



United Nations
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la science et la culture



African Women
in Science and Engineering

HIGHER EDUCATION SCIENCE AND CURRICULAR REFORMS: AFRICAN UNIVERSITIES RESPONDING TO HIV AND AIDS

IN-COUNTRY TRAINING REPORT KENYA

Held at the Kenya Institute of
Education (KIE)

8th – 10th May 2007





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Jointly Organized by
United Nations Education, Scientific and Cultural Organization (UNESCO)
and
African Women in Science and Engineering (AWSE)

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List of Abbreviations

ACUs	AIDS Control Units
ARV	Anti-retroviral Therapy
AWSE	African Women in Science and Engineering
BCC	Behavior Change Communication
CHE	Commission for Higher Education
CORPS	Community Own Resource Persons
DNA	Deoxyribonucleic Acid
EDUCAIDS:	The Global Initiative on Education and HIV &AIDS
FET	Further Education Training
HIV/AIDS	Human Immunodeficiency virus
IEC	Information, Education and Communication
ILO	International Labour Organization
JKUAT	Jomo Kenyatta Uni.of Agri. & Tech.
KDHS	Kenya Demographic and Health Survey
KNASP	National HIV and AIDS Strategic Plan
KU	Kenyatta University
MESA	Medical Students against AIDS
NACC	National AIDS Control Council
NGO	Non-Governmental Organizations
OVC	Orphans and Vulnerable Children
PCR	Polymerase Chain Reaction
PLWHA	People Living With HIV/AIDS
RNA	Ribonucleic Acid
STIs	Sexually Transmitted Infections
STME	Science, Technology and Mathematics Education
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNDP,	United Nation Development programme
UNESCO	United Nation Education, Science and Cultural Organization
UNFPA	United Nation Population fund
UNHCR	United Nation High Commission for Refugees
UNICEF	United Nation International Children Emergency Funds
UNODC	United Nation Office on Drugs and Crime
UoN	University of Nairobi
VCT	Voluntary Counseling and Testing
WFP	World Food Programme

Acknowledgements

The African Women in Science and Engineering (AWSE) would like to acknowledge the financial support from UNESCO that has enabled the smooth running of this programme and the support of the workshop facilitators.

AWSE acknowledge with thanks the contribution of facilitators Prof. Xiahoua Xia from University of Pretoria and Prof. Zipporah Ng'ang'a from Jomo Kenyatta University of Agriculture and Technology. AWSE greatly appreciate the organizing team who worked tirelessly to make the workshop a success. AWSE is also grateful for all those who attended the workshop and their active participation in the discussions.

Part I

1.0 Introduction

1.1 Workshop Overview

The three-day Workshop was a follow-up of the international workshop held in Nairobi, Kenya in April 2006. It brought together sixty three (63) Deans of Faculties of Science and Engineering and Coordinators of AIDS Control Units (ACU) from eleven (11) Kenyan public and Private universities.

The aim of the workshop was to identify specific entry points for mainstreaming HIV and AIDS into Engineering, Physical and Biological Sciences as a way of enhancing prevention efforts for HIV and AIDS and responding to its impact. The workshop delivery methodology emphasized on interactive learning through presentation of HIV and AIDS activities at the institutions, compulsory university HIV and AIDS courses and the process of mainstreaming HIV and AIDS into their curricular with a focus on integrating HIV/AIDS into the physical, biological and engineering courses.

1.2 Specific objectives

The specific objectives of the workshop were:-

- Confronting the HIV/AIDS pandemic through curriculum development and education in universities and communities; and
- Improving science and health education in African universities and communities.

The expected outputs of the Training are:-

- Identification of units for integrating HIV/AIDS into biological, physical and Engineering Sciences and full integration of HIV/AIDS into these courses.
- A group of trained Academic staff in each course area (Physical and Biological, and Engineering sciences) who should then be able to train others as Trained Trainers (ToTs) within the faculty on the integration of HIV/AIDS.
- HIV/AIDS integrated teaching modules developed on Physical and Biological Sciences as well as on Engineering.

2.0 Opening Session

2.1 Prof. Caroline Lang'at-Thoruwa, Secretary AWSE

Prof. Thoruwa welcomed all the participants to the workshop on African Universities responding to HIV/ AIDS. She also welcomed the guest speakers to the opening ceremony including Mrs. Miriam Mwiroti – Director of Policy and Planning Ministry of Education, Mr. Laban Ayiro – Ministry of Education, Prof. Francis Njeru – DVC APD JKUAT, Prof. Miriam K. Were – Chair NACC, Mr. Lawrence Okudo – Representative NACC, Mrs. Theresa Muthui – CHE and Prof. Xia from South Africa who would be one of the facilitators for the workshop. Participating universities included seven public and four private universities were:-

- Masinde Muliro University
- Maseno University
- Egerton University
- Kenya Methodist University
- Daystar University
- Catholic University
- United State International University
- University of Nairobi
- Jomo Kenyatta University of Agriculture and Technology
- Kenyatta University
- Moi University

2.2 Prof. Mabel Imbuga, Chairperson-AWSE

Ladies and gentlemen

I am delighted to welcome you all to this workshop on Higher Education Reforms: African Universities Responding to HIV and AIDS; Kenya in-country Training.

As recommended during the April 2006 workshop at Nairobi Safari Park Hotel, AWSE in Collaboration with UNESCO held in-country training for Ghana in December 2006, Rwanda in April 2007, Botswana in April 2007 and now we are holding the Kenyan training.

We consider integration of HIV and AIDS into Science and Engineering of major importance because:-

1. Science, engineering and technology are courses required to steer our country to industrialize even earlier than the targeted date of 2030.
2. We are relying on these professions to get our country out of the perceived poverty and hunger.

We therefore need to produce human resource in these areas without the interference of HIV and AIDS. Apparently this disease is hampering the efforts being made because University campuses currently provide a liberal atmosphere that might enhance the spread of HIV and AIDS. This can be

tackled as a social issue. Secondly the university communities have the highest concentration of the most vulnerable age group that has been reported to contract HIV and AIDS and which also currently has the highest prevalence. Most of the learners on our campuses are between the late teens and late twenties. What concerns us most is how to reduce infection rates and prevent new infections

The universities have also concentrated on dealing with challenges such as denial, stigma, discrimination and sustaining awareness of HIV and AIDS. However little was being done in the area of HIV and AIDS and curricular reforms.

We know that HIV is genetically changing so fast and that is why we are ending up with many subspecies. To defeat this virus we have to use triangulated approaches. That is in addition to curricular reforms, research on this virus has to be scaled up and social cultural approaches have to be included as well. Universities thus have to be alert and active in all these areas. AWSE hopes that universities will continue on the platform of sharing best practices setting up bench marks as we fight this evasive virus. Thus for universities to defeat the HIV and AIDS virus at its own game we have to go a notch higher and include HIV and AIDS in the core business which is teaching, research, innovation and corporate responsibility. This has to be like a 360° inclusion of HIV and AIDS in the strategic plans and budget for the intervention strategies in all areas in the university

Most universities are eager to produce graduates who are competent and able to make intelligent decisions and confront HIV and AIDS issues even at their workplaces.

AWSE and UNESCO have tried to forge a response by all universities. The approach that we have used has been to integrate/ mainstream HIV and AIDS, in to some courses. These serve several important functions.

- it gives learners the correct information on HIV and AIDS.
- It makes learners to be competent to deal with HIV and AIDS personally in their own lives such as to gain life skills for their own protection.
- To have different professions addressing HIV and AIDS in their own unique way so as to influence specific workplace policies and practices.

Already at the initiative of AWSE and Commission for Higher Education Kenya HIV and AIDS has been integrated into communication skills, entrepreneurship and developmental studies. These are core courses taught to all first years in nearly all the universities. This current workshop is in collaboration with UNESCO and Ministry of Education and we are targeting Science and Engineering programmes.

As we integrate these courses we are anticipating the fact that lecturers/ professors will equip themselves with the right information on HIV and AIDS which they never probably covered during their professional training. We

realize that this has to take personal interest as well. We hope that all of you here have that personal commitment.

Ladies and gentlemen I wish you a successful workshop and I do hope that every university represented here will implement the expected outcomes of this workshop that is HIV and AIDS integrated courses taught to our students soon.

Thank you.

2.3 Prof. Nick G. Wanjohi, Vice Chancellor – JKUAT

Prof. Francis Njeru – DVC, Administration, Planning and Development read the speech by Prof. Nick G. Wanjohi.

Representatives from: -

Ministry of Education, Ministry of Health, Chairperson, African Women in Science and Engineering (AWSE) – Prof. Mabel Imbuga, Fellow colleagues from different Universities, Other invited guests, All Protocol observed,

I am pleased to join you at the opening of today's Workshop entitled: **Higher Education, Science and Curriculum Reforms: African Universities Responding to HIV and AIDS**, jointly organized by UNESCO's Regional Bureau for Science and the Association of African Women in Science and Engineering (AWSE).

The HIV/AIDS pandemic has become a public health emergency worldwide, and particularly so in resource strained countries. In Sub-Saharan Africa, the pandemic has been acknowledged as a major challenge to Higher Education. The region is leading in the statistics of prevalence rates in the continent, being home to 60 % of all People Living With HIV and AIDS (PLWHs). Despite efforts to curb the spread of the pandemic, there are reports of increased prevalence rates and deaths due to HIV in the last 2 decades. It is estimated that the real impacts of the scourge will not be felt until 2015.

It is worth noting that the impacts of HIV/AIDS are experienced daily at the universities and need to be addressed as a matter of urgency. The university student population that largely comprises young people of the age ranging from 19 to 35 years are particularly vulnerable to HIV infection. The HIV and AIDS dimension must therefore, enter into every facet of the university's business, especially its core business of knowledge transmission (teaching), knowledge generation (research), and knowledge sharing (engagement with society). However, for a long time, HIV/AIDS had been treated principally as a health problem, a fact that had resulted in excessive focus on medical solutions without putting emphasis on other approaches in the fight against the pandemic.

To effectively serve societies where HIV and AIDS have become crucial public concerns, Universities must interpret their basic mandate in terms of the epidemic and its many implications. They must of necessity proactively respond to the needs of an AIDS-affected society through HIV/AIDS-informed

knowledge, training, research and engagement with external agencies and individuals. The challenge ahead is to increase the participation of those involved in higher education to maintain high quality, to meet international standards and human resource development against the backdrop of the impacts of HIV/AIDS.

This calls for a clear vision on the need to adjust the Higher Education curricular with the view of equipping graduates with the necessary skills to enable them deal with the impacts of HIV/AIDS in the society. This should not only occur during their stay at the university as students but should go beyond in their future professional careers as engineers, mathematicians, scientists and leaders in general.

Incorporation of HIV/AIDS into the teaching curricular in the universities would certainly help in equipping students and the entire university personnel with necessary skills to curb the spread of the epidemic thereby reducing its impacts on the universities and the society at large. This is why my own University, the Jomo Kenyatta University of Agriculture and Technology (JKUAT) made it mandatory to include HIV/AIDS as part of training in the curricular. It is now compulsory for all students irrespective of their field of study to take a unit on HIV/AIDS. I am pleased to inform you that the training effect is encouraging since the introduction in 2003. Besides, the yearly National HIV/AIDS Week at the University is set aside for workshops for all students, staff and the Council members as we believe the knowledge imparted is useful to all cadres. The event has since been factored into the University's yearly activities calendar.

In this respect, let me take this earlier opportunity to commend the African Women in Science and Engineering (AWSE) and UNESCO for the crucial role they are taking in spearheading this noble initiative to sensitize and facilitate Universities to respond to the HIV and AIDS scourge through curriculum reform. I am informed that this workshop is a follow up to a similar workshop held in Nairobi, Kenya recently in which participants from both Kenyan private and public universities participated alongside their colleagues from Eritrea, Ghana, Rwanda, and Botswana.

I am equally happy to note that the participating institutions have recognized the need to address HIV/AIDS as an institutional problem and have gone ahead to develop clear institutional guidelines and policies to enhance HIV/AIDS prevention and to mitigate its impacts. It is my hope that during this workshop, the abilities and capabilities of the participants will be utilized to identify and address any other hidden factors affecting the spread of the disease.

In conclusion, Ladies and gentlemen, my challenge to you in this workshop is to fully utilize this opportunity to learn from each other and from the experiences of different African universities in order to come up with comprehensive strategies for mainstreaming HIV and AIDS in the higher education curricular. It is my hope that the participants in this workshop will form a critical mass to spearhead efforts of combating all facets of the pandemic in Kenya.

The importance of nurturing partnerships in an effort to respond to HIV/ AIDS cannot be overemphasized. In this regard, I challenge the participants to foster and maintain linkages for research aimed at seeking solutions to the HIV/AIDS problem.

Finally, I wish to thank AWSE and UNESCO for sponsoring the workshop and wish you all successful deliberations.

Remember, HIV/AIDS is real and there are no negotiations about it.

It's now my pleasure to declare this workshop officially opened.

Thank you

2.4 Mrs. Miriam Mwiroti, Director of Policy and Planning, Ministry of Education

Mrs. Mwiroti congratulated the forum for their efforts in responding to the HIV and AIDS pandemic. She noted that there was little interaction between the Ministry and the Universities. She acknowledged that when the University of Nairobi was reviewing its curriculum last week the Ministry was invited. Consulting is important and collaboration of Universities and the ministry is an effort that should be continued. She gave an apology for the Permanent Secretary who was unable to attend the workshop and read his speech.

Facilitators,

Ladies and Gentlemen.

It is my pleasure to join you in this workshop which is entitled: Higher Education Science and Curriculum Reform; African Universities Responding to HIV and AIDS. HIV and AIDS continues to present a serious threat to humanity and challenges all of us to be involved in the struggle to curb its spread. The pandemic is profoundly affecting education and the general economy of Sub-Saharan African countries. Indeed the AIDS pandemic has caused and still continues to cause a development crisis of unparalleled proportion as it affects every strata of society. The populations in African universities have not been spared by HIV and AIDS. Young adults between 15 and 35 years old, the age bracket with highest number of people in most countries (75% of Kenya population) are its biggest target. The pandemic kills people just when they are in the most productive and reproductive phase of their lives. It spreads silently; as such millions of people in a population can be infected with HIV before the impact in illness and death become apparent. New data shows that HIV prevention programmes are getting better results if focused on reaching people most at risk. The idea of reforming curricular as a way of addressing HIV/AIDS related challenges is a noble idea. Evidence has shown that institutional based prevention programmes go along way in making impact on learners.

The universities have a duty to safeguard their learners from the HIV pandemic.

The Education Sector Policy on HIV/AIDS forms an important basis for addressing the needs of education service providers and the education institutions at all levels.

The universities will therefore need to be innovative enough to develop strategies to enhance prevention and mitigate against the impact that will meet the changing needs of learners, who risk being affected or infected by HIV and AIDS.

As you are all aware, HIV and AIDS was declared a disaster in Kenya in 1999 and the country embarked on a war to fight the pandemic. Taking cognizance of the need to involve all stakeholders in the national response through a broad based multisectoral approach involving national and international stakeholders.

The government and stakeholders have demonstrated formidable effort in fighting HIV and AIDS, with His Excellency the President personally taking the lead.

As a result of the concerted national response, Kenya has made positive strides in the intervention programme, reducing the national HIV and AIDS prevalence rate from 14% in 2000 to 5.9 in 2007.

Despite the progress achieved, a lot more needs to be done. Although the average national prevalence has gone down, infection rate is still unacceptably high.

Ladies and gentlemen, while the initial response to HIV and AIDS apparent that HIV and AIDS is social and development problem, affecting every aspect of our lives, hence a shift to a multisectoral response. It is on the basis of this approach that the country is recording a drop in the prevalence rate. Evidence suggests that significant number of Kenyans have adopted safer sexual behaviour and more young men and women are delaying their sexual debut, this should be encouraged in our institutions of higher learning.

Many countries are advocating “universal access” to HIV/AIDS prevention, treatment and care services. This is because knowing one’s HIV status is critical to planning one’s life. A person will determine whether to concentrate on staying HIV-negative or to go for appropriate treatment and care services in order to maintain quality of life and productivity if one is HIV-positive. Education is referred to as the “gateway” to HIV and AIDS prevention, treatment, care and support.

Ladies and Gentlemen, although the HIV prevalence for ages 15 – 19 has been found to be only 1.6% the prevalence rate, it rises very rapidly to 10.4% within the age bracket of 25 – 29 years. The Kenya National AIDS Strategic plan (2005-2010 KNASP) calls for the targeting of youth among most vulnerable to HIV infection. Indeed, the education and training sector has the largest institutions in closer contact with the majority of the youth. Clearly, the education and training sector therefore is uniquely well-positioned to help youth to combat the rapid increase in HIV prevalence in this country.

What you are doing needs to be taken up by all institutions of higher learning. Every institution should individually explore the options and intervention that can be best used to arrest the scourge and absorb the predictable and inevitable impacts of the disease.

I commend the Commission for Higher Education, UNESCO and African Women in Science and Engineering for taking the initiative in this project. Initiatives such as this one, not only make Education institutions to be part of the pool of organizations that are contributing towards the fight against the spread of HIV and AIDS but also add weight and value to youth orientation prevention programmes available in Kenya. There are many reasons why youth are at high risk of infection. The youth are highly sexually active group due to their age. Youths also initiate sexual activity at earlier ages than in the past and usually have multiple partners. They are also swayed by peer pressure and some of them are on drugs and alcohol since they cannot deal with stresses in life. Many youth do not come from strong, intact families and therefore lack stability, guidance, parental role models, and communication that mitigate the extent of the risk taking behaviour.

It is also important for institutions of higher learning to understand the role of intergenerational aspects of AIDS impact and stigmatization in the spread of the disease.

With these few remarks, I now declare the workshop officially opened.

Thank you and God bless you.

