The impact of an HIV/AIDS module on the knowledge and attitudes of Grade 11 Biology learners

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Abstract
The purpose of the study was to evaluate the impact of an HIV/AIDS module, taught for 24 hours over eight weeks in six schools, on the knowledge and attitudes of Grade 11 biology learners. The module contained scientific content on HIV/AIDS and outcomes-based assessment activities. Learners' answers in pre-, post- and retention tests and a questionnaire that included open and closed questions on general and functional knowledge, attitudes and skills (analysed for significant changes). Narratives written by each learner were analysed to determine how the module had dealt with issues that affected their lives.

Analysis of the tests and questionnaires showed a significant improvement in the means scored in the pre-, post- and retention tests. ANOVA showed that the difference was unlikely to be attributable to chance. Narrative analysis identified a number of common themes. The learners were glad to have been taught this information and many provided evidence of how the module impacted on their lives and sexual behaviour. They felt the knowledge had empowered and motivated them to control their own lives.

Introduction
The HIV / AIDS epidemic in South Africa
With 5.3 million people infected (Lewis, 2004) South Africa has one of the highest numbers of HIV positive citizens of any country. The Nelson Mandela/HSRC household survey (Shisana, 2002) estimates that 11.4% of people aged two years and older are HIV positive, with an estimated 2000 more South Africans contracting the disease daily (Williams, Gouws, Colvin, Sitas, Ramjee & Abdool Karim, 2000). In South Africa the HIV epidemic is spread mainly by heterosexual sexual intercourse. Harrison, Smit and Myer (2000) state that it is unlikely that an effective vaccine against HIV infection will be widely available in the next 10 years. Antiretroviral medicines are unavailable to most South Africans because of their high cost, and the lack of infrastructure for dispensing them and monitoring their effectiveness. Behaviour change is the only viable means of limiting the further spread of HIV infection. Campbell (2003) states that knowledge of health risks is a pre-condition for behaviour change although only part of a solution.

Epidemiological studies have shown that in South Africa the peak incidence (number of individuals infected in a set time period) occurs in young people aged 15-24 (Pettifor, Reed, Steffenson, Hlongwa-Madikizela, MacPhail, Vermaak & Kleinschmidt, 2004, p. 12). The 2001 Department of Health Survey of HIV Prevalence cited in the HSRC Survey (Shisana, 2002) estimates that 28.4% of pregnant women in South Africa aged 20 to 24 years attending antenatal clinics are infected with HIV. Whiteside and Lyerly, (1998) point out that if women of this age are HIV positive, then South Africans younger than this should be targeted for interventions that will increase their knowledge of HIV and change their behaviour and recommended that educators play a role in providing information about HIV / AIDS. This, together with the inclusion of AIDS prevention messages into the curriculum, is one of the

most cost-effective ways of reaching the young population. "The fact that HIV infection almost certainly results in serious illness and premature death, makes the stakes of HIV education higher than those educators commonly face" (Popham, W. J., n.d.a, p. 1).

Kirby (2000) points out reasons why schools should play important roles in reducing HIV risk behaviours amongst adolescents:

- schools are the institution in our society that most adolescents attend regularly
- almost all youth are attending school before they begin sexual activity and initiate risk-taking sexual behaviours
- schools are well suited to educate youth about sexuality
- schools are well suited to identify at-risk individuals and step in with interventions or referrals.

HIV/AIDS and adolescents in South Africa

The National Survey of HIV and Sexual Behaviour among 15-24-year-olds conducted in South Africa in 2003 (Pettifor *et al.*, 2004) contains some statistics that highlight the importance of HIV education in South African schools. Of note are the following:

- HIV prevalence in the 15-19-year age group is 4.8%
- 31.2% of females aged 21 years are HIV positive

Statistics indicate also the extent of HIV-risk behaviours in adolescents:

- 48% of the respondents in the 15-19 year age group reported being sexually experienced
- 62% of those already infected (who tested HIV positive in the survey) stated that they thought they had no chance or a small chance of contracting HIV
- the reported median age of first sex was 17 years (8% of those surveyed reported having sex at age 14 or younger)
- of the respondents who reported having had sex in the previous 12 months, 8% of males and 10% of females said that they had sex more than 5 times in the past month
- 15% of the sexually experienced males age 15-19 years reported having had more than 5 partners
- only 52 % of the sexually experienced respondents reported having used a condom the last time they had sex; this figure was higher in males (57%) than in females (48%).

