

# Beyond metaphor drawings to envisage integration of HIV & AIDS education: A self-study in primary Mathematics teacher education

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*Researchers using participatory methods that are engaging, purposeful and facilitate social change may need further pragmatic strategies to encourage the required change. Using pencil-and-paper drawings to introduce HIV & AIDS integration in a discipline such as Mathematics Education is an innovative participatory strategy to initiate change. However, following up on such innovations to encourage take-up of HIV & AIDS integration would benefit the initiative. The following research question guides this study: What pragmatic strategy could I use in pre-service Mathematics Education to further take-up of HIV & AIDS education integration in school disciplines? I explore HIV & AIDS integration in a pre-service Primary Mathematics Education module that I taught at a higher education institution in KwaZulu-Natal, South Africa, by studying the drawings and experiences of eight final-year pre-service teachers. I use a metaphor-drawing activity to disrupt the 'comfort zone' of teaching Mathematics, following up by providing the pre-service teachers with learner activities suitable for primary school classrooms. When asked if they were able to integrate HIV & AIDS in Mathematics classrooms, these generalist pre-service teachers appeared to rely on phase-specific teaching material in order to take up the initiative. There is a need to use innovative participatory methods to initiate change and to provide pragmatic support for this envisaged change.*

**Keywords:** HIV & AIDS education integration, primary Mathematics, self-study, metaphor drawings, pre-service teachers

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## **Introduction**

It is particularly important to explore HIV & AIDS education integration possibilities in school subjects in primary pre-service teacher education, since these teachers are generalists who are often expected to teach topics across disciplines in schools. Generalist teachers usually teach the majority of the curriculum to their allocated group of young learners for an entire year. These teachers thus spend the best part of the teaching day, which could amount to 25 hours per week, with the same learners. The large amount of interaction time affords these teachers opportunities to gain deep knowledge of particular learners' circumstances. This means that time spent with the learners allows for establishment of deep relationships with them, so that teachers gain a more holistic view of particular learners. Generalist teachers will be more likely to know how to motivate and sustain integration across disciplines in an age-appropriate manner. Furthermore, the teachers' expertise in primary pedagogy enables learning which, in turn, permits embedding and integration of disciplines (Sevik, 2011).

The benefits of using drawings to initiate reflexivity are well documented in the literature (see, for example, Mitchell, Theron, Smith & Stuart, 2011), but there does not appear to be documented research that explores extending or following up on drawing activities in a particular discipline, such as Mathematics Education. Published research reports on following-up activities for social changes initiated by drawing activities in Mathematics Education do not appear to be available. This study thus serves to fill this gap, by investigating following up of an initiative to facilitate social change, using a visual method in Mathematics teacher education.

I noticed the need to follow up on a metaphor-drawing activity and to explore a pragmatic strategy that is suitable and appropriate in generalist primary school teacher development. It was possible to guide pre-service teachers to believe in the need to integrate HIV & AIDS education in Mathematics using the drawing activity, because the drawing allowed them to relate to the initiative through imagining involvement by reflecting on their own life experiences. I sought additional supporting pedagogical knowledge, so that generalist teachers could be assisted in taking up the initiative to include HIV & AIDS education in school disciplines. Wilke and Losh (2008: 64) point out that there are limitations to employing beliefs to infer instructional intentions. I, therefore, wanted to use a pragmatic strategy to assist pre-service teachers in taking up an interdisciplinary approach to HIV & AIDS integration in Mathematics.

This study describes how I, a Mathematics teacher educator, started to improve and extend my own pedagogical practice to further integration in a core Primary Mathematics Education (PME) module at a higher education institution (HEI) situated at the centre of the HIV & AIDS pandemic. I explore the follow-up to a metaphor-drawing activity that I devised, coupled with a pragmatic strategy that I prepared

and provided during lecture presentations to encourage take-up of the intervention (Adler & Reed, 2002).