2.5 Mrs. Ochanda - UNESCO

Mrs. Miriam Mwiroti- Director Ministry of Education, Planning and Policy, Prof. Mabel Imbuga - Chairperson AWSE, Prof. Francis Njeru - DVC, Administration, Planning and Development, Mrs. Theresa Muthui – CHE and Mr. Lawrence Okudo – Representative NACC, Distinguished Guests

Ladies and Gentlemen,

I am honoured and also humbled to address you at this in-country training workshop for Kenyan university. A total of 15 Institutions of Higher learning in Kenya are gathered here today.

Exactly one year ago (11-13) April 2006) we had a three-day workshop that had brought together Deans of Faculties of Science and Engineering and Coordinators of HIV and AIDS activities in 22 African Universities from Botswana, Eritrea, Ghana, Kenya and Rwanda. That was the beginning of this project which has brought us here again today.

The project: African Universities Responding to HIV and AIDS aims at ensuring the production of HIV and AIDS competent engineers and scientists from our universities and fall within UNESCO's strategy of fighting the AIDS epidemic through prevention education.

The April 2006 workshop was Phase I of this project. This was followed by Phase II which entailed faculty sensitization and brainstorming workshops in your respective universities. I would want to believe that all of you seated here today have conducted their one-two day faculty sensitization workshops.

Today, we are having the Kenya In-Country Training workshop course for HIV and AIDS integration. I am happy to note that this is the last of the in-country training workshops which have already taken place in Ghana, Rwanda and Botswana.

Am also very happy to inform you that UNESCO Regional Office for Science and technology has continued to fully support the organization of these workshops and has contracted two resource people to take you through the training. Allow me at this point to introduce to you our trainers and please join me in welcoming them the workshop:

- i. Prof. Xiouhua Xia – Prof. Of Engineering, from the University of Pretoria (integration of HIV and AIDS into Engineering, Mathematics and Physics course)
- ii. Prof. Zipporah Ng’anga – Prof. of Biological Sciences, Jomo Kenyatta University (integration into Biological Sciences and Chemistry courses).

Ladies and Gentlemen, the importance of mainstreaming HIV and AIDS into university curriculum cannot be underestimated. Your presence at this workshop shows your commitment to the fight against HIV and AIDS. Research has depicted university academic staff as not being very committed to matters of HIV and AIDS prevention. However, your presence is indicative of your commitment to this as scientists and engineers.

UNESCO is very grateful to its implementing partner AWSE for ensuring that the Kenya In-country training takes place despite the short notice. Our sincere gratitude is extended to P.S Ministry of Education for accepting to partner with UNESCO in supporting the training. Ladies and Gentlemen, some of you may have been wondering why AWSE? And have probably assumed that “this is a Women’s project”. Let me assure you that this is not true. UNESCO decided to use AWSE as its implementing partner for this project because of the experience and expertise that they had after having had a similar activity with local universities and other in the Eastern Africa region. We gave it an Africa-wide perspective and focused on those of you who are sometimes left behind as a result of the mysterious nature of your areas of specialization.

Dear Participants, Learning is a lifelong process and as good educators, we also appreciate an opportunity to acquire knowledge and not to impart it to our students. This is the time, and I would like to believe that during these three days of the workshop, each one of you will take the opportunity to learn from those who have done what might have sounded impossible to some of you, enough to come as perfect trainers for your colleagues within the faculties.

I look forward to seeing an even more committed group of trainers at the end of this workshop, as I have experience in Ghana, Rwanda and recently in Botswana.

Thank you for your attention and God Bless,

3.0 The Role of Universities in the fight against HIV/AIDS by Mrs. Teresia N. Muthui, Assistant Commission Secretary for Higher Education (CHE)

During the Higher Education Science and Curriculum Reforms: African Universities responding to HIV and AIDS Kenya Onsite Country Training Workshops Ministry of Education: -

Where are we as an AIDS Control Unit in the University sub-section?

The AIDS Control Unit (ACU) in the commission for the Higher was established in January 2003 to coordinate HIV and AIDS control and prevent programme in Universities. The role of the ACU can be summarized as follows:

- i) To coordinate HIV/AIDS activities in the university sub-sectors.
- ii) To advocate for the right HIV and AIDS policies in the universities sub-sectors, and
- iii) To mobilize resources to fight the scourge in the sub-sectors.

Activities

The ACU in the commission oversees the following activities:

- a) Represents the university sub-sector in relevant forums on HIV/AIDS prevention and control. For example, in the development of the education Sector Policy on HIV and AIDS, the ACU ensured that the interests of the university sub-sector were taken care of.
- b) Carries out capacity building for institutional ACUs for example, the ACU:
 - Organized training of heads of ACU from 23 out of 25 expected institutions in 2004.
 - Organized a workshop in 2004 on developing policies and practices for mainstreaming HIV and AIDS in institutions of higher learning.
 - Funded AWSE for the development of a mainstreaming curriculum for universities.
- c) Organizes sharing of best practice for university institutions.
- d) Mobilizes funding, for example in 2004/5, nineteen (19) out of 25 eligible institutions in the sub-sector got funding through the commission a follows:
 - a) **Egerton University:** Kshs 4,386,472 for baseline survey, Behavior Change Communication (BCC), peer education, role modeling, policy development and dissemination and condom distribution.
 - b) **Jomo Kenyatta University of Agriculture and Technology:** Kshs 2,798,500 for baseline survey, BCC, policy development and condom distribution.

- c) **Kenyatta University:** Kshs 2,192,000 for baseline survey, policy dissemination, information, education and communication (IEC), Kenyatta University Students Association for HIV Testing week and condom distribution.
- d) **University of Nairobi:** Kshs 1,756,000:
 - i) Medical Students against AIDS (MESA) for peer education training.
 - ii) Students peer educators club for IEC activities.
 - iii) College of agriculture and veterinary science for BCC.
 - iv) The AIDS Control Unit policy dissemination and condom distribution.
- e) **Western University College of Science and Technology:** Kshs 1,633,900 for baseline survey and BCC.
- f) **Daystar University:** 1,165,500 for baseline survey, BCC, peer education and IEC material development.
- g) **Maseno University:** Kshs 649,000 for capacity building on care and support for the People Living With HIV/AIDS (PLWHA), policy development and dissemination and condom distribution.
- h) **Moi University:** Kshs 490,000 for policy development and dissemination and condom distribution.
- i) **United State International University:** Kshs 47,000 for policy development and dissemination and condom distribution.
- j) **St. Paul Theological College:** Kshs 400,000 for policy development and dissemination.
- k) **Kenya Methodist University:** for Kshs 400,000 policy development and dissemination strategies.
- l) **Scott Theological College:** for Kshs 400,000 policy development and dissemination strategies.
- m) **University of Eastern Africa, Baraton:** for Kshs 400,000 policy development and dissemination strategies.
- n) **Kiriri Women's University of Science and Technology:** for Kshs 400,000 policy development and dissemination strategies.
- o) **Pan Africa Christian College:** Kshs 388,000, for baseline survey and BCC.
- p) **Kenya Highlands Bible College:** Kshs 200,000 for BCC and peer education.
- q) **Higher Education Loans Board:** Kshs 103,000 for staff seminar on care and support for infected and affected.
- r) **African Women in Science and engineering:** Kshs 1,154,000 for the development of curriculum and mainstreaming HIV/AIDS.
- s) **University Consortium to Combat AIDS:** Kshs 22,000,000.
- t) **Commission for Higher Education:** Kshs 3,743,882 for:
 - i) A consultative meeting with Vice Chancellors and Commissions on the mainstreaming of HIV and AIDS into University curriculum.
 - ii) Training heads of institutional ACUs (Sub-ACUs).
 - iii) Workshop on developing workplace policy for and mainstreaming HIV/AIDS in institutions of higher learning.
 - iv) BCC for commission employees.
 - v) The development and dissemination of the Commission HIV/AIDS policy; and
 - vi) Condom distribution in the Commission

The total funding received from:

- The National AIDS Control Council – Kshs 22, 420,895.
- UNESCO –Kshs 913,141.
- Ministry of Education – Kshs 22,000,000.

ACU used the following approaches to realize its activities: -

- a) Institutions were required to appoint a contact person who should also be coordinator of the HIV/AIDS control program/activities in the institution. 22 institutions took action.
- b) All funding is given against a viable proposal and work plan.
- c) Proposals are evaluated by a committee in the commission which is chaired by the commission Secretary /Chief Executive Officer.
- d) BCC target the whole institutional community from top management to the lowest cadre and, where applicable, students and staff. In addition open IEC days are organized for the institutional communities, their families and the neighborhood.
- e) Strong collaboration with other agencies is encouraged.
- f) Inter-disciplinary and inter-departmental, highly participatory policy development and implementation process is required. The highest institutional policy making body, e.g. the university council is also required to be fully informed and to endorse and participate in the process.

Accounting for funds

The funds given by the Commission are public funds and it is a requirement that they are accounted for following the procedures prescribed in the financial accounting documents.

Why choose The University in the Fight against HIV and AIDS?

It is important to fight against HIV and AIDS because in addition to the traditional role of teaching, research and corporate responsibility:

- a) The University as an institution, including its lecturers and students, is an opinion leader.
- b) The University community is vulnerable. From a cloistered school system and home environment, most students, all over sudden, find unlimited freedom in the university where they control and manage their lives and time. They need information to be able to make informed decisions with regards to HIV/AIDS control and prevention.
- c) It has been said time and again that a university that does not undertake research is not worthy its salt. The university is therefore the citadel of research. There is a need for research in many aspects of HIV/AIDS control both at the university and the national levels. The university is well placed to undertake research in HIV/AIDS.
- d) Universities need to take HIV/AIDS control and prevention as one of its corporate responsibilities.
- e) Should be a member of 'Think Tank' on HIV/AIDS.

Universities have done a lot of work on BCC for many of them have organized workshops for management, staff (academic and non academic) and students. However, there is need to:

- i) Strengthen support service including VCT services.
- ii) To assess the impact of the effort directed at universities
- iii) To compile a report on all activities and programmes undertaken by various universities
- iv) To inform, educate and communicate the efforts that have gone into HIV/AIDS control and prevention in universities.

4.0 Education Policy on HIV/AIDS: The current situation and implications on Higher Education by Mr. Laban P. Ayiro, Senior Deputy Director of Education, Ministry of Education

A comprehensive education sector response has the following five essential components: -

- Quality education, including cross-cutting principles
- Rights-based, proactive and inclusive
- Gender responsive
- Age specific and
- Scientifically accurate

The content, curriculum and learning materials should be: -

- Specifically adapted and appropriate for various levels- primary/secondary/tertiary, vocational, formal and non-formal
- Focused and tailored to various groups including children/Orphans and Vulnerable Children (OVC), young people out of school, people with HIV, minorities, refugees and internally displaced persons, men who have sex with men, sex workers, injecting drug users, prisoners
- Prevention knowledge, attitudes, and behaviors covering sexual transmission, drug use including injecting, and other risk factors
- Focused on stigma and discrimination as well as care, treatment and support

Educator training and support include the following: -

- Teacher education, pre-and in-service, including modern and interactive methods.
- Non-formal educators, including youth leaders, religious leaders, traditional healers
- Support groups – mentoring, supervision, positive teachers, etc.
- School and community linkages
- Educational support and materials

Policy, management and systems includes: -

- Workplace policies
- Situation analysis/needs assessment
- Planning for human capacity, assessment and projection models
- Strategic partnerships, including coordination, advocacy and resource mobilization
- Monitoring, evaluating and assessing outcomes

The approached and illustrative entry points include the following: -

- School health
- Life skills
- Peer education
- Counseling and referral
- Communications and media
- Community-based learning and outreach
- School feeding
- Adult education and literacy
- Greater involvement of people living with HIV and AIDS (GIPA)

What are the implications on Higher Education?

- Strengthen the evidence base and improve the policy and programmatic responses through the documentation and dissemination of good practices and support for their use and application; the monitoring and evaluation of progress, trends and impact; and advocacy and technical assistance for evidence-informed responses to HIV and AIDS.
- Enhance the capacity of staff to implement comprehensive and scaled-up responses to HIV and AIDS, particularly in education sector, that are informed by available evidence, based on widespread consultation with key stakeholders, undertaken through strategic alliances and partnerships at all levels, and evaluated for impact.
- Promote full and effective multisectoral engagement and coordinated and harmonized AIDS responses by Universities within the framework of the agreed Education Sector Policy and other recommendations to improve harmonization and alignment with national priorities.

To conclude:

- The management of the response to HIV and AIDS lies in the realm of emotional intelligence. Values such as optimism, empathy, social deftness and delayed gratification have to be cultivated by those tasked with management of the response.
- It is critical that well coordinated responses across the sector are embraced. Peace meal efforts at impact mitigation will only engage us in numerous out puts without desirable outcomes.

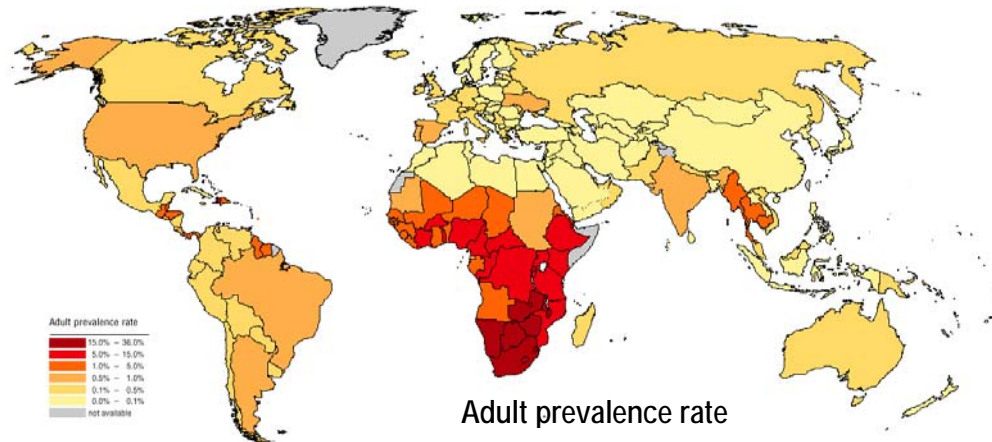
**5.0 An overview of HIV/AIDS in Africa and its impact on education
by Dr. Zipporah Ng'ang'a, JKUAT/AWSE**

Overview of Global HIV and AIDS Epidemic has revealed that

- In over 2 decades AIDS has become the most devastating epidemic in human history
- Globally 39.4 million people living with HIV
- Numbers of new infections continue to rise
- Prevention efforts remain small scale and ARV treatment reaches only a small percentage
- Countries in Eastern Europe and East Asia experiencing fast growing epidemic
- China, India and Indonesia

The global HIV estimates are (UNAIDS, 2006)

- PLWA 39.5 million
- Adults 37.2 million
- Women 17.7 million
- Children 2.3 million
- New Infections 4.3 million
- Adults 3.8 million
- Children 0.53
- Adult deaths 2.6
- Child deaths 0.38



Adult prevalence rate
 15.0% – 36.0%
 5.0% – 15.0%
 1.0% – 5.0%
 0.5% – 1.0%
 0.1% – 0.5%
 0.0% – 0.1%
 not available

Adult prevalence rate

- 15.0% – 36.0%
- 5.0% – 15.0%
- 1.0% – 5.0%
- 0.5% – 1.0%
- 0.1% – 0.5%
- 0.0% – 0.1%
- Not available

In Africa the status of the epidemic is as represented in the table below: -

	(Millions)	% of global T		
▪ Adults & Children	24.5	64 %	Women	13.2 76 %
▪ Newly infected (05)	3.2	64 %		
▪ Deaths (05)	2.0	71 %		
▪ Children Orphaned	2.0	79 %		
▪ Total deaths	22.9	91 %		

Increased feminization of the epidemic

Women comprise the majority of PLWA.

Sub-Saharan Africa 75 % of young people infected is women and girls

Why the increased vulnerability of women?

- Gender disparities
- Culture
- High viral load in semen
- Biological make up

Home care givers

Geography & HIV strains

▪ **Western Africa**

- HIV-2, less pathogenic (SIVsm)

Rest of Africa + Globally

-HIV-1 (SIVcpz)

▪ **M – Major group subdivided in A through J (+CRFs)**

B: Europe, USA, Australia

C: India, RSA (Sub-Saharan Africa)

N – New strain; Congo 1999

O – Outlier; Central African Rep, Cameroon, Gabon

The following are the characteristics of the disease in Africa

- Heterosexual transmission
- Higher rates of infection (> 60%)
- SS infected women > men, disparities in age
- AIDS orphans (>13 million)
- Different opportunistic infections (PCP vs. TB)
- Higher frequencies of STIs (‘untreated’)
- Poverty
- Government/ Leadership
- “International aid”

This African situation can be explained by the following factors: -

- *Medical*
- HIV-1 sub-type C transmission vs. B
- More pathogenic
- *Cultural practices/ beliefs*
- *Poverty*

-Prostitution and Migrant Labor

-Malnutrition

-Micronutrient deficiency

-Parasites

-Hygiene

-Health care (adequate & access)

AIDS affects all aspects of life on the continent

- Development gains

Life expectancy Swaziland

- Economic growth

15-49

- National security

Infection rates of 60%

- Health care

Zambian midwives

- Education
- Agriculture
- Industry

What are the major Impacts of the epidemic?

