of the *HIV/AIDS Mathematics Education Project*. Here I used mainly interpretive research methods to analyze data collected. I explored the beliefs of the focus group participants about the possible integration of HIV and AIDS education in mathematics. I describe how I used drawing of metaphors to understand the participants' beliefs about the integration possibilities. The focus group interactions, lesson observations, post lesson interviews and reflections, are then examined to expose possible links between the beliefs of the pre-service teachers and their classroom practice.

Chapter Six centres more on my story and experiences as a mathematics teacher educator doing self-study. The chapter reports on the analysis of the integration

process from my perspective. I explain experiences with ‘orphans’ in my personal life that influenced my decision to do this self -study. My exploration considers how I interacted with colleagues and pre-service teachers at various levels. I used collaborative autobiography and assisted self-study to understand my interactions with colleagues and sociometric to understand the dynamics of the focus group discussions. The role that I played in focus group discussions was analysed using Interpretive research methods to obtain thematic categories of the content of my interactions. This chapter highlights the significance of self-study in teacher education and I offer a reflection of my perspectives on integrating HIV and AIDS into mathematics education.

Finally, Chapter Seven summarizes the study and explores how self-study contributes as a pedagogical and methodological ‘umbrella’ for addressing HIV and AIDS education in pre-service teacher education. The chapter maps out the implications both for curriculum integration, as well as teaching and further research.

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Notes

1. In the text HIV and AIDS has been used instead of HIV-AIDS or HIV/AIDS or HIV & AIDS or HIV and Aids. Some quotations, however, use HIV-AIDS or HIV/AIDS or HIV & AIDS and these have not been altered.

2. On 1 January 2004 the University of Natal and the University of Durban-Westville merged to become the University of KwaZulu-Natal (UKZN).

3. In 2005, South African University Sector (SAUVCA) ceased to exist and was replaced by the Higher Education South Africa (HESA). HESA is the coming together of the representative organizations for universities and universities of technology, SAUVCA and the Committee of Technikon Principals (CTP).

4. There are eight learning areas in the *Revised national curriculum statement* (RNCS). A learning area is a field of knowledge, skills and values which has unique features as well as connections with other fields of knowledge and learning areas. In the RNCS, the learning areas are: Languages, Mathematics, Natural Sciences, Technology, Social Sciences, Arts and Culture, Life Orientation, and Economic and Management (DoE, 2002).

5. Pseudonyms are used to protect the identity of all the participants.

6. On 1 January 2001, the Edgewood College of Education, which was under the control of the provincial Department of Education, was absorbed into the Higher Education sector. The University of Natal (now called the University of KwaZulu-Natal) absorbed the Edgewood College of Education. The Edgewood Campus now houses the University of KwaZulu-Natal Faculty of Education.

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## **LIST OF APPENDICES**

- A Structure of Bachelor of Education Curriculum
- B Informed Consent Form
- C Integrated Activity
- D Questionnaire
- E Letter to Request Permission from Principals and Teachers
- F Observation Schedule
- G Interview Schedule
- H Integrated Learner Activity
- I Newspaper Article
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## APPENDIX A    STRUCTURE OF BACHELOR OF EDUCATION CURRICULUM

FIRST YEAR		SECOND YEAR		THIRD YEAR		FOURTH YEAR	
SEM 1	SEM 2	SEM 1	SEM 2	SEM 1	SEM 2	SEM 1	SEM 2
Prof Studies 110 (16C)	Computer Lit (8C)	Ed Studies 210 (16C)	Ed Studies 220 (16C)	Ed Studies 310 (16C)	Ed Studies 320 (16C)	Ed Studies 410 (16C)	Ed Studies 420 (16C)
ALE <sup>①</sup> or ELC (16C)	ALE <sup>①</sup> or English Com 110 (16C)	LA Studies 210 (16C)	Foundation ③ Module (16)	LA Studies 220 (16C)	Prof Studs 210 (8C)	LA Studies 310 (16C)	Prof Studs 220 (8C)
Basic Maths <sup>②</sup> (16) ... Or ..... 2 <sup>nd</sup> Language Com (16C)	Foundation ③ Module (16C) ... Or ..... 2 <sup>nd</sup> Language Com (16C)	Lang & Lit 120 (16c) 2 <sup>nd</sup> Language ④ Com (16C)	Prim Maths Edn 110 (16C) 2 <sup>nd</sup> Language ④ Com (16C)	Prim Maths Edn 210 (16C)	Lang & Lit 220 (16C)	Lang & Lit 320 (16C)	Prim Maths Edn 310 (16C)
Elective Module (16C)	Elective Module (16C)	Elective Module (16C)	Elective Module (16C)	Elective Module (16C)	Elective Module <sup>⑤</sup> (16C)	LA Studies 320 (16C)	
Prof Studies 120 (8C)	Prac Teach 120 (8C)		Prac Teach 220 (8C)		Prac Teach 320 (8C)		Prac Teach 420 (8C)
(72C)	(64C)	(64C)	(72C)	(64C)	(64C)	(64C)	(48C)

- ① ALE is a compulsory module for all students  
 ② Compulsory for students who do not have a Grade 12 pass (HG or SG) in Mathematics  
 ③ Students who register for Basic Mathematics in Semester 1 should register for one of the Foundation modules in Semester 2  
 ④ If not taken in 1<sup>st</sup> year  
 ⑤ Extra 16C elective needed if **Basic Mathematics** not required in 1<sup>st</sup> year

Source: Academic Qualification Co-ordinator (Mr P. Londal)

## APPENDIX B INFORMED CONSENT FORM

University of KwaZulu-Natal  
Edgewood Campus  
P. Bag X03  
ASHWOOD  
3605  
Tel: 031 260 3488

29 September 2005

### Informed Consent Form

I, ..... consent to participate in this study conducted by Mrs L. van Laren for her research on HIV/AIDS education in teacher education.

