

## CHAPTER 10

# **DRAWING IN AND ON MATHEMATICS TO PROMOTE HIV&AIDS PRESERVICE TEACHER EDUCATION**

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## INTRODUCTION

The various South African HIV&AIDS education policy documents (South African National Department of Education, 1999, 2001, 2002, 2003) set out what is expected of school teachers and higher education lecturers in integrating HIV&AIDS education into disciplines. These expectations are, however, not offered in conjunction with strategies or guidelines to achieve integration. The changes required of educators to explore innovative ways of including HIV&AIDS education in disciplines necessitate the development of new approaches, so before educators can begin to think about the implementation of such integration, they must explore issues related to their beliefs and mindsets. The use of hand-drawn metaphors (Van Laren, 2007) to address this integration in the discipline of mathematics is offered as one of the first steps in an implementation project. This chapter answers the question: How can the goal of integration of HIV&AIDS education in a discipline be initiated while working with a large number of preservice teachers who are registered for a compulsory module?

South African policy documents dictate that a variety of models may be used for HIV&AIDS education. The models suggested for delivering HIV&AIDS education in the institutional curriculum range from what is loosely termed the Integrated Model (HIV&AIDS education integrated across the curriculum) to what is called, also loosely, the Discipline/Subject Area Model (HIV&AIDS education integrated into one discipline—usually Life Orientation). Primary school teachers may consider the teaching of HIV&AIDS education to be appropriate only while they are teaching the range of health issues and the material relevant to social, personal, and physical development in the Life Orientation Learning Programme. To date, Life Orientation is not an examinable subject in all schools and does not enjoy the elevated status of other learning areas such as mathematics (Kollapen et al., 2006). Furthermore, according to the panel who reviewed the National Curriculum Statement (NCS) implementation (Dada et al., 2009) in the Foundation and Intermediate Phases, ‘health promotion’ should be accommodated under what will be termed ‘General Studies’. In General Studies, learners will be taught Health Education in the Foundation Phase for 1 hour per week, and in the Intermediate Phase, 1 hour per week will be used for the teaching and learning of religious and moral education. General Studies will include a wider variety of topics than that considered in Life Orientation because the “personal development and social

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development areas of Life Orientation curriculum are part of the general aims of schools” (Dada et al., 2009, p. 43) and need to be infused into the teaching of all subjects. If the recommendations of the panel are implemented, less time will be available for HIV&AIDS education in the primary school curriculum. To extend and improve HIV&AIDS education, it is necessary to encourage teachers to use other options, such as the integration of such education into other subject disciplines. So that teachers can be helped to see that HIV&AIDS education can be integrated into other disciplines, a change in their current mindsets and beliefs about the possibilities of integration is important. Teachers—preservice teachers in particular—need to be comfortable, willing, and able to include HIV&AIDS education in any discipline. Change is never easy and for any such initiative to be taken up, each teacher needs to come to terms with the innovation. For this reason, the beliefs of the individual teacher should be taken into account and developed so that she or he can come to accept the initiative before having to implement integration.

Brock and Salerno (1994) developed a cycle of organisational change that recognises and highlights the fact that accepting change is difficult. According to them, the initial stages in a change cycle are characterised by loss, doubt, and discomfort. When the individual is beginning to consider suggested changes, she or he may be fearful, resentful, or anxious. Furthermore, the person may approach the initiative with caution, scepticism, and confusion. She or he may then be unable to partake in any developmental activities or may become resistant or unproductive. If the change initiative is to succeed, the beliefs of the individuals who are being introduced to the need for change must be addressed. The individual must internalise and take on the challenge of the change before any positive action occurs. Therefore, in this research study of a group of 101 preservice teachers who were registered for a compulsory Primary Mathematics Education module at a faculty of education, it was necessary to initiate possibilities for the integration of HIV&AIDS education in mathematics through an activity that required an active response from each individual. Each preservice teacher was given the opportunity to explain her or his own vision of how this integration might take place by making use of hand-drawn metaphors. The purpose of the drawing activity was to provide preservice teachers with an opportunity to reflect on their beliefs about including HIV&AIDS education in a mathematics classroom. The unique drawings were seen to be a means of providing opportunities for exploring and communicating preservice teachers’ initial beliefs about the challenging changes required for this integrated approach.