There are six sections to this article. First, I locate the study by reviewing literature relating to metaphor drawing as a research method and HIV & AIDS education integration. Secondly, I provide the theoretical underpinnings of this study, and then explain the research design and methods chosen for this self-study. The next two sections present the findings and discussion of findings. Finally I draw conclusions based on the findings of the study.

## **Locating the study**

In order to locate the study, I describe the use of metaphor drawings to picture HIV & AIDS education in Mathematics Education, and the importance of integration of HIV & AIDS education, and provide a short explanation of meanings associated with integration and interdisciplinarity. To fully appreciate the potential within the use of imaginative and visual research methods such as drawn metaphors, it is important to explore building on, and extending the benefits of using a visual method for social change.

## **Metaphors as research method**

According to Nikitina and Furuoka (2008), numerous studies in education and pedagogy have made use of metaphors as a research strategy. These studies usually focus on “pre- and in-service teachers’ attitudes towards the classroom practices, teacher-student classroom interaction, and the evolution of the teacher beliefs about teaching and learning” (Nikitina & Furuoka, 2008: 161). For example, Leavy, McSorley and Boté (2007) assessed pre-service teachers’ drawn metaphor images to explore shifts in beliefs about instruction methods after completing a particular teacher education programme. However, if generalist pre-service teachers are willing to take up initiatives expressed in their metaphors, how can they be supported with pragmatic pedagogical strategies to realise the changes required? Wilke and Losh (2008: 71) point out that it is important to build on positive beliefs expressed by pre-service teachers, and that the focus should be on “helping pre-service teachers acquire a larger repertoire of strategies, understand the link between instruction goals and strategies, and learn to effectively implement various strategies”.

Metaphor drawings are mediums for thought expression which frequently depict personal experiences and realities. A metaphor may be described as a “creative linguistic and conceptual device that enables us to describe a way of being, feeling or doing in terms of another image” (McShane, 2005: 6). If a metaphor is drawn, then the drawing may be regarded as a further route to understanding the metaphor description. The drawing becomes a more ‘concrete’ form of the metaphor image. Van Laren (2011: 144) describes how metaphor drawings in pre-service teacher education “served as the relatively small, yet important, first step towards achieving

the vision of integration of HIV & AIDS education into mathematics". This step addresses the pre-service teachers' creative imagination about how HIV & AIDS education may be integrated in Mathematics, but does not provide what Golding (2009: 3) points out as explicit information on how to learn "meta-disciplinary skills, attitudes and understandings if they are to make these interdisciplinary moves and produce the integrative structures". In other words, Golding (2009) contends that metaphor drawings attend to the interdisciplinary move or cognitive operation, but do not address the integrative structure.

The integrative structure, according to Golding (2009: 3), is considered to be the "intended result of the interdisciplinary operation". Integrative structures are, however, exactly what pre-service teachers will be required to utilise in their own classroom teaching. The interdisciplinary move requires exploring the two disciplines in relation to one another, but the integrative structure is to make reasonable teaching decisions and judgements that ultimately shape classroom practice. This means that, in addition to beliefs about the possibility of integration of HIV & AIDS education, I as a Mathematics teacher educator need to ensure that pre-service teachers acquire subject content knowledge and pedagogical content knowledge (PCK) in order to translate the concepts and beliefs depicted in their metaphor drawings into a pragmatic school classroom initiative.

### **HIV & AIDS education integration**

Primary education has an important role to play in addressing issues relating to HIV & AIDS, since all South African children are required to attend primary school and are usually taught by generalist teachers. In primary schools, Mathematics is taught for between four and a half and seven hours per week, depending on the grade (Department of Basic Education, 2012). In addition, there are Annual National Assessments for Mathematics in the foundation and intermediate phases in South Africa. These tests are managed and set by the national Department of Basic Education. Thus, Mathematics (and Languages) is perceived as having a higher status than other subjects.

