

Harriet Mutonyi  
University of British Columbia

## Analogies, Metaphors, and Similes for HIV / AIDS Among Ugandan Grade 11 Students

*This article looks at the importance of student-generated analogies, metaphors, and similes as an entry point into their understandings of HIV/AIDS. In addition, it argues that analogies, metaphors, and similes are good tools for eliciting students' prior understandings of HIV/AIDS, especially matters relating to sexuality that are often figuratively communicated in many Ugandan cultures. It posits that students' prior knowledge determines how they respond to messages about HIV/AIDS. The article suggests that in order to prevent vulnerability to HIV/AIDS among Ugandan youth, learning should be viewed as a process of conceptual change so that students become active participants in their own learning process.*

*Cet article se penche sur l'importance des analogies, des métaphores et des comparaisons produites par des élèves et les prend comme point de départ pour étudier leurs connaissances sur le VIH/sida. De plus, on affirme que les analogies, métaphores et comparaisons constituent de bons outils pour obtenir des données sur ce que savent les élèves sur le VIH/sida, notamment en ce qui concerne des éléments de la sexualité qui sont souvent communiqués au sens figuré dans plusieurs cultures ougandaises. On maintient que les connaissances préalables des élèves déterminent leurs réactions aux messages portant sur le VIH/sida. L'article propose que pour rendre les jeunes ougandais moins vulnérables au VIH/sida, il faudrait concevoir l'apprentissage comme un changement conceptuel, ce qui permettrait aux élèves de participer activement à leur propre apprentissage.*

### Introduction

Uganda is considered a leader in sex education both in Africa and throughout the world (United Nations [Joint Programme] AIDS, 2001; United States Agency for International Development [USAID], 2002). Information about safe sex, HIV / AIDS prevention, and respectful sexual relations are prevalent in a variety of publicly visible and accessible media. These include posters, billboards, comics, and publications such as *Straight Talk*, a monthly newsletter for adolescents distributed nationally (Uganda AIDS Commission, 2004; UNAIDS, 2004; USAID, 2002). In addition, HIV / AIDS education is part of the central curriculum in subjects like biology, Christian religious education, and health science (see, e.g., *Health Education Syllabus for Secondary Schools*, Ministry of Health and Ministry of Education, 1992). Although HIV / AIDS messages seem to penetrate most strata of Ugandan society (from urban to rural) and have been somewhat successful in conveying messages about healthy sexual practices, there is nonetheless a significant and dangerous knowledge gap, par-

---

Harriet Mutonyi is a graduate student in the Faculty of Education (Centre for Cross Faculty Inquiry).

ticularly for adolescents, about critical topics like sexual health and HIV/AIDS (Burns, 2002).

Research shows that this is primarily due to cultural constraints that dictate selective presentation of sexual health matters and limited accessibility to information, which prevents holistic HIV/AIDS education. Teachers, health workers, and media sources have been reluctant to transgress these cultural barriers of sexual issues, although health workers and teachers are mandated to teach or disseminate HIV/AIDS information (Burns, 2002; Kinsman et al., 2002). Typically in most Ugandan cultures, messages about sex and sexuality are considered taboo in public spaces. In order to talk about sex, sexual transmission of HIV/AIDS, and other issues of sexuality publicly, indirect (figurative) language such as analogies, metaphors, and similes are used. Research shows that these are efficacious means of teaching abstract concepts because they begin with what students already know (Arroliga, Newman, & Longworth, 2002; Boerger 2005; Boers, 2003). However, other researchers have found that using analogies, metaphors, and similes for instruction can lead to misconceptions, especially if the students do not know the figurative concept (Hamilton, 2000; Nashon, 2004; Pittman, 1999). This means that using figurative language for instruction is a double-edged sword (Boers; Nashon; Clement, 1993; Dagher, 1995; Duit, 1991; Glynn, Duit, & Thiele, 1995; Hewson & Hamlyn, 1985; Solomon, 1986; Zeitoun, 1984).

Because the effectiveness of analogies, metaphors, and similes for instruction depends on what students already know, the current study was designed to investigate students' prior knowledge of HIV/AIDS. HIV/AIDS is prevalent in public media and communities (as mentioned above), so students come to biology class with some constructed understandings of the disease. Normally, a pedagogical focus on students' prior knowledge aims to use effective tools for instruction that can bring about effective learning. The assumption of this study is that if the students' prior knowledge is elicited, appropriate material to build on or engage what they already know can be designed. This approach to teaching and learning is also consistent with constructivist epistemologies that posit learning as a process of conceptual change (Posner, Strike, Hewson, & Gertzog, 1982). Conceptual change theory recognizes that learners come to classroom instructions having already constructed understandings of given phenomena based on their home and community experiences. Therefore, learning is a process of transforming these extant constructions as opposed to the empty-slate approach to teaching.

In this study, prior knowledge was elicited from student-generated analogies, metaphors, and similes for HIV/AIDS, because it has been proven one effective means of utilizing what students already know (Glynn et al., 1995; Nashon, 2004; Pittman, 1999).

### *Purpose of the Study*

The larger research project from which this article is developed sought: (a) to elicit students' prior knowledge on HIV/AIDS from the media messages they had encountered; and (b) to establish how prior knowledge affects students' understandings of new knowledge encountered in the classroom. However, in this article I focus on the students' prior knowledge as expressed through their

analogies, metaphors, or similes and subsequent elaboration of their figurative illustrations.

#### *Significance of the Study*

This study is significant because it directly responds to the need for effective HIV/AIDS education for youth in Uganda. Elucidating the students' prior knowledge gives the stakeholders (including policymakers and educators) insight into what aspects of HIV/AIDS need to be elaborated on to bring about meaningful learning. Because HIV/AIDS infection and deaths in Uganda are reported as prevalent among young people between the ages of 15 and 25 years (Uganda AIDS Commission, 2004), these people need to know how best to protect themselves against infection. But perhaps even more important, young people need to acquire sexual health literacy so that they can discover opportunities to use this information and knowledge such that it will empower them in real-life situations. This goal can be achieved only if the designers of HIV/AIDS education and public messages recognize existing misconceptions among students and design appropriate learning materials that address their specific needs.

This study is also significant because it provides some understanding of how cultural practices affect the teaching of target concepts. It also contributes to the knowledge base on students' prior knowledge and use of analogies, metaphors, and similes as tools for determining their understandings of given phenomena. Theoretically, therefore, it contributes to the literature that examines learning as a process of conceptual change (Posner et al., 1982) and border-crossing from the home culture to school science (Aikenhead & Jegede, 1999). Any information that can lead to designing an effective learning environment is needed by many stakeholders given the devastating effects that HIV/AIDS continues to have in Uganda and elsewhere.