### LOCATING THE STUDY

This chapter describes the use of drawings to investigate possible ways of overcoming the initial fearful, resentful, and/or anxious feelings that preservice teachers experience when they are considering the integration of HIV&AIDS education in mathematics. The work presented in this chapter builds on and then extends research that was previously explored with a group of 7 fourth (final) year

preservice teachers in a faculty of education who had volunteered to be part of an integration research project (Van Laren, 2007). In this chapter, work using drawings with an entire group of fourth-year preservice teachers to introduce the possibilities for integration of HIV&AIDS education as part of the requirements for teaching and learning of a compulsory Primary Mathematics Education module is explored.

At the University of KwaZulu-Natal (UKZN), Primary Mathematics Education is a compulsory requirement for preservice teachers registered for the Foundation, Intermediate, and Senior Phase tracks in the Bachelor of Education programme. These preservice teachers are preparing to become Grade R-9 teachers (of children between the ages of 5 and 14 years). Grade R-9 learners spend almost one third of their time at school doing mathematics, so while teaching compulsory mathematics in the school curriculum, these teachers, through integration, are in a favourable position to simultaneously provide the appropriate knowledge, skills, attitudes, and values for HIV&AIDS education. Furthermore, the integration of HIV&AIDS education in mathematics elevates the status of HIV&AIDS education since mathematics is considered to be a high status subject (De Freitas, 2006) in the school curriculum. Using drawing in the high status subject of mathematics to initiate integration is considered to be a deviation from the usual mathematics education requirements.

This research in which the use of hand-drawn metaphors is considered in mathematics education is informed by two theoretical and conceptual frameworks. The first makes use of a 'starting with ourselves' approach through self-study and the second relates to the notion that addressing HIV and AIDS should become the responsibility of all teacher educators and school teachers.

### *Self-Study*

Self-study involves making use of the emerging body of research in teacher education (LaBoskey, 2004; Loughran, 2004, 2007; Pithouse, Mitchell, & Weber, 2009) that emphasises the need for teacher educators to become self-reflective while taking on the challenges of research that is related to social action. Through teacher educator-led responses to the challenges of integrating HIV&AIDS education in mathematics, I explore the use of drawing as a creative, participatory approach to address the fearful, resentful, and/or anxious feelings that teachers experience when they are introduced to unfamiliar curriculum changes.

Pithouse et al. (2009) described seven key characteristics of self-study from the literature that point to the usefulness of self-study methodology for research on integration of HIV&AIDS education by a mathematics teacher educator. My self-study satisfies these seven key characteristics in the following ways: (1) aiming at understanding, describing, and improving the practice of preservice teachers and teacher educators; (2) making use of a variety of methods (including drawings) to promote integration of HIV&AIDS education in mathematics education from a social justice perspective; (3) being inquiry-orientated as my teacher/practitioner research is interwoven with social and/or political issues; (4) including experiences

and notions of the ‘self’ in relation to preservice teachers as ‘others’; (5) involving risk taking and gaining critical and reflective suggestions through interactions with preservice teachers; (6) providing opportunities to review what the preservice teachers and I observe in drawings and how we view integration from diverse perspectives; and (7) aiming at social action and changes to my practice, positions, and viewpoints as a mathematics teacher educator.

Tidwell and Manke (2009) showed how self-study methodology, using drawings of metaphors, facilitates reflective practice since the visual representation allows for the in-depth examination of meanings at a particular moment. These authors considered metaphor drawing to be important because of the two linked aspects—the process of drawing and the meanings represented by the drawings. Not only is it possible to explore the meanings expressed in a drawing but the process of developing the metaphoric representation is also significant. Part of the process requires appropriate individual selection of a drawing that best represents the understanding of a concept such as integration of HIV&AIDS education.