HIV/AIDS education programmes

During the course of the HIV epidemic, different HIV education programmes have been implemented in settings and cultures in several countries. Most of these occurred under the auspices of the public health sector. Government education departments have funded most school programmes. "In many jurisdictions there are laws mandating that HIV education be provided but without stipulations concerning how this should be done" (Fisher & Fisher, 2000, p. 3). Many education programmes only attempt to influence students' knowledge regarding HIV. Yet evidence indicates that knowledge-only programs typically have scant influence on students' behaviours (Popham, n.d.a, p. 10). "Primary and secondary educational institutions generally have fielded extremely weak, atheoretical interventions designed not to offend the religious right wing, with content that is highly unlikely to effectively change HIV risk behaviour", and "most have focused primarily – and in many cases solely – on providing information about HIV" (Fisher & Fisher, 2000, p. 3). King (1999) however believes that many "second-generation interventions were developed based on individual psychosocial and cognitive approaches that educate individuals in practical skills to reduce their risk for HIV infection" (p. 5) as researchers and developers have come to realise the complexity of sexual

behaviours and the importance of context. "Drawing on various models and modifying them to suit the populations and the context have been critical to implementation of prevention projects, especially in international settings, as nearly all theories were developed in the West" (p. 20).

Harrison *et al*. (2000) identify the common elements in interventions that have had positive outcomes on behaviour change, one of which is that such interventions "emphasise the individual as a rational actor in altering behaviour" (p. 285). As part of Life Orientation programmes in the school curriculum in South Africa, learners and educators experience the HIV education as problematic (Griessel-Roux, 2005). Teaching about HIV and sexual behaviour requires particular skills, and not all teachers can or want to teach it. Harrison *et al.* (2000) point out that while many initiatives have increased awareness of HIV/AIDS in South Africa, such as Soul City and the loveLife national youth sexual heath initiative, there have been few evaluations of HIV / AIDS education interventions in Africa.

The aims of the research

In this context, The Rainbow Biology Teacher Enrichment Programme[1] attempts to increase knowledge of the learners about HIV and help them recognise behaviours that could put them at risk of becoming infected. It attempts to provide the learners with the skills to avoid or alter such behaviours. In addition, because many learners are in contact with people who have HIV and AIDS, the programme teaches learners how to live with, and look after, someone who has HIV or AIDS. The aim of this research was to determine whether Grade 11 biology learners changed in their knowledge and attitudes concerning HIV/AIDS after completing a module taught by educators who had attended a Rainbow Biology Teacher Enrichment Programme HIV/AIDS workshop. Thus the research questions guiding the research were:

- What changes in knowledge and attitude resulted from learners' exposure to the Biology HIV/AIDS module?
- Did the module deal with the issues affecting the lives of Gade 11 learners to whom it was taught?

Theoretical perspective

For this study, Bronfenbrenner's social ecological model has the advantage of attempting a complete account of personal and contextual influences on behaviour. It views the individual as having a biological disposition and intrapersonal factors within a complex system of relationships and levels in the environment (Fig 1). As in an ecosystem, the relationships are bidirectional, i.e. the person is affected by each of the elements in the environment, and the elements of the environment are affected by the person and each other. "The child invariably influences those who influence him" (Bronfenbrenner & Mahoney, 1975, p. ix). The environmental factors, like the individual, are ever-changing (Berk, 2000; King, 1999). Participants in the situation are usually "not strangers but persons who have enduring roles and relationships vis-à-vis the child" (p. x). The model, in comparison with models such as the health belief model and the transtheoretical model (Popham & Hall, n.d.), de-emphasises the individual: "human behaviour is a function not only of the individual or his or her immediate

[1] The Rainbow Biology Teacher Enrichment Programme is the outcome of a partnership between the Departments of Biological Science at the University of Pretoria and the University of Wisconsin. "The goal of the Rainbow Biology Project is to promote excellence in the teaching of biology in line with the aims of Curriculum 2005 … by means of a series of workshops, which provide for both the professional development of teachers and the development of curricular materials" (Rogan & Nel, 2000, p. 467).

social relationships, but [depends] on the community, organisation and the political and economic environment as well" (King, 1999, p. 11).