#### *Analogies, Metaphors, and Similes*

The terms *analogy*, *metaphor*, and *simile* are close in meaning and are at times used interchangeably. Gentner and Clement (1988) state,

The basic intuition is that an analogy is a mapping of knowledge from one domain (the base) into another (the target), which conveys that a system of relations that holds among the base objects also holds among the target objects.  
(p. 313)

Barlow, Kerlin, and Pollio (1971) highlighted the technical differences between metaphors and similes. In describing metaphors and similes, they state that they "function by making an explicit or implicit comparison or conjunction of two disparate ideas that share some common, though often highly imaginative feature" (p. 4). Similes are close in character to metaphors, but the difference lies in how they are compared. Whereas in metaphors the comparison is implied as in the expression "that car is a rocket," in similes the comparison is made explicit through the use of words such as *like*, *as*, and *as if* (Boerger 2005), for example, "that car is like a rocket." Hamilton (2000) states, "in essence, a metaphor utilizes well-understood concepts or attributes from one domain to make points or provide insights about another" (p. 239). Hewson and Hamlyn (1985), however, suggest that metaphorical concepts are influenced by interactions with other people and by both physical and cultural environments.

Therefore, in many instances they are culture-specific and sometimes inapplicable across cultures. For this study, the structural differences were important during data analysis for easy categorization of the figurative language.

#### *Theoretical Framework*

Use of analogies, metaphors, similes, and other figurative language has been widely studied for decades. People consciously or unconsciously use figurative language in explanations or conversations (Lakoff & Johnson, 1980; Piaget, 1962). However, this study drew on literature that focused on using analogies, metaphors, and similes as a means of instruction or determining students' understandings of a given phenomenon. Analogies, metaphors, and similes as tools for instruction or evaluating students' understanding have been studied mostly in science classroom contexts (Brown, 1992; Clement, 1993; Dagher, 1995; Duit, 1991; Gentner, 1989; Glynn & Takahashi, 1998; Lawson, 1993; Nashon, 2004; Pittman, 1999). These figures of speech serve as initial models for the concepts so that students can build meaningful relationships between what they already know and the new concept (Arroliga et al., 2002; Boerger 2005). For teachers to guide students toward building relations between existing knowledge and new knowledge, students' prior knowledge needs to be elucidated and appropriate instruction designed, as is posited in conceptual change theories (Hewson & Hewson, 1992; Posner et al., 1982; Strike & Posner, 1985).

Based on the premise that analogies, metaphors, and similes help to build relationships on what the students already know, some researchers have focused on studying students' prior knowledge (Aikenhead, 1996; Aikenhead & Jegede, 1999; Driver, 1983). The focus on students' prior knowledge aims to provide effective tools for instruction that can bring about effective learning. One method used in determining students' prior knowledge is through analogies, metaphors, or similes that students use (Pittman, 1999; Solomon, 1986). In addition, understanding students' prior knowledge is aimed at expanding what students already know, as well as ensuring that canonically correct knowledge is constructed and misconceptions minimized. Some researchers have found that analogies, metaphors, and similes are effective instructional tools and have focused on how these tools can achieve the goals of learning (Clement, 1993; Dagher, 1995; Duit, 1991; Glynn, 1991; Glynn et al., 1995; Nashon, 2004; Thorley & Stofflet, 1996).

Duit (1991) researched the merits and demerits of using analogies and metaphors during instruction. The merits include the fact that they draw on students' immediate sociocultural environment, which makes it easy for students to begin to understand the new concept (Boers, 2003; Hewson & Hamlyn, 1985; Lagoke, Jegede, & Oyebanji, 1997; Nashon, 2004). The demerits, however, stem from the unsystematic use of analogies or metaphors that can cause confusion and misconceptions. Clement (1993) posits that analogies should not be taken as full proof for a concept, but should act as bridges or anchors that enable transition from preconceptual knowledge to scientific understanding (Glynn & Takahashi, 1998). Duit suggests that analogies and metaphors are double-edged swords that may totally mislead students if not elaborated or accompanied by further explanation (Boers; Pittman, 1999).

The assumption in this study is that if the students' prior knowledge is elicited, appropriate material to build on what they already know can be designed, hence scaffolding their knowledge-construction process. In addition, it builds on research that calls for new approaches to sex education that are sensitive to cultural practices, but explicit enough to enable sexual health literacy among youth (Muyinda, Nakuya, Whitworth, & Pool, 2004).

### *Methodology*

Studying HIV/AIDS is complex, especially because it touches on sexual health and behavior. Issues of HIV/AIDS directly related to sexual issues are generally hidden, and adults or young people (adolescents included) do not talk easily about sexual matters in formal settings, particularly in the presence of outsiders. The research, therefore, needed a setting that would generate discussion and give students an atmosphere of safety, allowing them to talk about all aspects of HIV/AIDS including sexual behavior if they so chose. Qualitative case study methods (Merriam, 1998; Stake, 1995, 1998) in an interpretivist framework (Schwandt, 1998) were used in this study. These involved the use of questionnaires, classroom observations, focus-group discussions, and informal follow-up discussions.

### *Sampling Strategy and Participants*

Sampling, or the selection of the site, time, people, and events (Merriam, 1998), is a crucial stage of any research process. The school district selected for this study was chosen for convenience and not because of its uniqueness. The research adopted a purposive sampling strategy in selecting schools (Glesne, 2006). This is a criterion-based sampling in which "rich" cases are selected to enable the researcher to discover, understand, and gain more insight into crucial study issues (Merriam, 1998). Although purposive sampling can be a possible source of bias, it was justifiable in this study given the wide distribution of schools and the nature of Ugandan schools (in terms of whether the school is residential, co-educational, or single-sex). The residential schools usually have students from middle-class and upper-class homes, whereas the nonresidential schools usually have students from lower socioeconomic backgrounds. This was considered as I selected schools to participate in this study. An additional assumption of this research was that differences in perceptions about HIV/AIDS might be influenced by the nature of schools, hence the reason for selecting four kinds of schools.

The research involved one grade 11 biology classroom (about 40 students) in each of four high schools in eastern Uganda. These schools varied in status representing typical public high schools in Uganda: girls-only boarding (Bulega Girls'), boys-only boarding (Martin Boys'), mixed-boarding (Namisidwa Co-ed), and mixed-day (Elgon Co-ed) schools. A total of 160 grade 11 biology students participated in the study. In grade 11 detailed biological aspects of HIV/AIDS and reproductive health are taught.