Furthermore, generalist teachers are likely to influence the knowledge, skills and attitudes of their young learners. These teachers spend a great deal of time with their learners, thus providing opportunities to "embed and integrate" (Sevik, 2011: 3). Although there is literature to suggest that knowledge about HIV & AIDS does not necessarily translate into prevention behaviours (Bennell, Hyde & Swainson, 2002), it is imprudent to ignore education's potential influencing of behaviour. In addition to influencing knowledge, generalist teachers have the potential to shape learners' attitudes to particular real-world experiences because of their "rich relationships with pupils to underpin motivation and learning" (Sevik, 2011: 3).

HIV & AIDS issues have already been totally integrated into the lives and work experiences of many South Africans, since the prevalence rate in the country is over

10%, and many lives have been and are being lost as a result of the pandemic (AVERT, 2012). Furthermore, media reports and constant awareness of the illness and loss of students, colleagues, friends and/or family members permeate the lives of millions of South Africans. Integration of HIV & AIDS education into disciplines is, therefore, not a foreign concept in a country where HIV & AIDS affects the lives of many people.

In academic literature, there appears to be a clear understanding of the notion of a 'discipline' in terms of scientific-epistemological, social and/or organisational considerations (Chettiparamb, 2007). However, the understanding of 'interdisciplinary' or integration may be confusing because of the variety of nomenclature, definitions and ranking criteria. For this study, I selected the meaning of integration proposed by Mathison and Freeman (1997: 12), who summarise an integrated approach as transcending:

*disciplinary-bound knowledge in the exploration of a more unified and realistic view of knowledge. It is inquiry oriented and usually thematically based, and the themes and activities are teacher [/teacher educator] picked and directed.*

## **Theoretical underpinning**

This study was informed by two theoretical frameworks, the first being the notion that addressing HIV & AIDS should be the responsibility of every higher education teacher and school teacher. Some higher education and school teachers consider Mathematics to be devoid of political and/or the social lived experiences of learners. According to De Freitas and Zolkower (2009: 189), "it is in part the practice of neutralizing mathematics as a decontextualized domain of knowledge, which allows teachers to avoid responsibility for its social impact". Furthermore, HIV & AIDS is identified as a barrier to learning, and one cannot ignore the increase in economic, social and emotional hardships of learners at teaching institutions in South Africa. This means that all university and school teachers need to acknowledge and take into account the incidence and impact of the spread of HIV (Department of Education, 2001: 23). In addition, appropriate action needs to be taken to provide education and training that is responsive and sensitive to the pandemic. This self-study aims to address how I, as a Mathematics teacher educator, went about improving my teaching by encouraging primary school pre-service teachers to integrate HIV & AIDS content in their Mathematics classrooms.

The second theoretical framework selected for this study is that offered by Golding (2009), which focuses on interdisciplinarity, and it was chosen because he provides suggestions as to what is required for the successful integration of disciplines. Golding (2009: 4) points out that an integrative structure such as HIV & AIDS curriculum integration requires "interdisciplinary moves, skills and understandings that are needed in an interdisciplinary subject". By integrating HIV & AIDS in Mathematics Education, the interdisciplinary moves would thus involve adapting aspects of both

HIV & AIDS education and Mathematics Education. According to Golding (2009), interdisciplinary subjects allow for exploration and integration through the views of separate disciplines; by combining these views, interdisciplinarity can result in a synthesis that permits analysis of a phenomenon in a unique manner.

Research has shown that some teacher educators initiate HIV & AIDS education integration in disciplines, and that their planning for interdisciplinarity ranges from being incidental and unplanned to deliberate and thoroughly planned (Van Laren, Mitchell, Mudaly, Pithouse-Morgan & Singh, 2012). These initiatives are, however, seldom fully documented and do not include what Golding (2009: 3) describes as interdisciplinary moves and integrative structures, which he identifies as defining features of interdisciplinary subjects; interdisciplinary being described as “cognitive operations” and integrative structures as the “intended result of the interdisciplinary operation”.