- Average life expectancy in sub Saharan has now fallen to 47 years. It would have been 62 years without AIDS
 - During the coming two decades, Africa is projected to experience 55 million deaths that would not have occurred in the absence of HIV/AIDS. This is more than five times the estimated number transported as slaves in America between 1518 and 1874
 - The epidemic is leaving a sea of orphans in its wake. It is estimated that 11 million children in sub Saharan Africa have lost one or both parents to AIDS, a figure that is projected to rise to over 20 million by 2010
- Household incomes are declining, but simultaneously household needs are increasing as they take in increasing numbers of orphans
- Many households break up, many reduce food intake, many focus on short term survival and jeopardize their future through disposal of productive assets, many strive valiantly to keep up appearances and perpetuate the myth of coping
- Health sectors are experiencing enormous additional pressures arising from the diversion of public and private health care spending to AIDS related conditions, an increasing number of hospital admissions, new threat of TB epidemic, burn out of staff, alarming increase in health worker illness and death rates
- The profitability of business enterprises is declining because of absenteeism, declining worker morale, reduced profitability of workers who experience periodic sicknesses, increased insurance costs, extensive costs for funerals, increased demands for training and recruitment
- Because of the epidemic, the rate of economic growth in Sub Saharan Africa is 2-4% lower than it would have been in the absence of AIDS. In addition large losses are incurred in agriculture and other informal activities. These do not feature in national economic data, but are core economic concerns of the great majority of people, ensuring their livelihoods, food security and general well being.

By removing productive workers through sickness and death, and diverting others to providing patient care, AIDS is undermining this sector and accelerating the downward spiral into poverty

Impact on the education sector

The relationship between AIDS and the education sector is circular

Level of Education

Basic Education is worth because: -

- Schools offer ready made infrastructure and easy access to some of the high risk groups (teenagers, parents, teachers)

This facilitates the design and implementation of effective prevention strategies and AIDS education programs

- Education is vital in reducing the special vulnerability of girls
- Educated girls/women support themselves
- Educated girls/women have options

Education of girls is vital in the fight against HIV/AIDS in that it: -

- Can assist in slowing the epidemic by contributing to female economic independence and improving the consciousness of the girls on self worth
- Education can provide information on options in life

However, HIV/AIDS faces some obstacles to Education Access

- HIV and AIDS are significant obstacles to children achieving universal access to basic education by 2015. UNESCO estimates 55 nations unlikely to reach universal primary enrolment
- A decline in school enrolment – (ECD) is one of the most visible effects
- Many AIDS affected families may withdraw children from school (home care givers)- most affected are girls reinforcing gender inequities
- OVC not able to attend school- head of households, care for siblings, no school fees

HIV compromises Quality of Education

- Absenteeism of teachers, death
- Inexperienced and under qualified teachers reduce quality of education
- Increased costs in retraining of teachers, in sickness, funeral costs, incentives to keep OVC in schools
- Weakened quality of training
- In Kenya, Uganda, Swaziland, Zambia and Zimbabwe, the epidemic is expected to significantly contribute to the shortage of teachers
- Swaziland an additional 7,000 teachers will need to be trained by 2020 to compensate for AIDS deaths

HIV Limiting the Supply of Education

- Increased mortality rates among teachers and administrators at all levels
- To supply the demand for teachers- reduce duration of teacher training (Zambia), positions filled by teachers not optimally qualified
- Death of teachers interferes with continuity and negatively affects educational outcomes. Quality and quantity of teachers is compromised

HIV Weakening the Education Sector

- This undermines the possibility of having the sector deliver necessary AIDS Education
- Education is necessary to enhance prevention, improve general health knowledge, combat stigma and discrimination and fear of the disease

‘VICIOUS CYCLE’

AIDS increasing education sector Costs

- With the effects of loss of productivity and human capital, increased drop out rates, education budgets must absorb higher costs with no increase in productivity and improvement in outcomes
- Teacher hiring and training costs, payment of full salaries to absent teachers, costs of medicines, funeral costs, terminal benefits

Tertiary education and HIV/AIDS

- The issue- AIDS is creating a special crisis
- Prevention education in tertiary institutions is vital
- They educate and train sexually active young adults
- Many are involved in high risky behavior
- Increased HIV/AIDS related morbidity and mortality is undermining the core functions of tertiary institutions

Why does it matter?

- The demand for tertiary education reduced
- The supply of highly trained and experienced teachers
- The quality of education
- Human capacity development
- Most tertiary institutions have not assessed the full impacts of the epidemic and are slow in responding
 - No policies to tackle
 - No mainstreaming in teaching programs

What needs to be done?

- To effectively deal with the epidemic, tertiary institution governing boards should provide leadership in the battle against HIV/AIDS and elaborate consistent and efficient strategies with a long term perspective that:
 - *Acknowledge the need for an institutional response*
 - Recognize the pandemic undermines the quality and quantity of education
 - The pandemic calls for a drastic, concerted and well coordinated response
 - Target both students, teachers and non teaching staff
 - Both inward looking and outward looking
 - Set new mechanisms to strengthen their capacity to establish an HIV/AIDS strategy
 - Identify focal points for dealing with HIV and AIDS across the institution
 - Set collegial and collaborative procedures at every stage of the response (design, planning, implementation, monitoring and evaluation)
 - Set aside resources to build their internal capacity to deal with HIV/AIDS
 - Quantify their direct and indirect losses among students, teaching and non teaching staff

What needs to be done at the level of learning systems?

- Promote open and transparent mechanisms within the education system and establish a legislative framework to support and encourage a dialogue on HIV/AIDS and the right for all to access basic education
- Implement education programs that make schools safe and supportive of the learner
- Mobilize resources to meet the increasing human and financial demands caused by HIV/AIDS to ensure the provision of Education for All
- Measure educational achievement related to knowledge, attitude, skills and behavior that works towards a system that does not discriminate or stigmatize the infected and affected

What works?

Practical and strategic actions in support of quality education should contain the following components:

- Support individuals and communities to break the silence on the impact
 - Ensure the involvement of families by establishing parental education programs
 - Improve access to school for all learners through reducing or eliminating tuition fees, and ensuring schools are safe, healthy
 - Support interventions that address the impact of power and gender dynamics
 - Develop and implement work place policies
 - Develop teacher training programs
 - Measure learning outcomes in terms of acquisition and use of knowledge, skills and competencies, values and behavior about HIV/AIDS
 - Expand access to ARV treatment and treatment education
 - Develop actions to minimize the impact on Education
- **Best practice - Ethiopia example**
In areas highly impacted by HIV/AIDS
 - Flexible time tables to accommodate the work responsibilities of children who head households-
Outcome: reduced drop out rates, improvement in student continuation and achievement rates

Tertiary Education respond to AIDS

- Policies and Strategic plans
- “Sensitivity”
- VCT and health care on campus
- Wellness
- In progress:
 - Curriculum Integration
 - Prevalence studies (‘break the silence’)

Education is another victim of AIDS BUT also the key to overcoming HIV

HIV/AIDS can be used to improve especially science education

Role of Education

Education can be a powerful force –perhaps the most powerful force of all – in combating the spread of HIV/AIDS” (World Education Forum, Dakar, 2000)

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- UNAIDS (2002) Report on the global AIDS epidemic, New York
- Boler T and Jellema A (2005), Deadly Inertia: Across country study of educational responses to HIV/AIDS
- UNDP, Human Development Report 2005
- US Census Bureau (2004) the AIDS Pandemic in the 21st Century
- All above references are referred to in reference 1. These references are in addition to those listed in the SENCER Paper

6.0 UNESCO's Initiatives on HIV and AIDS in Sub-Saharan Africa by Alice Ochanda, Programme Officer, UNESCO Regional Bureau for Science in Africa

Introduction

UNASAI/WHO report on the Global AIDS Epidemic indicates that an estimated 39.5 million people worldwide were living with HIV at the end of 2006. An estimated 4.3 million became newly infected with HIV while an estimated 2.9 million lost their lives to AIDS. AIDS was first diagnosed in 1981- no one ever imagined the magnitude and the urgency of the challenge to be posed on humanity in years to come.

UNESCO as a Member of UNAIDS

The Joint United Nations Programme on HIV/AIDS (UNAIDS) brings together the efforts and resources of ten UN system organizations to the Global AIDS response (UNHCR, UNICEF, WFP, UNDP, UNFPA, UNODC, ILO, UNESCO, WHO and the World Bank). UNESCO has pledged to play its role as part of the broader UNAIDS family. Its contribution is complimentary to and supportive of government's effort to scale up their responses to HIV/AIDS. Its efforts are primarily directed towards the young

- Most vulnerable
- Accessible in large number through schools, tertiary colleges and universities.

These institutions are critical for:

- Preparing the young to live in world with AIDS
- For stopping the spread of HIV.

UNESCO leads the Global Initiative on Education and HIV/AIDS, launched in 2004 by UNAIDS.

Goals of EDUCAIDS:

- To prevent the spread of HIV/AIDS through education.
- To prevent the core function of education systems.
- To shield education institution to enable the produce AIDS competent professionals.

Education revolves around three specific objectives:

- Build the capacity
- Mitigate the impact and
- Address structural causes

UNESCO's responses to HIV and AIDS are driven by the belief that:

- Prevention education works,
- If done well its effective,
- If done immediately it will have long term impact and
- If done massively it can turn the tide

UNESCO Intervention so far:

- UNESCO has distinctive expertise in education, natural sciences, social sciences, culture and communication- thus enabling it to possess the interdisciplinary organization and technical expertise needed to work on the education for prevention.
- Organization has adopted a strong advocacy for role of HIV and AIDS issues especially in relation to the vulnerable groups like youth and women.

UNESCO works more with regional, sub-regional and national institution for a better co-ordination of the efforts to support locally owned plans and strategies for responding to HIV and AIDS. It also engages in partnership with other organization and stakeholders to ensure effective response to the epidemic.

UNESCO supports initiatives that are inclusive and sensitive to the needs of all populations.

- Gender and age sensitive
- Culturally appropriate
- Ground in human rights and
- Involving PLWHA

The priority areas for intervention

UNESCO strategies for HIV and AIDS interventions revolve round five key areas: Advocacy at all levels-engages ministries and other agencies, NGOS, Civil society and the private sectors-especially those involved in education, culture science and communication etc.

Advocacy

- In Africa ministry of education have been sensitized at the highest level about HIV and AIDS and the need to ensure prevention education is effectively addressed through official school curriculum.
- Advocates for governments to ensure access to quality education to all irrespective of their HIV status. This has resulted to the development of the sector and institutional guidelines on HIV and AIDS prevention in countries such as Botswana, Burundi, Eritrea, Kenya, Rwanda, Namibia, Uganda and South Africa.
- Training workshops for non-formal educators and curricular developers, social workers, police and the media on the development of easy to read booklets and programmes have been conducted in Malawi, Namibia, Swaziland, Zambia and Zimbabwe.

Customizing the message and finding the right messenger

- UNESCO aims at ensuring the development of effective, culturally appropriate age specific and gender responsive message towards key populations especially those with particular vulnerability to HIV and AIDS. The joint project with UNAIDS on “A Cultural Approach to HIV and AIDS Prevention and Care” which was launched in 1998 has seen regional and national capacity building workshops organized in Egypt, Morocco Mozambique, Senegal and Uganda. For HIV and AIDS education to be effective, there is a need for effective communication with all the segments of the society. UNESCO has ensured capacity building for journalists on investigative journalism and effective reporting on HIV and AIDS especially in Eastern and Southern Africa. A reporting guide on HIV and AIDS has also been produced for journalists in the region. The Red Ribbon Awards is awarded to the journalist with excellence in media reporting and programmes on HIV and AIDS in Eastern and Southern Africa on World’s Aids Day.
- A regional project that focuses on getting the alternatives to cultural practices of wife/widow inheritance-regional musicians are being used as messengers to convey message through music as a cultural method.

Changing Risky Behaviour and Vulnerability

- The main focus here is the promotion of education programmes.
- By working with the ministry of education and commissions of higher education, UNESCO has managed to encourage them to develop institutional guidelines to guide their responses to HIV and AIDS and also to mainstream HIV and AIDS into their course programmes.
- Capacity building workshops organized for all universities and tertiary colleges in Kenya and Uganda.
- The current project with AWSE is to ensure that Faculty Science and Engineering are taken on board the HIV and AIDS mainstreaming process. Five countries namely Botswana, Kenya, Ghana, Rwanda and Eritrea are participating.
- There is a close collaboration with youth organizations in the efforts to mobilize young people to positive change of behavior for HIV and AIDS prevention.
- Youth friendly IEC materials developed (toolkits, posters post cards etc).
- UNESCO believes in Scientific Research and Information Dissemination. Support to research on HIV and AIDS and dissemination of research findings on low cost therapy.
- Production of resource materials in form of CD-ROMs that are useful in providing important information on AIDS epidemic. Available CD include:
 - HIV/AIDS and Higher Education; - a collection of resources.
 - Impacts of HIV and AIDS on Teachers and Educators.
 - UNESCO library of materials on HIV and AIDS.
- A global clearing house has been developed to disseminate relevant information on HIV and AIDS to all
<http://hivaidsclearinghouse.unesco.org>

Caring for the Infected and Affected

- UNESCO ensures that knowledge altitude and skills needed for provision of care and support are vital parts of any programme.
- Advocate for social and legal measures to address stigmatization, discrimination and isolation of PLWHA.
- Also work closely with ILO. Teachers Union and Teacher's Service Commission to develop workplace HIV and AIDS policies to cater for the infected/affected teacher and educators.

How to Cope with Institutional Impact

- UNESCO is developing and disseminating tools on how to respond to the impact of the AIDS epidemic on schools, educators, students and other key institutions at the country level.
- UNESCO-IIEP focuses its work on the capacity building, action research and an information clearinghouse on the institutional impact of HIV and AIDS.
- A Need Assessment Study has been conducted in Kenya, Ghana, Ethiopia and Rwanda. This resulted in the identification of the critical HIV and AIDS prevention training needs.
- Research has also been conducted o the impact of HIV and AIDS on education in Malawi, Uganda and Tanzania.
- Capacity building for educators and involvement of senior education managers in planning of HIV and AIDS prevention and mitigation of its impact on learning institutions and the sector has helped in creating the much needed commitment and political will.
- The recently launched EDUCAIDS continue to enhance UNESCO's efforts in mitigating the impact of HIV and AIDS in learning institutions.

To conclude, UNESCO's efforts in HIV/AIDS prevention continue to produce far-reaching effects in our community. It's in HIV/AIDS prevention through education touches all sphere of life in Africa and the world at large. Success is reflected in reduced prevalence rates, increased enrollment and retention rates in our learning institutions and production of graduates who are ready to face and work in a world that is darkened by HIV and AIDS.

Discussion session

Prof. Mabel Imbuga Commented about the presentations already given particularly on the following aspects: -

- Accuracy of Information about HIV/AIDS
- Moment of silence – PLWA
- Styling: HIV/AIDS vs. HIV & AIDS
- UNESCO publication clarification
- Religion and HIV & AIDS
- Terminologies & Correlations
- Mainstreaming modalities
- Inter-University HIV&AIDS template

7.0 East African Universities Response to HIV & AIDS and Curriculum Reforms by Prof. Caroline Lang'at Thoruwa, African Women in Science & Engineering (AWSE) and Kenyatta University, Nairobi, Kenya

Epidemic Update

Global picture HIV & AIDS is the fourth biggest killer worldwide. An estimated 39.5 million are now living with HIV and about one-third are aged 15-25 years. Most people do not know they are infected and young women are especially vulnerable (five times more than men). The region most affected by the epidemic is the Sub-Sahara Africa. HIV is now the leading cause of death in that region. Estimated 4.1 million are new HIV infections, 29 million Africans now live with the virus and 11 million children have lost their mother or both parents, and this figure is expected to double over the next decade.