#### *Responsibility for the Integration of HIV&AIDS Education*

In addition to the teaching and learning of HIV&AIDS education, where the focus is on health issues and social, personal, and physical development, teachers need to develop strategies to integrate HIV&AIDS education into other disciplines or learning areas. In this context, teachers need to address openly and confidently issues of discrimination, misconceptions, and myths surrounding HIV and AIDS. Some teachers may not be comfortable with discussing sex-related HIV&AIDS issues (Baxen & Breidlid, 2004), but all teachers should be HIV-aware and HIV-competent in everyday classroom interactions with learners. Issues related to HIV and AIDS are complex and require teachers to display particular attitudes while interacting with learners to teach a discipline. An interdisciplinary approach that explores HIV&AIDS education has a powerful influence on learners; what teachers know, do, care about, and believe has an important impact on the lives of learners (Hattie, 2003).

In order to integrate HIV&AIDS education into mathematics, preservice teachers need to be competent in the teaching and learning of HIV and AIDS as well as mathematics. In the vast body of literature on mathematics education, there are particular areas of competence advocated for the preservice teacher curriculum. For example, the influential work of Manouchehri (1997) described a range of competences required by preservice teachers who are to teach mathematics. The competencies included Mathematics Subject Content Knowledge (SCK), Pedagogical Content Knowledge (PCK), and Pedagogical Reasoning and Beliefs about teaching and learning. Manouchehri (1997) considered that the teachers’ beliefs form an important component since beliefs influence the ways in which teachers develop PCK for classroom presentations. If teachers are introduced to unfamiliar, innovative concepts, they need to believe that the change suggested is possible. Fullan (2001) also pointed out that the acceptance of new beliefs is significant in the development of curriculum innovations. Attending to the beliefs

that preservice teachers have about integration into the mathematics discipline is important, and it needs attention when one is promoting the concept of integration of HIV&AIDS education.

The inclusion of one kind of learning within another may be interpreted and used in a variety of ways. In this research, the theoretical framework suggested by Mathison and Freeman (1997) is adopted. They describe integration as an approach in which the crossing of disciplinary knowledge borders introduces a realistic view of knowledge through the use of thematically based activities. In discussing the hand-drawn metaphor activity in the next section, integrated activities for mathematics classroom use will not be explored. The focus of this chapter is on the use of drawings in addressing the initial beliefs of preservice teachers about the integration of HIV&AIDS education in a discipline.

#### METHODOLOGY

I chose to situate my research within a 'starting with ourselves' framework by selecting my own higher education teaching institution, where I am a mathematics teacher educator, as the research site. Connelly and Clandinin (1988) would have described this form of qualitative study as autobiographical since I investigated my own practice to understand how HIV&AIDS education may be facilitated in mathematics education modules that I teach. I researched my practice to help me see how I could become informed of preservice teachers' beliefs on HIV&AIDS education and its implementation so as to adapt my practice during mathematics education modules. Furthermore, I believe that I need to take action and do something as a teacher educator in relation to addressing HIV and AIDS.

The 'starting with ourselves' methodology is often challenged on the grounds of validity and subjectivity, but because of the interactions with other 'selves' within the lecture room situation, I was able to reflect on how I could study the integration innovation from the inside. Studying one's own practice to articulate it coherently is also demanding and difficult. In self-study, detailed documentation of the research process is a requirement for studying one's actions so as to facilitate reflexive teaching (Bleakley, 1999).

As previously discussed, after having worked with a focus group of 7 final-year preservice teachers who volunteered to work with me while we designed activities to initiate the integration of HIV&AIDS education in mathematics (Van Laren, 2007), I decided to extend this work on making use of drawings to further integration research with the entire group of Bachelor of Education preservice teachers who were registered for a compulsory final-year Primary Mathematics Education module.