- I realise that no harm will come to me, and that the study is being conducted for educational purposes.
- I participate voluntarily and understand that I may withdraw from the study at any time.
- I consent to being video and/or audio recorded as part of the study.
- I understand that I have the right to review the questionnaires I complete and the transcripts made of our conversations before these are used for analysis if I so choose.
- I can delete or amend any material or retract or revise any of my remarks.
- Everything I say will be kept confidential by the interviewer. I will only be identified by a pseudonym in the transcript. In addition, any persons I refer to in the interview will be kept confidential.
- Verbatim quotes from me may be used in the research report, but they will be reported so that my identity is anonymous. Any specific individuals or modules I refer to will be given pseudonyms. I understand that the results of the study may be published or used for a thesis/dissertation, but my identity will be anonymous.

Name:.....

Signature:.....Date:.....

**Supervisors:** Prof. C. Mitchell and Prof. R. Moletsane (UKZN, P. Bag X03, ASHWOOD, 3605.  
Tel: 031 – 260 1024)

# APPENDIX C INTEGRATED ACTIVITY

Name:.....Student number:.....Mark .....

## Working with bar and pie charts

Examples have been adapted from the textbook:  
Maths Education Project. (2000). Maths for all. Learner's Activity Book. CapeTown: Macmillan Boleswa Publishers (Pty) Ltd.

The extracts used are from *AIDS Epidemic Update* (December 2005) prepared by the Joint United Nations Programme on HIV/AIDS (UNAIDS) and the World Health Organisation (WHO). (<http://www.unaids.org>)

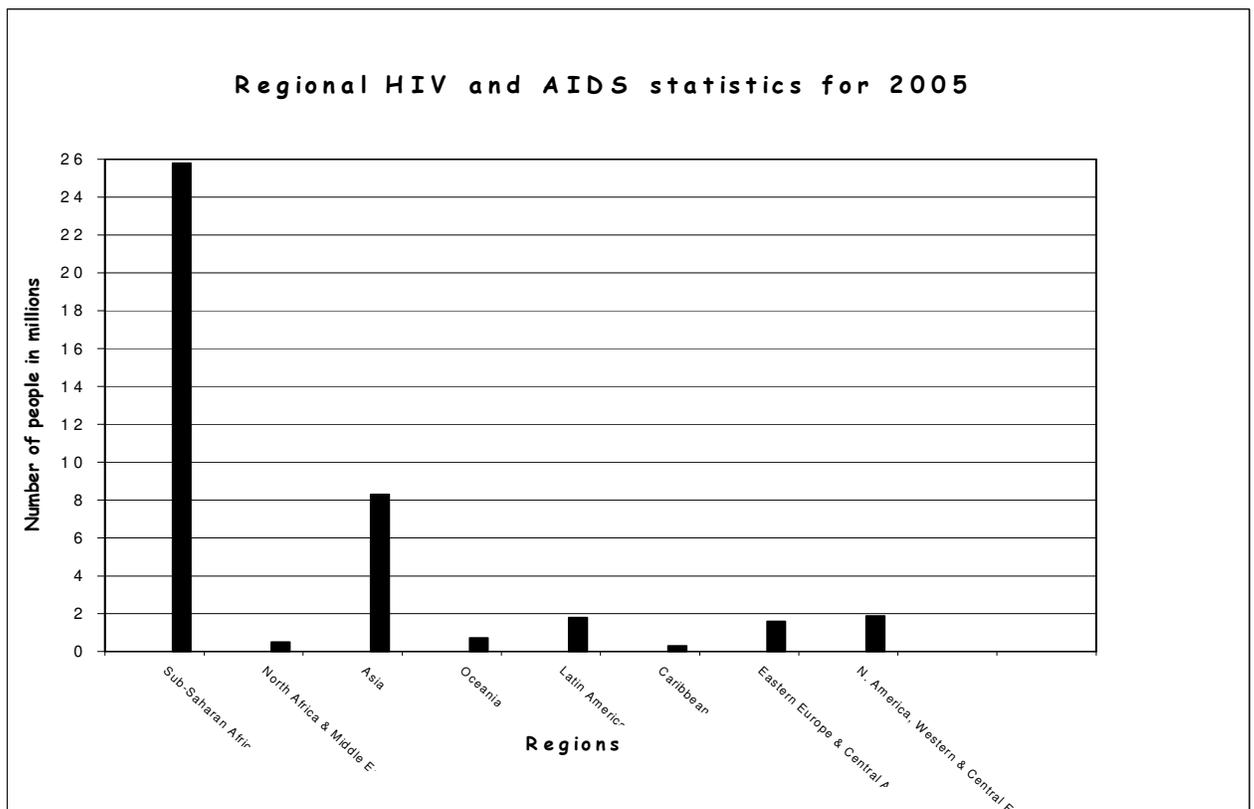
### Activity 1

#### The AIDS epidemic in the 21<sup>st</sup> century – a widening gap

Approximately 40,3 million men, women and children face a future dominated by a fatal condition that was unknown just a few decades ago. During the year 2005, approximately 4,9 million people became infected with the human immunodeficiency virus (HIV) that causes AIDS.

All the regions except Central & Western Europe, North America and Australia and New Zealand are considered to be part of the developing world. Most of the people infected with HIV live in the developing world. This proportion is set to grow even further as infection rates continue to rise in developing countries where poverty, poor health systems and limited resources for prevention and care fuel the spread of the virus.

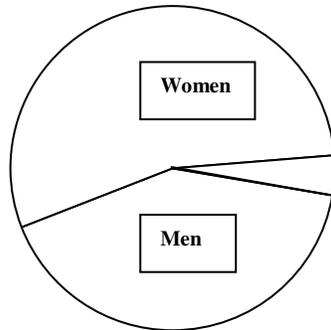
Study the graph and answer the questions given below.



1. Find the approximate percentage of people infected with HIV that live in the developing world.
2. During 2005, which region had the highest number of people living with HIV? From the graph find an estimate of the number of people living with HIV for this region.
3. Give three different reasons why **you think** there are so many people living with HIV in this region.
4. How do these statistics make you feel? Explain your answer.

5. South Africa has the highest number of people living with HIV in the world. By the end of 2003 (no 2005 data available), an estimated 5,3 million people were living with HIV in South Africa and 2,9 million of them women. The graph given below shows the data for infected men, women and children in South Africa. Use the graph (and a protractor) to find the number of infected children. Clearly show ALL working details.