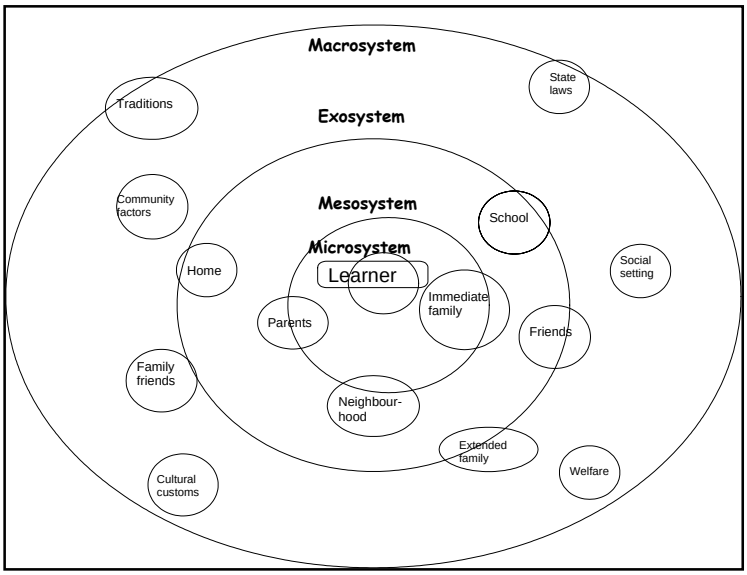

Figure 1: Bronfenbrenner's Social Ecological Model as applied to a school learner (adapted from Renn & Arnold, 2003).

Factors that influence an individual's sexual behaviour can be arranged in levels with the individual at the centre. The microsystem comprises the biological disposition and intrapersonal factors of the individual, close friends and family. Slightly removed is a mesosystem of school and friends, extending into an exosystem of community and a macrosystem of factors such as culture and the state's welfare system (Bronfenbrenner & Mahoney, 1975; King, 1999). Each person's ecosystem is a unique and complicated web of interactions and relationships. Such things as personality, social norms and history, cultural beliefs, gender and poverty are part of the complexity. Bronfenbrenner's model highlights how seemingly remote aspects of a person's environment, such as social welfare policies, can impact on his / her behaviour, as can the reactions and expectations of a valued friend. These interactions and their effects need not be rational, or conscious. The role of education is to help learners reflect on their particular ecosystems, and to gain knowledge and skills to cope, so that each learner is equipped to behave in an HIV-safe manner. The Rainbow programme and this study were developed from this framework.

Method

This study used a mixed method approach of quantitative and qualitative techniques, guided by the research questions and framework above (Matimolane, 2004; Cresswell, 2002, p. 567) The validity of the results was enhanced by triangulation of tests and narrative accounts (Marshall & Rossman, 1989). Teachers who had attended a Rainbow Biology Teachers' workshop on HIV taught the module to their Grade 11 classes. In order to determine if the module changed the learners' knowledge and attitudes, a one-group pre-test, post-test method was used. A pre-test with questions of knowledge, and a questionnaire with questions on attitude and behaviour was administered before the module was taught. The module was then taught and followed by the post-test and the questionnaire. To determine if the learners remembered the facts and skills they learned for more than a short period of time, they wrote a retention test and a follow-up questionnaire two – three months after they had completed the module, and these results were

added into the comparison and analysis. With a view to whether the module dealt with issues important in the lives of the learners, the learners wrote narratives when they did the retention test, thus providing rich information from the learners' perspective.

Sampling

The selection of the schools for this study was based on convenience sampling:

- the teachers had attended a Rainbow Biology HIV / AIDS workshop
- the teachers were willing to participate in the study
- the teachers taught at least one Grade 11 biology class
- the principal and the school were prepared to allow the study to occur
- the time that the implementation would occur suited the school and the study

Six schools of different types were chosen, thus also representing learners from different environments. Two of the schools were in urban settings – one a government, ex-model C school and the other a private college. Two of the schools were township schools and two rural. Within each school, the teacher who was part of the study taught all Grade 11 learners in biology the module by. 214 learners wrote the pre-test and questionnaire, 235 wrote the post-test and questionnaire and 177 wrote the retention test and questionnaire.

The structure of the test of knowledge and the questionnaire of attitudes

The test of knowledge contained twenty multiple-choice items on HIV knowledge and functional aspects i.e. how to avoid or reduce their risk of becoming infected (Popham n.d.b). It also contained a true or false section of twenty statements, mostly of functional knowledge. For each question, learners had to indicate whether they were sure of the answer, unsure or had guessed. The questionnaire on attitudes, beliefs and behaviour contained ten statements with 5-point Likert scales. In addition, three questions asked about the perceived sexual behaviour of friends and peers and three questions asked about strategies that learners felt would be effective (or not) in curbing the spread of HIV/ AIDS. Examples of questionnaire items follow.