Using preservice teachers' hand-drawn pictures and descriptions of metaphors, I explored the beliefs of preservice teachers about the integration of HIV&AIDS education in mathematics. The drawing activity was informed by the metaphor research done by Johnston, Needham, and Brook (1990) and Hobden (1999). Drawings of metaphors are described as a creative way of depicting a situation in

order to give a representation of teaching and learning. I explained the concept of a metaphor to the preservice teachers as follows:

A metaphor may be described as an imaginative way of describing a situation to give a vivid and interesting picture. These descriptions do not exist in real life. For example, we might refer to a caring person as ‘having a heart of gold’ because we associate something of good quality as consisting of gold.

In the lecture situation, the preservice teachers were given the opportunity to discuss a number of hand-drawn pictures that I provided as examples of metaphors. We explored the metaphors by considering who or what represented the teacher, the learner, the mathematics and the HIV&AIDS education embedded in the mathematics. I then asked the preservice teachers to draw their own personal metaphors. These were not meant to depict actual mathematics lessons but rather to show possibilities for inclusion of HIV&AIDS content into mathematics and facilitate reflection.

#### *Data Selection and Analysis*

I collected the drawings of all 101 preservice teachers. The preservice teachers’ drawings were not marked or graded for module assessment purposes. I selected interesting, unusual drawings made by 8 of the preservice teachers for further exploration. I asked these female preservice teachers for written permission to use their responses, and they were also asked to discuss their drawings. During these voluntary discussions of their hand-drawn metaphors, each of the 8 preservice teachers was given the opportunity to say more about why she decided on the particular metaphor, how her metaphor explained integration of HIV&AIDS education, and whether she saw herself as the teacher in her drawing. The preservice teachers were not directly asked to comment on their feelings about integrating HIV&AIDS education in mathematics. Instead, by replying to the question about seeing themselves as the teachers in their drawings, respondents were given the opportunity to say whether or not they would be willing to consider integrating.

The learning suggested by the drawing of a metaphor may be classified using Sfard’s (1998) two categories: Acquisition and Participation. These categories are based on interpreting the type of learning being represented as an end-product (Acquisition) or symbolically as a process (Participation). This classification may be used to identify types of learning theories: Does the drawing show that the preservice teacher appears to have a teacher-centred or a learner-centred approach to integrating HIV&AIDS education? It was not my intention to classify the types of learning for ranking purposes, but, rather, I wanted to understand the manner in which the participants envisaged integrated teaching. This would enable me to explore the drawing as an initial entry point in the consideration of the possibility of inclusion of HIV&AIDS education in mathematics.

To illustrate the variety of ideas about integrating HIV and AIDS into mathematics, I have used four (Anisha, Celest, Felicity, and Nandi’) of the 8

preservice teachers' drawings of metaphors for analysis in this chapter. Anisha, Celest, and Felicity are Foundation/Intermediate (Grade R–6) Phase preservice teachers, and Nandi is an Intermediate/Senior (Grade 4–9) Phase specialist.

The drawing activity and subsequent discussion did not focus on creative ability: It provided a starting point for preservice teachers to help alleviate their fears about integrating HIV&AIDS education into a discipline using an interesting, different—in that it was non-mathematical—activity. During the lecture in which I introduced the concept of the drawing of a metaphor, I emphasised that there was no such thing as a correct or incorrect metaphor drawing or description.

#### *What the Visual Data Revealed*

The “Masterpiece” metaphor was drawn by Anisha, who had elected to study English and Life Orientation as major subjects in her Bachelor of Education degree. In her drawing (see Figure 10.1), Anisha shows a painter standing beside an easel that has a painted canvas on it. A palette with paints and a paintbrush are featured next to the easel. The painting is at the centre of the drawing while the artist stands next to it. Her description of the metaphor indicates that the painter represents the teacher who uses mathematics, together with HIV&AIDS education, to develop the learner. The end result is the painted canvas that represents the learner.