### *Setting and Data Collection Process*

After recruiting the participants and explaining the purpose of the study as required by the ethics review board of the University of British Columbia (UBC), I started collecting data. This was done in four phases: questionnaires, follow-up discussions, classroom observation, and informal conversations.

However, in this article two phases of the data collection that elicited students' prior knowledge are considered and discussed in detail. The first phase involved inviting the students to fill in a specially designed questionnaire (Anderson, 1990; Gay & Airasian, 2003) that not only elicited their overall understandings of HIV/AIDS prior to classroom instruction, but also their factual knowledge about HIV/AIDS and their understandings of human sexuality and reproductive health. The questionnaire specifically asked the students to use figurative language for their understandings of given HIV/AIDS and sexual health concepts. The participants were given up to two hours to complete the questionnaires. The completed questionnaires were then collected and initial analysis conducted to identify themes to inform the choice of subsequent data collection and analysis methods.

The second phase was focus-group discussions (Fontana & Frey, 1994; Madriz, 2000). I chose focus-group discussions because the students, although from various schools, had common analogies, metaphors, and similes that potentially allowed transferability of the findings. In addition, Goldman (1962) suggests that focus-group discussions among peers provoke greater spontaneity and candor than can be expected in an individual interview and follow-up questionnaire. Therefore, focus groups would provide students with the opportunity to elaborate on their analogies, metaphors, or similes with peer support as well as to learn from their peers. As to the sensitivity of discussing sexual matters, Nyanzi, Pool, and Kinsman (2001), who conducted research on sexual relationships among students in Uganda, found focus groups a good tool for allowing expression of opinions, especially if there was minimal involvement of the researcher. Fontana and Frey posit that focus groups minimize power relations in the research process because there is minimal input from the researcher. Therefore, focus-group discussions were adopted as the method of choice for further elaboration of students' responses on the questionnaires. The focus groups were constructed based on students' questionnaire responses, and each had approximately 10 students. The discussions ranged from 30 minutes to an hour depending on the topic. The discussions were conducted in the time students were allotted for extracurricular activities in their particular schools. These discussions were held over one month, and each school was visited on separate days. The focus-group discussions were all audiorecorded with the permission of the participants.

### *Data Analysis*

Interpretive methods (Gallagher & Tobin, 1991; Schwandt, 1998) were used in analyzing data from this study. The questionnaire responses and audiorecorded focus-group discussions were transcribed verbatim. The transcribed data were entered in the *Atlas ti* (Scientific Software Development, Berlin) qualitative data analysis software program and coded using template analysis. This involved using an analysis guide with themes according to the research questions and objectives (Erickson, 1986). Themes included the analogies, metaphors, and similes that captured students' prior knowledge and understandings of sexual health. Transcripts were read and reread to discover the various intersections between students' figurative expressions and other scientific concepts of HIV/AIDS and related issues like reproductive and sexual health.

Focus-group discussions were coded and taken through a similar process of interpretation. All data were analyzed for intersectionality through listening, reading, and interpreting “against the grain.” This included careful listening and watching for information given off. Triangulation of data (Mathison, 1988) was achieved by allowing students to elaborate on their responses, which acted as member checking, as well as through comparing responses from the individual schools. Also, triangulation of data was enabled through using other data-collection methods and responses compared to enhance the validity, credibility, and reliability of the findings. Pseudonyms for schools and students are used throughout the article.

#### *Ethical Procedures*

I sought permission from the relevant authorities in Uganda before conducting the study. Permission was granted by the Permanent Secretary in the Ministry of Education and the Technical Person in Charge of HIV/AIDS research in Uganda. Permission was also granted by the National Council of Science and Technology. The District Education Officer (DEO), principals, and teachers of the selected high school biology classes all gave their permission. The students were given consent forms to sign as most were aged 18 or over. Permission was sought from and granted by the Ethical Review Board of the University of British Columbia (UBC). Ethical matters relating to confidentiality and anonymity were explained to the participants. Respondents were informed that the tape-recorded data would be destroyed five years after completion of the research. In addition, the researchers informed the participants that they were free to withdraw from the study at any time and that this would incur no punitive measures. This was also explained to the respective principals and teachers.

As to remuneration, the principals advised against it, arguing that it would set a bad precedent for other researchers, something the principals wished to discourage. However, I was asked to share my expertise (as a science teacher) and experience (as a woman pursuing graduate studies) in various capacities as a kind of remuneration to the students.

#### *Results and Discussion*

The results are discussed in three subsections. The first focuses on the media and type of messages the students had encountered, which provides an overview of the sources of HIV/AIDS information students had accessed. The second focuses on students’ prior knowledge as expressed through their use of analogies, metaphors, and similes of HIV/AIDS given in their questionnaire responses. The third subsection focuses on the students’ prior knowledge as elicited through focus-group discussions as they elaborated on their analogies, metaphors, and similes expressing their understandings of HIV/AIDS.

#### *Media Messages Encountered by the Students*

The students identified various media as their sources of information. These included television, billboards, school HIV/AIDS clubs, radios, and the teen newspaper *Straight Talk*. These media all provide factual information on how HIV/AIDS is transmitted and how transmission can be prevented. In the questionnaire, students were asked to write brief messages they had heard

from media sources about HIV/AIDS. Below are representative examples of the messages students had encountered.

In her questionnaire response Jeanette stated, "I usually listen to the radio program called *Capital Doctor*. In this program, I heard that HIV/AIDS is a virus and also heard about how it is transmitted and prevented." Andrew wrote, "The drama on HIV/AIDS shown on television tells us why we should be faithful to one sexual partner and why youth should abstain from sex." Peninah wrote, "*Straight Talk* tells us about the importance of staying safe and why we should concentrate on our studies." Jake stated, "We have heard that HIV/AIDS is killing many people and also we have heard that you can get AIDS through sharing sharp instruments."

From the sample messages outlined above, it was clear that the Ugandan government had designed messages aimed at preventing the spread of HIV/AIDS among the larger populace in general and youth in particular. All the students had a basic understanding of how the disease was transmitted and prevented and the risks that can lead to infection. The students' knowledge base on HIV/AIDS as developed from media messages and prior to classroom instruction is discussed in the next subtheme.

#### *Student-Generated Analogies, Metaphors, and Similes for HIV/AIDS*

In the questionnaire, students were specifically requested to express their understandings of HIV/AIDS and sexual health in figurative language and explain their choice of illustration. As mentioned above, the use of figurative language is a tool for discovering students' prior knowledge. The students provided a range of analogies, metaphors, and similes about varied aspects of HIV/AIDS. A sample of students' questionnaire responses is provided to represent grade 11 students' prior knowledge of HIV/AIDS based on the analogies, metaphors, and similes they used. Students' responses are shown in Tables 1, 2, and 3.