In addition, Golding (2009) points out that it is necessary to explicitly teach these moves and structures, as interdisciplinary teaching is not the norm at HEIs and at schools. He gives a number of examples of integrative structures that result from interdisciplinary operation, including preparing a metaphor or model. Interdisciplinary understanding (Boix Mansilla & Duraing, 2007) is not likely to be learnt incidentally. Therefore, students need to develop “meta-disciplinary skills, attitudes, and understandings if they are to make these interdisciplinary moves and produce integrative structures” (Golding, 2009: 3). Golding (2009) also considers it possible to measure the success of interdisciplinary subjects using formative and summative assessments.

## **Research design and methodology**

I used a qualitative approach to explore how I could change and improve my practice as a teacher educator who considers it important to influence take-up of integration of HIV & AIDS education in Mathematics classrooms. I wanted to improve on my own PCK to teach the necessary moves and structures (Golding, 2009) in order to facilitate interdisciplinary teaching. To develop my own personal and professional learning and bring about change (Mitchell, Weber & O’Reilly-Scanlon, 2005), I studied my own practice as a Mathematics teacher educator. After using metaphor drawings as a participatory research method to introduce the initiative, I sought pragmatic strategies for increasing take-up of HIV & AIDS education integration by generalist pre-service teachers.

### **Self-study**

I selected a self-study approach to explore my interdisciplinary initiative in order to improve my teaching. I initiated HIV & AIDS education integration in a core Mathematics Education module for pre-service primary school teachers by means of an innovative visual method using metaphor drawings. However, follow-up of such

innovations is needed to encourage take-up of HIV & AIDS integration. Hence, the following research question guided this study: What pragmatic strategy could I use in pre-service Mathematics Education to further take-up of HIV & AIDS education integration in school disciplines? As this question relates to both pedagogy and teaching, self-study research allowed for generation of specific PCK at the HEI where I teach and allowed me to build on my existing research expertise (Louie, Drevdahl, Purdy & Stackman, 2003). I also wanted to extend insight into integration of HIV & AIDS education by focusing on pragmatic knowledge that would lead to a change in my practice.

According to Loughran (2011: 285), “[s]elf-study is initially rooted in an individual’s concerns for, and issues in, teaching about teaching, so the crucible of practice is the site for inquiry”. My individual concern was to seek ways and means of furthering take-up of integration of HIV & AIDS education. Furthermore, Loughran (2004) points out that self-study methodology signals the study focus and not any specific method of conducting research. Therefore, I selected research methods that ‘best’ suited my research and teaching experiences in the field of PME in which I have been a teacher educator since 1975. However, I acknowledge my subjectivity in this study as my research has, without doubt, been shaped by my viewpoints, observations and interpretations as well as personal and professional experiences as a ‘seasoned’ Mathematics teacher educator.

Until I experienced the loss of a pre-service Mathematics teacher to HIV & AIDS in 2000, I was content to focus mainly on teaching and learning of Mathematics using context-free problems where social issues could be avoided. Through self-interrogation (De Freitas & Zolkower, 2009), I came to realise that my task as a Mathematics teacher educator in South Africa is to prepare teachers for the HIV & AIDS context in which they will be teaching Mathematics. Furthermore, by using decontextualised problems devoid of the pre-service teachers’ world of lived experiences, I was focusing too much on the Mathematics discipline and side-stepping the importance of recognising inherent social issues in Mathematics. In 2006, I started using self-study methodology to seek ways of integrating HIV & AIDS in my teacher education curriculum. I have come to acknowledge that there is a need to connect school Mathematics and social issues, and now actively seek ways of improving the manner in which I prepare Mathematics teachers for teaching in the context of HIV & AIDS.