University students are the most high-risk group (within 15-25 yrs group)

AIDS Generation. This is due to the factors such as: -

- Sexual experimentation
- Prostitution on campus
- Unprotected casual sex
- Gender violence

Therefore, **Education is the most powerful tool for tackling HIV& AIDS!** and Institutions of Higher learning can be used as channels for imparting education because: -

- Universities are centers of knowledge and opinion leaders
- Produce professionals and skilled personnel for society
- They are catalysts for development.
- Should provide leadership in the fight against the HIV and AIDS pandemic
- Best practices, research, and new skills

The Universities would Respond through: -

- Policies
- AIDS Control Units
- Strategic Plans
- Student Programs
- Community outreach
- Research
- Curriculum Reforms

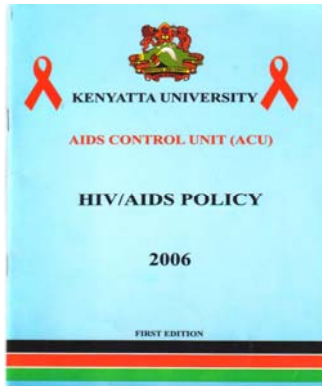
The following bodies would set up institutional Policies: -

- National HIV/AIDS bodies
- National AIDS Control Council (NACC) – national coordinating body
- Kenya Ministry of Education published – Education Sector Policy on HIV and AIDS in 2004.
- Many institutions have now developed their own policies or are developing them
- Commission for Higher Education

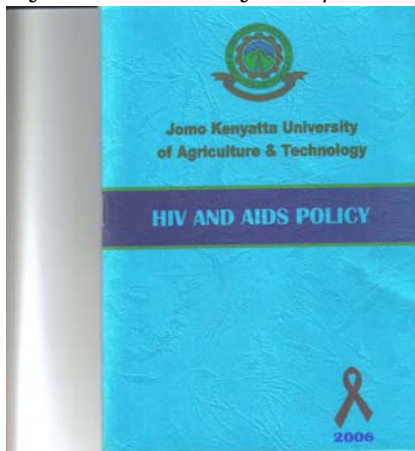
The Policy Issues would be: -

- Issues of prevention (education),
- Care, support and treatment
- HIV/AIDS and the workplace
- Management of response (ACUs)
- Research
- Finances

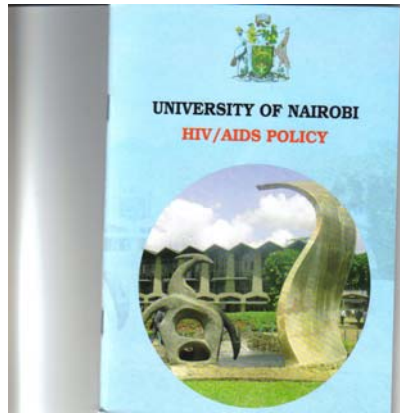
Kenyatta University HIV/AIDS POLICY



Jomo Kenyatta University HIV/AIDS POLICY



University Nairobi HIV/AIDS POLICY



Students would be involved through such activities: -

- HIV and AIDS coordination committees and AIDS Coordination Units;
- Student peer education and counseling groups; (Students trained, sponsored and supported by institutions)
- Linkages with other organizations (e.g. UNESCO, AAU, Rockefeller Foundation) Medical services (treatment and provision of condoms)
- HIV/AIDS related activities during orientation week, cultural festivals, drama, music, religious services to promote a behavior change
- I Choose Life (ICL).
- HIV/AIDS Day, Week, AIDS Testing Day
- Resource centers
- VCT services



Student Programs

- Few students have declared their HIV status,
- The majority fear stigmatization and discrimination
- Guest speakers including people living with HIV give lectures on hope despite the scourge
- Student community outreach

Music part of the HIV and AIDS campaign strategy





Community Outreach

- Varied activities
- Dissemination of information- talks, drama, leaflets, songs, religious messages etc...
- Invitation of communities to universities.
- Community visits -orphanages, PLWA
- Medical initiatives- mother to child transmission



Children are key targets of HIV and AIDS awareness message



Research

- Surveys – Knowledge, attitudes& Practice
- Vaccine development
- Interaction/convergence between traditional medicine and biomedical
- ARVs compliance
- Resistance to behaviour change
- Social cultural issues in HIV/AIDS
- Gender issues in HIV/AIDS
- Funding, external collaborations

Curriculum Initiatives

- HIV/AIDS being integrated into institutional curricular, programs and activities
- Informal curriculum - ICL
- Formal curriculum
- Public and private universities

HIV/AIDS Curriculum approaches would be:-

- Traditional Courses- health / medical fields
- Emerging Courses – cert., diploma, degree
- Specialized HIV/AIDS Courses
- Some are core / compulsory
- HIV/AIDS Integrated courses into:
 - Core courses
 - Subject specific courses

This would be achieved through Emerging /Specialized HIV/AIDS courses at Diploma/Undergraduate levels. Examples of such courses are: -

- ECM012; Sexually transmitted infections including HIV/AIDS
- ECM013; Socio – economic and cultural factors in HIV/AIDS
- ECM017; Ethical and legal issues in HIV/AIDS
- HND 313 – Nutrition management of diseases– KU
- CDM 100; HIV/AIDS Prevention and Management - WUCST
- ICM 65; HIV/AIDS Crisis Counselling - Daystar Univ.
- DEV/PSY/SWK 408; HIV/AIDS and Development - Daystar

Postgraduate Courses

- ECM 501: Medical microbiology and parasitology- KU
- ECM 502: Advances in sexually transmitted infections and HIV/AIDS – KU
- ECM 511: Research project
- PHT827 Community Based Health Care- Maseno university

Core HIV/AIDS courses

- UCU 105 HIV/AIDS AND DRUGS – Kenyatta Univ.CCS 010 HIV/AIDS - Univ. of Nairobi
- SZL 100 HIV and AIDS - JKUAT
- PMT112 Basic Knowledge on HIV/AIDS and Sexually Transmitted Infections -Maseno
- PMT 123 HIV/AIDS Management and Society
- Zoology 105 Biology of HIV/AIDS and Society – Egerton University
- Zoology 311 – Helminthology and HIV/AIDS

University of Nairobi CCS010 HIV/AIDS

- Course Description
- Introduction; Sex and sexuality; Communicable diseases; HIV/AIDS; Epidemiology; Prevention and control of HIV infections; Management of HIV and related infections; Legal and ethical issues in HIV/AIDS; HIV/AIDS as a national disaster; Recent advances and challenges in HIV/AIDS.

HIV/AIDS Integrated Cores courses

- Initiative of AWSE - Oct. - Nov 2005
- Sponsored Commission for Higher Education & Nat. AIDS Council
- Kenyan Public (6) and Private () Universities

Core units:

Communication Skills
Development Studies
Entrepreneurship



Moi University: IRD 305 Entrepreneurship for Small Business

Course Outline

1.0 The concept of entrepreneurship

- 1.1 Examination of definition by various scholars of entrepreneurship
- 1.2 Entrepreneurship as a discipline. Comparison with other academic disciplines

2.0 Theoretical and conceptual base for entrepreneurship

- 2.1 The various schools of thought about entrepreneurship concept. The 'Great person' school. The leadership school. The entrepreneurship school.
- 2.2 General characteristics of an entrepreneur.

3.0 Entrepreneurship and development

- 3.1 History of entrepreneurship education in Kenya
- 3.2 Review of unemployment situation in Kenya
 - 3.2.1 *Unemployment in Kenya Unemployment and HIV/AIDS*
- 3.3 The role of entrepreneurs in national development
 - 3.3.1 Entrepreneurs in National Development
 - 3.3.2 *Entrepreneurship and HIV/AIDS Micro finance contribution to raising the standards of PLWA Corporate responsibility in HIV/AIDS e.g. financial institutions. The importance of self-employment*
- 3.4.1 *Self-employment and the HIV and AIDS infected and affected. Why entrepreneurship for the graduate. Gender specific issues.*
- 3.5.1 *Gender and HIV and AIDS The Kenya government policy on entrepreneurship education, sessional papers, incentives, creation of awareness etc.*

4.0 Identifying a business opportunity

- 4.2 Sources of business opportunities; environment; current business scene; technological changes; demand (market); personal abilities.
- 4.3 Techniques of identifying a viable business opportunity
- 4.4 *Focusing on business opportunities on people living with HIV/AIDS (PLWHA)*

5.0 Assessing a business opportunity

5.2 Characteristics of a good business opportunity

5.3 Evaluating a business opportunity

5.3.1 *Special evaluating system for the HIV and AIDS infected and affected.*

5.4 Selecting the best business opportunity

6.0 Conceptualizing a business activity.

6.1.0 Pre-start-up

6.1.1 Perception of the potential entrepreneurs

6.1.2 Forms of business organization

6.1.3 Sources of credit and finance for starting business; NGO's banks, non-bank financial institutions

6.1.3.1 *Modifying lending policies for the HIV and AIDS infected, affected and female headed household including minors.*

6.1.4 Cost-benefit consciousness

6.1.5 Market survey

6.2.0 Start-up process

6.2.1 Stages of starting a business

6.2.2 Acquiring business skills and managing a business

6.2.3 Causes of business failure

- 6.2.3.1 Key causes of failure in business.

- *6.2.3.2 HIV and AIDS as a factor in business failure.*

- 6.2.4 Risks in business

7.0 Formulation of a business proposal/plan

7.2 The concept and role of a business plan

7.3 The parts of a business plan; executive summary; business description; marketing plan; organizational plan; operational plan and financial plan.

7.4 Students to assess business plans (case studies)

8.0 Business ethics

8.2 Public/customer relations

- *8.1.2 Stigma, discrimination and exclusion in customer relations to PLWHA'S.* Pricing policy

- Fair play (employees, competitors, customers)

- Government regulation. Maintaining standards.

- 8.4.1 Legal issues (HIV and AIDS bill)

9.0 Case Studies of Entrepreneurship

9.1 Available case studies in Kenya especially local ones in Eldoret

9.2 Case studies in the world

9.2.1 *Entrepreneurship and health e g individual, family and community health in respect to HIV/AIDS PLWHA in entrepreneurship.* Project work (students prepare a business plan and hand in as part of course work assessment)

Teaching Approaches

- To impart HIV/AIDS knowledge and skills to enable students develop appropriate strategies for HIV/AIDS prevention, control and care at all levels.
- Multidisciplinary
- Team Teaching
- Guest speakers – PLWA, NGOs
- Lectures and assignments- group work, research, videos, internet
- Examinable courses

Challenges and the future

- Should HIV/AIDS courses be compulsory?
- How to fit new courses in a tight schedule?
- Overloading of core courses
- Acceptance of new or modified courses by faculty not guaranteed; the process and time needed for approval of new courses; 6-12 months. University management support important
- What proportions of lecturers are HIV/AIDS literate?
- Course design:
- What skills are to be imparted?
- Do courses address future professional role of students in world with HIV/AIDS?
- At what levels should courses be taught?
- Choice of courses for integration HIV/AIDS fatigue? Classes tend to be large –
 - Pedagogical challenge
 - Indicative of popularity of the courses among students.
 - Few staff to teach the courses / some topics difficult to discuss HIV/AIDS.
- Resource materials limited – internet, books, journals, CD-ROMs
- Limited funds for workshops, training personnel and community outreach
- Monitoring and Evaluation

Conclusions

- Many universities have made commendable progress in formulating HIV/AIDS policies in the workplace.
- Student activities are in the forefront of university's responses to HIV/AIDS.
- Many community outreach and research programs are in place.
- East African Universities have made a good start in HIV/AIDS curricular reforms More efforts are needed in infusing HIV/AIDS into various subject area within the university curriculum in order to produce HIV/AIDS competent graduates

8.0 Southern Africa Universities on HIV/AIDS AND Curricular Reforms: A Control Engineering Approach to HIV/AIDS by Professor Xiaohua Xia

His main Agendas were: -

- Curriculum Reform: research
- What is a Control Engineering Approach
 - Measurements/tests
 - Mathematical models
 - Control issues
- Our Research Projects & Results

Curriculum Reforms: problems

- Curricular structure
 - Teaching materials
 - Organization of teaching materials
- Teaching styles
 - Lecturer-centered vs. student-centered
 - Passive vs. active
- Human sensitivity
- Issues of institutional leadership, government and Institutional autonomy

□HIV/AIDS Education in Africa, D. Meyer, July 2003

Creation of Knowledge: research
HIV/AIDS Education in Africa, D. Meyer, July 2003

Transfer of Knowledge: teaching

Researchers Supported in the Focus Area in 2006



as at 18 01 '07	Received	Funded	Not Funded	Seed Funds	Amount Awarded
DSA	83	33	46	2	R3 500 557 (R14 7000 000)
Dev					R1 500 000
CMEB	110	57	53	0	(R28 000 000)
ECC	41	33	8	0	R2 050 600 (R3 946 261)
EGIC	158	76	72	1	R40 000 000
GL					R2 261 412
ICT	32	16	15	1	R1 266 000 (R5 100 000)
SL	59	25	30	4	(11 000 000)
UTF	133	87	38	0	R7 094 509

64

Research: NRF focus area

Education and the Challenges for Change

Theme 1: Restructuring in Higher Education / Further Education and Training (FET)

Theme 2: Policy Implementation Studies

Theme 3: Science, Technology and Mathematics Education (STME)

Theme 4: Human Resource Development -Teacher Education and

Development

Theme 5: Curriculum, Pedagogy and Assessment

Theme 6: Language issues and Literacy

Theme 7: HIV/AIDS in Education

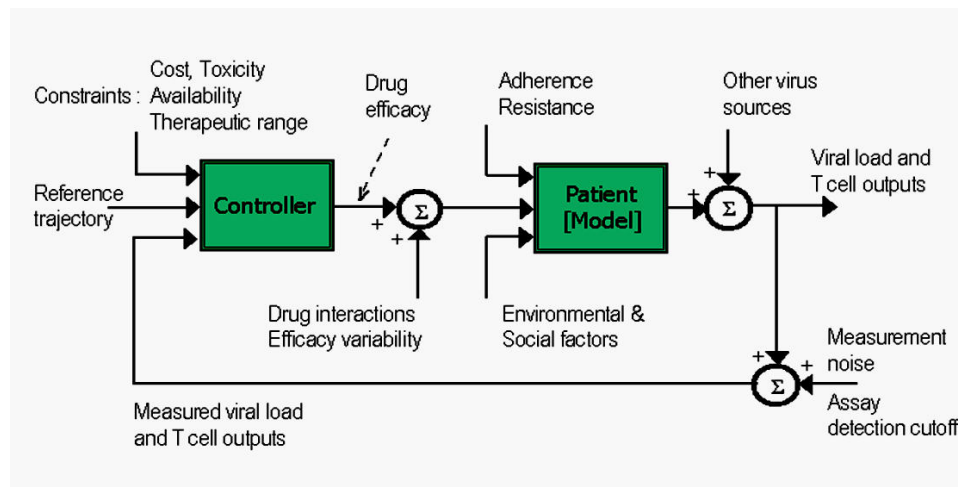
Educational reform is complex, non-linear, frequently arbitrary, and always highly political. It is rife with unpredictable shifts and fragmented initiatives?
(Fullan, 1992 :2)

Despite a growing South African literature on the biomedical aspects of HIV/AIDS, understanding of the educational meaning, impact and consequences of the pandemic is still limited. Yet the fact that about 20% of teachers, close to 100 000 children and about 15% of lecturers are shown to be HIV positive, demonstrates the urgent need for educational research that establishes both a specialist education knowledge base on the pandemic, as well as a research-informed action plan to address the crises facing the education and educational needs of teachers and children living with HIV-AIDS. Research results should aim to inform plans and strategies that can respond to the impact of HIV-AIDS on the sustainability and the human resource needs of the education and training system.

HIV Curriculum Reform: research

- Creation of knowledge
 - Scientific contribution
 - Suitable for SET education
- How the knowledge is organized
 - Mathematical approach
 - Engineering approach

What is a Control Engineering Approach?



Measurements/tests

- Antibody
 - ELISA
 - Western Blot
- Viral load
 - PCR (polymerase chain reaction)
 - bDNA (branched DNA)
- T-cell test
- HIV resistance
 - Clinical
 - Phenotypic
 - Genotypic

HIV Modeling: measurements/tests

- PCR

Each virus particle contains two RNA molecules that can be measured quantitatively by the PCR test. The test uses an enzyme to multiply the HIV in the blood sample. Then a chemical chain reaction marks the virus. The markers are measured and used to calculate the amount of virus. (Roche)

▪ bDNA
 The bDNA test combines a material that gives off light with the sample. This material connects with the HIV particles. The amount of light is measured and converted to a viral count. (Chiron)

Some older standard assays measure (precision) down to 500 copies/ml using the bDNA assay and down to 400 copies/ml, using the PCR assay. Some newest down to 5 copies/ml.

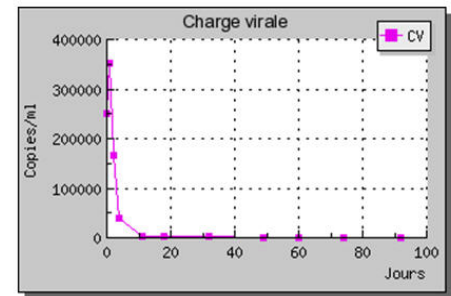
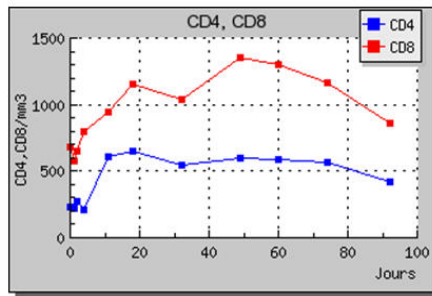
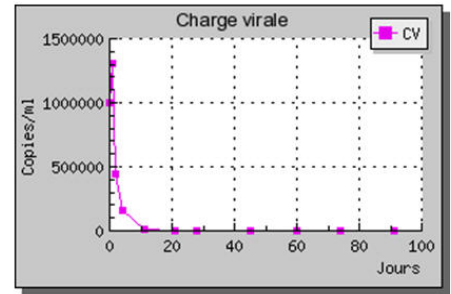
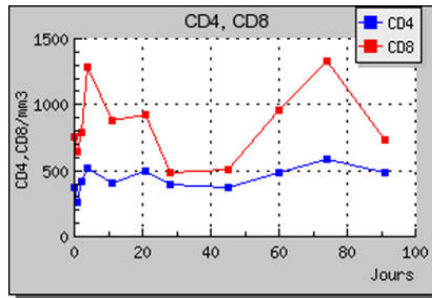
Data plots

exponential
 growth/decay

Measurement

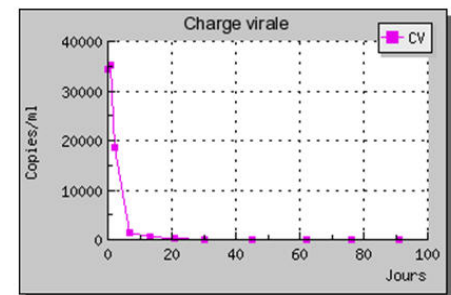
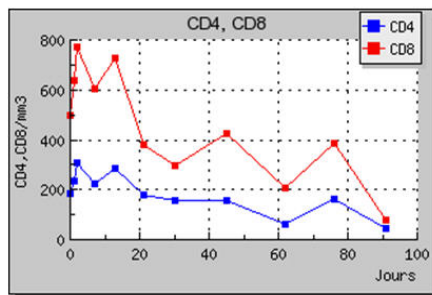
precision
 error

Mea

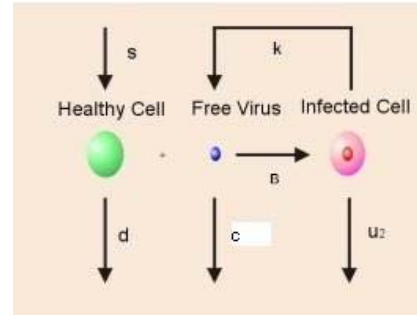
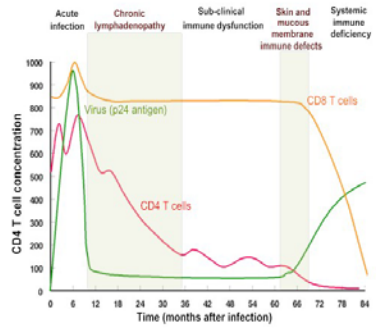
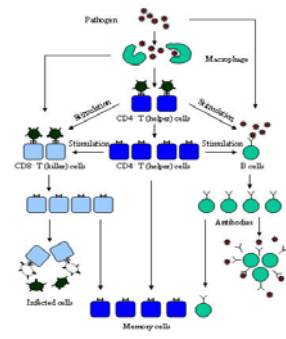
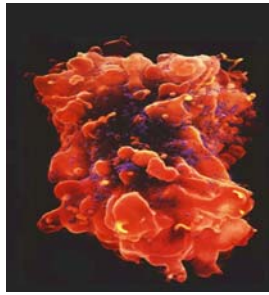


