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AWSE African Women
in Science and Engineering

HIGHER EDUCATION SCIENCE AND CURRICULAR REFORMS: AFRICAN UNIVERSITIES RESPONDING TO HIV AND AIDS THROUGH FACULTIES OF SCIENCE AND ENGINEERING

REPORT ON

COUNTRY TRAINING ACTIVITIES

IN

GHANA, RWANDA, BOTSWANA AND KENYA

December 2006 - May 2007

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Editors

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Executive Summary

The project on "Higher Education Science and Curriculum Reform: African Universities Responding to HIV and AIDS" was jointly organized by UNESCO's Regional Bureau for Science and Technology in Africa and African Women in Science and Engineering (AWSE), Nairobi, Kenya.

This report summarizes the in-country training workshops held for universities in four countries – Ghana, Rwanda, Botswana and Kenya between 2006 and 2007. The workshops were preceded by the Nairobi workshop held in April 2006 where representatives from universities in five countries namely Botswana, Eritrea, Kenya, Ghana and Rwanda were first sensitized on the concept of mainstreaming HIV and AIDS into the university curriculum.

The main purpose of the in-country workshops was to identify courses (units) for integrating HIV and AIDS into engineering, biological and physical sciences, train lecturers as trainers (ToTs) in each course area and produce country-specific integrated modules. The workshops also served as a forum for sharing information and experiences on HIV and AIDS prevention and impact mitigation interventions by different African Universities

The theme of the workshop fell within the wider UNESCO project on prevention education for African Universities which seeks to create awareness among scientists and in particular within the Faculties of Science and Engineering on the need and importance of responding to the impacts of HIV and AIDS within the university environment and the wider society. The project also aims at building the university staff capacity in applying the concept of mainstreaming HIV/AIDS into their respective courses.

List of Abbreviations

ACU	AIDS Control Unit
AIDS	Acquired Immuno-deficiency Syndrome
ART	Anti-retroviral Therapy
ARV	Anti-retroviral
AVU	African Virtual University
AWSE	African Women in Science and Engineering
CD4	Cluster of differentiation 4
HIV	Human Immuno-deficiency Virus
IPT	Insulin potentiation therapy
ISTA	Institute of Science and Technology for Africa
JKUAT	Jomo Kenyatta University of Agriculture and Technology (Kenya)
KIE	Kigali Institute of Education (Rwanda)
KNUST	Kwame Nkrumah University of Sci. and Technology (Ghana)
KU	Kenyatta University (Kenya)
PLWHA	People Living With HIV and AIDS
PMTCT	Prevention of Mother-to-child Transmission
TOTs	Trainer of Trainers
UCHAS	University Centre for HIV and AIDS Studies
UNAIDS	Joint United Nations Programme on HIV and AIDS
UNESCO	United Nations Educational, Scientific and Cultural Organization
UoB	University of Botswana (Botswana)
UoN	University of Nairobi (Kenya)
VCT	Voluntary Counseling and Testing

Background

The reality of HIV and AIDS threatens the world and particularly Africa like nothing else has done for the last few centuries and has surpassed malaria as the leading cause of death in Africa. In 2007 the global HIV and AIDS prevalence stood at 33.2 million people living with HIV and AIDS of which 22.5 million are in sub-Saharan Africa - that is 68% of the HIV infected population globally. It is also estimated that in 2007 AIDS related deaths globally was 2.1 million which decreased from 2.9 million estimated the year before. However, there are indications that the prevalence might be declining significantly in countries like Kenya and Zimbabwe and to a lesser extend in Cote d'Ivoire, Mali and urban Burkina Faso. The decline in these countries has been attributed to a shift towards safer behaviour.

Most of those who are affected by HIV and AIDS are within the age group of 15 - 24. During The International Conference on AIDS and STIs in Africa (ICASA) held in Nairobi in September 2003, it was revealed that women are the most affected with HIV and AIDS with women aged 15 - 49 years being 1.4 times more infected compared to men of the same age. By this and any other measure, the AIDS pandemic in Africa is one of unprecedented magnitude and complexity. This calls for an equal response from all the stakeholders. African universities have an important role to play in this response, both on and off campus, through promoting informed engagement on HIV and AIDS issues and through greater responsibility towards their stakeholder communities.

African Universities have been accused of being silent and ashamed about the presence of HIV and AIDS on their campuses and the impact on the operations of the institutions. There have been very few institutional responses and the few activities on HIV and AIDS have been on individual initiatives or student lead.

The project on African Universities Responding to HIV and AIDS through Curricula Reforms is a response to these conditions, aimed at eliminating the "culture of silence" and developing a concerted university response to HIV and AIDS both internally and in terms of engagement with the community at large. Universities must go beyond information and sensitization campaigns for behavior change, and integrate relevant HIV and AIDS concerns into all teaching programmes and courses, while underlining their relevance to subsequent professional life.... The goal is to develop HIV and AIDS-educated and HIV and AIDS-competent graduates who will be adequately qualified to carry HIV and AIDS concerns into their subsequent professional life. The project also comes at a particularly opportune time when many universities have realized the need to formulate institutional HIV and AIDS policies and to include prevention and impact mitigation activities in their strategic plans. In addition, many are re-examining their curricula and courses, with a view to addressing Africa's development needs and challenges and making them relevant to the industry and business demands. However, none of these curricular reforms have focused on HIV and AIDS in all teaching programmes. Some universities have initiated sensitization programmes not only to address on-campus needs, but also to link educators, staff, and students with off-campus organizations active in informal prevention education campaigns.

The project on African universities Responding to HIV and AIDS through Curricular Reforms has been implemented in the following three stages:-

1. Sensitization on the role of Universities in HIV and AIDS Prevention and impact mitigation through mainstreaming and integration of HIV into course programmes
2. Faculty sensitization activities and identification of course entry points for integration of HIV and AIDS
3. In-country training workshops for lecturers as trainer of trainers (ToTs) on mainstreaming and integration of HIV and AIDS into university courses.

Stage One - The role of Universities in HIV and AIDS Prevention and Impact mitigation: Mainstreaming and Integration of HIV and AIDS into the curriculum

A workshop was held in Nairobi, Kenya, from 11th – to 13th April 2006. The Deans of Faculties of Science and Engineering and Coordinators of AIDS Control Units (ACUs) from twenty two (22) Universities in five countries, namely; Botswana, Eritrea, Ghana , Kenya and Rwanda participated.

The Objectives of the workshop were:-

1. To sensitize scientists and engineers on the need for common and mainstreamed undergraduate courses on HIV and AIDS within their faculties.
2. To confront the HIV and AIDS epidemic through curricular review in universities, especially in science and engineering programmes.
3. To build the capacity of scientists and engineers on how to develop common HIV and AIDS undergraduate courses by exposing them to what other universities have done in this area.
4. To provide a platform for strategic planning by scientists and engineers on the best way of mainstreaming HIV and AIDS into their courses.
5. To improve science and health education in African universities and communities.

Outcome of the Workshop

The participants shared experiences of HIV and AIDS programmes and activities on their campuses, learnt about the concept of mainstreaming in the context of HIV and AIDS and the university environment and also identified specific entry points for integrating HIV and AIDS into physical and, biological sciences and engineering programmes. The idea was to build the capacity of the universities to include HIV and AIDS facts and issues where relevant into their teaching programmes.

The workshop discussed in detail the role of universities in Africa in the fight against HIV and AIDS and that of faculties of engineering, physical and biological science programmes in particular. The workshop was facilitated by Prof. Michael Kelly. In his address to the participants, Prof. Kelly outlined the mandate of the universities in an AIDS affected society as follows:

1. To respond to the needs of an AIDS-affected society.
2. To do so through HIV and AIDS-informed knowledge and training.
3. To protect, transmit and expand the storehouse of wisdom and knowledge.
4. To adapt what is best from outside.
5. To generate further knowledge, understanding, wisdom and practice.
6. To engage with society by applying old and new knowledge to the identification and solution of problems occasioned by HIV and AIDS.

Professor Kelly informed the participants that All universities must respond to HIV and AIDS simply because:

- No university is immune.
- The long lead-time between becoming HIV infected and manifesting what we call AIDS affects students and staff differently (mostly, AIDS tends to manifest itself in students after graduation, while for staff, it is while they are in service).
- This can affect institutional functioning and the attainment of institutional objectives.
- A society with AIDS needs the special kind of help that only a university can give.
- The university has a special responsibility for the development of professional human resources.
- A university should be a key agent of change and provider of leadership within a society.
- It should be the dynamic source for new intellectual, cultural, philosophical, theological, linguistic, scientific understandings of the disease.
- It has the multidisciplinary intellectual capacity to consider in depth the complex human rights, legal, and ethical issues raised by AIDS.
- The epidemic and its impacts will be part of the social scene for generations to come.

Mainstreaming HIV and AIDS in the Curriculum

While addressing the concept of mainstreaming, Professor Kelly noted that mainstreaming HIV and AIDS in the curriculum is a huge undertaking that requires academic leadership. This includes Vice-Chancellor, Deputy Vice-Chancellors, Deans of Faculties and Heads of departments. Each one of these people needs to be convinced about the importance of mainstreaming HIV and AIDS into the operations of the University and integrating HIV and AIDS into the curriculum in order for them to initiate action. This way, they will be able to bring other members of staff on board. The leadership has to bear in mind that when they respond to HIV and AIDS through mainstreaming and integrating it into the curriculum, they are showing responsibility at three levels:

- *Responsibility to staff and students* – to keep them HIV-free, to equip them with knowledge and understanding befitting university personnel in their discipline, to support those infected and affected.
- *Responsibility to institution* – to protect its functioning, to proclaim its commitment in the AIDS struggle, to foster positive responses to the epidemic.
- *Responsibility to society* – to identify with an AIDS-affected society, to bring university resources to bear on responding proactively and in a hope-filled way.