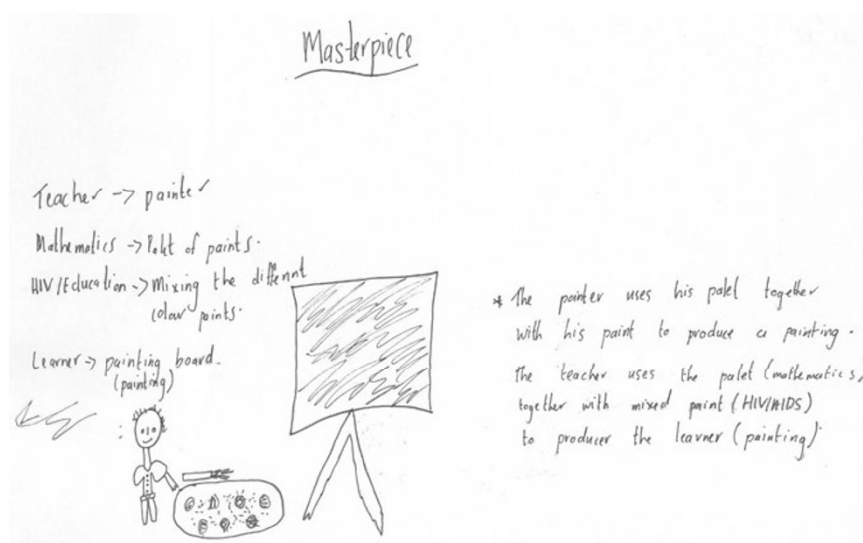


Figure 10.1. “Masterpiece”: The metaphor drawn by Anisha (October 2009) with her hand-written explanation of what each part of the drawing represents.

Anisha chose her metaphor drawing of a painter and painting because she thinks that effective integration is achieved through the mixing of different coloured paints. When she described her metaphor drawing of the masterpiece and how integration of HIV and AIDS may take place, she explained that, for her, the painter produces a message or symbol that needs to be interpreted through emotions and feelings in a particular context. The interpretation of the picture that the painter creates depends on the particular viewpoint of the individual interpreter. For Anisha, the learner could then become the painter once the integration of HIV&AIDS education in mathematics has been taught. She believed that each learner could then develop a different interpretation of the knowledge gleaned from the teaching situation.

Celest's major subject is Technology. She interpreted the integration differently and called her metaphor drawing "Chocolate Cake". Her drawing provides a step-by-step description of the various components (see Figure 10.2). The process begins with the baker, who uses ingredients to produce a cake. The cake, together with the icing, is the final product. A slice of the enticing iced chocolate cake is then presented to the learner for consumption.