It is important to state that students used various analogies in their responses. At least 60 (37.5%) students who participated in this study used the *weapon of mass destruction* analogy. These students were not from the same

Table 1  
Analogies Students Used to Explain Their Views of HIV/AIDS

---

Yuniah's weapon of mass destruction analogy: "HIV/AIDS is a weapon of mass destruction because it is killing people in large numbers."
Japyeni's terrorist analogy: "AIDS is a terrorist because you never know when it will strike you. You can think you are on the look out and then you go a test and they say you have the disease."
Milkah's Master AIDS analogy: "AIDS is strong; it destroys all the body immunity cells and allows other diseases to attack you. So it is like the king of all diseases, so a master."
Musa's Kavera (polythene bag) analogy: "When you hear about HIV/AIDS, you are always reminded to have a condom (kavera) for protection."
Mangeni's polythene bag analogy: "AIDS is like a polythene bag (kavera) because once you have it, you will die. It is like when a cow eats polythene, there is nothing that can be done because it gets stuck in the intestine and so the cow will die. AIDS is like that."
Byaruma's passport analogy: "AIDS is a passport to death. Once you have HIV/AIDS, you are sure you will die. Just like when you have a passport, you know that you will go to another place, AIDS makes you know that you will go to the other world."

---

Table 2  
Metaphors Students Used to Express Their Understandings of HIV/AIDS

---

Brenda's guardian angel metaphor: "HIV/AIDS is your guardian angel because if you are going to mess, remember HIV/AIDS is watching you."

Mildred's an unwrapped sweet metaphor: "Never eat an unwrapped sweet, you will get HIV."

Julia's unpeeled banana metaphor: "Remember not to peel the banana before you eat, you will get HIV/AIDS."

Bosco's monster metaphor: "HIV/AIDS is a monster, it has come to rob us of life making us not enjoy life because we fear AIDS will eat us."

Mikidad's bible metaphor: "Girls should remember not to open their bibles until they are sure the boys are wearing those glasses."

Paul's coke metaphor: "Don't allow someone to open that coke bottle on your behalf. Take time and open it only when you are ready."

---

school, which indicates that it is a common analogy. Most of these explained the analogy as did Yuniah, although one male student from Elgon School explained it differently; Musalimu wrote, "I think HIV/AIDS is a weapon of mass destruction because it was manufactured. If people can manufacture anthrax, I think they can manufacture HIV/AIDS."

At least 120 (75%) students used the *terrorist* metaphor and explained it in terms of its effect on the population as exemplified in Table 1. However, one female student from Bulega School wrote, "HIV/AIDS is a terrorist because it makes us live in fear." With the *polythene* analogy, all students used a common figurative meaning that they had all encountered. It was interesting, however, to note the varied explanations accorded to the same analogy as exemplified in Table 1. The *master* analogy was used by female students in Elgon School. It is important that this is an example of a culturally specific expression (Boerger, 2005) and might not be appreciated by some Western communities. However, it captures the effect of HIV/AIDS in the human body, and it was the only analogy that specifically focused on the effect of HIV on the immune system. The *passport* analogy was used by 10 (6.3%) students, all from Bulega (girls') school.

The metaphors used are all cultural: specific and focused on the sex-related information on HIV/AIDS. As mentioned above, the aspects of HIV/AIDS that

Table 3  
Similes Students Used to Explain Their Understandings of HIV/AIDS

---

Waniaye's cunning hunter simile: "HIV/AIDS is as cunning as a great hunter because it sees its prey and makes sure it gets it. The prey in this case is the person who doesn't protect themselves against HIV/AIDS infection."

Ogwapus's tuberculosis simile: "HIV/AIDS is like tuberculosis, because people with HIV/AIDS also have tuberculosis."

Gwen's malaria simile: "HIV/AIDS in Uganda is now like malaria. Many people are dying of AIDS like it was with malaria."

Julius's malaria simile: "Suffering from HIV/AIDS is like having malaria. We should not be afraid of it."

Owor's insurgents' simile: "HIV/AIDS is like the insurgents fighting in Uganda who are killing people indiscriminately. HIV/AIDS has killed the young, old, male, female, rich and poor in Uganda. It has not spared anyone."

---

relate to sexual behavior are highly metaphorical in most Ugandan cultures (Muyinda et al., 2004; Nyanzi, et al., 2001). All metaphors apart from the *monster* metaphor were cautionary in nature and focused on how HIV/AIDS can be prevented. The students were referring to having protected sex. The words *sweet*, *banana*, *bible*, and *coke* all refer to sex and reproductive organs (sweet and banana—male; bible and coke—female), while the reference to unpeeled or unwrapped means the wearing of a condom while having sex. The metaphors were drawn from the sociocultural world of the students in Uganda. This supports research that posits that metaphors can act as barriers to communication across cultures if the referent is unknown in the new culture (Boerger 2005; Boers, 2003).

Again, all students used metaphors, but most used the *unwrapped sweet* and *unpeeled banana* metaphors. The bible metaphor was common among the female students (60 of the 87—70%—used it). Only five students used the *monster* metaphor, and at least 40 (25%) used the *coke* metaphor. In general, metaphors are indeed brief, which makes them effective tools of communication, especially if their meanings are clear to the target audience (Boers, 2003). The students did not write elaborate explanations, which I interpreted as related to the cultural restraints about discussing sex-related issues.

In their responses, all the students used the *malaria* simile although this was explained variably as shown in Table 3. Whereas Gwen's simile refers to the number of people infected with HIV in Uganda, Julius's explanation hinges on fatalism or hopelessness due to the sheer numbers of those infected. The *tuberculosis* simile was used by 100 (62.5%) students, indicating that many of them know that it is one of the opportunistic diseases. However, as many researchers have suggested, it is important that the relational factors be explained because otherwise it could lead to misconceptions (Duit, 1991; Glynn, 1991; Glynn et al., 1995, Nashon, 2004). For example, the only relational aspect of tuberculosis to HIV/AIDS is the fact that both diseases lead to weight loss. The nonrelational aspects include the fact that TB is airborne whereas HIV is not; TB is bacterial whereas HIV is viral, and finally, TB is curable and HIV is not.