Prof. Kelly went ahead to highlight reasons why HIV and AIDS must be integrated into the curriculum. These include:

- *Personal reasons:* to provide knowledge and dispel myths; strengthen life skills; facilitate/support responsible behaviour; enhance basic value systems (human rights; gender equality; absence of stigma/discrimination; rule of law; confidentiality)
- *Professional reasons:* to develop competence to respond to and manage HIV and AIDS in the world of work (especially AIDS-in-the-workplace issues); initiate into areas of developing understanding and research
- *Institutional reasons:* to manifest university's concern; protect investment in human resource development; enhance university's ability to respond; bring university into public leadership response role

In his concluding remarks, Prof Kelly further noted that there is need to appreciate all the efforts in place to address HIV and AIDS. He specifically pointed out the need to acknowledge and appreciate programmes that benefit people living with HIV and AIDS such as PMTCT, IPT and ARV. However he also stressed the need to realize that for every person who is on ARV, the interpretation is that society has failed to prevent that infection. This shows that prevention is vital and integrating HIV and AIDS into the curriculum is one prevention program that universities can provide leadership in. It is anticipated that universities will pick up this challenge in order to instill positive and meaningful impact on staff and student behaviour aimed at reducing HIV infection rates and preventing new infections through curricular reforms on the campuses.

Stage Two: University Sensitization Workshops

All participating universities in stage one above were invited to submit a proposal for funding to sensitize members of their universities and to identify curriculum for integration. Twenty (20) Universities won the mini grants and proceeded to stage three of the programme. Most universities held workshops to sensitize university management, senior officials, staff and students leaders on the importance of mainstreaming HIV and AIDS and integrating it into the science and engineering curriculum.

Stage Three: In-country Training workshops

Stage three was the in-country training workshop to impart knowledge and skills to lecturers on how to integrate HIV and AIDS into their respective curriculum and the teaching approaches to be utilized. The resource persons took the participants through key functions of mainstreaming and integration. Individual curriculum/course outlines from each Faculty from participating universities were used to train on integration into the curriculum as part of the hands on experience to sharpen the participant's skills and instill confidence in their ability to integrate and teach HIV and AIDS. In-country training workshops were implemented in four countries namely, Ghana, Rwanda, Botswana and Kenya.

1.0. Ghana In–Country Training Workshop

Workshop Overview

The workshop was held at Kwame Nkrumah University of Science and Technology (KNUST), Kumasi, Ghana from 6th – 8th December 2006 at the University Centre for HIV and AIDS Studies (UCHAS) of the Institute of Science and Technology for Africa (ISTA). Workshop participants were from KNUST, University of Ghana, University of Cape Coast, University of Education Winneba, Garden City University College, Kumasi Polytechnic and Christian Service University College. A total of thirty nine (39) participants were trained during the workshop.

The objective of the workshop was to learn about the concept of mainstreaming in the context of HIV and AIDS and the university environment, and 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 an 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 the curricular with a focus on integration of HIV and AIDS into the physical, biological and engineering courses.

Specific objectives

- To confront the HIV and AIDS epidemic through curricular review in universities, especially in science and engineering programmes.
- To sensitize science and engineering lecturers from universities in Ghana on the need for a common and mainstreamed undergraduate courses on HIV and AIDS within their faculties.
- To build the capacity of scientists and engineers from universities in Ghana on how to develop common HIV and AIDS undergraduate courses by exposing them to what other universities have done in this area.
- To assist the participants develop country-specific sample teaching modules for their individual courses.
- To provide a platform for strategic planning by scientists and engineers on the best way of mainstreaming HIV and AIDS into their courses.

Expected Output

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

Plenary Presentations

1. ***An Overview of HIV and AIDS in Africa and its impact on Education*** - Prof. Debra Meyer.

   The presentation focused on the following key issues:-

   - Statistics on HIV and AIDS in Africa
   - AIDS affects all aspects of life on the African continent
   - Causative agents of HIV and AIDS
   - Factors promoting or fueling HIV transmission in Africa

- AIDS impacts education in the following ways:-
  - Decrease support systems and access to education
  - Increase absenteeism and demand for education
  - Decrease the supply of education
  - Increase education sector costs
  - "The new brain drain"
- Education is a powerful agent to curb the infection through awareness creation for behavioral change.
- Universities are responding through policies and strategic plans.

2. ***UNESCO initiatives on HIV and AIDS in Africa*** - Mrs. Alice Ochanda.

The presentation focused on the following key issues:-

- Global statistics on HIV and AIDS
- UNESCO as a member of UNAIDS
- UNESCO's contribution is mainly complimentary to and supportive of Governments' efforts.
- UNESCO' leads the Global Initiative on Education and HIV and AIDS, launched in 2004 by UN-AIDS - EDUCAIDS
- EDUCAIDS' goals are to prevent the spread of HIV and AIDS through education and to protect the core functions of education systems.
- UNESCO's response to HIV and AIDS are driven by the belief that
  - Prevention education works,
  - If done well, it is effective,
  - If done immediately it will have long-term impact and,
  - If done massively, it can turn the tide.
- UNESCO's strategy for HIV and AIDS intervention revolves round five key areas:.
  - Advocacy at all levels
  - Customizing messages and finding the right messengers
  - Changing risk behaviour and vulnerability
  - Caring for the affected and the infected
  - Coping with the institutional impact

3. ***East African Universities Initiative on HIV and AIDS and Curricular reforms*** - Prof. Caroline Lang' at Thoruwa.

The presentation focused on the following key issues:-

- The impact of HIV and AIDS on Universities
  - Responses by the East African universities in the areas of policy, AIDS Control Units, Strategic Plans, Student Programs, Community outreach, Research and Curriculum Reforms.
  - Approaches that some universities in Kenya have employed to mainstream HIV and AIDS in the curricula.
  - Review of traditional health/ medical courses.
  - Emerging HIV and AIDS programs and courses.
  - Specialized HIV and AIDS core/common courses.
  - HIV and AIDS integrated into existing core courses.
  - Teaching Approaches:
    - Team teaching.
    - Guest speakers – PLWA, NGOs.
    - Lectures, assignments- group work, research, videos, and internet.
    - Examinable courses.

- Challenges Experienced:
    - Large classes.
    - Limited resource materials – internet, books, journals, CD-ROMs.
    - Limited funds for capacity building and community outreach.
    - Lack of monitoring and evaluation.

4. ***Southern African Universities Response to HIV and AIDS and Curricular reforms*** - Prof. Debra Meyer.

   The presentation focused on the following key issues:-

- The need to ensure that any attempts to reform the curricular complied with the existing structure and policy of the university.
- Defined HIV and AIDS curriculum integration to mean the addition of HIV and AIDS relevant content to existing curriculum or development of new HIV courses.
- Noted that there might be a need to engage educational experts for assistance in order to integrate HIV and AIDS in the curricular.
- The focus of the reform should be on behavioral change rather than memorization.
- Not to overload the existing curricular.
- Incorporating research projects on HIV and AIDS as part of students work.
- Introduced SENCER as another mode of curriculum integration.
- The SENCER (Science Education for New Civic Engagement and Responsibilities) concept means teaching science through the lens or a door way of a burning social issue like AIDS.
- The universities need to acknowledge that HIV and AIDS does exist and combat it through: teaching, research, and community engagement.
- The need to develop university policies & strategies on HIV and AIDS - link with national policies/ plans
- Structures to manage HIV & AIDS issues
- Establish HIV and AIDS Committees, Units, Centers

5. ***Overview of HIV and AIDS in Ghana*** - Dr. S.Osafo Acquaah.

   The presentation focused on the following key issues:-

- Statistics on HIV and AIDS in Ghana
- Government response to HIV and AIDS in Ghana – multi-sectoral strategy of the Ghana AIDS commission:-
    - Policy, advocacy and enabling environment.
    - Co-ordination and management of decentralized response.
    - Mitigaging social,cultural, legal and economic impacts of AIDS.
    - Prevention and behaviour change communication.
    - Treatment, care and support.
    - Research, surveillance, monitoring and evaluation.
    - Resource mobilization and funding arrangements.
        - Existing behaviour of the general public

6. ***Knowledge, attitude and perception of KNUST students to HIV and AIDS epidermic*** - Dr. S. Osafo Acquaah.

   The presentation focused on the following key issues:-

- Background to HIV and AIDS
- Survey at KNUST and some secondary schools in Ghana on knowledge, attitude and perception to HIV and AIDS.

- Survey results – KNUST students and those of other tentative institutions needed more information on HIV and AIDS
- There is need to train more peer educators

7. ***Rationale for integrating HIV and AIDS into University Curricular*** - : Dr. Zipporah Ng'ang'a.

The presentation focused on the following key issues:-

- Global statistics on HIV and AIDS.
- The purpose of integrating HIV and AIDS into university curricular:
  - To provide accurate information on the disease.
  - To train them as peer counselors.
  - To reach out to the community.
  - Be generators of information through research and innovation.
    - Rational for integrating HIV and AIDS into university curricular.