### Pie Chart to compare HIV in women, men and children in South Africa



6. In the light of these statistics and as a South African teacher, what challenges will you be required to face in the classroom? List at least three **different** challenges.
7. How could South African teachers, go about addressing each of the challenges that you listed? Suggest sensible/appropriate strategies teachers could use in an Intermediate Phase classroom to address HIV/AIDS issues.

## Activity 2

### Comparing men, women and children

Estimates made by UNAIDS and WHO, 38,0 million adults (17,5 million women) and 2,3 million children (under 15 years) in the world were living with HIV by the end of 2005. Further, they suggest that there are significantly more women than men living with HIV infection in Sub-Saharan Africa. Across Sub-Saharan Africa women are disproportionately affected by HIV. In Sub-Saharan Africa there are, on average, 13 women living with HIV for every 10 infected men. UNAIDS/WHO estimated that, at the end of 2005, about 13,5 million women were living with HIV in sub-Saharan Africa.

Using the data given in the above extract, estimate how many Sub-Saharan men are infected with HIV. Show all working details.

## Activity 3

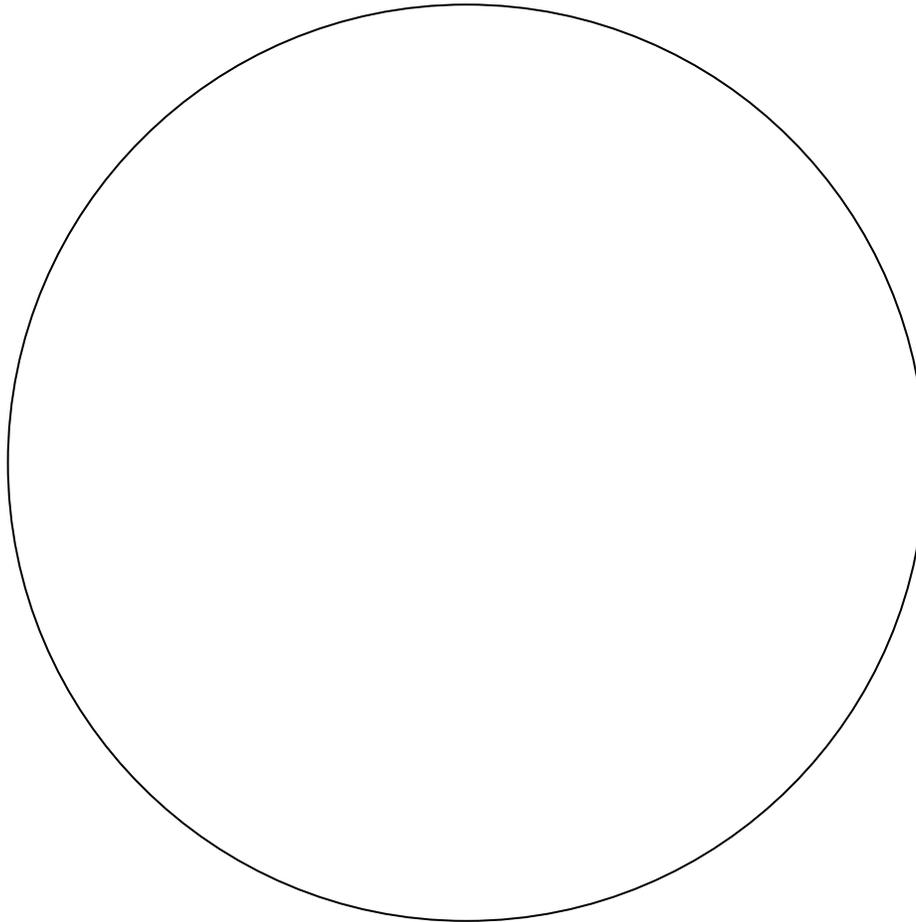
### People living with HIV and dying of AIDS (2004)

Africa, especially sub-Saharan Africa, is the area of the world worst affected by HIV and AIDS. By 2005, approximately 25,8 million sub-Saharan Africans were estimated by UNAIDS/WHO to have HIV infection or AIDS. This means that more than 60% of the world's total number of infected people, come from just 10% of the world's population.

The following table was prepared by UNAIDS to show adult and child deaths due to AIDS in the various regions of the world during 2005.

Region	No. of adult and child deaths due to AIDS	Percentage of world's total number of infected people	No of degrees
Sub-Saharan Africa	2,4 million	77%	278°
Asia	520 000		
Eastern Europe & Central Asia	62 000		
Caribbean	24 000		
Latin America	66 000		
N. America, Western & Central Europe	30 000		
Australia & New Zealand	4 000		

1. Draw a pie chart to compare the number of people who died due to AIDS in these regions of the world in 2005. Use the given circle but first use an appropriate method to accurately find the centre of the circle.



2. To compare the deaths in the regions, would it be better to draw a pie chart or a broken line graph? Explain your answer.
  
  
  
  
  
  
  
  
  
  
3. Comment on the accuracy of statistics regarding deaths due to AIDS. Explain your answer giving reasons why you think this data is accurate or not. Give at least two reasons.



## APPENDIX D QUESTIONNAIRE

### HIV/AIDS teacher education

This questionnaire forms part of a research project that explores Human Immunodeficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS) education in pre-service teacher education. This questionnaire investigates pre-service teachers' and pre-service teacher lecturers' views on the preparation of pre-service teachers for (HIV/AIDS) education. On completion of the data collection, a summary of the data will be made available for reflection.