At first glance of the reported data, one can only make assumptions on whether the students' prior knowledge is consistent with the HIV/AIDS concepts or whether the figurative language has led to misconceptions (Clement, 1993; Driver, 1983). However, the analogies, metaphors, and similes even with little elaboration provide insight into how classroom instruction can be designed to build on what students already know. In addition, the students' expressions also show where misconceptions might occur, which makes it important for teachers to elicit students' prior knowledge, as is consistent with conceptual change theories (Pittman, 1999; Posner et al., 1982). Nevertheless, to gain holistic understanding of Ugandan students' HIV/AIDS knowledge prior to classroom instruction, focus-group discussions were conducted. The detailed proceedings are reported in the following section.

#### *Students' Prior Conceptions of HIV/AIDS From Focus-Group Discussions*

For gaining a better understanding of the depth of students' prior understandings of HIV/AIDS, the analogies, metaphors, and similes served as discussion points for focus-group discussions. These provided the students with opportu-

nities to elaborate their on analogies, metaphors, and similes and gave additional insights into students' prior understandings. Figurative expressions that generated many other interesting topics are used as examples of how the focus groups led to a better understanding of students' knowledge base on HIV/AIDS and sexual health.

During the focus groups, analogies, metaphors, and similes were not discussed as distinct categories because the students did not know the differences between them. The *terrorist* analogy turned out to be a compound analogy. They used it to explain various aspects of HIV/AIDS in relation to sexual behavior and their own feelings. For example, students in the Elgon Co-ed School suggested the following explanation as exemplified in group A.

We think HIV/AIDS is a terrorist because it is killing many people indiscriminately even those who are innocent like babies. It has killed so many people and many people are still dying. Now everyone is living in fear of the disease. We cannot "enjoy life" like in those days because of HIV/AIDS. Even we are worried that it could be airborne because we don't understand how the disease spread so fast in Uganda. The disease is a terrorist because it has altered our life pattern and all we can think about is how to take care of ourselves and avoid acquiring HIV/AIDS.

This statement summarizes the effect of the HIV/AIDS epidemic on the population and communities according to these students. The statement also shows that many people have changed their sexual behavior because of the fear of HIV/AIDS. This has caused them to seek information on how HIV/AIDS is transmitted and to take measures to prevent infection. However, some statements show areas for possible misconceptions. For example, the reference to HIV/AIDS as being airborne is incorrect. The students had difficulty connecting the numbers of people infected to the methods of transmission. This is an example of figurative language being a double-edged sword (Pittman, 1999).

The phrase "enjoy life" carries multiple interpretations, but with this group of students, it referred to one factor. It became clear what the students were referring to when they talked about the *kavera* analogy. I use an excerpt from Group C of the Elgon Co-ed School to illustrate this.

In our community, we refer to people living with HIV/AIDS as having *kavera*. This is because the disease has no cure, but more importantly, it is because if you are going to have sex, you are required to use a condom to avoid infection.

Another segment of the discussion captured what students thought about using condoms.

*Billy*: These days all things are "condomized." When shall we have the real thing?

*Group*: laughter.

*Kulika*: Exactly, condoms, condoms, condoms, eh, no "live action."

*Peace*: Live action wapi [slang for no way], who wants to get HIV/AIDS?

*Puriko*: Life is different now; you cannot just go around enjoying life. AIDS will get you.

In this dialogue the students were referring to having unprotected sex. The boys were wondering when it is all right to have unprotected sex whereas the girls preferred to remain practical by reminding themselves and the boys that

there is HIV/AIDS. These students were also using metaphorical language when referring to sex, thus maintaining the culturally specific ways of communicating matters of sexuality in a formal and public setting. Terms like *live action*, *real thing*, and *enjoying life* mean the same to these students. If these words were used in another culture, they would have a different meaning, confirming Boers' (2003) suggestion that some metaphors are culturally specific and only understood by a specific community. The aspects of enjoying life were taken up again by the boys in Namisidwa Co-ed and Martin Boys' schools when talking about metaphors like *eating an unpeeled banana* and *eating an unwrapped sweet*.

In Namisidwa Co-ed School the students explained the two metaphors as meaning the same thing: making sure one uses a condom. The choice of *banana* or *sweet* was because "sex is sweet just like bananas and sweets." After establishing the relationship, the students in lion group then wondered if it was really pleasurable to have protected sex as shown below.

*Milkah*: Hey, is having protected sex the same as going "live?"

*Oscar*: I don't think so, how can it be the same when you know that there is something between you?

*Paul*: Yeah, nyama ku nyama [flesh on flesh] is better.

*Julia*: Perhaps it is the same but you just think it is not.

*Glen*: Aha, I don't think so; a banana is sweeter without its peelings so sex must be sweeter without a condom.

The debate on whether protected sex was the same as unprotected sex turned out to be a major question in all the groups, particularly among the boys. The students in Martin Boys' School had this to say about sex, condoms, and pleasure.

Just like a sweet is sweeter when it is unwrapped, having sex without a condom is better than having sex with a condom. This disease is taking away something very pleasurable from us, now all you hear is condoms, condoms and condoms. We want to have sex "live" to enjoy it. How shall we ever break away from this "condomization?"

The male students who participated in this study felt that HIV/AIDS had restricted their sexual behavior. Further discussions on the metaphors for condom use revealed that although the students talked about condom use, not all would use condoms. The students in Martin Boys' School felt that the liquid in the condoms caused cancer, and those in Namisidwa Co-ed School thought that using condoms consistently made men impotent. The students in Bulega Girls' school revealed that the boys refused to use condoms by invoking issues of trust and loyalty in relationships. This is what the girls said.

Even though the boys talk about condom use, they do not use them. The boys say that can you eat an unwrapped sweet? If the girl insists he uses a condom, the boy will get annoyed and ask the girl if she doesn't trust him. He can even become rough and say that you are accusing him for being sexually unfaithful. It is difficult to ask boys to use condoms because they prefer to go "live."

Although the students were aware that condoms were a preventive method against HIV infection, there seemed to be much complexity in actual use of the condom. The boys seemed to say that there was a hidden fear to condom use,

and the girls thought that the fear was masked in issues of trust and loyalty. The *New Vision* (Ogwang, 2005) reported that many Ugandan men do not use condoms because they think it is not part of Ugandan culture. Rejection of condom use has also been found by other researchers (Pool et al., 2000). With this rejection come a number of myths, some of which include what students mention above. This puts women at greater risk of sexual transmission of HIV/AIDS and other STDs (*Monitor*, April, 2004).