8. ***Incorporating HIV and AIDS issues into Biological Sciences curricula at KNUST*** - Dr Peggy Oti-Boateng.

The presentation focused on the following key issues:-
The purpose of incorporating HIV and AIDS into Biological Sciences curricular is:-
- For information.
- To assist students to appreciate the effect of nutrition on the disease.

Areas that HIV and AIDS studies could be integrated are:-
- Nutritional Interventions for food security and health promotion.
- Nutrition and Anti-retroviral Therapy: Health Promotion and Nutritional supplementation for PLWA.
- Nutrition and Palliative Care: Role of nutrition in the disease and specific food Benefits for HIV and AIDS patients.

9. ***Incorporating HIV and AIDS issues into Engineering curricula at KNUST*** - Dr Eric Forkuo, . The presentation focused on the following key issues:-

- Various mathematical and statistical models that can be used for understanding the epidemiology of HIV and AIDS.
- The spread of HIV and AIDS infection is often associated with geographic factors such as population mobility, accessibility and proximity to high transmission or urban areas etc, spatial analysis of HIV Prevalence.
- Undergraduate Programmes in Engineering.
- Existing Common Courses- Examples for integration:
  - Engineering drawing.
  - Communication skills.
  - Mathematics and statistics.
  - Engineering technology.
- Mathematical modelling of HIV and AIDS Epidemic.
- Other Models- Spatial Information Systems.
- GIS undergraduate and postgraduate courses.
- Research options.

10. ***Incorporating HIV and AIDS issues into Mathematics curricula at KNUST*** - Prof. I. K. Dontwi.

The presentation focused on the following key issues:-

- Integrating HIV and AIDS into statistics and Mathematical modeling.

11. ***HIV and AIDS activities at the University of Cape Coast*** - Dr. Alfred Owusu.

The presentation focused on the following key issues:-

- Formation of a university committee.
- Training of committee members in South Africa.
- Proposal on mainstreaming HIV and AIDS in University curriculum.
- University grant from UNDP on HIV and AIDS. key issues.

12. ***Integration of HIV and AIDS into Physics and Engineering*** - Prof. Debra Meyer

The presentation focused on the following key issues:-

- Highlighted areas in physics and engineering that could be integrated
- Noted that tertiary education institutions:
- Must be dynamic
- Change with the time
- Needs to better prepare students for the 'real world'
- Needs to update/improve continually

13. ***Integration of HIV AND AIDS into Biological Sciences*** - Dr Zipporah Ng'ang'a. The presentation focused on the following key issues:

- Challenges of integrating HIV and AIDS into the Biological Sciences.
- Identified topics in biological Sciences that HIV and AIDS could be integrated.

Breakout Discussion Groups

The participants were then divided into four working groups to facilitate the training process. The groups were as follows: Social Sciences (In areas of Business and Religious Studies), Engineering, Biological, and Physical Sciences. In-depth discussion on how HIV and AIDS issues could be integrated or mainstreamed into these courses took place within the groups and paved way for consensus among the lecturers on entry points for each course.

Courses Identified for Integration by Universities in Ghana

Integration of HIV and AIDS into the following existing Common Courses for all engineering students:

- Engineering drawing
- Communication skills
- Mathematics and statistics
- Engineering technology

Communication Skills (First Year, semester 1)
The discussion group suggested that the first semester Communication skill syllabus for all first year students in Engineering could be re-structured to integrate the following HIV and AIDS topics:

- General back ground of the disease
- Biology of the disease

- Parasitology of the disease
- Prevalence
- Prevention

The group agreed that a multidisciplinary approach would be used to teach the courses. The group also proposed that experts in HIV and AIDS from other departments would be invited to teach these non-engineering topics.

Other courses that could integrate HIV and AIDS are:

- Mathematical modelling of HIV and AIDS Epidemic
- Math 151 Mathematics I (First Year, semester 1)
- MATH 152 Mathematics II (First Year, semester 2)
- MATH 251 Mathematics III (Second Year, semester 1)
- MATH 251 Mathematics III (Second Year, semester 2)
- MATH 351 Statistics (Third year, semester 1)
- Geographic Information Systems (GIS)

In Ghana, GIS course is being offered to third and fourth year students of Geomatic Engineering. GIS is also offered in the following postgraduate courses where integration is possible.

- Msc in Geomatic Engineering
- Msc in Transportation Engineering
- Msc in Water resources
- Msc in Environmental Engineering
- Msc in Natural Resources
- Msc in Land Economy
- Msc in Planning

Undergraduate Research Option

Students with different background undertake research using GIS as a tool. Currently there are students in Civil Engineering, water resource management, natural resources, land economy and Geomatic Engineering. Spatial analysis may be an important tool to monitor the epidemic, predict future treatment demands and to target areas for public health interventions. The difficulty of obtaining HIV data and the stigma associated with disclosure however, is a major obstacle to the use of GIS in HIV research in Ghana.

Use of GIS in HIV and AIDS research:

- Geographical modelling and spatial prediction of impacts of HIV and AIDS
- Health service locational planning using GIS Spatial Model
- Relationship of HIV and AIDS with climate and physio-environmental

Postgraduate Research Option (Mphil and MSc)

Another major area where the integration of HIV and AIDS can be effective is at the postgraduate level. Students from Geo-physics, Transportation Engineering, Water resources management, Environmental Engineering, Natural resources, Geomatic Engineering, Settlement planning and, Land economy can be targeted to generate research projects that focus on HIV and AIDS. GIS concepts and principles are handled and the students could use GIS as a tool for monitoring the spread of HIV and AIDS, modelling the future diffusion of the disease and in planning the timely allocation of resources to prevent the spread of the disease and to treat those who already have fallen victim to it.

Integrating HIV and AIDS into Social Sciences

Case I: Introduction to Business Studies – BUS100

Case 2: Introduction into Religious Studies

Challenges faced by universities in their response to HIV and AIDS

- Lack of University Policy on HIV and AIDS. This would be important for effective integration of HIV and AIDS into the curriculum. The University commitment is very important.
- The study of the HIV and AIDS is multifaceted including basic and clinical sciences, epidemiology, public health, and social sciences. Therefore for effective integration, experts in these areas are needed.
- Insufficient teaching resources including textbooks, reference books, journals and magazines in HIV and AIDS to support effective teaching

COMMUNIQUÉ

The conference participants appreciated the workshop initiative by UNESCO/AWSE to support African Universities to respond to HIV and AIDS through curricular reforms and issued the following Communiqué:-

COMMUNIQUE FROM THE WORKSHOP ON HIGHER EDUCATION, SCIENCE AND ENGINEERING CURRICULA REFORMS: IN-COUNTRY TRAINING WORKSHOP AT KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, (KNUST), KUMASI, GHANA 6TH TO 8TH DECEMBER 2006

We, the participants of the Workshop on Higher Education, Science and Engineering Curricula Reforms drawn from higher educational institutions in Kenya, South Africa and Ghana,

Recognizing the alarmingly high incidence and prevalence rates of HIV and AIDS in Sub-Saharan Africa,

Aware of the debilitating consequences of the virus on the human resource base of the continent,

Conscious of both the short and long term impacts of the virus on higher educational institutions on the continent in particular,

Desirous to respond to and provide the leadership that will create the platforms for in-depth discourse on finding solutions to curb the menace caused by the virus,

UNESCO and the AWSE, have instituted a series of seminars and workshops with the objective of ensuring that HIV and AIDS issues are effectively integrated and mainstreamed into the curricular and workplace policies of higher educational institutions at all levels.

Universities are crucial agents of change and must provide leadership and direction. As such they are expected to take a lead role in HIV and AIDS prevention and impact mitigation. As the brain cells of society, universities must not disappoint those societies. HIV and AIDS is not a passing cloud and no University in sub-Saharan Africa can stand by and watch.

Universities have a moral duty to respond adequately to the pandemic by adopting pragmatic policies and strategic plans, and ensuring that the curricula respond adequately to the disease aimed at making students competent in dealing with HIV and AIDS personally in their own lives and to dispel myths and misconceptions.

Mainstreaming, to be effective, should occur at various levels. Stand-alone, core courses are essential to provide general information, but integration should take place as much as possible in all courses. Research by staff and students on HIV related issues would provide both information and the means to reduce the infection. Leadership of the universities must support the general objectives of HIV integration and the subsequent campus-wide programs and workplace policies to mitigate the institutional impacts. All these must be done in the context of our cultures.

We call on national governments to also provide the consistent leadership so as not to contradict and retard progress of all the efforts being made to induce behavior change. Poverty is a major contributor to HIV infection as it affects the nutritional status of the people and increases their vulnerability to infections. Governments must intensify poverty reduction programmes to improve the quality of life.

We commit ourselves as torch-bearers and flag-bearers in the campaign against the virus and re-dedicate ourselves to providing the leadership in our Faculties and in our own homes to spread the message in the effort to curb the disease, recognizing that education is crucial in this endeavor.

2.0 Rwanda In country Training Workshop

The workshop was held at La Pallise Nyandungu, Kigali, Rwanda from 28th – 30th March 2007.