*Thank you for your contribution.*

PERSONAL PARTICULARS										
Please tick (✓).										
<b>GENDER</b>	Female	Male	<b>OCCUPATION</b>		Lecturer	Student (Year of study - 1 2 3 4)				
<b>RACE</b>	Black	Coloured	Indian	White	Other (Specify)					
YOUR OPINION OF THE EXISTING SITUATION AND THE DESIRED SITUATION										
For each statement, please tick (✓) the option that you consider reflects the existing or desired situation.										
A tick on '1' indicates that you <b>strongly disagree (SD)</b> with the statement.										
A tick on '2' indicates that you <b>disagree (D)</b> with the statement.										
A tick on '3' indicates that you <b>do not agree or disagree (N)</b> with the statement.										
A tick on '4' indicates that you <b>agree (A)</b> with the statement.										
A tick on '5' indicates that you <b>strongly agree (SA)</b> with the statement.										
				<b>SD</b>	<b>D</b>	<b>N</b>	<b>A</b>	<b>SA</b>		
1.	Pre-service teacher education at Edgewood pays sufficient attention to HIV/AIDS education.					1	2	3	4	5
	Pre-service teacher education at Edgewood should pay more attention to HIV/AIDS education.					1	2	3	4	5
2.	There is an active HIV/AIDS education policy at Edgewood for pre-service teachers.					1	2	3	4	5
	A more active HIV/AIDS education policy for pre-service teachers should be in place at Edgewood.					1	2	3	4	5
3.	Pre-service teachers at Edgewood are equipped with the necessary knowledge, skills and attitude to contribute to HIV/AIDS education in society.					1	2	3	4	5
	Pre-service teachers at Edgewood should be better equipped with the necessary knowledge, skills and attitude to contribute to HIV/AIDS education in society.					1	2	3	4	5
4.	Pre-service teachers at Edgewood play a role in changing and improving their training for HIV/AIDS education in schools.					1	2	3	4	5
	Pre-service teachers at Edgewood should play a more active role in changing and improving their training for HIV/AIDS education in schools.					1	2	3	4	5
5.	Sufficient attention is paid to HIV/AIDS education issues at Edgewood.					1	2	3	4	5
	More attention should be paid to HIV/AIDS education issues at Edgewood.					1	2	3	4	5

6. Pre-service teachers at Edgewood should be informed by the discipline specialists in Life Orientation or Gender Education on how to manage the teaching and learning of HIV/AIDS education at the classroom and school level.	1	2	3	4	5
Pre-service teachers at Edgewood should be informed by specialists across disciplines on how to manage the teaching and learning of HIV/AIDS education at the classroom and school level.	1	2	3	4	5
	SD	D	N	A	SA
7. Programmes at Edgewood incorporate adequate sociological and anthropological concepts that are relevant for HIV/AIDS education.	1	2	3	4	5
Programmes at Edgewood should incorporate more sociological and anthropological concepts that are relevant for HIV/AIDS education.	1	2	3	4	5
8. Programmes at Edgewood pay adequate attention to current ideologies/beliefs on HIV/AIDS.	1	2	3	4	5
Programmes at Edgewood should give more attention to current ideologies/beliefs on HIV/AIDS.	1	2	3	4	5
9. Programmes at Edgewood include effective strategies that will assist pre-service teachers with managing the teaching and learning of HIV/AIDS education at the classroom and school level.	1	2	3	4	5
Programmes at Edgewood should include a larger number of effective strategies that will assist pre-service teachers with the management of the teaching and learning of HIV/AIDS education at the classroom and school level.	1	2	3	4	5
10. Programmes at Edgewood provide pre-service teachers with sufficient information about personal attitudes towards HIV/AIDS.	1	2	3	4	5
Programmes at Edgewood should provide pre-service teachers with more information about personal attitudes towards HIV/AIDS.	1	2	3	4	5
11. Programmes at Edgewood provide pre-service teachers with sufficient personal knowledge about HIV/AIDS.	1	2	3	4	5
Programmes at Edgewood should provide pre-service teachers with more personal knowledge about HIV/AIDS.	1	2	3	4	5
12. Programmes at Edgewood provide pre-service teachers with sufficient information about attitudes towards people living with HIV/AIDS.	1	2	3	4	5
Programmes at Edgewood should provide pre-service teachers with more information about attitudes towards people living with HIV/AIDS.	1	2	3	4	5
13. Data handling using HIV/AIDS statistics in Mathematics education modules at Edgewood provides personal knowledge for pre-service teachers.	1	2	3	4	5
Mathematics education modules at Edgewood should make more use of HIV/AIDS statistics to provide personal knowledge for pre-service teachers .	1	2	3	4	5
14. Programmes at Edgewood provide sufficient information about the causes and consequences of discrimination against people with HIV/AIDS.	1	2	3	4	5
Programmes at Edgewood should prove more information about the causes and consequences of discrimination against people with HIV/AIDS.	1	2	3	4	5
15. Programmes at Edgewood provide pre-service teachers with sufficient knowledge and skills to counsel learners who are affected by HIV/AIDS.	1	2	3	4	5
Programmes at Edgewood should provide pre-service teachers with more knowledge and skills to counsel learners who are affected by HIV/AIDS.	1	2	3	4	5
16. During teaching practice pre-service teachers are encouraged to develop practical know-how in the teaching and learning of HIV/AIDS education.	1	2	3	4	5
During teaching practice pre-service teachers should be encouraged to develop better practical know-how in the teaching and learning of HIV/AIDS education.	1	2	3	4	5
	SD	D	N	A	SA

**In your opinion, how could Mathematics Education modules assist with the development of knowledge, skills or attitudes in HIV/AIDS teacher education?**

**Which modules at Edgewood have dealt with HIV/AIDS?**

**Please give the year in which you attended these modules and, if possible, the name of the module.**

**Please feel free to make any additional comments about HIV/AIDS education for pre-service teachers.**

**Would you like to be involved in a research project that deals with HIV/AIDS education?  
Please write your name below if you are interested.**

## **APPENDIX E LETTER TO REQUEST PERMISSION FROM PRINCIPALS AND TEACHERS**

**University of KwaZulu-Natal  
P. Bag X03  
ASHWOOD  
3605**

Telephone: 031 260 3488

18 July 2005

### **The Principal**

Kamalinee Primary  
MariannRidge Primary  
MariannHill Primary  
Our Lady of Natal Junior Primary  
Maidstone Primary

### **Request to use teaching material**

We are working on a project where we are preparing teaching materials for the teaching and learning of HIV/AIDS through the Mathematics Learning Area. The names of the members of our team are given in the table below:

<b>Van Laren, Linda (Project leader)</b>
<b>Londi</b>
<b>Celiwe</b>
<b>Thembe</b>
<b>Kathy</b>
<b>Keshni</b>
<b>Netha</b>
<b>Nobunti</b>

Our research project focuses on how the Mathematics may contribute to the teaching and learning of HIV/AIDS education. We have prepared a booklet that we would like to use during practice teaching in our classrooms. This booklet includes a variety of mathematics activities that are aimed at developing knowledge, skills and values related to both mathematics and HIV/AIDS education. We would welcome, appreciate and value any comments or suggestions that you may have regarding the material presented in our booklet. A copy of the booklet is attached to this letter.