A major reasons given for the rapid spread of HIV/AIDS in Uganda is the number of men having sex with nonregular sexual partners (Nyanzi et al., 2001). From the discussions it could be concluded that the term *enjoy life* referred to having several sexual relationships. Because of the fear of HIV/AIDS, these students thought that they could not have several sexual relationships and thus could not enjoy life. Such responses made me realize that the students had a negative attitude toward condom use. This negative attitude is masked in myths about condom use like the idea that it leads to impotence. With Uganda being fronted as one of the African countries with a reduced rate of infection (UNAIDS, 2004; USAID, 2002), there might be negative behavioral change because HIV/AIDS might no longer be perceived as a threat. It is, therefore, important that the HIV/AIDS education cover issues of epidemic and endemic so that students understand that although HIV/AIDS may not be an epidemic, it is endemic, so continued vigilance is required to avoid the resurgence of the epidemic.

Focus-group discussions revealed some misconceptions and knowledge gaps about HIV/AIDS among grade 11 students. Most of the discussions were concentrated on condom use and sexual behavior. These topics brought out gendered discussions. The boys felt that condoms were a disadvantage because they were denied sexual pleasure, whereas the girls felt that condoms were a good preventive method except that they were surrounded by many controversies, the biggest being that men do not wish to use condoms. Furthermore, because the interest was more about the metaphors, it was not possible to gain in-depth understanding of some of the similes. However, the students tied all their explanations into one aspect: the effect of HIV/AIDS on sexual behavior. It is recorded that because of the HIV/AIDS scourge, Ugandans have changed their sexual behavior, with more people having regular sexual partners and practicing monogamy (Stoneburner & Low-Beer, 2004).

#### *General Discussion*

This study examined what understandings of HIV/AIDS students had constructed from media messages prior to classroom instruction. The understandings were elicited from their figurative expressions offered on a questionnaire and subsequent follow-up focus-group discussions. The student-generated analogies, metaphors, and similes showed that prior to instruction, students had a wide knowledge base on varied HIV/AIDS concepts like cause, effect, spread, and prevention. An advantage of having students generate their own analogies, metaphors, and similes is that they can then readily recall them (Glynn & Takahashi, 1998; Pittman, 1999) even much later. This was evident in this study during the focus group discussions. The students were able to give elaborated meanings to their figurative expressions. In addition, students used expressions from their environment that fitted their own cultural modes of

communication. These expressions could be useful for building a conceptual foundation and bridge to understanding target concepts of HIV/AIDS or sexual health behavior (Hamilton, 2000).

The use of metaphors, similes, and analogies provides a valuable catalyst for initial discussions with students and follow-up educational opportunities, because these expressions provide entry points for conversations that reveal prior knowledge. In addition, using students' own cultural references and words allows educators insight into what myths, misconceptions, and fears may be hidden in their initial explanations. It also provides an opportunity for educators to plan curricular strategies for HIV/AIDS instruction that engages these prior beliefs. Furthermore, using figurative language as a tool for eliciting students' understandings of matters pertaining to sexuality provides educators with an understanding of how students process sexual health information and perceive HIV/AIDS and its effect on their sexual relationships. Teachers need to build on what students already know by co-generating analogies for concepts that are culturally too difficult to discuss explicitly.

Furthermore, having students explain their analogies, metaphors, and similes provided insight into other understandings of HIV/AIDS developed by grade 11 students. It became evident that the students had misconceptions and unwarranted fears. The concern is that if these misconceptions—especially those related to condom use—are not addressed, the students will risk HIV/AIDS infection. Education about sex and sexual behavior needs to be elaborated alongside HIV/AIDS education that goes beyond prevention. Students' curiosity and lack of appropriate understandings warrant this broader curriculum.

The significance of the study is that eliciting students' prior knowledge can help in the design of lessons that can engage students' misconceptions, which in turn can offer students a more relevant curriculum. For example, the metaphors used to capture condom use easily fell apart when students began to talk about the sweetness of eating a peeled banana or unwrapped sweets. Therefore, lessons need to address some of these expressions that can lead to misconceptions.

In terms of practical implications, the findings of this study clearly support the need for eliciting students' prior understandings of target concepts. This is consistent with constructivist epistemologies on learning that view learning as a process of conceptual change (Driver, 1983; Hodson & Hodson, 1998). Indeed, students come into class with prior experiences and constructed knowledge about their world. This study shows that for these grade 11 students to construct correct understandings of given concepts, learning must be seen as a process of conceptual change (Posner et al., 1982). Providing facts as is currently the case in Uganda will not correct students' misconceptions.

In terms of theoretical implications, the findings of this study suggest that figurative language can play a role in capturing students' understandings of science concepts. Therefore, it contributes to the scarce literature on student-generated analogies and the role they can play in framing the development of relevant learning activities. In addition, it provides insight into the importance of environmental analogies, metaphors, and similes as communication tools consistent with other researchers' findings (Boerger 2005; Boers, 2003).

### *Implications for Teaching and Learning*

Effective instruction on HIV/AIDS must consider students' culture in relation to pedagogical aims. Studies on teaching as a process of conceptual change (Clement, 1993; Driver, 1983; Duit, 1991; Posner et al., 1982) all posit that it is important to take into account the students' environment and prior experiences when designing lessons.

Students come to school with already constructed knowledge, including their home beliefs and cultural values acquired in their home or community environments. Such knowledge serves as the framework for constructing new understandings (Driver, 1983). However, this already constructed knowledge may not be congruent with the science of HIV/AIDS, making it imperative that teachers elicit students' prior understandings and design lessons that engage students' prior understandings of given phenomena.

Figurative language is a tool that teachers can use not only to elicit students' prior knowledge, but as a means of scaffolding students' knowledge construction process of HIV/AIDS and related concepts. Teachers and students can co-construct analogies that are culturally appropriate, the meaning of which is easily translatable to both the teachers and students. This is important if misconceptions are to be minimized (Nashon, 2004).

*Conclusion, Limitations, Implications for Research, and Future Research Directions*  
This study focused on student-generated analogies, metaphors, and similes as windows into students' prior knowledge of HIV/AIDS and other related matters. The article also highlights the importance of eliciting students' prior knowledge before classroom instruction. Of more importance is the use of figurative language in soliciting students' understandings of sex-related information in a culture where sex is not discussed publicly. This section of the article consolidates the major findings, points out the limitations, and makes suggestions for learning and future research.