The validity of self-study is often challenged because of the underlying epistemological question that concerns being simultaneously the researcher and the researched. Validation of this research was enhanced by working *with* (not *on*) final-year Bachelor of Education (B.Ed.) students (Setati, 2000). I enhanced self-reflexivity by interacting with these students to challenge possible assumptions or preconceived ideas. Interactions are an important feature of self-study; LaBoskey (2004) emphasises that one of the essential characteristics of self-study methodology is interactions with others during the research process. I thus wanted to explore my

self-initiated, self-focused, self-improvement qualitative research (LaBoskey, 2004) by interacting with the student participants in order to balance my focus on self, using both inward and outward perspectives (Mitchell & Weber, 2005). In this self-study research, the 'self' was the "focus of the study with the goal of leading to a reframed understanding of [my] role in order to impact students' learning" in the context of the South African HIV & AIDS pandemic (Samaras, 2011: 57).

The student participants were fourth-year foundation (Grades R-3), intermediate (Grades 4-6) or senior phase (Grades 7-9) B.Ed. pre-service teachers. Fourth-year pre-service teachers were selected since, at the time of this study, they had over three and a half years' experience of teacher education at my HEI and were registered for a compulsory PME module that I taught. I assumed that their knowledge and experience were sufficient for them to be able to reflect, in an informed manner, on knowledge gained during the module about integrating HIV & AIDS education.

### **Data selection and analysis**

I introduced integration of HIV & AIDS education to a group of B.Ed. pre-service teachers using metaphor drawings. The pre-service teachers drew their own metaphors. Each pre-service teacher gave his/her drawing a caption and recorded who or what represented the teacher, the learner, Mathematics and HIV & AIDS education (Van Laren, 2011). The drawing did not illustrate a lesson, as the metaphor activity was aimed at disrupting the status quo in Mathematics and gave them opportunities to consider and reflect on possibilities for integrating HIV & AIDS education.

The metaphor-drawing activity was followed up by providing the pre-service teachers with a collection of learner activities suitable for primary school classroom use, where HIV & AIDS education was integrated (Van Laren & Ismail, 2009). These activities were provided, because teachers often find it difficult to transfer what they learn about in HIV & AIDS training programmes into action (Wood & Goba, 2011). The activities did not focus on aspects related to medical issues, but explored social issues of HIV & AIDS. The exemplars given to the pre-service teachers were activities suitable for Grades 4-8 learners. The activities focused on integration of the symbolic meaning of the red ribbon with problem-solving, measurement and geometry Mathematics activities or making use of authentic HIV & AIDS statistics for data-handling investigation that allowed for reflection on the implications of the statistics.

I collected the metaphor drawings from the entire group of pre-service teachers who attended the PME module, but did not mark the activity for assessment purposes. However, I included questions relating to HIV & AIDS integration in a test that formed part of the continuous assessment of the module. In assessing their work on integration in a test, I wanted to drive home the importance of the initiative. Golding (2009) points out that it is possible to measure the success of interdisciplinary subjects, using formative and summative assessments. The following test question was directly linked to take-up: Would you be able to integrate HIV & AIDS education

when teaching Mathematics in a primary school? Give a full explanation with reasons for your answer.

The metaphor drawings of 11 of the pre-service teachers were selected on the basis of the drawings being clear and carefully thought out illustrations of how integration of HIV & AIDS education may occur. Before I invited these 11 pre-service teachers to make appointments with me to discuss their drawings, I complied with all of the university's ethical clearance requirements. Only eight of the 11 pre-service teachers chose to discuss their drawings with me individually and became the student participants in this study. Written consent was requested from eight female participants, who made an appointment to speak with me about their drawings. They willingly signed ethical clearance forms that clearly stated that their responses were to be used for research purposes. The discussions were not related to sensitive issues but, where necessary, pseudonyms were used to protect their identities. While discussing their drawings, I asked the participants the following question: Do you see yourself as the teacher in the drawing? In asking this, I tried to ascertain possible take-up of the ideas expressed in their personalised metaphor drawing.