Multiple-choice item:

- One of the main types of cell of the immune system that is infected by HIV is:
  - A CD4 cells
  - B B cells
  - C Killer T cells
  - D Clone cells

True or false statements:

- A person in the first few weeks following infection with HIV is not infectious to anybody else.
- Most of the people worldwide now living with HIV don't know that they are carrying the virus.

Example of a statement of attitude (5 point Likert scale: strongly agree-strongly disagree)

- I have no problem with using the same plate and cutlery as someone who is HIV positive.

Example of a question related to perceived sexual behaviour of friends and peers

- To the best of your knowledge, how many of your class mates or friends in your age group have had sexual intercourse more than once? (none / a few / about the half / most)

Example of a question on strategies to help curb the spread of HIV / AIDS

- If you were appointed to help curb the spread of HIV/AIDS in your school and community, which of the following messages do you think would be the most effective?
  A. Persuade all classmates to abstain from sexual activity.
  B. Persuade all classmates to always use condoms when having sexual intercourse.
  C. Persuade all classmates to be tested for HIV so that their HIV status can be checked before having sexual intercourse.

Results

Tests of knowledge and questionnaire of attitudes

Table 1 below presents the mean scores for the pre-test, post-test and retention test.

Table 1: A summary of the means obtained in the knowledge and attitudes sections of the tests and questionnaires

Section	Mean obtained by the learners (Percentage)		
	Pre-test / questionnaire	Post-test / questionnaire	Retention test / questionnaire
Multiple choice	43.55 %	51.85 %	51.55 %
True or false	67.5 %	71. 5 %	71.0 %
Attitudes	63.8 %	68.5 %	68.5 %

For the multiple choice questions, the mean increased by about 9 points in the post-test, and held in the retention test. For the true-false questions and attitudes questions, the starting points (the pretest) were higher, and the gains less. ANOVA indicated that the differences from pre-test to post-test were significant for the multiple choice questions ($p< 0.00$), and for the true and false section ($p< 0.0318$).

The narratives

The writings of the narratives indicated the following issues learners thought relevant: how to use a condom properly, how to negotiate condom usage, how to live a healthy life with HIV/ AIDS and how to look after somebody with AIDS. They valued knowing what to do to protect someone who has been raped from HIV infection, and felt that the knowledge they had acquired could go a long way towards reducing the stigma attached to the disease. Some of the common themes and sub-themes identified in the narratives are summarised below.

Feelings about HIV/AIDS

For many learners HIV/AIDS is part of their ecosystem. For some, it has impacted on their immediate family, while for others on the community. 54.6% of the learners wrote about the reality of HIV and AIDS in their lives – that the disease exist, there is no cure (13.0%), and it kills:

> We are always a friend of death because of HIV/AIDS and every Satuerday is a feneral for a person that dae by HIV/ IDS.

28.1% of the learners expressed pain, sadness and helplessness for those who are infected and affected:

> It happened at my street at home some one who is now late because of that virus then I

> begin sad and fill pitty for a poor human who left alone with her two daughters. Unfortunately not so long that poor human was also taken by that virus and she was also buried. I was always thinking about death saying how will that happen a very strong man can turn to be tiny and die.

Perceptions of how people behave and some of the reasons for the behaviour

A number of the learners described how many of the youth are sexually active:

> Our parents sometimes tell us how people are dying but we as youth we take them easy. Our parents tell us that we may have one partner because is not easy to tell someone to abstain. Teenagers take the serious things and play with it. Instead of plays soccer, netball and cricket they play with sex.

5.4% described how young people have sex for material reasons:

> I know some girls they have eight boyfriends one boy friend is for air time another one is for clothes etc.

5.0% link the use of alcohol to irresponsible sexual behaviour:

> The people you drinking alcohol so your body is release so the boy you must rape and don't use condom.

Learners' attitudes towards learning about HIV/AIDS

Teachers noted that learners are tired of being told about HIV and AIDS, exemplifying an overkill of the message that 'HIV is there, use a condom', and that the learners just switch off. So it was pleasing to read such statements as:

> At first a though that this book is going to be boring but as it come we really find it enjoy. It touch us of an important virus. Further on this learner wrote: It was a pleasure doing this module with you. Please go to another school so that they can now more about HIV.. thank you.