### *Conclusions*

Using student-generated figurative expressions can indeed provide insight into how much students already know about the topic under discussion: in this case HIV/AIDS. This is similar to what Pittman (1999) and Solomon (1986) have found. Figurative expressions like analogies, metaphors, and similes alone cannot fully reveal how much the students know. However, providing opportunities for further elaboration of the expressions is essential. These expressions need to be taken as starting points toward a deeper understanding of the students' knowledge and not as replacement for whole concepts (Clement, 1993; Dagher, 1995; Duit, 1991; Glynn, 1991; Glynn et al., 1995; Nashon, 2004; Thorley & Stofflet, 1996). During the focus group discussions, students revealed more of their understandings as they elaborated on the analogies and their attached meanings. In these discussions it became clear that students harbored misconceptions that might prevent them from appropriately using their knowledge about HIV/AIDS prevention, especially as related to sexual health and behavior.

### *Limitations*

Although this study was extensive, there are some general limitations. First, because the topic under investigation was sensitive, I was careful not to pursue

certain information, especially that relating to sexual behavior. This missed information might have strengthened the study. The focus-group discussions were suitable for encouraging the students to talk to each other, but some were silent as they made sure they did not divulge certain information, especially about the extent of their sexual knowledge or experience. This was further compounded because I was not their peer and so found it difficult to gain the students' trust.

Furthermore, a study like this requires one to spend a great deal of time in the schools to gain the students' trust, which was not possible on this occasion. Having four schools participating in the study turned out to be both ambitious and expensive. The breadth of the study also limited the amount of information elicited from the students on particular HIV/AIDS-related concepts.

#### *Implications and Directions for Future Research*

Research that examines student-generated figurative language as an entry point into their understandings of given phenomena is limited in the literature. Future research could pursue this to develop a broader knowledge base on the effectiveness of student-generated figurative language in teaching and learning, especially abstract science-related concepts.

I suggest that co-constructed figurative language can be a way of overcoming cultural barriers in teaching matters of sexuality as they relate to HIV/AIDS in Uganda today. However, no examples of co-constructed analogies for teaching sex education can guide teachers on how to engage in this process of co-construction of knowledge. Therefore, research that pursues co-constructed figurative language as tool for teaching is urgently needed.

Generally, more research is needed that is sensitive to cultural diversity in talking about sex and sexual behavior in formal settings. Because learning and instruction are closely related, common theoretical perspectives are used in research to engage learning and instruction. Researchers either use cultural approach frameworks or cognitive science approaches as used in this study. It is, therefore, imperative to have research that produces an intersection between these common theoretical perspectives. This is important because as noted above, teachers in Uganda fear crossing cultural barriers in addressing issues of sexuality and HIV/AIDS.

#### *Acknowledgments*

The author thanks Lynn Fels and Graeme Chalmers of the University of British Columbia for the time they spent editing this article. She also thanks *AJER's* anonymous reviewers for their input and the Canadian Commonwealth Scholarship for funding the project.

#### *References*

- Aikenhead, G.S. (1996). Science education: Border crossing into the subculture of science. *Studies in Science Education*, 27, 1-52.
- Aikenhead, G.S., & Jegede, O.J. (1999). Cross-cultural science education: A cognitive explanation of a cultural phenomenon. *Journal of Research in Science Teaching*, 36, 269-287.
- Anderson, G. (1990). *Fundamentals of educational research*. Basingstoke, UK: Falmer Press
- Arroliga, A.C., Newman, S., Longworth, D.L. (2002). Metaphorical medicine: Using metaphors to enhance communication with patients who have pulmonary disease. *Annals of Internal Medicine*, 137(5), 376-380.
- Barlow, J.M., Kerlin, J.R., & Pollio, H.R. (1971). *Training manual for identifying figurative language* (Technical Report #1). Knoxville, TN: Metaphor Research Group, University of Tennessee.

- Boerger, M.A (2005). Variations in figurative language use as a function of mode of communication. *Journal of Psycholinguistic Research*, 34(1), 31-49.
- Boers, F (2003). Applied linguistics perspectives on cross-cultural variation in conceptual metaphor. *Metaphor and Symbol*, 18(4), 231-238.
- Brown, D.E. (1992). Using examples and analogies to remediate misconceptions in physics: Factors influencing conceptual change. *Journal of Research in Science Teaching*, 29, 17-34.
- Burns, K. (2002). Sexuality education in a girls' school in Eastern Uganda. *Agenda*, 53, 81-88.
- Clement, J. (1993). Using bridging analogies and anchoring intuitions to deal with students' preconceptions. *International Journal of Science Teaching*, 30, 1241- 1257.
- Dagher, Z.R. (1995). Analysis of analogies used by science teachers. *Journal of Research in Science Teaching*, 32(3), 259-270.
- Driver, R. (1983). *The pupil as a scientist*. Milton Keynes, UK: Open University Press.
- Duit, R. (1991). On the role of analogies and metaphors in learning science. *Science Education*, 75, 649-672.
- Erickson, F. (1986). Qualitative research methods on teaching. In M.C. Wittrock (Ed.), *Handbook on research on teaching* (pp. 119-161). New York: Macmillan.
- Fontana, A., & Frey, J.H. (1994). Interviewing: The art of science. In N.K. Denzin & Y.S. Lincoln (Eds.), *Handbook of qualitative research* (2nd ed., pp. 361-376). Thousand Oaks, CA: Sage.
- Gallagher, J.J., & Tobin, K.G. (1991). Reporting interpretive research. In J.J. Gallagher (Ed.), *Interpretive research in science education* (pp. 85-95). Monograph No. 4. Manhattan, KS: National Association of Research in Science Teaching.
- Gay, L.R., & Airasian, P. (2003). *Educational research: Competencies for analysis and application*. Upper Saddle River, NJ: Merrill Prentice Hall.
- Gentner, D.C. (1983). Structure mapping: A theoretical framework for analogy. *Cognitive Science*, 7, 155-170.
- Gentner, D., & Clement, C. (1988). Evidence for relational selectivity in the interpretation of analogy and metaphor. In G.H. Bower (Ed.), *The psychology of learning and motivation: Advances in research and theory* (vol. 22, pp. 307-358). New York: Academic Press.
- Glesne, C. (2006). *Becoming qualitative researchers: An introduction* (3rd ed.). Toronto, ON: Allyn and Bacon.
- Glynn, S.M. (1991). Explaining science concepts: A teaching with analogies model. In S.M. Glynn, R.II. Yeany, & B.K. Britton (Eds.), *The psychology of learning science* (pp. 219-240). Hillsdale, NJ: Erlbaum.
- Glynn, S.M., Duit, R., & Thiele, R (1995). Teaching with analogies: A strategy for constructing knowledge. In S.M. Glynn & R. Duit (Eds.), *Learning science in the schools: Research reforming practice* (pp. 247-273). Mahwah, NJ: Erlbaum.
- Glynn, S.M., & Takahashi, T. (1998). Learning from analogy-enhanced science text. *Journal of Research in Science Teaching*, 35(10), 1129-1149.
- Goldman, A.E. (1962). The group in-depth interview. *Journal of Marketing*, 26, 61-68.
- Hamilton, A (2000). Metaphor in theory and practice: The influence of metaphors on expectations. *ACM Journal of Computer Documentation*, 24(4), 237-253.
- Hewson, M.G.A.B., & Hamlyn, D. (1985). Cultural metaphors: Some implications for science education. *Anthropology and Education Quarterly*, 16(1), 31-46.
- Hewson, P.W., & Hewson, M.G (1992). The status of students' conceptions. In R. Duit, F. Goldberg, & H. Niedderer (Eds.), *Research in physics learning: Theoretical issues and empirical studies* (pp. 59-73). Kiel, Germany: Institute for Science Education.
- Hodson, D., & Hodson, J. (1998). From constructivism to social constructivism: A Vygotskian perspective on teaching and learning science. *School Science Review*, 79(289), 33-41.
- Kinsman, J., Kamali, A., Kanyesigye, E., Kamulegeya, I., Bassaja, V., Nakiyingi, J., Schenk, K., & Whitworth, J. (2002). Quantitative process evaluation of a community-based HIV / AIDS behavioural intervention in rural Uganda. *Health Education Research*, 17(2), 253-265.
- Lagoke, B.A., Jegede, O.J., & Oyebanji, P.K. (1997). Towards an elimination of the gender gulf in science concept attainment through the use of environmental analogies. *International Journal of Science Education*, 19(4), 365-380.
- Lakoff, G., & Johnson, M. (1980). *Metaphors we live by*. Chicago, IL: University of Chicago Press.
- Lawson, A.E (1993). The importance of analogy: A prelude to the special issue. *Journal of Research in Science Teaching*, 30, 1213-1214.
- Madriz, E. (2000). Focus groups in feminist research. In N.K. Denzin & Y. Lincoln (Eds.), *Handbook of qualitative research* (pp. 835-850). Thousand Oaks, CA: Sage.
- Mathison, S. (1988). Why triangulate? *Educational Researcher*, 17(2), 13-17
- Merriam, S.B. (1998). *Case study research in education*. San Francisco, CA: Jossey Bass.