Workshop Overview

The Rwanda in-country training workshop was attended by the three public Universities in Rwanda. These included Kigali Institute of Education (KIE), Kigali Institute of Science and Technology (KIST) and National University of Rwanda (NUR). These universities were represented by 25 university lecturers drawn from the Faculties of Science and Engineering.

The workshop had the follow objectives:-
Specific objectives

- To confront the HIV and AIDS epidemic through curricular review in universities, especially in science and engineering programmes
- To sensitize science and engineering lecturers from universities in Rwanda on the need for a common and mainstreamed undergraduate courses on HIV and AIDS within their faculties
- To build the capacity of scientists and engineers from universities in Rwanda on how to develop common HIV and AIDS undergraduate courses by exposing them to what other universities have done in this area
- To assist the participants develop country-specific sample teaching modules for their individual courses.
- To provide a platform for strategic planning by scientists and engineers on the best way of mainstreaming HIV and AIDS into their courses

Expected Output

- identification of units for integrating HIV and AIDS into Biology, Physical and Engineering Sciences and full integration of HIV and AIDS into these courses.
- a group of trained academic staff in each course area who should then be able to train others as Trained Trainers within the faculty on the integration of HIV and AIDS
- HIV and AIDS integrated teaching modules developed for physical and biological sciences as well as engineering courses for universities in Rwanda.

Plenary Presentations

1. An Overview of HIV and AIDS in Africa and its Impact on Education - by Prof. Zipporah Ng'ang'a

   The presentation focused on the following key issues:-

   - AIDS affects all aspects of life on the African continent
   - Current statistics indicate that:
     - Many African countries have an adult prevalence rate of 5.0 - 36.0%
     - The situation is more disturbing in Sub-Saharan Africa:
       - 60% worldwide HIV infections
       - 70% AIDS deaths
       - 20-30% prevalence
   - The relationship between AIDS and the education sector is circular:
     - AIDS impacts Education
       - Decrease support systems and access to education
       - Increase absenteeism and demand for education
       - Decrease the supply of education
       - Increase education sector costs

- HIV and AIDS is considered "The new brain drain"
- Loss in skilled labour
- Absenteeism
- -Drop-out (illness or finance)
- Drop in Performance

2. UNESCO Initiatives on HIV and AIDS in Africa - by Mrs. Alice Ochanda

   The presentation focused on the following key issues:-

   - Statistics on HIV and AIDS worldwide
   - UNESCO as a member of UNAIDS
   - UNESCO's approach to HIV and AIDS prevention and initiatives in Sub-Saharan Africa
   - UNESCO's Priority areas for intervention:
   - Advocacy
     - Customizing the message and finding the right message
     - Changing the risky behaviour and vulnerability
     - Caring for the infected and affected
     - How to cope with institutional impact

3. East African Universities Initiatives on HIV and AIDS and curricular reforms - by Prof. Mabel Imbuga

   The presentation focused on the following key issues:-

   - The statistics on the epidemic
   - Impact of HIV and AIDS on Universities
   - Road blocks to success
   - Challenges facing universities
   - Education, training, research, innovation and HIV and AIDS
   - Institution of higher learning and Universities responses to the pandemic
   - Institutional Policies
   - Students' activities and programs
   - Research on HIV and AIDS
   - Community outreach on HIV and AIDS
   - Curriculum reforms in HIV and AIDS
   - Common courses
   - Selected Integrated courses

4. Southern Africa Universities on HIV and AIDS AND Curricular Reforms: A Control Engineering Approach to HIV and AIDS - by Prof. Xiaohua Xia

   The presentation mainly focused on the following key issues:-

   - Curriculum reform: Research
   - What is a Control Engineering Approach?
   - Research projects and Results
   - The presenter demonstrated how the control engineering approach model can be used to asses parameters associated with HIV and AIDS such as- CD4 counts, viral load; HIV Infection and Progression; infection to clinical latency; drug response.
   - That real data on HIV and AIDS could be used in the classroom situation to teach aspects such differential equations, Data plots, exponential growth/decay; Measurement precision and error

5. An overview of HIV and AIDS in Rwanda and its impact on Education in general and high Education in particular - by Mary Kampogo

   The presentation mainly focuses on the following key issues:-
   - How HIV and AIDS affects the education system in Rwanda
   - Why should HIV and AIDS be of particular relevance to University?
   - The role of Tertiary Education Institutions in fight against HIV and AIDS
   - Mission of Higher Institution of Learning.
   - HIV and AIDS program objectives
   - Students HIV and AIDS awareness organisations
   - Curriculum content
   - Possible services
   - Awareness campaigns
   - Community outreach and partnership

6. Rationale for Integrating HIV and AIDS into University Curricular - by Dr. Zipporah Ng'ang'a

   The presenter emphasised the need to provide lecturers and students with adequate and accurate information on HIV and AIDS. Special emphasis was laid on:-

   - Severity of the AIDS crisis globally
   - The deep roots of HIV and AIDS
   - Why the global Epidemic got out of hand?
   - Rationale for Integration of HIV and AIDS in the curriculum.
   - How to Integrate HIV and AIDS into curricular

7. The Development of an HIV and AIDS Integrated Engineering curriculum and Educational Compact Disks for HIV and AIDS prevention - by Prof. Xia

   The presentation focused on the following points:-
   - Curriculum reforms: teaching
   - Presentation of the Educational CD
   - General HIV and AIDS Test
   - CD demonstration
   - HEAIDS(Higher Education HIV and AIDS program)
   - Introduction and purpose for integration
   - The process for incorporating HIV and AIDS into curriculum
   - Evaluation of the process
   - Evaluation of the student
   - Challenges and successes

8. Unversities Responses to the HIV and AIDS Pandemic

i. Kigali Institute of Education (KIE)

   On November 3rd 2006, a workshop was organised in KIE and the participants were academic and administrative authorities of the institute. Participants of NUR and CNLS were also present. The objective of the workshop was to sensitize the participants and to see what policy and actions can be put in place to fight HIV and AIDS in KIE community and its environs.

   Some of the recommendations from the workshop were:

   - to develop or revise the course content to facilitate the acquisition of knowledge about HIV and ADS.

- to develop a special reference module for both pre-service and in-service. students -
- Organise training for trainers targeting academic staff and to identify the specific skills to be acquired and applied.

The general feeling was that the common course of Life skills in which a part deals with HIV and AIDS should remain, and be taught to beginners in their first semester.

ii. National University of Rwanda

The LUCS (Ligue Universitaire de Lutte contre le SIDA) was created in 1999. This is the central unit that coordinates all activities on HIV and AIDS including research. LUCS has in its structure: a President, a Vice President, Secretary, and specialised commissions. Its missions are primarily:

- Fight against HIV and AIDS
- Provide support for students and PLWHAs
- Conduct Research on HIV and AIDS

The main achievements of LUCs are:

- Creation of a VCT centre
- Mounting of an annual course on HIV and AIDS
- Creation of Association of PLWHAs called "Arc-en- Ciel"

Other activities of LUCS are:

- Distribution of condoms
- The radio Salus Populi"call people for behaviour change"

However, integration of HIV and AIDS into the curricula has not been done but it is necessary because students co-habit and thus infection can spread quickly and on a large scale.

iii. Kigali Institute of Science and Technology

- The fight against HIV and AIDS started in 2001 in KIST.
- free distribution of condoms and sensitization campaigns targeting both students, and staff.
- A VCT centre established.
- In 2006, an attempt for integration of HIV and AIDS into the curricula was introduced but it was not successfully implemented because of heavy workload of the students.
- There is also an association of PLWHAs to help them live positively despite
- KIST also provides funds for supplementary diet

9. Integration of HIV and AIDS into: Biological Science and physical sciences courses - by Dr. Zipporah Ng'ang'a

The presenter pointed out the key issues to be addressed while integrating HIV and AIDS in both Biological and Physical science courses in question form as follows:

- Is it necessary to integrate HIV and AIDS in the curricular?
- When and how should the integration be done?
- How do lecturers and students cope with information fatigue?
- How should the process be evaluated and coordinated?

It was stressed that for effective integration, there is a need for basic knowledge on public health and hygiene.

Examples of courses where integration is possible are:

- Structure of Bio molecules.
- Molecular Genetics.
- Biochemistry.
- Biostatistics.

10. How and why teach HIV and AIDS Integrated Courses - by Dr Zipporah Ng'ang'a

The presentation focused on the following key issues:-

- Rationale for creating HIV and AIDS awareness
- Definition of HIV and AIDS
- Modes of transmission of HIV
- Signs and symptoms that typify AIDS in adults
- Prevention and protection of HIV and AIDS
- Voluntary counselling and testing
- Possible HIV test results
- Living positively with HIV and AIDS
- Stigma and discrimination
- There was a personal risk assessment test by each participant. The message from the assessment is:
  - Everyone is at risk and therefore there is no Risk group but rather, Risky behaviour.
  - It begins with the self and people should therefore avoid pointing fingers at others.
  - It is possible to live positively and therefore everyone should be encouraged to go for HIV and AIDS tests.
  - All the participants were encouraged to leave with the motto that "If HIV and AIDS has to come to an end, it depends on me"

The meeting noted that none of the universities had integrated HIV and AIDS into their courses apart from the medical and biological related courses.