Data plots

Logarithm scale
 Curve fitting
 Linear regression
 sdv



Patient/Model: HIV Infection and Progression

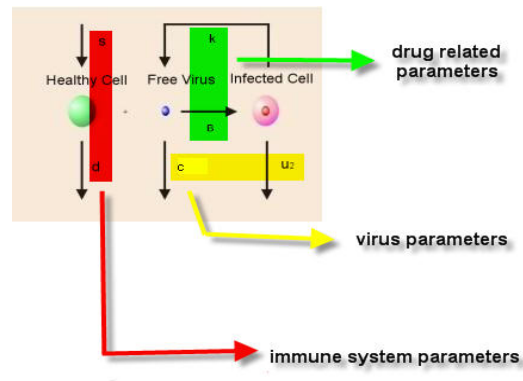


HIVls3d differential equations

$$\frac{dT}{dt} = s - dT - \beta T v$$

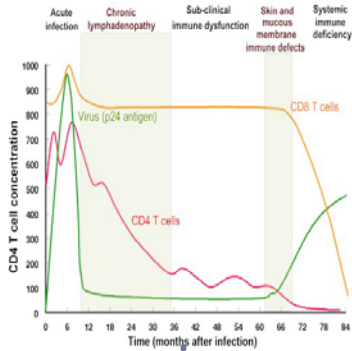
$$\frac{dT^*}{dt} = \beta T v - \mu T^*$$

$$\frac{dv}{dt} = k T^* - c v$$

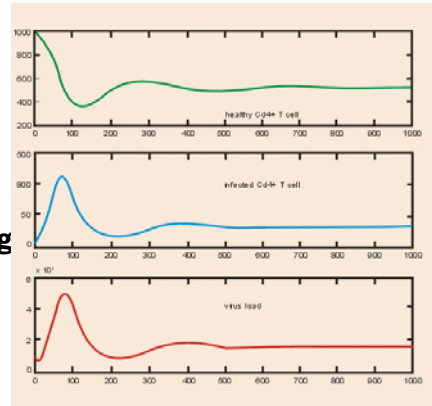


3 D model is good: it simulates infection to clinical latency

Matlab/Simulink response



s drug



100% RTI.

$$\frac{dT}{dt} = s - dT - \beta T v$$

$$\frac{dT^*}{dt} = \beta T v - \mu T^*$$

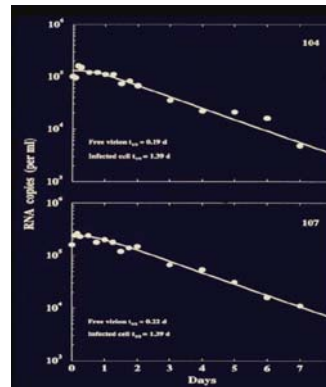
$$\frac{dv}{dt} = k T^* - cv$$

Sol of linear diff. eq:

$$T(t) = \frac{s}{d} + \left(\frac{s}{d} - T_0\right) e^{-dt}$$

$$T^*(t) = T^*_0 e^{-\mu t}$$

$$v(t) = A e^{-ct} + B e^{-\mu t}$$



Two operating points
/equilibria

If $R < 1$, P_1 is **stable**
Infection not spread,
Vaccination

If $R > 1$, P_1 is **unstable**, P_2 is **stable**
Infection spread

$$P_1 = \left(\frac{s}{d}, 0, 0\right);$$

$$P_2 = \left(\frac{\mu c}{\beta k}, \frac{s}{\mu} - \frac{dc}{\beta k}, \frac{ks}{\mu c} - \frac{d}{\beta}\right)$$

$$R = \frac{\beta s k}{dc \mu}$$

Models 3D: reality reflection

Legendary: leading researchers in mathematical modeling

- Two Nature papers (Ho et al 95, Wei et al 95)
half life of virus = 6 hours ($c=3$),
half life of infected cells = 1
day ($\mu=0.45$): rapid
dynamics vs. slow disease
- Citation over 500 within the year of
publication
- Ho was elected the Man of the Year
1996, Time Magazine

Control vs. drug effects

RTI dosage designs through simulation the effects of

- The time at which therapy is initiated;
- The time at which therapy is terminated;
- The strength of the dosage: strong, medium or weak
- Combined therapy

Limitations: 3D model is not good enough

- It does not reflect the hallmark depletion of CD4 +T cells in clinical latency.
- It was found later that there's a second and a third phase of viral decay.

Our HIV Modeling Research: projects

□ HIV/AIDS Educational CD 2001

- <http://www.ee.up.ac.za/profiles/aidsposter.jpg>
- Control System Approach to HIV/AIDS 2002, 2003
- NRF, Focus Area: Distinct South African Research Opportunities
- Control-Aided Parameter Estimation in Oscillatory Systems 2003--2005
- RSA/Swedish Bilateral Agreement
- Vaccine Readiness Study 2003, 2004
- HIVNET 28
- Modeling, Identification and Control of the Dynamics of the Infection of HIV/AIDS 2005—2006
- CNRS/NRF Research Cooperation
- Aid for Early Diagnosis of HIV Therapies 2006—2007
PROTEA: Franco/RSA Agreement

Our Research Results: summary

□ Parameter identifiability theory

–Xia & Moog (2003)

- Parameter estimation techniques

–Xia (2003), Filter and Xia (2003)

- Vaccine readiness study

–Filter and Xia (2005), Gray et al (2005)

- Therapy initiation

–Jeffrey, Xia & Craig (2004)

- Therapy interruption

–Jeffrey (2006)

- Drug effectiveness/ failure

–Moog et al (2005)

- Immune system prognosis

–Moog et al (2007), Xia (2007)

- HIV/TB co-infection

–Du Toit and Xia (2007)

- Educational reforms

–Craig, Xia & Venter (2004), Craig & Xia (2005)

Our Research Results: publications

10 articles in journals

11 in conference proceedings

20+ keynote and public speeches

I.K. Craig, X. Xia, and J.W. Venter, Introducing HIV/AIDS education into the electrical engineering curriculum at the University of Pretoria, IEEE Transactions on Education, vol. 47, no. 1, 65-73, February 2004.

I.K. Craig and X. Xia, Can HIV/AIDS be controlled? IEEE Control Systems Magazine, vol. 25, no. 2, 80-83, February 2005.

X. Xia, Modeling of HIV infection: Vaccine readiness, drug effectiveness and therapeutical failures, *Journal of Process Control*, 17 (2007) 253 - 260.

9.0 Report on Sensitization Workshop and Progress on Integration of HIV/AIDS - Kimani Wairiri, KEMU department of Nursing

Background

- Project at KEMU under the aegis of KEMUHAP
- KEMUHAP steering committee is multidisciplinary- Involving members no limited to Science and Engineering as per the last workshop
- NRS 324: HIV/AIDS Palliative Care and Counseling
- COUN 250: HIV/AIDS Seminars

After April Workshop:

- A consultative forum was constituted to look into mode of integrating/ mainstreaming HIV
- Sensitization workshop for faculty management held in November, 2006 and
- Workshop consisted of formal presentations and deliberations in groups.

The Important Developments achieved were that: -

- All stakeholders felt the need for a integrating HIV education in the curricular
- Nursing felt that the existing course did not address the needs of students as people who are themselves vulnerable to HIV infection
- Senate approved Nursing's proposal for Health Science common undergraduate course: that course determined to be on HIV/AIDS
- Consultative forum agreed upon organizing HIV/AIDS education into four modules/units
 - Understanding HIV/AIDS
 - The nature and scope of HIV/AIDS in Kenya
 - Impact of HIV/AIDS in society
 - Organizational strategy and policy implications in response to HIV/AIDS pandemic

The implementation these developments have been achieved through the following strategies: -

- Module 1 (Understanding HIV/AIDS) now a mandatory common course commencing Sept. 2007
- Department of Nursing has taken ownership for running the course
- Course' main aim is help students to view HIV/AIDS as an issue that affects them, and to break the silence associated with HIV

The course highlights are

- Largely experiential in design
- Key areas:
 - General principles of HIV/AIDS
 - Human sexuality and reproductive health
 - Myths and facts related to HIV
 - HIV related stigma and discrimination

At present, the other three modules are ready for implementation in departments where they apply and a consultative forum is currently working on instructor manuals and learning materials.

**10.0 Rationale for Integrating HIV and AIDS into University
Curricular - Dr. Zipporah Ng'ang'a, JKUAT/AWSE.****Severity of the AIDS Crisis**

The pandemic of HIV and AIDS is a public health emergency of unparalleled magnitude. It started since 1981, 25 years now. During that time they have continued to accelerate in every continent. Prevalence is rising to heights never thought before (20-30 %)

HIV and AIDS is currently out of control

The pandemic has progressed faster than anybody expected. 1996 –about 20 million PLWHA. In 2006 more than 38 million. The problem has doubled in just ten years. Commendable achievement in the use of ARV to improve the quality of life of PLWHA by delaying the onset of opportunistic infections and preventing MTCT. Globally the epidemic remains out of control.

Barriers to Anti-Retro viral Therapy: Access stigma, non-adherence, side effects and development of resistance.

HIV is dynamics worldwide (UNAIDS, 2005) as revealed from the estimates below: -

- PLWA 40.3 million.
- New HIV infections 4.9 million.
- Deaths 3.1 million.
- 50 % – 60 % of all new infection among sexually active youths (15 –25 years).
- Sexual contact 80 –85 % of all infections.
- Every year 500-600,000 infants are born with HIV.
- MTCT 10-15 % of HIV transmission.

Kenya HIV Estimates for 2005**The Deep Roots of HIV and AIDS**

Manifestations of the Impacts of HIV/AIDS

Why the continued rise of the pandemic?

- Lack of sense of agency and commitment at all levels to fight the pandemic. (Leadership).
- Silence and denial.
- Attention focuses on the immediate causes and manifestations but fails to address the contexts of poverty and gender.
- Youth needs not adequately addressed.
- Conflicts with cultural and religious perceptions and values.
- Stigma and discrimination.

HIV/AIDS and Institutions of Higher Learning

- Needs to recognize that HIV/AIDS is a vital matter that requires a coordinated response from all faculty of higher learning.
- Two aspects to the response
- Serve the needs of an AIDS affected person.

Integration into the curricular? What is it? How?

Ultimate goal...

- Provide life skills that influence behavior change among students
- Reduce vulnerability particularly among girls
- Promote care and support of infected
- Alleviate poverty (root cause)
- Reduce stigma and discrimination
- Multiplier effects
- Develop professional competence to cope with the scourge
- Community involvement

Rationale for Integration of HIV/AIDS in the Curriculum would be achieved at three levels: -

- At Personal level: provide adequate, accurate factual knowledge (dispel myths and misconceptions) provide life skills; instill values that influence behavior change; enhance basic value systems (human rights; gender equity, absence of stigma and discrimination, confidentiality)
- As future professionals: Develop competence to respond and manage HIV and AIDS in world of work as future managers, policy makers, architects, engineers, politicians, researchers etc
- At Institutional level: Demonstrate university's concern for the needs of society; protect investment in human resource development, enhance university's ability to respond to emergencies, bring university into public leadership response role.

HIV/AIDS is a Major Concern for every Higher Education Institution

because: -

- HIV/AIDS is real at the universities
- Death of students and staff has become a common place
- Ramifications of the epidemic are experienced on a daily basis
- HIV affects the continued effective functioning of Universities- Negative impacts on student numbers and learning potential, increased staff mortality and morbidity, reduced staff and student productivity, diversion of

concerns and resources to coping or response measures, increased financial costs

- *In most universities IEC efforts for raising HIV/AIDS awareness are concentrated during orientation or are piecemeal and uncoordinated, not backed by suitable policy framework and not rooted in well developed action plans*
- *Their survival depends on initiative of few interested and committed members of staff*
- HIV belongs to the family of lentiviruses
- The long incubation period between initial HIV infection and the development of AIDS has major implications for Universities
- *The university may be successful in graduating qualified individuals, but HIV/AIDS can undermine its accomplishments by the immature death of young graduates (loss of alumni).*

HIV/AIDS is also a Concern for Universities because

- University students constitute a particularly high risk group for HIV infection (15-24 years)
- University is the start of life for most students
 - New independence
 - Strong peer pressure to adopt certain behaviors
 - Uncertain sense of identity and self-esteem
 - Experimentation with sexual behavior and drug use
 - Unlimited social interaction

There is need to introduce a subject that can help charter their lives and consequently affect not only their academic performance but future life which starts to take shape at this level

- Personal and family worries arising from HIV/AIDS can interfere with teaching and learning activities and inhibit quality performance at secondary school HIV is discussed at the surface limited discussion, care with information, no discussion on sexuality at this level
 - *At university level students must be provided with: Facts, statistics, and comparative analysis*
 - *They must be equipped to discuss and analyze HIV in their own context, own circumstances*
- HIV/AIDS has impacts on every sector of life social, economic, political, environmental etc
- HIV/AIDS both an art and science
- HIV/AIDS both social and economic
- HIV/AIDS both political and biological
 - *At University level there is training for sociologists, biologists, doctors, politicians, economists, engineers, architects who must be well equipped to address the ramifications of the scourge*

There is need for synergy in addressing the scourge because:-

a) The mandate of the university is

- Intellectual imagination
- The heart of a university business is knowledge acquisition and dissemination
- Generate expertise in well demarcated specialized areas

- The graduates from universities are duty bound to respond to the needs of the society for HIV/AIDS related scholarship and skills as future policy makers, managers, leaders who must take a front line in addressing the scourge

b) University is the transfer of skills

- By training intellectuals you would expect transfer of skills through community education, peer education, formal and informal education etc. *Integration of HIV in the university becomes a sustainable way of transfer of skills, knowledge and attitudes that may foster behavior change*
- In Africa, university students are looked upon as responsible people who must give back to the community

In an era of unemployment we would want to create a pool of Community Own Resource Persons (CORPS) who are trained, skilled and experienced in this area

- In the process of responding to the scourge, many mistakes and omissions have been committed
- Wrong information- not factual, distorted information
Why?
Response has been by NGO's, with no formal training

c) Integration of HIV in the University curriculum creates a golden opportunity to address knowledge gaps

- Role of research
 - There is lack of clearly researched data on HIV/AIDS
 - Example in all reports: It is estimated that....
 - Universities can play a critical role in operational research and also help in designing tools that help monitor the scourge
 - Social scientists- Research on Best social system for care and support
 - There is need to address the scourge from an intellectual point of view which highly considers well researched facts, statistics, tested scientific processes and experimentation
 - This can only be achieved through integration of HIV/AIDS in the university curricular
- Universities have a responsibility for development of human resources
- Universities are among the principal agencies for preparation of large segment of professional and skilled personnel that society needs
- This imposes three responsibilities to them
 - *To ensure that all graduates are competent to deal with HIV/AIDS in their own lives and professionally in their area of expertise*
 - To ensure that universities continue to produce graduates in the changing numbers required by society where the pandemic may be eroding the human resource base to introduce new areas of professional training to respond to emerging needs in a society affected by the disease
- Universities are crucial agents of change
- Universities must take a lead role in:
 - Behavior change
 - Eradication of stigma and discrimination
 - Care and support of the infected and the affected

- Treatment of those who are ill
- Every response demands leadership that will inspire and guide individuals and communities to adopt
 - *Every University should serve as a role model, a facilitator and a source of knowledge, understanding and skills*
- Universities are the think caps of society which provides them with resources and freedom to do the work of reflection on their behalf
- Progress has been made in understanding of the virus, AIDS as a biomedical condition, ARV's etc.
- There has been no corresponding understanding of HIV/AIDS as a social phenomenon or intellectual challenge
- The disease flourishes under silence, stigma and discrimination which mitigate against the prevention/protection of the scourge
- IEC have attempted to influence behavior change but failed because they are based on inappropriate communication models
 - *Universities have the intellectual resources to deal with these issues for more tractable and successful efforts to manage the scourge*
- HIV/AIDS raises a host of complex moral, ethical, human rights and legal issues that cry out for the kind of knowledge, understanding and insights that universities are well equipped to provide.
- HIV/AIDS is not a passing phenomenon but one that is likely to beset society for much of the remainder of this century
- No university in sub-Saharan Africa can stand and watch
- Those in countries where prevalence continues to grow will need to bend their energies to developing the human resources lost to the disease
- Those in countries where the prevalence has stabilized will need to reflect on factors responsible for the change and play a significant role in ensuring that the situation does not reverse and provide lessons learnt to newly affected countries

Societal's silent voice to Universities in face of HIV/AIDS

Integrate HIV/AIDS in the curriculum so that:

- Protect yourself, your staff and your students against infection, otherwise you will not be able to help
- Provide trained and skilled personnel needed by all sectors in numbers and areas of need
- Understand the disease better and develop solutions, interventions and programs that will bring hope
- Share knowledge, understanding, time, expertise with the community outside the university, learn from them so as to understand what has to be done and

PROVIDE HOPE TO A GENERATION THAT HAS NOT KNOWN A WORLD WITHOUT HIV

11.0 The Development of an HIV/AIDS Integrated Engineering Curriculum and Educational Compact Discs for HIV/AIDS Prevention By Prof. Xia, University of Pretoria

His talk was based on two aspects:

- CD development
- How to organize teaching.