- Ministry of Health and Ministry of Education. (1992). *Health education syllabus for secondary schools*. Kampala, Uganda: National Curriculum Development Centre.
- Monitor. (2004, April). Ugandan women still die quietly. Retrieved April, 10, 2004, from: <http://www.monitor.co.ug/socpol/socpo105121.php>
- Muyinda, H., Nakuya, J., Whitworth, J.A.G., & Pool R. (2004). Community sex education among adolescents in rural Uganda: Utilizing indigenous institutions. *AIDS Care*, 16(1), 69-79.
- Nashon, S.M. (2004). The nature of analogical explanations: High school physics teachers' use in Kenya. *Research in Science Education*, 34, 475-502.
- Nyanzi, S., Pool, R., & Kinsman, J. (2001). The negotiation of sexual relationships among school pupils in south-western Uganda. *AIDS Care*, 13(1), 83-98.
- Ogwang, J. (2005). 67% of Mukono men don't use condoms. *The New Vision*. Retrieved November, 10, 2005, from: [www.newvision.co.ug/PA/9/34/466091](http://www.newvision.co.ug/PA/9/34/466091)
- Piaget, J. (1962). *Play, dreams and imitation in childhood*. New York: Norton.
- Pittman, K.M. (1999). Student generated analogies: Another way of knowing? *Journal of Research in Science Teaching*, 36(1), 1-22.
- Pool, R., Hart, G., Green, G., Hamilton, S., Nyanzi, S., & Whitworth, J.A.G. (2000). Men's attitude to condoms and female controlled means of protection against HIV and STDs in south-western Uganda. *Culture, Health and Sexuality*, 2(2), 197-211.
- Posner, G.J., Strike, K.A., Hewson, P.W., & Gertzog, W.A. (1982). Accommodation of a scientific conception: Toward a theory of conceptual change. *Science Education*, 66(2), 211-227.
- Schwandt, T.A. (1998). Constructivist, interpretivist approaches to human inquiry. In N.K. Denzin & Y.S. Lincoln (Eds.), *The landscape of qualitative research: Theories and issues* (pp. 221-259). Thousand Oaks, CA: Sage.
- Solomon, J. (1986). Children's explanations. *Oxford Review of Education*, 12(1), 41-51. Retrieved May 2, 2006, from: <http://www.jstor.org>
- Stake, R. (1995). *The art of case study research*. Thousand Oaks, CA: Sage.
- Stake, R.E. (1998). Case studies. In N.K. Denzin & Y.L. Lincoln (Eds.), *Strategies of qualitative inquiry* (pp. 86-109). Thousand Oaks, CA: Sage.
- Stoneburner, R., & Low-Beer, D (2004). Population-level HIV declines and behavioral risk avoidance in Uganda. *Science Magazine*, 304, pp. 714-718.
- Strike, K.A., & Posner, G.J. (1985). A conceptual change view of learning and understanding. In L.H.T. West & L.A. Pines (Eds.), *Cognitive structure and conceptual change*. Orlando, FL: Academic Press.
- Thorley, R., & Stofflett, R.T. (1996). Representation of conceptual change model in science teacher education. *Science Education*, 80(3), 317-339.
- Uganda AIDS Commission. (2004). *The revised national strategic framework for HIV/AIDS activities in Uganda, 2003/04-2005/06*. Kampala: Ministry of Health.
- United Nations (Joint Programme for) AIDS. (2001). *HIV prevention needs and successes: A tale of three countries*. Geneva: Author.
- United Nations AIDS. (2004). *AIDS epidemic update on sub-Saharan Africa*. Retrieved January 24, 2005, from: [www.unaids/countries/uganda.com](http://www.unaids/countries/uganda.com)
- United Nations AIDS (UNAIDS). (2004). *Life-skills-based HIV/AIDS education in schools*. Retrieved November 11, 2004, from: [http://www.unaids.org/ungass/en/global/UNGASS19\\_en.htm](http://www.unaids.org/ungass/en/global/UNGASS19_en.htm)
- United States Agency for International Development. (2002). *What happened in Uganda?* Retrieved January 24, 2004, from: [www.usaids.gov](http://www.usaids.gov)
- Zeitoun, H.H. (1984). Teaching scientific analogies: A proposed model. *Journal of Research in Science and Technological Education*, 2(2), 107-124.