Yours sincerely

---

L. van Laren

# APPENDIX F OBSERVATION SCHEDULE

## OBSERVATION SCHEDULE

The purpose of this schedule is to collect information on the HIV/AIDS mathematics learning experience.

### Part One: General Information

1. Name of pre-service teacher \_\_\_\_\_
2. Date: \_\_\_\_\_
3. Learning Experience: \_\_\_\_\_
4. Site of the Learning experience: \_\_\_\_\_
5. Grade \_\_\_\_\_
6. Duration: \_\_\_\_\_
7. No. of Learners: \_\_\_\_\_

### Part Two: Establishing the Lesson context

1. Position of Learning Experience	Tick
Was this:	
An introductory lesson?	
A continuation of a previous lesson?	
The end of a series of lessons?	
Other, specify?	

2. Lesson structure	Sequence	Time	Minutes
a. Whole class teaching			
b. Whole class discussion			
c. Group work			
d. Individual work			
e. Organisation of activity			
f. Interruptions			
g. Other			



b. Group activity

c. Individual activity

d. Other

**Field notes**

# APPENDIX F OBSERVATION SCHEDULE

## OBSERVATION SCHEDULE

The purpose of this schedule is to collect information on the HIV/AIDS mathematics learning experience.

### Part One: General Information

1. Name of pre-service teacher \_\_\_\_\_
2. Date: \_\_\_\_\_
3. Learning Experience: \_\_\_\_\_
4. Site of the Learning experience: \_\_\_\_\_
5. Grade \_\_\_\_\_
6. Duration: \_\_\_\_\_
7. No. of Learners: \_\_\_\_\_

### Part Two: Establishing the Lesson context

1. Position of Learning Experience	Tick
Was this:	
An introductory lesson?	
A continuation of a previous lesson?	
The end of a series of lessons?	
Other, specify?	

2. Lesson structure	Sequence	Time	Minutes
a. Whole class teaching			
b. Whole class discussion			
c. Group work			
d. Individual work			
e. Organisation of activity			
f. Interruptions			
g. Other			



b. Group activity

c. Individual activity

d. Other

**Field notes**

## **APPENDIX G INTERVIEW SCHEDULE**

**Name**..... **Date**.....

### **Post observation interview**

**Why did you decide to select this aspect/mathematics activity in your learning experience?**

**Did you use any other resources/books? Explain.**

**Describe how you went about teaching this topic?**

**Why did you go about teaching this topic in this way?**

**What did you learn from teaching this lesson?**

**What is the significance of this learning?**

**What aspect of teaching this topic would you like to change?**

**What would you do to improve on the lesson you taught?**

**How would you improve on the materials you used for your lesson?**

**Did you discuss your lesson with your teacher mentor? What advice did s/he give?**

**How does the way you approached the lesson link with the metaphor you described in our focus group discussions to show how HIV/AIDS may be used in a mathematics lesson?**

**What knowledge that you gained during our focus group discussions assisted you in your teaching of HIV/AIDS through mathematics?**

**What further knowledge do you think would assist you in your teaching of HIV/AIDS through mathematics?**

**What skills that you gained during our focus group discussions assisted you in your teaching of HIV/AIDS through mathematics?**

**What additional skills do you think would assist you in your teaching of HIV/AIDS through mathematics?**

**How did you feel about teaching this HIV/AIDS mathematics activity?**

**What was the learners' response to this HIV/AIDS mathematics activity?**

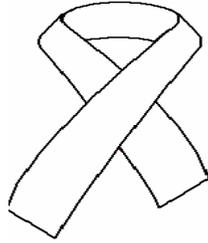
**What advice would you give to a fellow student who wanted to teach this HIV/AIDS mathematics activity?**

**Do you think that integrating HIV/AIDS into mathematics activities is purposeful? Explain.**

**Would you like to add any other comments or give suggestions about the use of HIV/AIDS in the Mathematics Learning Area?**

## APPENDIX H INTEGRATED ACTIVITY

### The Red Ribbon



1. What do you think it means to wear a Red Ribbon like the one shown above?
2. A Red Ribbon is a national and international symbol of HIV and AIDS awareness. Find out why the KwaZulu-Natal Department of Health has chosen this Red Ribbon for the Care and Concern, Hope and Support required for AIDS awareness. If you have access to a computer, visit the website <http://www.kznhealth.gov.za/redribbon.htm>.
3. If you were given a Red Ribbon, would you wear it? Explain your answer.
4. As a fund raising activity for the Golden Acres (an AIDS orphanage in Cato Ridge) you decided to make Red Ribbons to sell. Find out:
  - what materials are required to make a Red Ribbon,
  - how much a Red Ribbon would cost to make,
  - how much will you need to sell each Red Ribbon for, and
  - how many ribbons you would need to sell to make a **profit** of R100,00.
5. Look for pictures or craft work with the AIDS awareness symbol. If the symbols are in old magazines or newspapers, cut them out and paste them in your mathematics exercise book.

6. Look at the shape of the Red Ribbon made in craft work articles. What do you notice about the shapes?
  
7. Complete the Red Ribbon by drawing the mirror image of the Red Ribbon given below.

- 8.1. Find the amount of surface covered by the Red Ribbon drawn by counting the number of hexagons covered by Red Ribbon Shape 1. (Decide on what to do with the ‘bits’ of hexagons covered.)

### **Red Ribbon 1**

- 8.2. Find the amount of surface covered by the Red Ribbon drawn by counting the number of triangles covered by Red Ribbon Shape 2. (Decide on what to do with the ‘bits’ of triangles covered.)

### **Red Ribbon 2**

- 8.3. Is it possible to decide which Red Ribbon shape covered the most amount of surface by comparing your answers to questions 8.1 and 8.2? Explain your answer.
- 8.4. Find the number of squares covered by the Red Ribbon shapes drawn below. Which Red Ribbon shape covers the most amount of surface?