What the students learned from the module

9.6% of the learners wrote about their increased content knowledge:

> Now is better I know all the things about it how it is transferred from one person to another person. Before we learned about HIV/AIDS I thought people get it only when they sex with a person who is infected. But now I do know that you can get it when you changes body fluids. ... Now I know that HIV/AIDS you don't get infected by eating with a person who is HIV infected and by using the same toilet, by staying at the same house.

They wrote of how important it is to know this information:

> After receiving a Rainbow Project Education I felt that it is better if I change my life because I didn't take HIV/AIDS importantly and now I realised that it is important to know all the facts about HIV and AIDS.

5.8% mentioned that the knowledge that they have enables them to refute myths and misconceptions about sex and the disease:

> If you can thinks back on discussion we had with our friend about sex we were all curious about sex & sexuality, you could think of two or three pieces of information which we thought there were facts but later learned in life that they are nonsense.

Knowing what to do when a person is sexually abused

1.6% of the learners stated that they now know what to do if raped, or how to help someone who has been raped or abused.

Knowing how to look after or advise someone who is HIV positive

21.8% of the learners wrote that they were confident that they could now give advice to someone who is HIV positive on living a healthy life, or look after someone who was HIV positive, or be able to live healthily themselves if they found themselves to be HIV positive:

> My new knowledge has influenced my life because now I understand everything about HIV/AIDS. I know how to live, communicate and advice a person who lives with the disease. I now know how to make my own choices, because of the diseases.

13.8% of the learners stated that they were confident that they could sit and live with or touch people with HIV/AIDS, and use utensils/cutlery used by them, in the knowledge that HIV is not transmitted in these ways:

> I feel comfortable touching someone who is HIV positive.

Increased knowledge is only one aspect necessary for behaviour change. These narratives indicate that the learners not only had increased knowledge, but also reportedly had learned and practised HIV-safe skills and were confident that they were able to use those.

Changed perspectives

The perspectives of many of the learners were changed:

> Now I can spread the news about HIV/AIDS because I know many things about it. Some people when they see me they are so amazed because they don't know me they I am. They see difference of the past and of these days. And me too I never thought that things can be improved like these.

13.0% of the learners described their change in attitude towards people who are HIV positive:

> I thought if a person had HIV/AIDS was a sex worker or a 'bitch' which is not true.

> At first I used to say most people who have HIV and AIDS they deserve to "die" cause many TV programmes, newspaper they talk about AIDS. But now I know how to give an advise to friend who don't have much information about AIDS ...

Learners were emotionally changed

19.3% of the learners wrote of their pride in having done the module and the knowledge they gained. They were proud that they could share their knowledge with others:

> My life have changed now I can sit down to talk to my mother face to face and the other way around I could teach my mother more about HIV/AIDS. My mother sat with me down and wanted to talk to me about sex and HIV/AIDS the next thing it was me teaching her about sex.

25.2% expressed the happiness and hope they now feel:

> I feel so free because when I started to involve to fall in love I will make things step by step because I have learned about life, and no body can try to sleep with me without a condom.

47.8% of the learners wrote with confidence about their lives and their knowledge:

> Now that I have my new knowledge about HIV and AIDS I feel much better. I found it

> easy to talk to other people about it and feel free about it.

Learners wrote of the power that the knowledge has given them:

> When the Rainbow Project came to my school this now days I can take time to share the problem of HIV/AIDS and now my brother and my sister are very happy because he / she now many things about syndrome ... now I know learning and schooling is the power because Rainbow Project it come to my school to teach about a dieses and effecting of dieses.
>
> Now I feel very very confident because I have power against it.

Pettifor *et al*. (2004) say that 'without a sense of future, youth may have little motivation to protect themselves from becoming infected with HIV' (p. 58), so it is pleasing that 16.3% of the learners expressed confidence in the control they have over their lives – that they know that there are choices, and they perceive that they know how to make the correct ones:

> My new knowledge has influenced my life because now I understand everything about HIV/AIDS.I know how to live, communicate and advice a person who lives with the disease. I now know how to make my own choices, because of the diseases.
>
> Talking about sexuality and HIV/AIDS, and sharing this knowledge with others

Most of the learners wrote with pride about sharing their new knowledge with others. They were confident that they knew the facts about HIV and were keen to help others in their communities:

> I think this knowledge saved my life as I am going to pass it to those who don't know and tell them to do the same as I did to them. I think this knowledge and condoms etc is the saviour of our lives.
>
> We know according to many cultures it is a taboo to talk to children about sexuality and that inhabit the transfer of information because wrong information get passed from one person to the other and we as children could not afford to have secretive conversation about HIV/Aids & sex with our friend so these project has helped a lot because now I have a confidence to got to my parent and ask them about sex and HIV starts and they feel open now because of me & these project I've told them about. Before these project I couldn't talk about sex or HIV/Aids cause I felt like I was making a great sin till this project came and I realised talking about this things gives us an open mind.