Break-out Discussions Groups

The participants were divided into 3 working groups:

Group 1: Maths-Physics-Engineering

Group 2: Biology-Chemistry

Group 3: Non-science/ Special group

Mathematics – Physics/Engineering Group
Suggested areas for integration

MATHS: KIE

Year I: Calculus MAT 112
Entry Point

- Use of Exponential function.
- Collection and presentation of HIV and AIDS related data using Statistical methods/Tools
- Graphical representation of HIV-related data e.g. patient response after using ARVs

MATHS: KIST

Year III: Mathematical modeling I: MAT 3344.

This could be used to design HIV Research and could also be done on modelling of HIV and AIDS infection and progression (Optional)

Physics

PHYSICS: KIE

Year I: Mechanics:

- Classical Mechanics: Stability and Instability of HIV and AIDS, Rate of Change of the Virus, with respect to time.
- Graphs that can be used here include: Speed Vs Time and Momentum Vs Velocity.
- Oscillation and Waves
- Nuclear Physics

Engineering:

- Control systems
- Automatic control systems
- Signals through use of Mat labs software
- Sanitation Engineering

Biology

Year I: Cell Biology and Genetics

- Prokaryotic and Eukaryotic cells structures:
- Structure of membranes (transport through the membrane, organelles functions), chromosomes, karyotype
- Proteins membranes involving interaction between host and parasites (causal agent for example HIV membrane structures and HIV penetration in human cell)
- Different types of membranes including HIV
- Cell divisions (Mitosis and meiosis), multiplication of HIV in the human cells

Year II: Molecular Genetics, Biochemistry and Biostatistics

- Introduction of some definitions as DNA and RNA (, nucleic acid ,viral genome), transcription in the HIV using reverse transcriptase, chemical structure of HIV
- Structure of viruses (HIV)
- Statistic analysis on using data on HIV research (prevalence, new infection)

Year III: Zoology and Biotechnology option

- Zoology: - History of HIV, microevolution of the disease
- Ecology: HIV parasitism (interspecific interaction).
- Entomology : resistance , opportunistic diseases -immune and metabolic disorders, diagnostic of some diseases, to toxins

Botanic option

- Systematic: medicinal plant (opportunist diseases)

Year IV: Biotechnology

- Molecular biology: molecular structure of HIV, resistance mutation, recombinant vaccines and drugs, molecular diagnosis (PCR, MABs)

Chemistry

It is virtually possible to integrate HIV and AIDS into all Chemistry courses, the only limiting factor seems to be knowledge the lecturer has about HIV and AIDS. The following are some examples of courses in which mainstreaming is possible.

Introduction to Chemistry

- Common ion effect; addition of an electrolyte bearing a common ion to a saturated solution of a partly soluble electrolyte causes precipitation(decreasing of solubility)
- Sexual contact with a HIV infected person causes infection
- Multiple sexual contact with infected persons increases viral load

Physical Chemistry

- Comparison of nuclear decay with the disappearance of CD4 cells along the time
- Half life of radioisotope and half life of CD4 cells
- Chromatography used in analysis of viral proteins
- Chemical equilibrium and stabilization of CD4 cells due to ARV use
- Reversible and irreversible reactions : Relate with HIV infection: Once infected you remain infected and infective for life

Qualitative Analysis

- Use of qualitative techniques in chemistry in identification of cations and anions: Relate this to qualitative analysis using ELISA in detection of antibodies to HIV in serum.

Quantitative Analysis

- Use of quantitative methods in determination of viral load

Calculus MAT 112

- Use of quantitative methods in CD4 counts
- Quantitative methods in determining dosage of ARV
- Use of quantitative methods in determining the nutritional value of foods
- Use quantitative methods in determination of chemical composition of herbal extracts

Water pollution and Waste Treatment

- Characteristics of waste water: Role of waste water as source of disease causing organisms (Giardia, Cholera Salmonella, Entamoeba, Shigella,)
- Biological microorganisms: bacteria, fungi, protozoa, viruses- Their role as opportunists following immunosuppression
- Safe drinking water- Methods of water treatment (traditional and modern methods). Importance of clean drinking water in PLWHA
- Removal of nutrients- Impact on nutritional value of foods

Biochemistry

The Cell and its External Environment

- The structure of prokaryotic cell: The structure of the viruses (prokaryotes)
- Organelles: Importance of cellular organelles as sites of HIV replication (cytoplasm, cell membrane, nucleus)
- Biochemistry of specialized cells: nerve cells, muscle cells, renal tubular cells (Effects of HIV on given cells)
- Extracellular fluids: Blood and lymph- Role of blood in HIV transmission
- Effect of HIV on composition and functions of blood and lymph components

Special Group

Language Listening skills

Myths about HIV and AIDS – Prof. Zipporah Ng'ang'a

To analyse the myths in Rwandan culture, and explain the reality to students. Examples of myths:

- "When you have sex with a virgin, you recover from HIV and AIDS",
- "You cannot contract HIV when you have sex once" etc
- "Virus is contracted through Mosquitoes"

All these myths should be corrected through teaching listening skills by use of stories to correct those myths. It is also important to encourage active Listening

Speaking:

Be selective with words you use while teaching and speaking to avoid hurting those infected. The following need to be emphasised in integrating HIV and AIDS into speaking skill:

- Art of persuasion:
- Use of visual materials to communicate HIV and AIDS
- Develop HIV and AIDS related stories from pictures.

Talk about rape and Post- Exposure Prophylaxis and if possible where these could be accessed (Provide information)

Reading:

- Encourage students to read HIV and AIDS materials while teaching reading skill
- Break the silence by speaking out e.g. Philly LUTAYA
- Use debates (HIV and AIDS related topics), puppetry, role play etc
- Vocabularies that incorporate HIV and AIDS

Writing:

- Use cartoons that talk about transmission
- Text writing and analysis: proper reporting of HIV and AIDS information

Professional ethics:

- Breaking the silence: encourage openness; declare their sero status, e.g. a Vice Chancellor going for VCT.
- Stigma: staff and students are treated equal
- Treatment for students and staff: talk about the drugs that are available
- Confidentiality: e.g. a lecturer keeps information from students' parents

Psychology:

- Counselling: its importance in HIV and AIDS
- Behaviour of the Virus vs. human behaviour: it is aggressive
- People are selective in choosing friends, the same applies to how HIV chooses CD4
- Attitudes about herbal medicines: there are people who believe these medicines are better than western ones

Clinical Psychology:

- Trauma
- Psychological disorders
- Brain damages
- Counselling

Educational Planning:

- How HIV and AIDS affects education, institutions, supply and demand quality, work place issues and policies, compulsory counselling and testing, care and support in educational system, Curriculum planning and development: guidance and counselling in school

Recommendations of the Workshop

The following are the recommendations that were collectively agreed upon by the participants:

- That each institution would organise sensitisation workshops on mainstreaming HIV and AIDs in the curricular. The target group would be colleagues and administrative staff. Participants would sensitize and train colleagues on the integration HIV and AIDS in the curricula at the Faculty and Departmental levels. Departments and Faculties would harmonize and coordinate the information to be taught. Provision of relevant and up to date information on HIV and AIDS to students and the development of relevant Information, Education and Communication (IEC) materials in science and Engineering was important.

3.0 Botswana In-Country Training Workshop

The workshop was held at Great Palm Hotel, Gabarone Botswana from 17th – 19th April 2007. Workshop participants were from University of Botswana, Kanye SDA college of Nursing, Botswana College of Agriculture, Lobatse College of Education – Physical Sciences and Serowe College of Education. A total of twenty nine (29) participants were trained during the workshop.

Workshop overview

The three day workshop brought together participants from the University of Botswana, Institutes of Health Sciences and Colleges of Education who offer Science and Engineering courses. The participants represented 13 institutions of higher learning in Botswana from the fields of Science and Engineering. This included Deans of faculties of Engineering, Science, and lecturers from the following departments: Biological Sciences, Mechanical Engineering, Civil Engineering, Computer Science, Electrical Engineering, Health sciences, Environmental Sciences, Geology, Population Studies, Mathematics, Physics, Computer Science and Information skills and School of Nursing. The workshop provided a forum for sharing experiences on HIV and AIDS and learning how to integrate HIV and AIDS information in the curriculum. The opening ceremony was attended by 100 participants. The main purpose of the workshop was to bring the participants together and train them on how to integrate HIV and AIDS into the Science and Engineering curriculum. The training was provided with the expectation that the trainees would then train colleagues in their respective departments on HIV and AIDS integration after having been trained as trainers. The three-day workshop was expected to have a cascading effect.

Workshop Objectives

The Specific objectives of the workshop were to:-

- To confront the HIV and AIDS epidemic through curricular review in universities, especially in science and engineering programmes.
- To sensitize science and engineering lecturers from universities in Botswana on the need for a common and mainstreamed undergraduate courses on HIV and AIDS within their faculties.
- To build the capacity of scientists and engineers from universities in Botswana on how to develop common HIV and AIDS undergraduate courses by exposing them to what other universities have done in this area.
- To assist the participants develop country-specific sample teaching modules for their individual courses.
- To provide a platform for strategic planning by scientists and engineers on the best way of mainstreaming HIV and AIDS into their courses.

Expected Output

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

In his keynote address, Prof. Kelly informed participants that they have a primary responsibility to innovatively prevent the spread of HIV and AIDS not only within their institutions but in the communities at large. Educational institutions have a mandate to serve the society through the generation of knowledge and teaching; and this requires their involvement in HIV and AIDS issues. Educational institutions also have a responsibility to develop human resource and must ensure that they produce personnel who have the knowledge required to mitigate the impact of HIV and AIDS. He noted that the focus on Science and Engineering is to ensure that these areas are not left behind as this problem is being addressed. Educational institutions are well placed to positively influence behavior change and attitude that promote the spread of the epidemic.