**Red Ribbon 1**

**Red Ribbon 2**

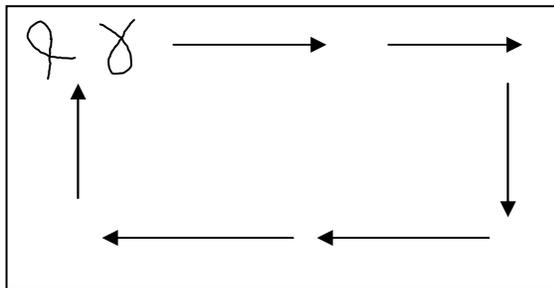
- 8.5. Find the number of squares covered by the background of the Red Ribbon. Which background covers the most surface?
- 8.6.1. On the squared paper provided, design your own Red Ribbon with a background.

- 8.6.2. Find the amount of surface covered by the Red Ribbon you designed.
- 8.6.3. Find the amount of surface covered by the background of the Red Ribbon you designed.
- 8.7.1. For each square covered in the Red Ribbons draw above, a crafter requires approximately 16 beads. How many red beads for the ribbon and white beads for the background would be required to make one beaded rectangle for Red Ribbon 1? Red Ribbon 2? Your Red Ribbon?
- 8.7.2. The crafter decided to use beads that were double the size of the beads used in question 8.7.1. above. How many red beads for the ribbon and white beads for the background would be required to make one beaded rectangle for Red Ribbon 1? Red Ribbon 2? Your Red Ribbon?
- 8.8. Each beaded rectangle has a mass of approximately 5 g. What fraction of a 25 g -bag containing red and white beads would be required to make one beaded rectangle?

### **Red Ribbon 3**

- 9.1 On the squared paper provided, draw a Red Ribbon that is similar but double the size of Red Ribbon 3.
- 9.2. On the squared paper provided, draw a Red Ribbon that is similar but half the size of Red Ribbon 3.
10. Place the drawing of Red Ribbon 3 given above on top of a piece of cardboard. Use a drawing pin to pierce through the points labelled A, B, C, D, E, F, G, H, I, J, K, L and M in the above diagram onto the cardboard. Redraw the Red Ribbon 3 on the cardboard by joining the holes made by the drawing pin. Cut out the cardboard Red Ribbon 3.
- 10.1. Use the cardboard Red Ribbon 3 to make copies of the Red Ribbon around the border of a piece of A3 paper. Start making your pattern in the top left hand corner of the A3 piece of paper. Make the pattern round the border of the A3 paper in a clockwise direction. Make a pattern by drawing round the cardboard Red Ribbon.

For example



- 10.2. In your mathematics exercise book explain how you move the cardboard Red Ribbon to make the pattern on the piece of A3 paper. Use drawings in your explanation.
- 10.3. Use the piece of A3 paper to make a poster to explain what Care and Concern, Hope and Support is required for AIDS awareness.

Front page of 'The Independent on Saturday',  
19 February 2005.

# NO ONE DIES OF AIDS

## Stats dodge issue of virus as cause of death

By BRUCE VENTER and  
KARIMA BROWN

**S**OUTH Africa has no reliable statistics on HIV/Aids on which to base any plan to fight the pandemic decimating the population.

This was highlighted yesterday when Statistician-General Pali Lehohla admitted statistics on HIV/Aids deaths in South Africa were not available.

And at a parliamentary media briefing in Cape Town, in reply to repeated questions, Health Minister Dr Manto Tshabalala-Msimang refused to be drawn on any government figures relating to HIV and Aids, including the number of people receiving anti-retroviral treatment and those who have since fallen off the programme.

She challenged anyone to give examples of any other country where exact figures of HIV and Aids were available.

"I never like to talk about figures. Our patient information system is not up to scratch. When I was preparing for this briefing, there were different sets of figures, and I said let's remove the figures," she said.

Speaking yesterday in Pretoria at the release of Statistics South Africa's report into causes of death, Lehohla said mortality data was drawn from death notification forms.

"The leading causes of death are

determined by information taken from death notification forms on which the cause of death is recorded," said Lehohla.

The study found that tuberculosis, influenza, pneumonia and cerebrovascular diseases were the leading causes of mortality.

Lehohla refused to be drawn on whether deaths caused by the above conditions could be HIV/Aids-related, which is a non-notifiable disease. "To do this, analysis of the data needs to be combined with other sources of information, population projections and demographic modelling," he said.

The study found that between 1997 and 2002 mortality had increased steadily, up from 318 287 deaths to 492 268. This represented an increase of 57%.

Adult deaths (15 years and above) climbed by 62% from 272 221 in 1997 to 441 029 in 2002. A disturbing trend, the report noted, was that the increase in mortality in the 20-49 age group had increased from 121 548 in 1997 to 250 936 in 2002.

The infant death rate displayed a marked increase, with 34 779 and 48 572 fatalities for children below the age of four for the same period.

Lehohla conceded that HIV/Aids contributed to the mortality increase. "The data gathered provides indirect evidence that the HIV epidemic in South Africa is raising the mortality levels of prime-aged adults, in that associated diseases are on the increase," he said.

## **APPENDIX J REASONS OF SPECIFIC METHODS USED FOR STATISTICAL ANALYSIS**

### **METHODS USED TO ANALYSE QUESTIONNAIRE DATA**

The measurement used in the questionnaires allowed for assigning of numbers to represent particular attributes. This measurement allowed for transformation of abstract phenomena relating to HIV/AIDS education at the Edgewood Campus into quantitative variables. Before the analysis of the numerical data was carried out, decisions were made about which measurement scale (nominal, ordinal, interval or ratio) were appropriate for the variables. This ensured that the mathematical properties of the numbers were appropriate for the amounts or levels of the attributes that were represented by these numbers in the various sections of the questionnaire.

In the biographical section of the questionnaire 'Nominal' measures merely indicated that there is a difference between categories of people who responded to the questionnaire. The numbers were used as labels to distinguish one category from another. For example, the numbers that were used to label females was '1' and males '2'. Gender, year of study and race were thus classified by nominal measures to distinguish individuals in one group from individuals in another. No mathematical operations ( +; -;  $\times$ ; or  $\div$  ) or mathematical relations, is less than (<) or is greater than (>) may be performed with these numbers because the attributes which are represented by them do not allow such operations (Durrheim, 2002a).