He continued with curriculum reforms relating to:

- Teaching style
- Lecturer sensitivity
- Institutional leadership

CD Development

It is a multi-disciplinary involvement of three departments. He gave a comprehensive coverage of the contents of the CD in subsections ranging from the **Introduction (1)** through the end with aspects such as the following coming out clearly

- Model-3D and T Model, mathematic model
- Counseling
- Gender issues
- Law and Rights
- peer education
- References

He followed this overview with the CD demonstration. This showed clearly the place of engineering in enhancing understanding HIV/AIDS- audiovisual. Model – He spent a little more time explaining the mathematical model; both 3 dimensional and 4 dimensional models very important models in treatment, etc. Combination of treatment (cocktail treatment) etc and other salient aspects of HIV/AIDS (See the soft copy if his work/CD).

Agenda

- Curriculum Reforms: teaching
- Educational CD
- General HIV/AIDS Test
- CD Demo

HIV Curriculum Reform: teaching

- Style
- Lecturer sensitivity
- Institutional leadership
 - The need of an HIV educational CD

Curriculum Reforms: Institutional

- Horizontal
 - General curricular rationalization, e.g., common two years for all engineering students in UP
 - Cross faculties
- Telematric dept

- Center of the Study of AIDS
 - HIV teaching materials
- Vertical
 - NRF
 - HEAIDS
 - Etc.
- Introduction and purpose for integration
- The process for incorporating HIV and AIDS into the curriculum
- Evaluation of the process
- Evaluation of student
- Challenges and successes
- Conclusion

HIV/AIDS Educational CD

- Developers
 - Department of Electrical, Electronic, and Computer Engineering,
 - Department of Telematic Learning and Education Innovation,
 - Centre for the Study of Aids
- Objective
 - A generic HIV/AIDS educational tool by the University of Pretoria
- Target market
 - Undergraduate students
 - The population at large.

HIV/AIDS Educational CD: contents

- 1) *Introduction:*
An introduction to HIV/AIDS and the reasons for developing the CD.
- 2) *Time line:*
A brief history of HIV, where the virus possibly came from, when it was first discovered, and it's spreading throughout Southern Africa. A discussion on the future demographic impact of HIV/AIDS in South Africa.
- 3) *What is HIV/AIDS?*
Differences between HIV and AIDS are explained, and animations demonstrate HIV infection, the HIV life cycle and drug development.
- 4) *Statistics*
Worldwide spread of AIDS overtime and also gives specific statistics for South Africa.
- 5) *South Africa:*
Spread of HIV in South Africa as well as high-risk groups and factors contributing to the epidemic.
- 6) *Prevention:*
Safer sex practices, and information on preventative measures, vaccines and risk factors.
- 7) *Transmission:*
How transmission occurs and which bodily fluids are infectious
- 8) *Diagnosis*
Here the blood tests (e.g. ELISA, Western blot and PCR), which are used for HIV diagnose HIV, are discussed with an explanation of the window period i.e. the period between the onset of HIV infection and the appearance of detectable antibodies to the virus.

9) *Symptoms:*

The symptoms one can expect after being infected with HIV is discussed here as well as the asymptomatic period where no obvious symptoms are observable.

10) *Treatment:*

Treatment is discussed here using the HIV life cycle to explain the purpose of the three main categories of antiretroviral drugs currently in use, i.e. nucleoside reverse transcriptase inhibitors, non-nucleoside reverse transcriptase inhibitors, and protease inhibitors. Concepts such as drug resistance are also described.

11) *Sexually transmitted infections (STIs)*

A discussion of STIs are included here as the presence of, a STIs indicate unprotected sex behavior that put people at risk of HIV infection. There is also an increased chance of HIV transmission when another STI is present as STI's serve as avenues for HIV to enter the bloodstream

12) *Model:*

3rd- and 4th-order HIV/AIDS mathematical models are used here to describe the interactions of healthy CD 4+ cells, infected CD 4+ cells and free viruses, using predator-prey type relationships. The models are packaged as a Java Applet, which allows the user of the CD to view the time evolution of these model outputs in graphical form. Model parameters can be adjusted by choosing different treatments and the effects of such treatments can be seen in the model outputs.

13) *Counseling*

This is one of the main functions of center for the study of AIDS at the University of Pretoria. It is explained here that because of the psychosocial impacts of HIV/AIDS, counseling is considered necessary, especially before and after HIV testing. Counseling is also an important part of prevention to help people to negotiate sexual behavior, and to act as a support function for the infected.

14) *Gender Issues:*

Most strategies to prevent the spread of HIV/AIDS have focused on the promotion of condom use, reduction of numbers of sexual partners and treatment of STIs. It is explained in this section that many of these responses have failed to address social, economic and power relations between men and women, among men and among women. This section therefore analyses gender stereotypes and looks at the defining of male and female relationships and roles.

15) *Law/ Rights*

It is explained here that promoting human rights in the contexts of HIV/AIDS is not only an imperative of justice to overcome the existing forms of discrimination and intolerance but it is also a tool to prevent the further spread of the epidemic. Although several changes have been made to existing legislation, discrimination is still a reality as people are denied jobs, accommodation, access to facilities and basic equal rights on the grounds of their HIV status.

16) *Peer education:*

This section discusses what it takes to become an AIDS' peer educator, the training of which is based on material covered in this CD.

17) References:

The CD contains a comprehensive list of references, including PDF-files of journal articles published in a special issue of the South African Journal of Science on HIV/AIDS research in South Africa. This issue reviews the recent work on the origin, prevention and treatment of the epidemic.

CD Demo

Talk two

Integration of HIV/AIDS into Engineering

The university experimented with the following approaches:-

Communication Forum- Integration in 3rd and 4th curricular.

Lecture 1: Introductory lecture on HIV given at the beginning and Lecture 2 after a week. A test on knowledge about HIV was given at the end of each of the test to be able to determine if there is learning. Prof. Xia took the participants through the content of the general HIV/AIDS test.

Specialized course- Control systems HIV/models used to illustrate standard materials and concepts in engineering.

The rules of assessment were given as well. It is noteworthy the way the course is integrated and the models used in such a way that content of engineering is not compromised; reflected in the course outline (See soft copy for details)

He further emphasized on use of lectures not handouts

- Student experiment
- Student project
- Integration of HIV with other set courses
- Importance of use of right language when dealing with physics, Medical doctors or engineers,
- Entry point for the set courses

Discussion Session Question on Availability of CD.

CD is available at Enterprise University of Pretoria for 20 \$. It is a copy right of Unit of Pretoria.

12.0 Prof. Z. Ng'ang'a by Integration of HIV/AIDS into Biological Sciences

Stressed that interest is important for effective integration and basic knowledge integration is not about over handling course content.

Core courses important for integration as large number of students can be accessed, she gave example of the courses that could easily have HIV/AIDS integrated into them done; where there are window of chance e.g.

- i) Medical biochemistry I-SBC 303
- ii) Nutritional biochemistry SBC 306
- iii) General Zoology SZL 100, Origin of life forms etc, different strains of HIV, resistance to discuss microevolution.
- iv) Ecology and bioanalysis – relationship between HIV and host organism population dynamics, Analysis of biological data students can be given HIV related data and they can see the actual reality.

History and philosophy of biology either as tutorials or take away assignment.

Many windows are available

Evolution and history of HIV

Moral implications of biology

Science and national development

Biostatistics

- Use HIV related data e.g. λ^2 to determine the relationship between age and prevalence
- Use of descriptive statistics e.g. percentage.
- Experimental design
- Use of computer HIV/AIDS data analysis.

Emphasized the need to integrate in units that are not obvious.

Economic Botany

- Nature and importance of plant primary and secondary products.
- Medicinal plants and plant dissolved
- Medicines
- Traditional foods and vegetables in the management of HIV among PLWHA

Bacteriology

TB, Meningitis, Typhoid- opportunistic disease infection following HIV infections. Hygiene of infected people, vaccine for screening and treatment.

Recent advances in diagnosis of bacterial diseases.

Integration of HIV/AIDS into Chemistry

- Classical analysis and separation of techniques
- Get analytical data e.g. HIV & AID Epidemiology
- You can analyze any form data, but need to get AIDS related data.
- E.g. t-test,

Separation Techniques	e.g. Column Chromatography Use Immunoglobulin to teach Separation
Gel Electrophoresis	Separation of different components e.g. Antibodies of an HIV infected person
Atomic Structure & Bonding	Nature of Bonds – Hydrogen & metal Antigen – Antibody interactions are ionic, Hydrogen or Vanderwaal forces
Spectroscopic methods	e.g. frequency, wavelength Absorbance Application of ELISA using different wavelengths
Fluorescence	Determination of CD ₄ counts as a measure of AID progression
Chemical Kinetics	Chemical reaction – Are they reversible or irreversible HIV - infection is chain reaction and is irreversible.
Catalysis	-Increasing reaction rates -What are the factors that will increase HIV transmission or HIV to AIDS progression? e. g. malnutrition,

13.0 Positive Strides in the War against HIV/AIDS: The Kenyan Situation by Prof. Miriam Were, Chairman, National AIDS Control Council

General Overview

Ladies and gentlemen,

The first case of AIDS in Kenya was diagnosed in 1984 and by 2000 the HIV prevalence had rocketed to 14%. Fortunately there has been a progressive and sustained decline to 13 %, 10 %, 7 % and current data indicate adult HIV prevalence of 5.9 % in 2005. Therefore Kenya has been quoted in a number of UNAIDS GLOBAL UPDATES, including those of 2005 and 2006 as one of the three countries in Africa and the world at large where this sustained decline in prevalence is observed. Furthermore, there has been observed to be a sustained decline in new infections (incidences) from 100,000 to 85,000 to the estimate of 60,000 for 2006.

The decline in adult prevalence is supported by data from studies on behavior change. The Kenya Demographic and Health Survey (KDHS, 2003) reported that among men and women the age at first sexual contact had raised from 16,8 and 16.7 % to 17.1 and 17.8 % in 1988 and 2003 respectfully. Equally important was the report on the practice of having multiple sexual partners recorded to be declining among men and women. In 1998, 24.1 and 4.2 % of men and women respectfully were found to have multiple sexual partners, and when prepared with five years later in 2003 the proportion had declined to 11.9 and 1.8 % respectfully. The reported number of sexual partners is still too higher for men but at least there is a downward trend.

Ladies and gentlemen, another area where Kenya has scored highly is the provision of **Voluntary Counseling and Testing Services (VCT)**. According to the plan in place by all stakeholders, Kenya has now 80 % population coverage with VCT services. This implies that most people have an opportunity to know their HIV status and thus take steps to maintain HIV-status off. If HIV+ live positively and prevent re-infections with other HIV types or strains. Another area where progress has been made is the provision of **Anti-Retroviral Therapy (ART)**. Available data for March 2006 indicate that of the 263,000 HIV positive people who require ART, Kenya is servicing 130,000 people representing 49.4 %. A fourth area among these services regarded as essential in the fight against HIV and AIDS is the **Prevention of Mother to Child Transmission (PMTCT)**. It is estimated by that 1,423,000 cases required to be reached by the PMTCT programs. Again this is not a level to be proud of expect that a couple of years ago, this was less than 10 %.

Ladies and gentlemen,

These gain have been made in the context the mobilization of the people of Kenya to fight against this scourge in an increasingly supportive environment. To mention but just a few of the decision made: -

- The declaration of HIV and AIDS as a national disaster in 1999 and Total War against HIV and AIDS in March 2003.

- The establishment of Cabinet Committee in HIV and AIDS and chaired by H.E. the President.
- The enactment of HIV and AIDS Prevention and Control Act 2006.
- An inclusive process for the development of the second multi-sectoral Kenya National HIV and AIDS Strategic Plan (KNASP 2005/6-2009/10).
- The mobilization of domestic as well as external resources from both the bilateral and multi-lateral donors to support the war against HIV and AIDS.
- The establishment of NACC structures at all levels to facilitate the fight against HIV/AIDS, at the Constituency, District, provision levels as well as the establishment of AIDS Control Units (ACUs) in ministries, Departments, Commissions and indeed all parastatals and Sub ACUs in the units of those ministries/department and commissions.

An Overview Specific to Higher Education

In Kenya the commission of higher Education (CHE) is the main partner with the National AIDS Control Council in the HIV/AIDS responsible in the University. The CHE is therefore the ACU and each University/institution is the Sub ACU. To date 25 Universities fall under the Kenya CHE.

The following are the roles of the Universities in the Fight Against HIV/AIDS

- Conduct research such as development of HIV and AIDS vaccine.
- Provide teaching in the area of HIV and AIDS by imparting life skills (Curriculum Development).
- Have student who acts as role models to the society.
- Reach out to the teaching fraternity within the society who are vulnerable.
- Corporate responsibility such as they being a 'Think tank' for the country.
- Reaching out to the external clients in the area of HIV and AIDS.

The achievements would be:-

- Developed a curriculum for all the Universities to teach HIV/AIDS.
- Training of lecturers and students on HIV/AIDS.
- Sensitization of both lecturers and students within the universities.
- Continued research in the area of HIV and AIDS.

In the relationship within NACC, universities have participated as per the table that follows: -

Institutions

Egerton University

Objective: -

- Conduct a baseline survey,
- Undertake condom distribution
- Implement BCC activities.

Jomo Kenyatta University of Agriculture and Technology

Objective: -

- Conduct a baseline survey on the HIV and AIDS situations.
- Behavior change Communication activities.
- Condom distribution.
- HIV and AIDS policy distribution.

Kenyatta University

Objective: -

- Staff and students sensitization.
- Curriculum Development

University of Nairobi

Objective: -

- Implement a peer Education program.
- Behavior change Communication activities.
- Condom distribution.
- Policy dissemination

Masinde Muliro University

Objective: -

- Behavior change Communication activities and
- Conduct a baseline survey

Daystar University

Objective: -

- Behavior change Communication activities and
- Conduct a baseline survey

Maseno University

Objective: -

- Capacity development on the area of Care and Support.

Moi University

Objective: -

- Policy development and condom distribution

Kenya Methodist University

Objective: -

- Policy development and dissemination

St. Paul Theological College

Objective: - Curriculum development and research

Baraton University

Objective: -

- Develop HIV and AIDS policy and dissemination.
- Training the TOTs within the University for both students and lecturers
- IEC materials development e.g. pamphlets.

Conclusion

The University Community in Kenya has made a healthy start in their involvement in TOTAL WAR AGAINST HIV/AIDS. The challenge for the AWSE is not so much reinvent the wheel but to stand on the shoulders of what has been done and thus see farther than the achievements to date.

Thank you for your kind attention.

14.0 Mainstreaming HIV/AIDS in the Academic Curricula by Dr. Genevieve A. Mwayuli, Catholic University of Eastern Africa

Workshop Aim

The workshop was held on 19th January 2007 with the following aims:-

- Deliberate on mainstreaming of HIV/AIDS into the university curricular in various faculties and in the natural science, mathematics and computer science courses in particular
- Brainstorm on how to enhance prevention and impact mitigation efforts at the university.
- 60 participants including Deans from Science, Arts and Social Sciences, Theology, Commerce, Education faculties and heads of departments attended plus Science academic and support staff
- Forum provided opportunity for sensitization of staff on the importance of integrating of HIV/AIDS in their programs at faculty level
- Special emphasis given on integrating HIV/AIDS in the natural sciences
- Heads of various departments given opportunity to chart the way forward for integrating HIV/AIDS in their programs
- Participants identified gaps in the curricula with regard to HIV/AIDS
- Mainstreaming HIV/AIDS in Institutions of Higher Learning
- Trends, current issues and role of NACC in the fight against HIV/AIDS in universities and society
- Integration of new content and issues in the academic curriculum
- Integration of HIV/AIDS in the Science courses
- Methods of teaching HIV/AIDS both as a core course and an integrated one
- Assessment of learning outcomes of HIV/AIDS in academic curricula

Mainstreaming HIV/AIDS into the university curricular challenges identified

- Lack of knowledge
- People living in a state of denial
- Limited human resource capacity
- Leaving the responsibility of HIV/AIDS to specific persons (ACU coordinator)
- Inability to identify HIV/AIDS as a strategic priority
- General fatigue and disinterest relating to HIV/AIDS matters
- Tendency to think that HIV/AIDS relates to medical related courses
- HIV/AIDS not identified as a strategic priority
- An already crowded curriculum

Fundamentals of mainstreaming

Includes:-

- Openness and breaking of silence
- Promotion of gender equity and empowerment
- Adoption of a strong human rights approach
- Inclusion of people living with HIV/AIDS at all levels
- Ownership and acceptance of the problem across the entire institution

15.0 Way Forward

The Participants gave following suggestions as the way forward:-

- Each university need s an info center to help integration of HIV – could be ACU, Biology dept.
- Need to network to share information
- Recognize emerging areas and exploit synergies in disciplines for the sensitization on HIV and AIDS
- Need to share and disseminate experiences at respective universities (induction workshops) preferably more than one day
- Engage with students in extra-curricular activities (sports)
- More training for staff to give accurate information on HIV and AIDS – information to be made accessible also
- Evaluate current prevention initiatives - VCT centers statistics
- Student feedback necessary for evaluation
- Pooling to access funding (national and international)
- Staff sensitization and training on teaching
- Plan on possible effects of the awareness education
- Examine linkages and effects of media on initiative
- Alternative therapies including traditional medicine
- Subject specific platforms for exchanging information
- CHE to ensure new programs have mainstreaming element before approval
- External mainstreaming with immediate communities priority
- Resources for mainstreaming
- Involvement of students for creative solutions
- Condoms to be availed in learning institutions (staff and students)
- Need to have a networking focal point/ secretariat possibly at AWSE
- Examine curriculum to mainstream in totality
- CHE establish HIV and AIDS specific research funds
- Support programs
- Means of condom disposal
 - Time frame for actions – launching the networks
 - Harmonization of mainstreamed/ integrated courses
 - Informal entry points vital – e.g. sports
 - Course objectives to reflect outcomes relating to HIV and AIDS
 - Examinations to creatively incorporate HIV and AIDS issues
 - Basic counseling skills for staff relating to HIV and AIDS
 - Common courses to be compulsory in addition to mainstreamed ones
 - Adopt the term mainstreaming in favour of integration
 - Adopt a generic questionnaire (from UoN – School of Physical Sciences) for data gathering baseline data
 - Fix date for sensitizing colleagues and commencing teaching of mainstreamed curriculum

- Ways and means of assessing outcomes

16.0 Closing remarks – AWSE Chair

The AWSE Chairman acknowledged all the participants and support from institutions. Pleased with progress and full attendance of workshop, went well. Stressed the need to help the students with our new sensitization on HIV and AIDS. Reminded participants the need to be involved especially to students and also to build capacity among staff. Together as a team to minimize HIV and AIDS in our campuses.