The test responses of these participants were also analysed to gain insight into possible take-up of the initiative. However, I realised that these responses were 'for marks', so this would influence their written responses. Nonetheless, I was interested in their responses to attempt to ascertain the take-up of the interdisciplinary initiative. The participants' responses to the test question and metaphor discussion question were transcribed and tabulated to analyse connections. Analysis of the test question responses was linked to what was offered to the participants as a collection of Grades 4-8 integrated learner activities during the module lecture presentation. All responses of the participants were used to answer the research question. This would, in turn, help me improve my practice as a Mathematics teacher educator who prepares teachers for their profession in the context of HIV & AIDS.

## **Findings**

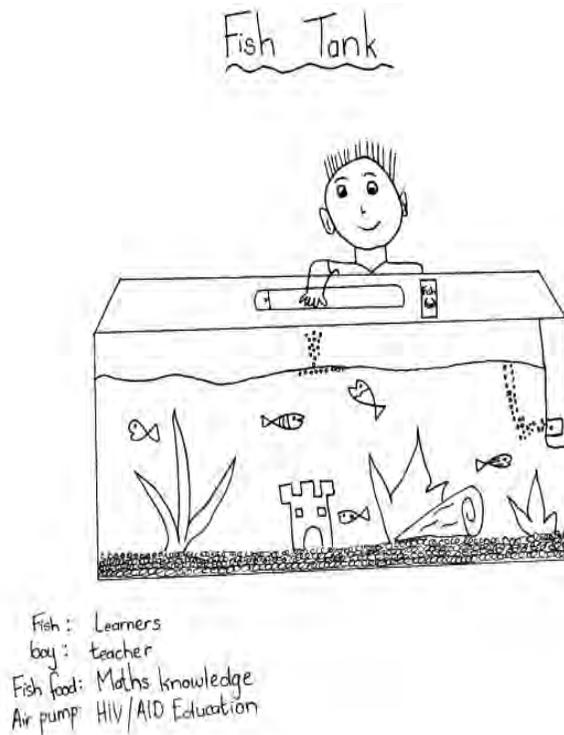
The findings are discussed in two sections: the first summarises the use of metaphor drawings as a visual method, and the second explains how possible take-up of HIV & AIDS curriculum integration was assessed.

### **Introducing integration using a visual method**

To illustrate the manner in which the student participants personalised the metaphors, I have selected the drawings by Ashlyn and Lisa. These participants are registered for different tracks in the B.Ed. programme: Ashlyn is an intermediate/senior phase pre-service teacher and Lisa is a foundation/intermediate phase specialist. These metaphors were selected from participants in different teaching phases to show that using drawings served as a participatory method across Mathematics teacher preparation phases. Their drawings clearly indicate that the participants had reflected

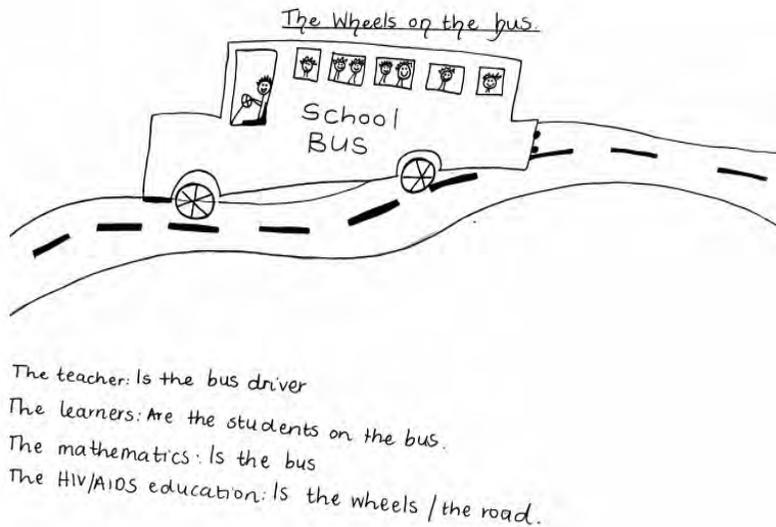
on the HIV & AIDS integration initiative and completed the activity according to the specified requirements.