Plenary Sessions

The following papers were presented:

1. The importance of HIV and AIDS integration in Universities: Prof. M. J. Kelly

   The presentation was divided into three critical areas:-

i. Setting the Scene

   It was noted that the epidemic has gotten out of hand as a result of some of the following reasons: insufficient leadership, vision, sense of urgency, commitment at all levels, coupled with epidemic-enhancing global structures, focusing attention on the immediate causes and manifestations and failing to address the contexts of poverty and gender, insufficient attention to youth needs, lack of sensitivity to and conflict with cultural and religious perceptions and values and pervasive stigma and offensive discrimination towards people living with HIV and AIDS.

   There is need to make progress against HIV and AIDS through among other things; paying more attention to the social, economic and cultural environment within which HIV flourishes, addressing the fundamental causes of the epidemic, uplifting the low status of women, addressing HIV-related stigma and issues of poverty and inequality.

ii. The mandate of the university in a Society with HIV and AIDS

   - Protecting the university's own functioning as an AIDS-affected institution
   - Serving the needs of an AIDS-affected society

iii. Mainstreaming HIV and AIDS in the Curriculum

   Mainstreaming HIV and AIDS in the curriculum is a huge undertaking that requires academic leadership.

   There are many reasons why HIV and AIDS must be integrated into the curriculum. These include:-

   - Personal reasons
   - Professional reasons
   - Institutional reasons

2. An overview of HIV and AIDS initiatives at the University of Botswana: Dr. E. Seloilwe

   The presentation focused on the following key issues:-

   - Establishment of University of Botswana HIV and AIDS Committee
   - HIV and AIDS Policy
   - Health and Wellness Centre
   - Health Services (student clinic)
   - Society Against HIV and AIDS (SAHA) – Student Organisation)

- Curriculum integration
- Research
- Challenges
- Future Plans

3. An overview of HIV and AIDS in Africa and its impact on education: Dr. Zipporah Ng'ang'a

The presentation focused on the following key issues:-

i. AIDS affects all aspects of life on the African continent

- Current statistics indicate that:
  - Many African countries have an adult prevalence rate of 5.0 - 36.0%
  - The situation is more disturbing in Sub-Saharan Africa:
    - > 60% worldwide HIV infections
    - > 70% AIDS deaths
    - 20-30% prevalence

ii. The relationship between AIDS and the education sector is circular:

- AIDS impacts Education
  - Decrease support systems and access to education
  - Increase absenteeism and demand for education
  - Decrease the supply of education
  - Increase education sector costs
  - HIV and AIDS is considered "The new brain drain"
  - Loss in skilled labour
  - Absenteeism
  - Drop-out (illness or finance)
  - Drop in Performance

4. UNESCO's initiatives on HIV and AIDS in Africa - Mrs. Alice Ochanda.

The presentation focused on the following key issues:-

- Global statistics on HIV and AIDS
- UNESCO as a member of UNAIDS
- UNESCO's contribution is mainly complimentary to and supportive of Governments' efforts.
- UNESCO' leads the Global Initiative on Education and HIV and AIDS, launched in 2004 by UN-AIDS - EDUCAIDS
- EDUCAIDS' goals are to prevent the spread of HIV and AIDS through education and to protect the core functions of education systems.
- UNESCO's response to HIV and AIDS are driven by the belief that
  - Prevention education works,
  - If done well, it is effective,
  - If done immediately it will have long-term impact and,
  - If done massively, it can turn the tide.
- UNESCO's strategy for HIV and AIDS intervention revolves round five key areas:-
  - Advocacy at all levels
  - Customizing messages and finding the right messengers
  - Changing risk behaviour and vulnerability
  - Caring for the affected and the infected
  - Coping with the institutional impact

5. East African Universities Initiative on HIV and AIDS and Curricular reforms - Prof. Caroline Lang' at Thoruwa.

   The presentation focused on the following key issues:-

   - The impact of HIV and AIDS on Universities
     - Responses by the East African universities in the areas of policy, AIDS Control Units, Strategic Plans, Student Programs, Community outreach, Research and Curriculum Reforms
     - Approaches that some universities in Kenya have employed to mainstream HIV and AIDS in the curricula:
     - Review of traditional health/ medical courses- health / medical fields
     - Emerging HIV and AIDS programs and courses – cert., diploma, degree
     - Specialized HIV and AIDS core/common courses
     - HIV and AIDS integrated into existing core courses
     - Teaching Approaches
     - Team teaching
     - Guest speakers – PLWA, NGOs
     - Lectures, and assignments- group work, research, videos, internet
     - Examinable courses
   - Challenges Experienced
     - Large classes
     - Limited resource materials – internet, books, journals, CD-ROMs
     - Limited funds for capacity building and community outreach
     - Lack of monitoring and evaluation

6. Southern Africa Universities on HIV and AIDS and Curricular Reforms: A Control Engineering Approach to HIV and AIDS: Prof. Xiaohua Xia

   The presentation mainly focused on the following key issues:-

   - Curriculum reform: Research
   - What is a Control Engineering Approach?
   - Research projects and Results
   - The presenter demonstrated how the control engineering approach model can be used to asses parameters associated with HIV and AIDS such as- CD4 counts, viral load; HIV Infection and Progression; infection to clinical latency; drug response.
   - That real data on HIV and AIDS could be used in the classroom situation to teach aspects such differential equations, Data plots, exponential growth/decay; Measurement precision and error

7. Rationale for integrating HIV and AIDS into University Curricular - Dr. Zipporah Ng'ang'a

   The presentation mainly focused on the following key issues:-

   - Global statistics on HIV and AIDS
   - The purpose of integrating HIV and AIDS into university curricular:
     - To provide accurate information on the disease
     - To train them as peer counselors
     - To reach out to the community
     - Be generators of information through research and innovation

8. The development of HIV and AIDS integrated engineering curriculum and educational Compact Disks for HIV and AIDS prevention: Prof. Xia

   The presentation focused on the following points:-
   - Curriculum reforms: teaching
   - Presentation of the Educational CD
   - General HIV and AIDS Test
   - CD demonstration
   - HEAIDS(Higher Education HIV and AIDS program)
   - Introduction and purpose for integration
   - The process for incorporating HIV and AIDS into curriculum
   - Evaluation of the process
   - Evaluation of the student
   - Challenges and successes

9. University of Botswana courses integrating HIV and AIDS: Dr. L. W. Odirile and Mr. R. Mmereki

   The University of Botswana has made some tremendous progress in the area of integrating HIV and AIDS into the curriculum. An audit conducted in 2003 showed that there were courses that had already integrated HIV and AIDS into the curriculum. These were mainly in the faculties of Education and Social Sciences and very few courses came for the faculties of Engineering and Maths.

10. Integration of HIV and AIDS into Biological Sciences: Dr. Zipporah Ng'ang'a

    The presenter pointed out the key issues to be addressed while integrating HIV and AIDS in both Biological and science courses in question form as follows:

    - Is it necessary to integrate HIV and AIDS in the curricular?
    - When and how should the integration be done?
    - How do lecturers and students cope with information fatigue?
    - How should the process be evaluated and coordinated?

    It was stressed that for effective integration, there is a need for basic knowledge on public health and hygiene.

    Examples of courses where integration is possible are:

    - Structure of Bio molecules.
    - Molecular Genetics,
    - Biochemistry,
    - Biostatistics.

Break out groups discussions

The facilitators divided members into the following groups:-

- Biological Sciences
- Physics
- Mathematics
- Engineering
- Geology
- Computer Sciences
- Chemistry
- Environmental Sciences

Each group was asked to identify courses that could be integrated with HIV and AIDS topics and the information to be included in the selected topics in each course.

The following courses were identified by the various groups for integration at the entry points indicated.

Biological and Health Sciences

Participating institutions:

- Botswana College of Agriculture; Department of Basic Sciences: offering Certificate, Diploma and Degree programs
- University of Botswana; Department of Biological Sciences: offering Degree programs
- Institute of Health Sciences; Serowe, Francistown, Kanye Seventh Day Adventist College f Nursing: offering Diploma programmes
- Ministry of Health; Health Sector Relations
- Gaborone Technical College: offering Certificate and Diploma programmes

In all these institutions the general mode of assessment used for all the courses uses the final year Continuous Assessment which comprises of:

- Tests
- Assignments
- Project; comprising of case studies.

The group identified the following courses as either an obvious course for HIV integration, needing integration. Points of entry are also identified.

Key: OBV=Obvious;
NI=Need Integration;
*=point of entry

Year I:

- Communication and Computer skills course that is taken across at entry level by ALL the named institutions (OBV)
- BIO111-Principles of Biology (NI): The course deals with the core concepts of biology, hierearchial organization and scientific method. There is need to find information from different sources on the latest articles on HIV and AIDS. The sources include the internet, bibliography and learning how to write essays and cite references on HIV and AIDS related topics. The recommended teaching method for this course would be the Scientific method using Participant Based Learning (PBL).