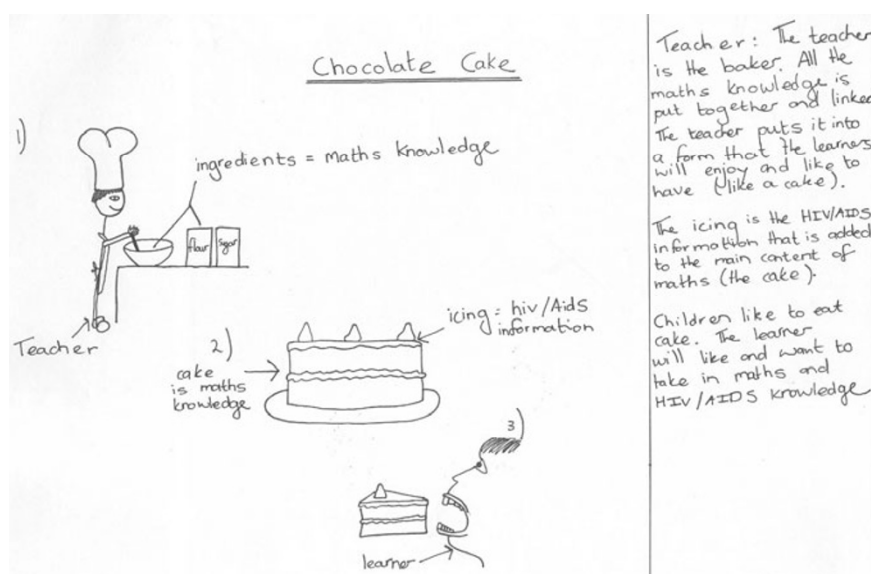


Figure 10.2. "Chocolate Cake": The metaphor drawn by Celest (October 2009) with her hand-written explanation of what each part of the drawing represents.

Celest's metaphor was influenced by what her friends had drawn. In the discussion, she pointed out that the teacher decides what is important when including HIV&AIDS education content. The teacher, represented as the baker, wants the presentation of the content to be in a palatable form. The chocolate cake with icing,



then, is a tempting, encouraging way of presenting the mathematics and HIV&AIDS education knowledge. The cake, which consists of mathematics and HIV&AIDS education, is consumed by the learner so that her/his knowledge of mathematics and HIV and AIDS can be taken in.

Felicity's major subject is English. She titled her metaphor, "New Concepts" and drew a central hovering spaceship with a pilot. From the spaceship, rays are shown beaming down to a person standing on the ground (see Figure 10.3).

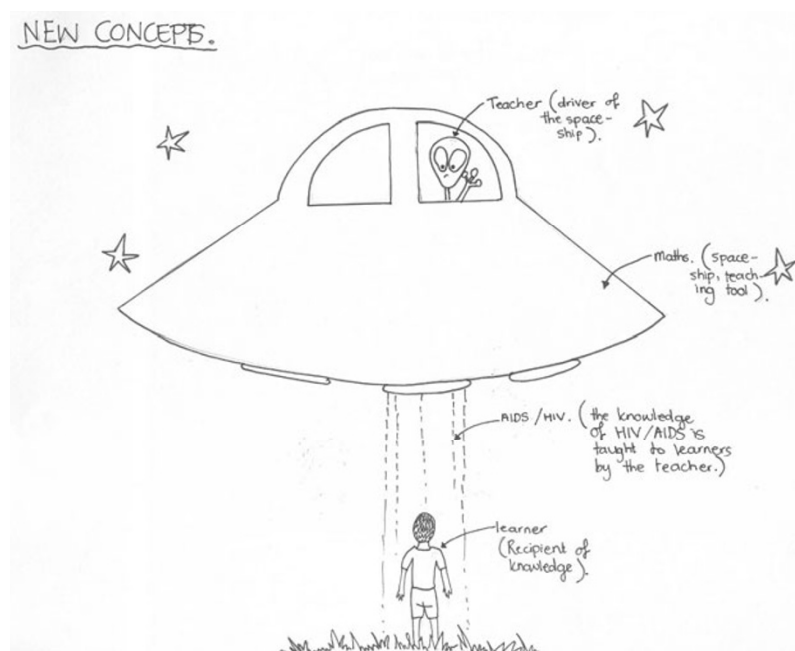


Figure 10.3. "New Concepts": The metaphor drawn by Felicity (October 2009) with her hand-written explanation of what each part of the drawing represents.

Originally, Felicity considered drawing a person planting seedlings to illustrate her metaphor for integrated teaching and learning, but then she decided to draw "something more fun and different", so she drew a scene showing a spaceship interacting with a human. She emphasises that the teacher uses mathematics to deliver the HIV&AIDS education since the learners may not know about the required HIV&AIDS education. In her drawing, the pilot of the spaceship represents the teacher, and the spaceship is the mathematics that is the vehicle used by the teacher to teach about HIV and AIDS. The person on the ground is the learner, who receives the knowledge about HIV and AIDS through the mathematics.