Ashlyn chose to draw a fish tank (Figure 1), because she is responsible for looking after the fish at home, and the concept of sustaining life through feeding and caring for the fish in the enclosed tank influenced her thinking about integration of HIV & AIDS education in Mathematics. When she described her metaphor drawing, she pointed out that HIV & AIDS is part of life, as is the air required for life in the fish tank. She also saw Mathematics as being a “way of life”, because there are many instances in everyday life where Mathematics knowledge is required.



**Figure 1: ‘Fish tank’: Metaphor drawn by Ashlyn, with her handwritten explanation of what each part of the drawing represents.**

Lisa wanted to draw something that related to the school learning situation, so she drew a school bus (Figure 2). She pointed out that many learners know about buses and the song ‘The wheels on the bus go round and round’. She considered Mathematics to be a “carrier subject” but noted that HIV & AIDS education should not be “brushed off”, as it is an important aspect. She emphasised that both HIV & AIDS education and Mathematics need to work together.



**Figure 2: 'The wheels on the bus': Metaphor drawn by Lisa, with her handwritten explanation of what each part of the drawing represents.**

All participants selected and depicted aspects that were familiar to them and within their own lived experiences. The familiar, everyday experiences that were drawn in addition to the two examples above included making tea; baking and eating cake; painting a picture; imagining a spaceship; attending a wedding, and eating ice cream on the beach. Despite the wide-ranging variety of aspects selected for drawing the metaphor, each participant was able to connect HIV & AIDS education in Mathematics to it and to identify the teacher and learner in his/her picture.

In the discussions on individual metaphor drawing with the participants, seven of them confirmed that they saw themselves as the teacher in their picture. One of the participants indicated that she did not see herself as the teacher in her metaphor drawing, as she did not feel confident enough to integrate HIV & AIDS education in a classroom (Van Laren, 2011). She pointed out that she did not have enough subject content knowledge or PCK in the field of HIV & AIDS education.

### **Assessing take-up of the integration initiative**

In the written responses to the test question, all of the pre-service teachers who completed the PME continuous assessment test wrote that they would be able to integrate HIV & AIDS education when teaching in a primary school. The participants explained why they would be able to take up the initiative, by providing examples of particular activities that they could use in the classroom.

In their written explanations and reasons, four participants indicated that they would make use of what the red ribbon symbolises (care, concern, hope and

support), in conjunction with a variety of measurement (length, area, money and time) Mathematics problems. Denise, for instance, explained making use of the red ribbon as follows:

*By teaching the learners about the red ribbon symbol, such as what it stands for, etc., and then getting the learners to make and create posters about how to have empathy for people living with HIV and Aids. The requirement would be to make a border on the poster of the red ribbon symbol. Learners would have to draw [these] themselves, measure using a ruler [and find] an appropriate thickness [for] the border ...*

Furthermore, three participants described how they would link the red ribbon to geometry (symmetry) concepts in order to encourage empathy. To illustrate, Lisa wrote:

*You could use the ribbon as a point of discussion, what it means, and in turn what HIV and AIDS means. With respect to the mathematics knowledge you could use lines of symmetry within the red ribbon ...*

Half of the participants' test responses indicated that teaching and creating awareness about HIV & AIDS is possible by making use of data-handling activities such as using graphs to show the number of people infected with HIV & AIDS in a pictorial form that is easier to understand. For example, May wrote:

*Integration of HIV/AIDS is vital, as children need to be aware of the current epidemic/crisis. The disease has a damaging impact on the youth, and learners can be involved in conducting surveys and recording findings, as to raise awareness.*

From these responses it is clear that nearly all of the participants see themselves as the teacher in their metaphor drawing. Furthermore, the collection of Grades 3-8 integrated learner activities received during the module lecture presentation provided pragmatic strategies that would further take-up of the integration initiative in schools.