In the section of the questionnaire where the opinions of the pre-service teachers were canvassed, another measurement scale was required. Here 'Ordinal' measures were used to indicate categories that are different from each other and there were also ranked or ordered in terms of each statement. When the opinions were labelled according to whether the individual strongly disagreed (1) through to strongly agreed (5), using a Likert-type measure, the numbers provided a means by which the statements being investigated were classified. The arrangement in this systematic way according to the amount of agreement or disagreement allowed for performing mathematical relations (< or >) but not mathematical operations (+; -;  $\times$ ; or  $\div$ ). The intervals between the numbers on this ordinal scale are meaningless. According to Clason and Dormody (1994), however, Likert-type scaling presumes the existence of an underlying continuous

variable whose value represents the individuals' attitudes and opinions. It would therefore be possible to use Likert-type measures as 'true quantitative measures' (Durrheim, 2002a) i.e. as 'Interval' measures, because in addition to marking difference and rank, the differences or distances between any two numbers on the scale are meaningful. So, in addition to performing mathematical relations (< or >), it is possible to perform the mathematical operations of addition and subtraction (+; -) with these numbers. Interval scales do not, however, have a true zero point so for Likert-type interval scales the mathematical operations of multiplication and division ( $\times$ ;  $\div$ ) may not be performed on this scale. Despite the absence of a real zero, in most social science research it is accepted that interval scales, similar to the Likert-type interval scale, be treated as if all mathematical operations (+; -;  $\times$ ; or  $\div$ ) may be used (Durrheim, 2002a).

The types of measurement (nominal, ordinal or interval) are important classifications as they determine the kind of statistical analyses which can be performed on the data. It is thus necessary to use non-parametric statistics for the variables measuring the biographical data where nominal scales are used but it is possible to use parametric statistics to analyse the individuals' responses to statements that use Likert-type interval scales. A number of suitable descriptive and inferential statistical tests have been selected.

***Descriptive statistics***

According to the Moonstats User Guide (2002: 525), the following list of univariate descriptive statistical techniques and measurement levels are advised for nominal, ordinal and interval measurements.

	Categorical	Continuous/Qualitative	
	<b>Nominal</b>	<b>Ordinal</b>	<b>Interval</b>
Descriptive statistic	Frequency tables Min-maximum Mode	Frequency tables Min-maximum Median	Frequency tables Min-maximum Mean and Standard deviation 95% confidence interval of the mean Skewness & Kurtosis
Graphical method	Pie chart Bar chart	Pie chart Histogram	Pie chart Histogram

**Table of descriptive statistical techniques used for types of measurement (Moonstats User Guide (2002:525))**

The descriptive analysis of the HIV/AIDS education data was aimed at describing the distribution of the scores on each variable as well as determining whether the scores of different variables are related to each other. It was also possible to compare the scores on each variable over the three-year period of PME 210. The descriptive analysis assisted in gaining an initial overview of the data for each variable. Using descriptive analyses I was able to summarise scores for a single variable. Here single variable or univariate statistics were considered. Descriptive analyses included making use of frequency distributions, measures of central tendency (mode and median), and measures of variability (range, variance and standard deviation)

Firstly the general 'picture' was obtained from frequency distributions for each variable. This was done for both nominal and ordinal/interval measurements. The distribution is shown in terms of the numbers of pre-service teachers who choose each category. This frequency distribution is also shown graphically using a bar graph. The graphical representation of the observations allowed for description of the shape, central tendency and variability of each distribution pattern.

Secondly, the shapes of the frequency distributions are described in terms of their skewness. Skewness refers to the degree to which the distribution deviates from a symmetrical distribution. The symmetrical distribution occurs when the centremost point lies in the middle of the distribution and the distribution to the top and the bottom of the centremost point are mirror images of each other. If the histogram displays quite low frequencies on the left, build steadily up to a peak and then drops steadily down to low frequencies again on the right and if the peak in the centre of the histogram and the slopes on either side are virtually equal to each other, the distribution is said to be symmetrical. If the peak of the histogram lies to one or other side of the centre of the histogram, then the distribution is said to be skewed (Harper, 1971). The direction of the skew depends upon the relationship of the peak to the centre of the histogram, and is indicated by the terms positive skew and negative skew. The skew is positive when the peak lies to the left of the centre and negative when the peak lies to the right of the centre. Positively skewed distributions have more of the pre-service teachers choosing the lower numbers (disagree) on the Likert-type scale whereas negatively skewed distributions indicate that more of the pre-service teachers chose the higher (agree) numbers on the Likert-type scale. If the skewness co-efficient is larger than 0, the

distribution is positively skewed, i.e. there are fewer cases above the mean than below the mean. If the skewness co-efficient is less than zero, the distribution is negatively skewed i.e. there are more cases above the mean than below the mean.

Another measure that considers the shape of the frequency distribution is kurtosis. When the scores are clustered symmetrically, an indication of how thick the tails of the distribution of values are is given by the measurement called kurtosis i.e. This is a measure of flatness or peakedness of the distribution (Wetherill, 1982). If the distribution is neither very peaked nor very flat, i.e. the two tails are moderately thick, the kurtosis is 0. This measure was not used in exploring the distribution of values of the pre-service teachers' choices in the questionnaire because only five intervals were used in the Likert-type scale so the tail possibilities are limited not pronounced.

The measures of central tendency are different types of estimates of the centremost score in a distribution. This measure is often considered as the best representative of the data collected for a particular variable. One of the measures of central tendency is the mode. The mode is the most commonly occurring score in a distribution and has the highest frequency. Another measure of central tendency is the median. This is the middle score in a data set which has been ranked/ordered from highest to lowest. The third type of measure of central tendency is the mean. It is calculated by finding the sum of all the values in the data set and dividing this sum by the number of values. The mean was selected as a measure of central tendency for the ordinal/interval measurements made when using the Likert-type measurements and the modes were clearly visible in the bar graphs drawn.