Felicity enjoyed the activity and was excited about the prospect of the integration of HIV&AIDS education into mathematics. Her drawing showed that it

is possible to integrate in a manner that is not a forceful bombarding. Integration, then, provides her with opportunities to “slip in” information about HIV and AIDS “smoothly” without using heavy-handed tactics.

Nandi had elected to register for Arts and Culture and Technology as her major subjects. One of her family members was about to get married, so she decided to draw a wedding scene (see Figure 10.4). She wanted to represent “something that is familiar to everyone because we all go to weddings”. In her drawing, the bride is the central figure and the groom is presenting a ring to her. The groom in her picture represents the teacher and the whole wedding ceremony is the mathematics teaching and learning. An important part of the ceremony is the handing over of a ring that represents HIV&AIDS education. The centrality of including HIV&AIDS education in mathematics is portrayed in her drawing. The bride is the learner receiving the information about HIV and AIDS. Nandi sees herself as taking the role of the groom in her picture—the one who provides the bride, who represents the learner, with HIV&AIDS education.

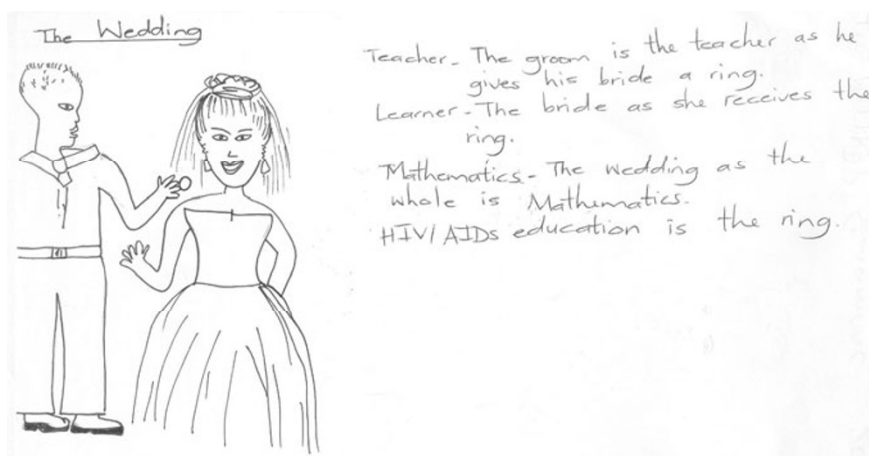


Figure 10.4. “The Wedding”: The metaphor drawn by Nandi (October 2009) with her hand-written explanation of what each part of the drawing represents.

#### DISCUSSION

From the drawings made by Anisha, Celest, Felicity, and Nandi, it is evident that there is an interesting variety of views on how the integration of HIV and AIDS into the mathematics curriculum could be developed. Their views on integration, as displayed in the drawings, should not be seen to be static and unchanging views of teaching and learning. The preservice teachers were given only about an hour during a mathematics education lecture to explore the possibility of integration into mathematics, so their views may change once they have reflected on the possibilities. They will certainly be influenced by the experiences once they qualify

to teach in their own classrooms and will probably consider teaching and learning from a different viewpoint by then.

The metaphor drawings and descriptions offered by the preservice teachers showed that all were willing to consider integration processes in mathematics. Yet, Celest openly admitted that she did not see herself as a teacher who had enough knowledge about HIV and AIDS to confidently integrate HIV&AIDS education into a mathematics classroom. All 4 preservice teachers indicated that mathematics education modules could assist with the development of HIV&AIDS teacher education, but it is clear that Felicity would like integration activities in mathematics to be extended to incorporate further information about HIV and AIDS together with concrete examples of how attitudes can be changed. Three of the preservice teachers pointed out that HIV&AIDS education should be considered across *all* disciplines to assist with the preparation of teachers for the management of HIV&AIDS education at classroom level. Celest, however, proposed that “there should be a general module on HIV&AIDS education that shows us how to incorporate it across learning areas, as a lot of us are generalists”.