- BIO112- Diversity of Life (NI) and B113 – Diversity of Life (NI): A survey of the Kingdom Plantae and Animalia, classification, general structure, reproduction and life cycles of the different divisions and Phyla, major adaptations of animals from aquatic to terrestrial habitats. The point of entry could be the classification and structure of viruses; origin and history of HIV and AIDS; life cycle, adaptations of HIV virus in the host.

Year II:

- BIO211- Cell Biology (NI): Course serves as an introduction to the structure and functions of the cell, with emphasis placed on the cell as the fundamental unit that mediates all biological activities and the composition of the cell including nucleic acids, DNA/RNA structures. The point of entry for integration could focus on the mode of entry of HIV, role of HIV on the host cell degeneration and replication of HIV.
- Communicable diseases (NI): Focus could be on STI's and HIV and AIDS

Year III:

- Biometrics, (NI)
- Quantitative Biology (NI)
- Statistics (NI)

These courses cover generation, handling and presentation of biological data, descriptive statistics, scientific methods of design and implementation of biological investigations. Points of entry could include data collection, analysis and being able to interpret community case studies and patient care activities in HIV and AIDS related issues. HIV and AIDS epidemiological data such as prevalence rate during VCT.

Year IV:

- BIO450 (NI)
- APB410/420 (NI)

These are final year research projects that enable students to prepare and execute an individually guided research project; and will be trained to devise a project proposal in an identified study area. Research topics covering various aspects of HIV and AIDS with hands on practical with the use of PCR and ELISA for HIV detection can be addressed. Interpretation of results carried out by the knowledge acquired from the year III course that dealt with analysis and interpretation of data would become useful for this process.

Physics

Course Code: G1 - Physics

Title: Measuring and Calculating

Description:

- Accuracy of measurement
- Error in Measurements
- Measuring Instruments
- Measuring Length, Area, Volume, Mass density, Time and Temperature.
- Proportionality: Inverse proportion and straight line graphs.

Entry Points:

1.Sources of error in HIV and AIDS information

Unqualified personnel involvement

Myths associated with HIV transmission

* Importance of need for accurate information in regard of HIV and AIDS

2. Data Collection of HIV and AIDS

Temperature – instruments – ways to reduce risks of transmission (Avoiding risks of transmission e.g. measuring body temperature of HIV and AIDS patients – digital electronic thermometers in comparison to use of conversional clinical liquid in glass thermometer – waste avoid risks of transmission through body fluids - sweat, under tongue).

- Body mass
- CD4 count - instrument used
- Viral load – instrument used.

3. Data Analysis (tabulating and graphing normal scale or lock scale); CD4 count, viral load, temperature graph, body mass graph.

4. Investigate relationship between length of time of administering ARV drugs and viral load.

Course code: P1 Force and Pressure

Description:

- Effects of forces, methods of measuring force.
- Moment of force and equilibrium, centre of gravity and stability.
- Pressure: definition of pressure, pressure in solids and liquids, Archimedes principle: sinking and floating.

Entry Point:

- Human Immuno virus has effect of multiplying itself by attaching the CD4 + cells which are crucial for the normal function of human immune system.
- Equilibrium and stability of HIV in the body – stable state or equilibrium condition of HIV infection.
- Peer pressure as a risk factor to becoming vulnerable to infection.
- Sinking and floating analogy of HIV status
- Weight gain on taking treatment – floating being alive
- Weight loss – sinking- loosing life depreciating health.

Course code: P2 Optics

Description:

- Rectilinear propagation,
- Images by plane mirrors, total internal reflection centred angle optical fibres in medicine and wave guides in communication.

Entry Points:

- Methods of HIV transmission
- Critical condition of HIV positive person – CD4 count less than 200 suspcitible to opportunistic infections.

Course code: P4 Waves

Description:

- Amplitude, wave length, frequency, speed velocity, culfraction and interference, electromagnetic waves.

Entry Point:

- Testing for HIV – frequency of testing for those who are negative.

Course code: P5 Basic Electricity:

Description:

Conductors and insulators, storing charge, discharging and charging, electric fields charges and current. Potential difference, Ohm-s law.

Entry Point:

* HIV stores in body fluids – blood, semen etc
* HIV transmission through contact with more fluids
* Adherence to treatment – direct relationship to keeping healthy
* Resistance to drug – non-adherence to drugs.

Course: Electronics

Description:

Electronic model of logic gates illustrating factor that promotes chances of contracting HIV.

Course: Electricity and Magnetism

Description:

Use of Ohm-s law to demonstrate how the flow of current in different circuits can be used to illustrate the factors necessary for ease of transmission of HIV and the prevention of HIV spread.

Computer Sciences

Code Code: CSI462

Title: Distributed Systems

Credits: 3

Description:

Characteristics and design issues of Distributed Systems (DS), DS architecture; network, operating system, applications, design and implementation of DS. Comparison of DS to PCs and centralized systems. Performance, security and reliability issues. Process communication: IPC, remote procedure calls (RPC), java communications, transactions; processing and concurrency control. Naming, security, Distributed file system, replication, shared memory, distributed algorithms and message passing. 3 lecture hours

Below is the modified description to include HIV and AIDS

Characteristics and design issues of Distributed Systems (DS), DS architecture; network, operating system, applications, design and implementation of DS. Comparison of DS to PCs and centralized systems. Performance, security and reliability issues. Process communication: IPC, remote procedure calls (RPC), java communications, transactions; processing and concurrency control. Naming, security, Distributed file system, replication using HIV analogy, shared memory, distributed algorithms and message passing. Modelling of human being social sexual interactions around threads and processes. Consideration of computing power required to model individual viruses on a high-performance cluster.

Geology and Environmental Sciences

Geology

GEO101: Introduction to Geology

A general introductory course into Geosciences.

Introduction to evolution

TOPIC: The concept of stratigraphy, correlation, the geologic time scale, fossils and geological time, evolution, mass extinctions.

GUEST LECTURE: Example of evolution - evolution of HIV and its mutation, implications in transmission, disease progression and drug implications

Weathering and erosion

VIDEO SHOW ON ISSUES AFFECTING HIV and AIDS PREVALENCE: Fluvial activity, levels of water in water catchment systems, food security, resulting in poverty.

GEO301: Field Mapping

The course covers methods of geological mapping using topographic maps and aerial photographs. Field studies include measuring sections, construction of cross sections, production of geological maps using field data and report writing.

Basic concept of mapping can be used with HIV and AIDS prevalence.

METHOD OF DELIVERY: Practicals

ASSESSMENT: Assignments involving mapping geological areas with the most prevalence of HIV and AIDS.

GEO408: Environmental Geology

Geology and human environment

THEME: Geological controls on soils, vegetation, climate, agrogeology, groundwater, mining operations, mineral processing and pollution/health risks.

SUB-THEME 1: Geological controls on soils - A geology of an area can, through weathering and other geomorphic processes, enrich the soil with elemental nutrients such as selenium (which is thought to inhibit the attachment of an HIV particle to the CD4 receptacle of a cell) and iron (which is essential for HIV and AIDS patients who tend to be anaemic).

ASSESSMENT: Students to research and present on the link between geochemical-related processes (e.g. weathering and erosion) and the various elemental nutrients consumed as food and drugs, and how this influence the pathology of HIV and the treatment of HIV and AIDS related diseases.

SUB-THEME 2: Geological controls on groundwater - The quality of water can be compromised by the pollution of groundwater through biogeochemical processes in the soil.

ASSESSMENT: Research and present (either individually or as groups) or submit assignments on the effect of water quality in the spread and prevalence of HIV and AIDS.

Natural hazards

Natural hazards can displace people who may migrate and separate from each other, potentially resulting in the spread of diseases associated with mobility, such as HIV and AIDS.

ASSESSMENT: Research on the influence of environmentally-induced demographic mobilities on the spread and prevalence of HIV and AIDS and make group presentations or submit assignments thereof.

Environmental Health

ENH202: Food safety and hygiene

Unhygienic food handling

Unhygienic handling of food by providers may result in the transmission of pathogens that may lead to opportunistic infections in people living with HIV and AIDS e.g. gastro-enteric infections.

ASSESSMENT: Research on various aspects of some HIV and AIDS-related diseases associated with food (i.e. history, aetiology, pathology and treatment options).

Emerging food-borne diseases

Emerging food-borne diseases can aggravate the condition of HIV-infected persons who are immuno-compromised.

ASSESSMENT: Research on some emerging and re-emerging food-borne HIV and AIDS-related diseases (e.g. global trends in trade, the environmental, socio-economic, political factors).

Inspection of food premises

Inspection of building designs of food premises and the environment to ensure cleanliness and hygiene so as to minimize the transmission and spread of diseases which may worsen the prevalence of HIV and AIDS-related illnesses.

ASSESSMENT: Field assessment of selected food processing premises, Assessment will include sickness policy and other related schedules. Students to give full report on findings and their recommendations to mitigate the adverse findings.

Cross cutting issues for all the presentations:

During the workshop, it was observed that there is a lot of information circulating on HIV and AIDS. But it also came out clearly that not everyone is as knowledgeable about HIV and AIDS as they should be. Lectures therefore would need to be careful that students internalize and analyze the information they come across and not just to give it back as they got it from the different sources.

There is need to develop HIV and AIDS modules for each faculty. These modules can be used by any institution in the country offering courses in the same area. There is need to have the modules created specifically for Certificate, Diploma and Degree programmes. Once they are available, the modules can be used by all the countries participating in the UNESCO initiative.