Thanks and God bless
Gave certificates of participation

Part II

17.0 Integrating of HIV/AIDS into Biological, Physical and Engineering Sciences

17.1 Botany

Mainstreaming HIV-AIDS into UG University curriculum

Workshop on Higher Education Science and Curricular Reforms
African Universities Responding to HIV/AIDS
Kenya Institute of Education (KIE)
8th – 10th May 2007

Team members

- Prof. Isaac Kigatiira - ANU
- Dr. Maina Muniafu - USIU
- Dr. Ethel Monda - KU
- Dr. Genevieve Mwayuli - CUEA
- Dr. Catherine Lukhoba - UoN
- Dr. Norman Njoroge - UoN
- Mrs. Margaret Immonje - MMUST
- Mr. Ireri Ndwiga (Secretary) - JKUAT
- Mr. Bethwell Owuor (Chairman) - CUEA

COURSES IDENTIFIED

- **PLANT ECOLOGY**
- **BOTANICAL TECHNIQUES**
- **PLANT BIOCHEMISTRY AND PHYSIOLOGY**
- **CERTIFIED EXIT SEMINAR -(proposal for all universities)**

BOTANICAL TECHNIQUES

- **Entry points**
- An introduction to the scientific method, basic methods and instrumentation in biology, emphasizing fundamental laboratory procedures. Techniques to be studied include light and electron microscopy, spectrophotometry, gel electrophoresis (*for the identification of viruses Southern blot and ELISA*), chromatography, sectioning and staining. Laboratory specimen: collection, classification, nomenclature, storage, preservation and processing. *Blood sample collection methods*, Records and inventory. Laboratory reagents, preparation and storage. Safety (*safety in relation to HIV*) in the lab, rules and regulations.
- **Teaching methodologies**
- Lectures, tutorials, class presentation, practicals, assignments, *resource person*

- PROPOSED ASSIGNMENT
- *Establish the diagnostic techniques used in clinics, hospitals and VCT centers*

PLANT ECOLOGY

- **Entry points**
- A study of the ecosystems will be done. The abiotic environment; minimums, tolerances and the medium; isolation, precipitation, and climate; soils, nutrients, and other factors will be looked into. Species interactions (*parasitism – HIV*) Biotic environment (*viruses as forms of life HIV strains*) Energy flow in ecosystems: energy fixation by autotrophs; energy flow beyond the producers will be examined. Biogeochemical cycles and ecosystems: gaseous and sedimentary nutrient be examined, so will be community ecology (habitat locations of plants with bioactive molecules), its structure, function; stability and change. the nature of human ecology, the human population. Impact of pollutants on human health and other living systems. Risk assessment of chemicals in the environment will be examined together with global approach to solution of environmental problems. Techniques used in terrestrial and aquatic environments to gather ecological data and quantitative data analysis using computers will also be examined. herbal medicines
- **Teaching methodologies**
- Lectures, tutorials, class presentation, field trips, assignments, resource person (herbalists)
- PROPOSED ASSIGNMENT
- Field trip to list plants claimed to have medicinal and nutritional value

PLANT BIOCHEMISTRY AND PHYSIOLOGY

- **Entry points**
- The course examines the basic principles of plant physiology including cell structure and function together with hereditary and environmental influences on plant behaviour. Respiration (reliance of HIV virus on host cell's energy): biological oxidation; respiratory metabolism; photophysiology; and photochemistry will be looked into. Biochemistry that is role of ATP and NADPH, chloroplast as unit of photosynthesis; factors influencing photosynthesis; photorespiration: characteristics and biochemistry of CAM, C3 and C4 plants will be examined. The course will also look into mineral nutrition –essential and beneficial elements, solutions and soils as nutrient sources; elemental analysis of plant tissues; nutritional disorders; chemical fertilizers in crop production; foliar nutrition. Biosynthesis: primary and secondary metabolites (secondary metabolite diversity: usefulness of secondary metabolites in management of HIV-AIDS). The physiological and biochemical actions of plant growth substances and genetics of plant will be studied. Physiology of seeds – development, germination, dormancy (latency of CD4 cells) will be examined. Quality together with factors affecting plant growth and reproductive growth will be examined.

- **Teaching Methodologies:**
- Lectures, tutorials and practical sessions.
- PROPOSED ASSIGNMENT
- Report on secondary plant metabolites used to boost immunodeficiency in HIV-AIDS (Use electronic and bibliographic literature)

FINAL YEAR

- Certified exit seminar – information on HIV-AIDS (for all universities)
- (Presentation of latest HIV-AIDS data)

17.2 Biochemistry

Catherine Mutunga	KEMU
Patrick wairiri	KEMU
Naomi Maina	JKUAT
Eucharua U.K	JKUAT

SBH 2200: Structure of Biomolecules.

- Occurrence of Biomolecules in prokaryotic and eukaryotic cell organelles. Hierarchy of Biomolecular organization. Structure of amino acids and proteins, complex lipids and nucleotides and nucleic acids.
- *Entry points*
 - *Structure of amino acids, nucleotides and nucleic acids. HIV as an example of RNA uses the host DNA to replicate.*

SBH 2204: The Cell and its external environment

- Ultrastructure of prokaryotic and eukaryotic cell organnnels: nuleus, cell wall, plasma membrane, cytoplasmic inclusions and intracellular attachments. Extracellular fluids, blood and lymph, their composition and relationship to the cell. Biochemistry of specialized cells- WBC, RBC, Nerve cells, and muscle cells.
- *Entry points*
 - *Biochemistry of some specialized cells- WBC*
 - *WBCs are immune cells which contain CD4 receptors. The HIV virus attaches to the CD4 receptors to gain entry to the human cell.*
 - *The role of extra cellular fluid in HIV transmission.*

SBH 2325: Biochemistry of muscle contraction

- Fibre composition of the muscle: metabolic behavior- carbohydrates, adenine nucleotide metabolism; muscle fatigue, physiology and biochemistry of terminal exhaustion, proteins of muscle contraction
- *Entry points*
 - *Biochemistry of terminal exhaustion and HIV/ AIDS*
 - *Muscle wasting and atrophy due to HIV/AIDS.*
 - *Nutrition in relation to HIV and muscle function*

SBH 2200: Structure of Biomolecules

- Structure of amino acids, nucleotides and nucleic acids.
- Hiv as an example of RNA- uses the host DNA to replicate.

SBH 2204: The Cell and its external environment

- Biochemistry of some specialized cells- WBC
 - WBCs are immune cells which contain CD4 receptors. The HIV virus attaches to the CD4 receptors to gain entry to the human cell.
- The role of extra cellular fluid in HIV transmission.

SBH 2300: Basic metabolism

- Lipid metabolism- fatty acid oxidation, metabolism of purines and pyrimidines.
- Side effects of ARVs at the biomolecular level.

SBH 2325: Biochemistry of muscle contraction

- Biochemistry of terminal exhaustion and HIV/ AIDS
- Muscle wasting and atrophy due to HIV/AIDS.
- Nutrition in relation to HIV and muscle function

SBH 236: Pharmacognosis

- ARV discovery/ extraction, herbs in the treatment of opportunistic infection
- Herbalists and the treatment of HIV/ AIDS.

SBH 2400: metabolic regulation and integrated metabolism in Mammalian Tissues

- The effects of HIV/aids on the control mechanisms in the body
- The role of HIV and ARVs on the wasting of brain and adipose tissues.

SBH 2402: Biochemistry of Microorganisms

- Biochemistry of milk and lactation, mother to child transmission of HIV and its prevention.

SBH 2421: Applied microbial biochemistry.

- The importance of fermented foods in the prevention of opportunistic bacterial infection.

17.3 Zoology

SZL 101 Invertebrate Zoology

Introduction: origin and diversity of animals classification, kingdoms of living organisms, the species, embryonic features used in animal classification, the rise of zoology, where animals are found, animals of the past and their distribution through geological times.

- ❖ *Origin and evolution of retro viruses*
- ❖ *Sub types and viral strains in relation to geographical regions*
- ❖ *Phylogeny and viral strains/types*

The scope of zoology. The Invertebrata: a survey of invertebrate groups emphasizing their habits, structural features, functional anatomy, and evolutionary relationships using Eastern African examples. Kingdom Protista, Subkingdom Protozoa, Phyla Sarcomastigophora, Labyrinthomorpha, Apicomplexa, Microspora, Ascetospora, Myxozoa and Ciliophora. Origin of Metazoa. Kingdom Animalia: Subkingdom Phagocytellozoa Phylum Placozoa; Subkingdom Parazoa Phylum Porifera; Subkingdom Metazoa: phylum Mesozoa. The Radiata: Cnidaria and Ctenophora. The Bilateria: the Acoelomata: Platyhelminthes, Nemertea and Gnathostomulida. The Pseudocoelomata: Nematoda and minor pseudocoelomates. The Coelomata: Annelida, Mollusca, Arthropoda, Echinodermata, the unsegmented coelomates, and other minor coelomates. Differences between the Protostomata and Deuterostomata phyla. Invertebrate phylogeny.

- ❖ *HIV structure*
- ❖ *Why viruses are not living things*

SZL 303 Biostatistics

Introduction to quantitative treatment of biological data: nature of biological variation; basic descriptive statistics,

- ❖ *Statistical analysis and practical use of quantitative HIV data*

Types of distribution, probability and tests of significance, differences between means, association of two variables, parametric and non-parametric tests and variation under different conditions.

- ❖ *Variation in infection, prevalence rates across sex, age gender, geography*
- ❖ *Efficacy of data on condom / ARV usage*
- ❖ *Bio-geographical survey*

Experimental design.

- ❖ *Experimental design in HIV research, vaccine testing etc*
- ❖ *Methods of data collection*
- ❖ *Epidemiological surveillance*
- ❖ *Error reduction techniques in relation to HIV/ AIDS data*
- ❖ *Statistical / prediction models for projecting future trends, prevention and surveillance*

SZL 404 History and Philosophy of Biology

History: the growth of biological thought from the ancient Greeks to the present day. From Alcmaeon and the Hippocratic school to Aristotle. Aristotle's biology and his scientific method. Theophrastus to Crateuas and Galen. The eclipse of ancient science in the West. Transmission of Greek science by the Christian Syrians to the Arabs.

- ❖ *Theories and origin of HIV*
- ❖ *Nature and biology of HIV*
- ❖ *HIV virus*
- ❖ *Discovery of the HIV virus*

Islamic biology and medicine from the 9th to the 12th centuries.

- ❖ *Various religious perspectives towards HIV – role of the church Christian, Islamic and African*
- ❖ *Ethical implications (homosexuality, wife inheritance and role of cultural practices in preventing or promoting HIV)*
- ❖ *Moral implications (shame, guilt, stigma)*

Re-transmission to the West and the rise of Western science in the 12th and 13th centuries. The Western Universities. Leonardo and Vesalius to Borelli and Harvey. The classical microscopists. The early taxonomists to Linnaeus.

The overthrow of spontaneous generation theory: Redi, Spallanzani and Pasteur; modern ideas on the origin of life. Organic evolution: Buffon, Lamarck to Darwin and Wallace; modern controversies.

Mendel and modern genetics and research. The new synthesis. Watson and Crick and molecular biology. Philosophy: the presuppositions of science.

The nature of scientific law and the meaning of scientific explanation. The hypothetico-deductive method.

- ❖ *Legal and human rights issues (breach of confidentiality, discrimination and denial of care, hospital admission and drug treatment)*

Scientific proof: verificationism and falsificationism. Reductionism in science. The unity and diversity of scientific methods. Role of concepts and their refinement in biological explanation.

- ❖ *Impact of HIV on national development*
- ❖ *Discordant couples*
- ❖ *Gender disparity and HIV/AIDS*

SZL 410 Population ecology

Growth and regulation of populations,

- ❖ Diseases as regulators eg HIV AIDS impact on human populations
- ❖ Effects of age and gender on population

Intra specific and inter specific interactions;

- ❖ Polygamy and its impact on HIV transmission

Evolution of ecological strategies. Community ecology, delimitation of communities locally geographically, energy flow and its regulation.

- ❖ Geographical variations in HIV prevalence, locally and worldwide

Determinants of community structures and diversity,

- ❖ Cultural practices e.g. polygamy

Topics will be given a mathematical treatment whenever appropriate.

- ❖ Modeling of population dynamics
- ❖ Survival analysis

17.4 Chemistry

SCH 101: Atomic Structure and Chemical Bonding (R)

- Radiation: properties and applications; the theory of atomic spectroscopy – Planck, Einstein, Bohr and de Broglie theories; the line spectrum of hydrogen. The classical wave equation, the wave function concept, Heisenberg's uncertainty principle and the photoelectric effect, introduction to the Schrödinger equation; Quantum numbers, orbital types, shapes and energies. The electronic configuration of atoms and ions; Pauli Exclusion Principle and Hund's rule. The Aufbau principle: filling of s, p, d and f orbitals. Trends in atomic properties: the periodic table; ionization energies, effective nuclear charge, electronic affinities, atomic and ionic radii. Ionic and covalent bonding: bond length, bond energy, and bond polarity as indicators of reactivity and The Born-Haber cycle and Born-Landé equation. The molecular orbital theory, the valence bond and valence shell electron pair repulsion models as applied to shapes of simple molecules and ions. Hybridization of atomic orbitals.
- Periodic table: Mention on the micronutrients of metals and non-metals.
- Nutritive value of Mg, Ca, Fe, Zn, Se & I₂ and foods contain them to fight against HIV/AIDS in PLWA.
- Chemical reaction, van-der Waals bond, hydrogen bonds: The type of bonding between the HIV molecule and the cell can be said to be either van-der Waal forces. These are weak bonds which are holding the molecules together. (Antigen and antibodies in HIV/AIDS) hydrogen bond or some cases.
- Lattice energy: A HIV/AIDS patient needs a lot of energy

SCH 103 - General and Physical Chemistry (NT)

- Gaseous state: kinetic theory of gases; general equation of state; units of variables, properties of molecules and gas laws; velocities of molecules and kinetic energy; specific heats, C_p and C_v for monatomic gases; behaviour of real gases; determination of molar masses. Gas-liquid equilibrium; liquids and their solutions containing non-volatile solutes; modes of expressing concentrations; colligative properties and Raoult's laws; solutions of gases in liquids; Henry's law; solutions of two volatile (ideal) liquids. Chemical equilibrium; equilibrium constant; equilibria in gas phase, K_c and K_p interrelationship; ionic equilibria and solubility product principle; aqueous solutions of weak acids, weak bases and their salts; dissociation constant, hydrogen ion.
- The irreversibility of infected host cells.
- Catalysis; bioorganic enzymes that facilitate replication of the HIV.
- ARV acts as inhibitors of HIV replication.

Chemistry of the Main Block Elements (R)

- General trends of physical and chemical properties of Groups I – VIII along the periods and down the groups; Chemical intuition for inorganic chemistry connecting chemical composition, structure and bonding with reactivity; the chemistry, properties and uses of selected inorganic compounds including boranes, silicones, silicates, sulphates, nitrates, phosphates. Chemistry of some compounds of Noble gases; Ozone and

freons in the atmosphere; Role of inorganic chemistry in biology and the environment;

- Role of inorganic elements in biology: Mention on Ca, Mg, Se and I2.
- Selenium as immune booster through its antioxidant properties. Most reactions in patients results in production of free radicals.

SCH 204 - Introduction to Chemical Kinetics and Electrochemistry (R)

- Reaction rate processes and rate laws; order and molecularity of a reaction; explanation of zero, first, second, third and pseudo order reactions; determination of an order of a reaction; differential and integral rate equations; effect of temperature on reaction rate; energy of activation; Arrhenius equation.
- Electrolysis; electrical units; electrolytic conductance; molar conductance; experimental determination of conductance; conductance of solutions of strong and weak electrolytes; ionic conductance at infinite dilution. Applications of conductance measurements - conductometric titrations and solubility of sparingly soluble salt. Transference numbers and the methods of their determinations.
- Electrochemical cells: electromotive force (emf) of cells, the hydrogen electrode, the emf series and its uses, Nernst equation, concentration cells, the standard cell, the principle of measurement of the emf of a cell. Applications (electrolysis of NaCl, electroplating).
- Rate of HIV replication and HIV concentration in body fluids. Factor influencing progression from HIV to full-blown AIDS as analogy.
- Applications of emf in testing for HIV.

SCH 301: Theory of Spectroscopy (O)

- The electromagnetic spectrum, general introduction to spectroscopy, rotational, infrared and Raman spectroscopy; Electronic spectra of atoms and molecules, fluorescence and phosphorescence, atomic absorption, spin resonance spectra.
- The spectroscopic principle involved in detection of HIV using ELISA.