#### *Advantages of Using Drawings*

The preservice teachers were not asked to extend their initial integration ideas, as presented in their drawings, to real action in classrooms, but the drawing activity did appear to dispel the initial fears, doubt, and discomfort about the integration innovation. The drawing of a particular metaphor opened up discussion on possibilities for integration of HIV&AIDS education into mathematics without focusing on a correct or incorrect solution to the problem. The drawings allowed for thinking about an innovation in a non-threatening, non-stressful situation. The preservice teachers were given the opportunity to experiment with their own ideas through the drawings. By making integration concepts visible in a hand-drawn metaphor, each preservice teacher gained some insight into coming to terms with integration.

#### CONCLUSIONS AND IMPLICATIONS

In having them produce hand-drawn pictures, the complexity of integration was customised into a simple form that matched each individual preservice teacher. Individual participation allowed the preservice teachers to consider how each thought about the suggested integration innovation from the inside, through reflection. Although I proposed the innovation as a mathematics teacher educator, this could have been seen to be a change initiative developed by an outsider imposing an unwelcome top-down change strategy. Using personalised hand-drawn metaphors, we could explore individualised understandings of change.

The drawings addressed the initial risks and fears described in the change cycle mentioned above (Brock & Solerno, 1994) and enabled these preservice teachers to move towards the discovery of, and also the understanding of, integration possibilities. By affording each preservice teacher the opportunity to take on the

challenge at a simple level using a hand-drawn picture, the preservice teachers would work through the “Danger Zone” (Brock & Solerno, 1994). The drawings provided support for overcoming possible cautiousness, resistance, and confusion and paved the way for creativeness and pragmatic focus on integration strategies. The personalised drawings served as an ice-breaking activity to reduce tension and anxiety so that each preservice teacher could mull over the implications of the intervention. The drawings facilitated their becoming acquainted with the intervention and provided them with opportunities to directly become involved and work to the next step in the process of the integration of HIV&AIDS education. The activity paved the way for the next goal, which could include the development of required integration action through the exploration of classroom strategies.

The metaphor drawings uncovered the initial responses of these preservice teachers to teaching and learning and are not meant to represent a permanent, unchanging, cast-in-stone statement about their beliefs and attitudes. The illustrations suggest that these preservice teachers were inclined to adopt a teacher-centred approach to integrating HIV&AIDS education into mathematics, and this is linked to Sfard’s (1998) Acquisition metaphor for learning. This approach could, however, change through further reflection and after classroom teaching experience. In this chapter, the drawings allowed for exploring the ‘beginning’ ideas. After further teaching and learning experiences, these preservice teachers may want to adapt and/or reconceptualise their drawings. At a later stage in their professional careers, it would be useful and very meaningful to ask them to reconsider or repeat the drawing activity so that we could compare their current beliefs and attitudes about implementing HIV&AIDS education integration with their earlier beliefs and attitudes.

The drawing activity served as the relatively small, yet important, first step towards achieving the vision of integration of HIV&AIDS education into mathematics. It provided the bottom rung of the scaffold—in an explicit manner and with a particular outcome—to address beliefs about integration. Each preservice teacher who was registered for the Primary Mathematics Education module was willing and able to engage with this first step, which focused on convincing them that the change in the teaching and learning of mathematics is achievable. The relatively new initiative that involved their drawing of a metaphor in a mathematics module encouraged the acceptance of an alternative way of thinking about the teaching and learning of mathematics in a school classroom. Furthermore, the activity highlighted the fact that the preservice teachers at a faculty of education in KwaZulu-Natal, where HIV&AIDS teacher education is mainly considered in the elective Life Orientation module, would not only require but welcome and benefit from more HIV&AIDS education subject content knowledge and pedagogical content knowledge from Life Orientation specialists and from other disciplines.

## NOTE

<sup>i</sup> Pseudonyms are used to protect the identity of the participants.

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