Discussion and conclusions

The data obtained from this study show that the knowledge and beliefs improved significantly as a result of the intervention. The narratives provided information about the extent to which the module related to the lives of the learners. Sexual behaviour is, however, a complex matter. Although many of the students wrote of their intention to behave in an HIV-safe manner, only time will tell whether they do.

In the following section some aspects of Bronfenbrenner's social ecological model of health behaviour that emerged as most influential in the context of this article will be discussed. In terms of the macrosystem, traditions and religion played an important role in the lives of many participating learners. Some learners wrote about the basic biblical tenants of 'do not commit adultery', fidelity, no sexual intercourse outside of marriage and how these are the solution to slowing the spread of HIV. In terms of cultural customs learners in the study related that females play a subservient role and are unable to negotiate either sex or condom use. With regards to state laws learners point to migratory labour, separated families and the legacy of the

apartheid as contributing to the spread of HIV. Concerning welfare issues learners attributed the lack of effective welfare for those affected by poverty as contributing to the spread of HIV. Participating learners wrote about adolescents in their communities who have sex for material possessions and money. Clinics are often few and far between, so learners did not always have access to condoms and medical advice. At some clinics learners felt they were treated aggressively or turned away by nurses.

With reference to the exosystem poverty is the major community factor that emerged, followed by the role of the extended family where relatives are called upon to nurse those affected by AIDS, and some have contracted HIV through lack of education about the correct way to handle infected body fluids.

Pertaining to the mesosystem learners in the study noted that they spent a lot of their waking time at school. Thus the role of schools, teachers and peers is central in determining attitudes and knowledge concerning HIV / AIDS, safe sex, and HIV-safe behaviour. Many of the learners wrote about peer pressure and relationships, signifying friends as a considerable mesosystem factor.

Regarding the microsystem learners wrote about how the module raised opportunities for them to talk to their parents openly about HIV / AIDS and sex, and share knowledge with their parents and siblings. They were proud of how much they knew, and enjoyed 'educating' their families. The greatest impact of this module was on the learners themselves. While the research did not seek to measure behaviour changes, the narratives (written 2-3 months after completion of the module) contained extracts revealing how motivated and confident they were. Many wrote about the power their knowledge and skills had given them to keep themselves safe from HIV.

Some limitations of the study

It is difficult to demonstrate that an HIV education programme has produced genuine and long -term changes in the life of a learner. HIV is a stigmatised disease, sexual issues and behaviours are not talked about openly in many cultures, and learners may be less than truthful in reporting their attitudes or writing about their behaviours. The only way in which the true effectiveness of such a programme can be evaluated would be to monitor HIV infection rate amongst the learners to whom the programme is taught.

It is not possible to exclude the effect of extraneous factors on the changes in the pre-, post- and retention test and questionnaire responses of the learners. During the time of the study learners might have been exposed to HIV/AIDS information in the media or people they know might have disclosed their HIV status (Popham, W. J., n.d.a). At the same time, the module might have made the learners more aware of information and experiences in their environment, and so they might have gained more from this external information than they would have otherwise. Such interactions are the basis of Bronfenbrenner's social ecological model of health behaviour.

Nearly all surveys about knowledge, attitudes, beliefs and behaviours towards HIV/AIDS have the limitation that the responses are based on the self-declarations of the respondents. These might be affected by a "social desirability bias" (Shisana, 2002, p. 31).

It was not possible to eliminate the reactive effect caused by the pre-test, i.e. the pre-test may have alerted students to what they were expected to get out of the programme and thus they might have reacted differently to the programme (Popham, n.d.a).

Many of the learners involved in the study were not English first language speakers. It is possible that they did not understand all the questions in the tests and questionnaires and so their marks were not a true reflection of their knowledge or attitudes. In addition, their answers might have been worded in such a way that the researchers misinterpreted what they meant to say.

There is such diversity in the learners of South Africa (ethnic and cultural groups, religious groups, living conditions). Thus it is not possible to generalise results obtained from a study in six schools to apply to all learners in South Africa. As the sample used in this study was not chosen randomly the results are also not generalisable.

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