## **Discussion**

Golding (2009: 22) points out that it is possible to measure the general success of interdisciplinary subjects by means of formative and summative evaluations that determine the extent of "meta-disciplinary understanding, and interdisciplinary skills". The take-up of any initiative in teacher education is, however, difficult to assess by means of the normal formative and summative evaluations as have been used in this research, as their classroom practice was not observed. However, the pre-service teachers may communicate that they are willing and able to take up the

integration initiative during module evaluations and assessments, but only when they are teaching in their own classrooms may the actual take-up be evaluated.

When the pre-service teachers gave details in their test responses of why they would be able to integrate HIV & AIDS education, they did not provide any noteworthy, novel, additional explanations and reasons that were significantly different to what was offered in exemplars provided during the PME module. It was, however, interesting to note that they focused on being able to integrate HIV & AIDS education, because they were able to use the learner activities provided to facilitate the integration. This indicates that the generalist pre-service teachers appear to rely on phase-specific practical classroom teaching material for take-up of the integration initiative. The integrated learner activities that I provided during lectures appear to have served as an interdisciplinary move (cognitive operation) for the integrative structure (intended result of the interdisciplinary operation) (Golding, 2009).

Although the pre-service teachers gave reasons and explanations that were similar to those provided during lectures, asking this question in a test required them to interrogate and reflect on the materials provided. In other words, they indicated that they would make use of the suggested activities; they thus considered the activities acceptable for classroom teaching. This suggests that providing phase-specific materials may lead to classroom take-up actions in HIV & AIDS education integration.

## **Conclusion**

In this study, I sought a pragmatic strategy that I could use in Mathematics Education to further take-up of HIV & AIDS curriculum integration in schools. The impact that my research has had on my learning is that I have come to realise that using metaphor drawings is an appropriate way to introduce HIV & AIDS curriculum integration and attend to beliefs about the need to integrate HIV & AIDS in Mathematics (Leavy *et al.*, 2007). The metaphor-drawing activity was a way of engaging the pre-service teachers in the integration concept.

However, it is important to take cognisance of the fact that, in South African primary schools, there is a policy that requires teachers to teach all subjects. In other words, the primary school teachers are not Mathematics specialists who can easily translate their integration visions into appropriate integrated learner activities. In order to answer my research question, I needed to simultaneously explore “outwards” (Mitchell & Weber, 2005: 4) and “gaze inward” (Pithouse, Mitchell & Weber, 2009: 47) to seek the specific requirements to assist generalist pre-service teachers in taking up the integration initiative in Mathematics. I explored outwards by collecting information offered by the pre-service teachers during interactions and responses to assessment, and inwards by reflecting on how these interactions and assessment responses can be used to effect changes in my practice.

From interactions with generalist pre-service teachers, take-up of the integration initiative appears to require further PCK to assist with the 'how' for classroom practice. If pre-service teachers are required to take up the initiative in South African classrooms, then it appears that they will rely on the availability of phase-specific practical teaching material. These learner activities would need to include a variety focusing on HIV & AIDS social issues across primary school subjects. The activities should, however, be appropriate for young learners as there may be traumatic, emotional feelings associated with HIV & AIDS. If age-appropriate materials are provided in learner textbooks, then generalist primary school teachers and South African learners will be able to explore HIV & AIDS issues of discrimination, stigma, gender and poverty from a different disciplinary perspective.

This means that, in order to improve my teaching in the context of HIV & AIDS, I need to actively pursue additional ways of locating and/or developing age-appropriate integrated learning material.

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