### ***Inferential statistics***

In addition to considering the individual variables that are defined by the statements on the questionnaire, it was necessary to explore possible relationships between variables. This allows for exploration of possible links between responses to two statements on the questionnaire. The descriptive statistics assisted in arranging and ordering responses obtained from individual statements but the relationships between variables needed to be tested using inferential statistics. In using inferential statistics, the exploration of relationships called for a study of covariation. Using statistical methods is it possible to

study whether variables covary or are independent/orthogonal. Graphical representations of two variables on a scatter plot provided a useful picture to show patterns of relationship between variables. In addition, the relationships between interval measures (Lickert-type results) were calculated mathematically by means of correlation coefficients. The types of bivariate statistics used were scatterplots, correlation coefficients, Pearson product-moment tests, T-Tests and Analysis of Variance (ANOVA).

A scatterplot is a two-dimensional graph in which each pre-service teacher's response is represented by a point. The choice for one statement is represented on the horizontal axis (x-axis) while the choice for a second statement is represented on the vertical axis (y-axis). Scatterplots are interpreted by looking for patterns in the arrangement of the dots. The strength and the direction of the relationships are of interest in scatterplots. Positive relationships occur when high scores on one variable are associated with high scores on another variable. Here the dots tend to form a line that slopes upward from the left. When high scores on one variable are associated with low scores on another variable, a negative relationship is said to occur. This is seen when the dots tend to form a line that slopes downward from left to right. When the dots appear to be randomly distributed then the variables are orthogonal and do not correlate with each other. The direction of the relationship is represented by the slope of the line but the strength of the relationship is indicated by the degree to which the dots cluster around the line. The closer the dots are around the line, the stronger the correlation between the variable.

Scatterplots drawn using the responses from the questionnaire gave a general picture of the association between variables but because only 5 choices are available for each statement, the scatterplot is often unclear. A clearer method of finding the relationship between the variables was using correlation coefficients. The correlation coefficient becomes a number that is the estimate of the degree to which the points on the scatterplot cluster around the line. The correlation coefficient represents the strength of covariation between two variables by means of a number that ranges from -1 to 1. When the correlation co-efficient is 1 it means that there is a perfect, positive relationship whereas a co-efficient of -1 represents a perfect negative relationships. If there is an orthogonal relationship between the variables then the correlation co-efficient is zero. Because these variables are measured on an ordinal/interval scale using the Lickert-type

responses, it was possible to obtain a correlation coefficient (**p**) as well as Pearson's product correlation coefficient (**r**) to measure relationships between two sets of responses.

A correlation coefficient (**p**) of less than 0.05 is regarded as indicating that a statistically significant correlation exists between responses to statements. The Pearson product-moment test was an appropriate bivariate analysis tool for the interval level data obtained from the questionnaire when the Lickert-type responses were gathered. This test was thus chosen to show the relationship between responses to two different statements. The strength of the relationships between variables was measured using Pearson's product correlation coefficient to describe the correlation. The scale used is shown in Table .

<b>Pearson's product correlation coefficient</b>	<b>Interpretation</b>
- 0.29 < <b>r</b> < - 0.10	weak negative correlation
- 0.49 < <b>r</b> < - 0.30	moderate negative correlation
- 1.0 < <b>r</b> < - 0.50	strong negative correlation
0.29 > <b>r</b> > 0.10	weak positive correlation
0.49 > <b>r</b> > 0.30	moderate positive correlation
1.0 > <b>r</b> > 0.50	strong positive correlation

**Table showing interpretation of correlation scale used**

It was not necessary to investigate the relationships between categorical/nominal variables but the relationships between a nominal and ordinal/interval measurements were required when, for example, the relationship between the race of the pre-service teacher and the opinion selected by the pre-service teacher on the Lickert-type scale. A number of suitable inferential statistical tests have been selected to provide statistically significant confidence level in any observed relationships. Inferential statistical tests provide a statistically significant confidence level for any observed differences within the data. The level of statistical significance has been set at 0.05 (95 %) unless other wise stated.

Because of the measurement scales employed, bivariate analysis using T-Tests or multivariate analysis using ANOVA were methods of choice to explore relationships between a nominal and an ordinal/interval measurement (Mouton, 1996: 167; Tredoux and Smith, 2002:342). Details of each of these tests used are considered below.

T-Tests were used to explore perceptions of different gender groups regarding the questionnaire statements. Using a T-Test it was possible to decide whether the variation between the two gender groups is greater than that which would be expected just by random sampling variation (Tredoux and Smith, 2002:344). This test provides a level of significance for differences between the two gender groups to a statement requiring a response using a Likert-type scale. When a T-Test presents a value (**p**) of less than or equal to 0.05, it indicates that there is statistical significance between gender groups' responses but if the value was greater than 0.05, then there is no statistical significance between gender groups' responses.

ANOVA tests were used to explore perceptions of different race groups regarding questionnaire statements. Using ANOVA it was possible to evaluate whether the variation between the race groups is greater than that which would be expected just by random sampling variation. ANOVA checks for significant differences across race groups by examining the group means and the variance within groups. When an ANOVA test presents a value (**p**) of less than or equal to 0.05, it indicates that there is statistical significance between race groups' responses but if the value was greater than 0.05, then there is no statistical significance between race groups' responses.

In the writing up of the quantitative data I followed the suggestions made by Miller (2004), where I introduce the focus of the table or graph by a question(s), describe the facts in terms of trends or obvious exceptions and relate the evidence presented in the table or graph back to the original question posed about the particular data.

## **APPENDIX K    REQUEST VOR VERIFICATION OF TRANSCRIPTIONS**

University of KwaZulu-Natal,  
School of Science, Mathematics  
and Technology Education,  
Edgewood Campus,  
P. Bag X03,  
ASHWOOD,  
3605

3 November 2005

Dear Student

I have asked a transcriber to transcribe the lesson that I observed and the interview we audio taped after the lesson. Please read through these transcripts. If there are incorrect or misinterpretations of what you said, please feel free to correct the attached copies. Please sign the attached letter if you are satisfied that the transcripts are true reflections of what happened. Please may I have your contact details for further communication?

Thank you for being involved in the HIV/AIDS education in Mathematics project. Your input is valued and all your novel ways of adapting material from textbooks were insightful and helpful.

Yours truly,

L. van Laren  
Tel: 260 3488

I .....(please print name and surname), am satisfied that the transcriptions are appropriate and accurate.

.....

Signature

.....

Date

**Contact details:**

Telephone numbers:.....

Address:.....  
.....  
.....

Plans/post for 2006.....  
.....  
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