SCH 304: Coordination Chemistry (O)

- General properties of transition elements: electronic configuration, variable oxidation states, catalysis, coloured compounds and complexes. Transition metal complexes: Ligands, nomenclature, coordination number, effective atomic number (EAN) or 18-electron rule, stereochemistry, isomerism, Chelate and chelate effect. Bonding of coordination complexes: Valence bond theory, Crystal field theory: crystal field splitting of different geometries, electronic configuration of complexes and states arising, high and low spin complexes, crystal field stabilization energy, spectrochemical series, Orgel and Tanabe- Sugano diagrams. Ligand field theory: interelectronic parameters, Nephelauxetic effect. Molecular Orbital theory: complexes with and without π orbitals. Steric effects: tetragonal distortion, square planar and the Jahn Teller effect. Electronic Spectra: d-d transitions, charge transfer, selection rules, colours of different complexes. Effect of d orbital splitting: ionic radii and thermodynamic factors. Magnetic properties of transition metal

complexes. Some application and uses of selected examples of useful coordination compounds.

- Multi-dentate and chelating properties of protein (e.g. in HIV). The charge transfer in chromophores (i.e. presence of S, P, N, O etc in proteins). Haemoglobin as a metallo-protein complex: role in uptake and distribution of oxygen in human body.

SCH 310 - Surface and Colloid Chemistry (R)

- Adsorption: determination, characteristics and classification.
- Contributions of Langmuir, Brunauer-Emmett-Teller. Applications - chromatographic methods. Heterogeneous catalysis. Liquid surface. Solutes and surface tension. Action of surface active agents.
- Colloid state. Soils - preparation and properties. Gels. Emulsions. Natural and synthetic macromolecules - principles involved in their molar mass determinations. Applications. (Requires reformatting)
- The more the HIV particles adsorbed on the cell the more the destruction of the CD4 white blood cells.
- HIV only binds on CD4 selectively. Colloidal nature of protein separation in electrophoresis.

SCH 401 The Chemistry of Transition Elements (R-NT)

- Discussion of common features: Properties; colour, radii, shapes of d & f orbitals, magnetism, oxidation states and trends in ionization potential of first, second, third d-block and f block elements. Elemental sources; binary compounds, chemistry of lower and higher oxidation states, shapes of stable compounds, and reaction mechanisms of the first, second and third series of d and f-block elements. Introduction to lanthanides and actinides. Industrial uses and biological role of some transition elements.
- Importance of foods containing Fe and Zn to PLWHA.

SCH 4XX: Organometallic Chemistry (N)

- General survey of organometallic compounds: ionic, sigma bonded and non-classically bonded compounds. Synthetic methods, structures and chemical reactions of non-transition metals, organo compounds of lithium, sodium, potassium, magnesium, mercury, boron, aluminium, silicon, germanium, tin, lead, phosphorus, arsenic, antimony, bismuth compounds. Organometallic compounds of transition elements with lewis bases: phosphine, halides, hydride, oxygen, nitrogenase. Organometallic compounds of alkyls, aryls, carbines, cyclopentadiene and carbonyls. Introduction to reaction mechanisms/kinetics of catalysis of selected organometallic complexes. Industrial application and uses of some organometallic complexes.
- Application of organometallic compounds as catalysis in drug synthesis (e.g. ARVs/ART).
- Zeigler-Natta catalysis in polymerisation alkenes for making polythene (condoms).

17.5 Mathematics, Physics and Engineering

Mathematics

- **SMA 2104: MATHEMATICS FOR SCIENCES**
- **SMA 2200 CALCULUS III**
- **SMA 2343: OPERATIONS RESEARCH I**
- **SMA 2432: DESIGN AND ANALYSIS OF SAMPLE SURVEYS (G Orwa)**
- **SMA 2436: STOCHASTIC PROCESSES**

Physics

- SPH 2100 Mechanics I
- SPH 2202 Thermal Physics I (W. Njoroge)
- SPH 2303 Quantum Mechanics I
- SPH 2404 Nuclear Physics

Engineering

- FEE251/EME2208 Engineering thermal dynamics (A. Gitahi)
- FEE232/COM301 Computer programming
- FEE252/EME2209/WEEN215 Fluid mechanics
- FEE 582 Engineering management
- PRD511 Industrial law & ethics
- FEE560/WEEN560 Engineering project
- FEE650/TXL201 Research methodology

SMA 2432: DESIGN AND ANALYSIS OF SAMPLE SURVEYS (G Orwa)

Sample survey: definition, advantages and principal steps in organizing a survey. Types of samples: probability sampling and purposive sampling. Simple random sampling: sampling proportions and percentages: estimating sample size; stratified random sampling, systematic sampling, cluster and multistage sampling. Selections with PPS (probability proportional to size). Ratio estimation and regression estimation, sampling and non-sampling errors, organization of national surveys, and the central bureau of statistics ways of doing surveys. Use of computer packages.

Entry points

- Principal steps in organizing a survey; one may request the students to write down these steps in view of a research that involves HIV/AIDS
- Sampling proportions; here, the idea of splitting populations into two distinct parts is stressed and this may be further achieved using the fact that one either has the virus or not or all are affected yet one is either infected or not
- Types of sampling; systematic sampling, whereby after a number of known people, someone has the virus
- Ratio and regression estimation, in this topic, the concept of using auxiliary information to make inferences is brought. We may extend this idea to counseling that involves HIV/AIDS patients, especially when dealing with people who are not willing to volunteer information regarding their status
- the central bureau of statistics way of doing surveys; here one may ensure that data involving HIV/AIDS in the country has been discussed as one of the case studies from the CBS

SPH 2202 Thermal Physics I (W. Njoroge)

Heat, Temperature, Temperature scale. Zero'th Law of thermodynamics, thermodynamic systems. Adiabatic wall. Thermal Equilibrium. Calorimetry; Specific heat, thermal properties, one-dimensional heat flow. First law of thermodynamics. Adiabatic and isothermal processes. Black body radiation. Stefan - Boltzmann Law. Spectral distribution and electro-magnetic spectrum.

Entry points

- Reversible and irreversible processes compared to the irreversible nature of HIV
- Thermal equilibrium (or 0th law): If three systems (in this case people) are “interacting” they will come to equilibrium, i.e., if one is infected they will all be infected.
- Thermal equilibrium: Taking drugs can bring a state of equilibrium where the rate of reproduction of the virus is equal to the rate of discussion.
- Thermal diffusion: The HIV virus spreads quickly throughout the entire body and is not contained in a local area where it might be treated more easily.

FEE251/EME2208 Engineering thermal dynamics (A. Gitahi)

Definitions; system, process, state, property of a system, cycle, pressure, volume, temperature, work, heat. First law of thermodynamics: internal energy; non-flow energy equation; energy equation and reversibility. Application of first law to non-flow processes; constant volume, constant pressure, polytropic, adiabatic and isothermal processes. Application of first law to flow processes; continuity equation, application to boilers, condensers, turbines, compressors, nozzles, diffusers and throttling devices. Second law of thermodynamics: concept of the heat engine; cycle efficiency; reversibility and irreversibility. Engine efficiency. The Carnot cycle. Absolute temperature scale. Entropy; determination and property diagrams. Working fluids: properties of fluids and vapours; thermodynamic properties of steam; properties diagrams. Avogadro's law, the equation of state of a perfect gas, specific heats and non-flow gas processes.

Entry points

- Fundamental definitions with respect to the human system: *state*, *process* of infection
- The *irreversibility* of the HIV infection process – *entropy* as a measure of irreversibility

	Engineering thermodynamics	The case of HIV/AIDS in humans
1	Thermodynamic <i>system</i> : a region of fixed (definite) identity i.e whose state is well defined	Human <i>system</i> : human existence of a known identity (state) e.g. in good health, ill, critically ill etc
2	A thermodynamic system is moved from one state to another through a <i>process</i> . The process can either be <i>reversible</i> or <i>irreversible</i> . If reversible, the initial state of the system can be recovered	The human body is taken from a state of good health to a HIV-positive status through a <i>process of infection</i> . The infection process is <i>irreversible</i> i.e. the initial uninfected state cannot be recovered
3	In all natural processes, a <i>property</i> called <i>entropy</i> can either increase or remain the same - it <i>never</i> decreases. Additionally, entropy is a measure of irreversibility, if a process is accompanied by an increase in entropy, the process is irreversible	The human body always has foreign bodies, even in good health. But if the foreign-body load increases beyond a certain threshold, one gets sick...and if the foreign bodies involved are the HIV-virus, the process is irreversible i.e. the person's <i>entropy</i> has increased.

17.6 Mathematics and Statistics

YEAR ONE

SMA 2104: Mathematics for Sciences

Quadratic functions and Equations, Surds, logarithms and indices.
Permutations and combinations. Series: finite, infinite, arithmetic, geometric and binomial (positive integral index only) including applications to compound interest, approximations, growth and decay. Remainder theorem and its applications to solution of factorisable polynomial equations.

Trigonometric functions including their graphs and inverses in degree and radian measure, sine and cosine formulae, addition, multiple angle and factor formulae.

Statistics: collection and representation of data, and measures of central tendency and variability by graphical and calculation methods.

Probability: classical and axiomatic approaches to probability, compound events, conditional probability, tree diagrams, and binomial distribution.

Entry points:

- (i) *Permutations and combinations; one could give examples like, if a population is known to have 20% of the it as PLWA, then the meaning of this is that there are 20 people in every 100 LWA, and the students may be asked to find the possible ways in which these PLWA can be found within the population of 100, a question that requires them to find 100 combination 20.*
- (ii) *Growth and decay; the very introductory concepts of growth curves may capture the manner in which HIV/AIDS prevalence is increasing or decreasing in a certain village. This may simply be mentioned as a highlight or some data may be provided for the students to fit into the growth curves.*
- (iii) *Statistics; in this topic, the methods of displaying data like histograms, pie charts, ogives etc, may be plotted using HIV/AIDS data in relation to any aspect of the pandemic*
- (iv) *Probability; topics like the contingency tables are introduced here, and when describing the different intersections and unions of events say A and B, one may look at these as HIV positive and negative people and briefly demonstrate to the students the different concepts of probability like $pr(A/B)$, $pr(A^{\wedge}B)$ or even $pr(\sim A/ \sim B)$ etc. in the same topic, one may use the tree diagrams to describe problems that ensure from complex sex villages, and how this leads to HIV/AIDS from even unknown quarters.*

YEAR TWO

SMA 2200 Calculus III

Polar coordinates: their definition, relationship with Cartesian coordinates, graphs and equations.

Limits, continuity and differentiability. Sequences and series: convergence tests. Mean value theorem of differential calculus. L'Hopital's rule. Rolle's theorem. Power series: Taylor's and Maclaurin's theorems including applications to binomial, logarithmic, exponential, trigonometric and hyperbolic functions. Trigonometric and hyperbolic representation of complex numbers.

Partial differentiation including first and second partial derivatives, total derivatives, and change of variable for two independent variables.

Integration: reduction formulae, applications to arc length, plane and surface area, volume, mass centre and moments of inertia in Cartesian and polar coordinates. Improper integrals and their convergence. Integration as the limit of a sum including pincer method for evaluation of simple integrals. Double integrals including change of order of integration and change of variable.

Entry points:

- (i) *limits, continuity and differentiability; tell the students that a continuous function is similar to a person who is HIV negative, and because of this, they continue living without so many conditions, unlike the HIV positive who must be on diets to live long just like the functions which will be undefined if some conditions are not heeded*
- (ii) *Partial differentiation; one may have one of the variables being considered as the HIV. By this consideration, it is possible to explain to the students how this virus differentiates the whites cells selectively with respect to time amidst other cells, thereby reducing the immune levels of the person affected*
- (iii) *Integration; in the review of the techniques of integration, it is easy to demonstrate how complicated functions can be broken in partial functions (partial fractions) and integrated separately and later summed to find an ultimate solution. In the same way, we may divide and rule/administer to people with HIV/AIDS. In reduction formulae, we get a structure that can be used to integrate any other function that takes the shape of a known one. In the same way we may develop a therapy to be used by all the patients in possession of particular characteristic or at a given stage/phase of the disease. In the same topic of integration, we demonstrate how integration is a limit of a sum. This can straight a way be related to the fact that AIDS is the limit of HIV.*

YEAR THREE

SMA 2343: Operations Research I

Formulation of linear optimization models. Convex analysis in R^n (n dimensional space). Linear programming: formulation and graphical solution, the simplex method, duality, economic interpretation and sensitivity analysis. Classical transportation problems and extensions. Models from agricultural economics, regional planning and resource allocation. Use of computer packages.

Entry points:

- (i) *formulation of linear optimization models; these models apply to all the spheres of life and one should therefore try to capture a scenario in which a model is constructed to optimize a particular HIV/AIDS aspect like cost of living for a patient,*
- (ii) *linear programming, one may get data that involves choosing different combinations of foods which will enable a patient to be strongest at the cheapest cost, given many options. The concept of living positively may also be mentioned here since it maximizes the duration of stay for the patients*
- (iii) *Transportation problems and extensions; this part may be used as an example of a well-wisher who is distributing food and other necessities to HIV/AIDS patients all over the country. A scheme can therefore be worked to advice on the best paths to adopt in order to get furthest at the lowest cost*
- (iv) *Regional planning and resource allocation; here, resource allocation is usually based on some weights. One may use infection by the virus as a score to getting bigger shares of anything*

YEAR FOUR

SMA 2432: Design and Analysis of Sample Surveys

Sample survey: definition, advantages and principal steps in organizing a survey. Types of samples: probability sampling and purposive sampling. Simple random sampling: sampling proportions and percentages: estimating sample size; stratified random sampling, systematic sampling, cluster and multistage sampling. Selections with PPS (probability proportional to size). Ratio estimation and regression estimation, sampling and non-sampling errors, organization of national surveys, and the central bureau of statistics ways of doing surveys. Use of computer packages.

Entry points:

- (i) *Principal steps in organizing a survey; one may request the students to write down these steps in view of a research that involves HIV/AIDS*
- (ii) *Sampling proportions; here, the idea of splitting populations into two distinct parts is stressed and this may be further achieved using the fact that one either has the virus or not or all are affected yet one is either infected or not*

- (iii) *Types of sampling; systematic sampling, whereby after a number of known people, someone has the virus*
- (iv) *Ration and regression estimation, in this topic, the concept of using auxiliary information to make inferences in brought. We may extend this idea to counseling that involves HIV/AIDS patients, especially when dealing with people who are not willing to volunteer information regarding their status*
- (v) *the central bureau of statistics way of doing surveys; here one may ensure that data involving HIV/AIDS in the country has been discussed as one of the case studies from the CBS*

SMA 2436: Stochastic Processes

Random phenomena in time and space. Stochastic processes in discrete and continuous time. Poisson processes: homogeneous and inhomogeneous Poisson processes. Markov chains: property and discrete time. Sojourn times and stationary distributions. Classification of states. Absorption probabilities. Expected times of transitions. Random walks and generating functions. Recurrent events. Pure birth, pure death, birth – death processes.

Entry points:

- (i) *Random phenomena in time*
- (ii) *Poisson processes- talk of the Poisson approximation of rare events to binomial. An example can be used to illustrate the effect of the disease in an institution if it is still rare.*
- (iii) *Markov chains; the forgetfulness property of these chains is exactly similar to the human behavior which is actually so independent of what their neighbors encounter.*
- (iv) *Expected times of transitions; one may use a transitional matrix developed from hospital data to just demonstrate how patients get into the different phases of the disease and how long they might take to exit from the population when they finally succumb to the disease*
- (v) *Random walks; highlight to the students the fact that the HIV/AIDS virus is indiscriminate in its actions of infection*
- (vi) *Pure birth, pure death, and the birth – death processes; here one may discuss examples involving population changes with respect to HIV/AIDS*

17.7 Computer Science

UCC104 : Concepts of Computer Applications

This course provides first year students with the generic computer skills needed for academic, personal and professional achievement. Students will be introduced to windows-based operating systems, typing tutor, graphic presentations, Internet, word processing and spreadsheet applications.

Contents

1. Introduction to computers, typing tutor and operating systems,
2. Word processing
 - a. Core
 - b. Advanced
3. Internet, E-mail, Networking
Entry Point
 - ♠ *Students will be encouraged to browse the internet on HIV/AIDs when practicing their browsing skills.*
 - ♠ *The Computer viruses will be compared to the HIV/AIDS virus whereby the students will be taught the different types of viruses, transmission methods (e.g. infected storage devices vs having intercourse with infected people) and prevention methods e.g. Use of Anti-Viruses.*
4. Graphic Presentation Tools
Entry Points.
The students will be required to make graphic presentations on HIV/AIDs topics researched on Internet browsing.
5. Spreadsheets
Entry Points.
The statistics researched above can be used to draw different types of charts using MS Excel.
6. Databases

CSC 102: Computers and Society

This course introduces Information Technology and information systems. Social structures, their boundaries and their interdependencies are considered along with perspectives on IT, Society and IT, National development, legal and ethical issues relating to IT systems (intellectual property rights, copyright laws, etc.), the information society: emergence and perspectives, and IT in selected application areas.

Entry Point

When discussing the impact of IT in the society, the students will be asked to research on the impact of IT in the fight against HIV/AIDS and consequently in National development.

CSC 406 Applied Computer Graphics

This course includes displays (line and point plotting systems; raster vector, pixel and point plotters; continual refresh and storage), devices (very high-resolution devices, display processors, and character generators), display techniques (colour-display techniques, display description, screen co-ordinates, user co-ordinates, graphical data structures, and display-code generation, the viewing algorithm and transformation), interactive graphics (pointing and positioning devices such as cursors, light-pens, digitising tablets, mouse and track balls), interactive graphical techniques (positioning, elastic lines, windowing, zooming, clipping, etc.), graphical software (three-dimensional graphics) workstation models (bit-mapped, raster operations postscript) and graphics standards (PHIGS and GKS).

Entry Point

Students will be encouraged to come up with projects that model the HIV/AIDS behavior e.g. replication, transmission etc, to facilitate easy comprehension of the HIV/AIDS to lay-people.

**Higher Education Science and Curricular Reforms:
African Universities Responding to HIV/AIDS**

**In-Country Training, Kenya
Kenya Institute of Education (KIE)
8th – 10th May 2007**

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