Participants observed that HIV and AIDS cannot be integrated everywhere. There is need therefore to be able to identify areas where integration can take place.

Recommendations

1. Set aside funds for the development of teaching materials/modules. The HIV and AIDS Office should be responsible for budgeting for the production of the modules. The individual staff members should also check with their departments on the availability of funds that could be used
2. Teaching of integrated courses should start when the semester begins. This should be followed by training of other members within the department. The HIV and AIDS Coordinator's office should work closely with the office of the Vice Chancellor to release a memo to this effect.
3. Ensure leadership commitment and support for the implementation of the integrated courses
4. Trainees need to show commitment to the implementation
5. There is need for teaching materials (CDs, videos ectc) to be developed or purchased
6. To ensure continuity, there should be regular meetings of those who have been trained at this workshop to enable exchange and share experiences
7. The core group must be role models: they need to play their roles as agents of change
8. There is need to build expertise in the various departments and ensure that the knowledge is shared with others.
9. Those are spearheading the process should ensure that departments have basic knowledge on HIV and AIDS
10. Lecturers should use teaching methods that will make the subject more interesting
11. Websites can also provide a good source of information for integration of HIV and AIDS and other relevant areas hence the use of websites should be encouraged
12. Participants should convince their supervisors on integration and the importance of embracing it. Supervisors should then take the initiative with the relevant Heads of Departments.
13. Networking is crucial for effective implementation of integrated courses.
14. HIV and AIDS Office to come up with an incentive for those who have managed to integrate.

Closing session

Prof. I. Mazonde, Acting Deputy Vice-Chancellor, Academic Affairs provided the closing remarks

- There is need not to only concentrate in teaching but to also concentrate on research related to HIV and AIDS.
- There is need to develop resource materials to support the integration of HIV and AIDS in the curriculum.
- There is need for synergy – encourage team teaching and involve people living with HIV and AIDS to share experiences to make it as real as possible. Can encourage field trips to orphanages, hospitals and other places where the situation can be real.
- All participants are faced with the biggest challenge of familiarizing themselves with HIV and AIDS patho-physiology. This was evident in all the presentations made. There is need for participants to learn more about the topic.

4.0 Kenya In-Country Training Workshop

Workshop Overview

The Kenya in-country training workshop was held at Kenya Institute of Education (KIE) in Nairobi from 8th to 10th December 2008. There were over seventy eight participants representing all the seven public Universities (University of Nairobi, Jomo Kenyatta University of Agriculture and Technology, Kenyatta University, Moi University, Masinde Muliro University, Maseno University and Egerton University and four of the private universities (Kenya Methodist University, Daystar University, Catholic University, United State International University

The main purpose of the workshop was to bring the participants together and train them on how to integrate HIV and AIDS into the Science and Engineering curriculum. The training was provided with the expectation that the trainees would then train colleagues in their respective departments on HIV and AIDS integration after having been trained as trainers. The three-day workshop was expected to have a cascading effect.

Specific objectives

- To confront the HIV and AIDS epidemic through curricular review in universities, especially in science and engineering programmes
- To sensitize science and engineering lecturers from universities in Kenya on the need for a common and mainstreamed undergraduate courses on HIV and AIDS within their faculties
- To build the capacity of scientists and engineers from universities in Kenya on how to develop common HIV and AIDS undergraduate courses by exposing them to what other universities have done in this area
- To assist the participants develop country-specific sample teaching modules for their individual courses.
- To provide a platform for strategic planning by scientists and engineers on the best way of mainstreaming HIV and AIDS into their courses

Expected Output

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

Highlights of the guest speakers

1. ***Welcoming speech*** - AWSE Chairperson Prof. Mabel Imbuga

   The presentation focused on the following key issues:-

   - The importance of integrating HIV and AIDS into science and Engineering courses
   - Science, engineering and technology are courses required to steer our country to industrialization even earlier than the targeted date of 2030.
   - We are relying on these professions to move our country out of poverty and hunger.
   - 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 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.

2. ***Opening speech*** - Prof. Nick Wanjohi

   The presentation focused on the following key issues:-

   The Vice Chancellor of JKUAT noted that HIV and AIDS was a major public health emergency that universities should address as a matter of urgency. He explained that the university supported efforts to respond to HIV and AIDS pandemic through curricular reforms to equip graduates with necessary skills to deal with the impacts of the disease.

   - Statistics of HIV and AIDS
   - The role of universities in regard to HIV and AIDS
   - Human resource development
   - Importance of HIV and AIDS curriculum reforms at university level

3. Director of Policy and Planning Ministry of Education Mrs. Miriam Mwirotsi, representing the Permanent Secretary

   The presentation focused on the following key issues:-

   - The Education Sector Policy on HIV and 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.
   - The Kenya National AIDS Strategic plan (2005-2010 KNASP) calls for the targeting of youth among most vulnerable to HIV infection.
   - 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.
   - 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.

4. ***The Role of Universities int the fight against HIV and AIDS*** - Mrs. Teresa Muthui of the Commission for Higher Education (CHE) Kenya

   AIDS control Unit (ACU) at the Commission for Higher Education was established in 2003

   The role of the ACU can be summarized as follows:

   - To coordinate HIV and AIDS activities in the university sub-sectors.
   - To advocate for the right HIV and AIDS policies in the universities sub-sectors, and
   - To mobilize resources to fight the scourge in the sub-sectors.
   - Activities of ACU
   - Funding of ACU's in Kenyan universities by CHE.

5. ***Education Policy on HIV and AIDS:*** The current situation and implications on Higher Education - Mr. Laban P. Ayiro, Senior Deputy Director of Education, Ministry of Education

   The presentation focused on the following key issues:-

   - A comprehensive education sector response
   - The content, curriculum and learning materials
   - Educator training and support
   - Policy, management and systems
   - Approaches and illustrative entry points
   - The implications on Higher Education

6. ***An overview of HIV and AIDS in Africa and its Impact on Education*** - Prof. Zipporah Ng'ang'a

The presentation focused on the following key issues:-

- AIDS affects all aspects of life on African the continent
- Current statistics indicate that:
  - Many African countries have an adult prevalence rate of 5.0 - 36.0%
  - The situation is more disturbing in Sub-Saharan Africa:
    - > 60% worldwide HIV infections
    - > 70% AIDS deaths
    - 20-30% prevalence
- The relationship between AIDS and the education sector is circular:
  - AIDS impacts Education
    - Decrease support systems and access to education
    - Increase absenteeism and demand for education
    - Decrease the supply of education
    - Increase education sector costs
    - HIV and AIDS is considered "The new brain drain"
    - Loss in skilled labour
    - Absenteeism
    - Drop-out (illness or finance)
    - Drop in Performance

7. ***UNESCO's initiatives on HIV and AIDS in Africa*** - Mrs. Alice Ochanda

The presentation focused on the following key issues:-

- Global statistics on HIV and AIDS
- UNESCO as a member of UNAIDS
- UNESCO's contribution is mainly complimentary to and supportive of Governments' efforts.
- UNESCO' leads the Global Initiative on Education and HIV and AIDS, launched in 2004 by UN-AIDS - EDUCAIDS
- EDUCAIDS' goals are to prevent the spread of HIV and AIDS through education and to protect the core functions of education systems.
- UNESCO's response to HIV and AIDS are driven by the belief that
  - Prevention education works,
  - If done well, it is effective,
  - If done immediately it will have long-term impact and,
  - If done massively, it can turn the tide.
- UNESCO's strategy for HIV and AIDS intervention revolves round five key areas:-
- Advocacy at all levels
  - Customizing messages and finding the right messengers
  - Changing risk behaviour and vulnerability
  - Caring for the affected and the infected
  - Coping with the institutional impact

8. ***East African Universities Initiative on HIV and AIDS and Curricular reforms*** - Prof. Caroline Lang' at Thoruwa.

The presentation focused on the following key issues:-

- The impact of HIV and AIDS on Universities

- Responses by the East African universities in the areas of policy, AIDS Control Units, Strategic Plans, Student Programs, Community outreach, Research and Curriculum Reforms
- Approaches that some universities in Kenya have employed to mainstream HIV and AIDS in the curricula:
- Review of traditional health/ medical courses
- Emerging HIV and AIDS programs and courses
- Specialized HIV and AIDS core/common courses
- HIV and AIDS integrated into existing core courses
- Teaching Approaches
  - Team teaching
  - Guest speakers – PLWA, NGOs
  - Lectures, assignments- group work, research, videos, internet
  - Examinable courses
- Challenges Experienced
  - Large classes
  - Limited resource materials – internet, books, journals, CD-ROMs
  - Limited funds for capacity building and community outreach
  - Lack of monitoring and evaluation

9. ***Southern Africa Universities on HIV and AIDS AND Curricular Reforms:*** A Control Engineering Approach to HIV and AIDS - Professor Xiaohua Xia.

   The presentation focused on the following key issues:-

   - The presentation mainly focused on the following key issues:
     - Curriculum reform: Research
     - What is a Control Engineering Approach?
     - Research projects and Results
   - The presenter demonstrated how the control engineering approach model can be used to asses parameters associated with HIV and AIDS such as- CD4 counts, viral load; HIV Infection and Progression; infection to clinical latency; drug response.
   - That real data on HIV and AIDS could be used in the classroom situation to teach aspects such differential equations, Data plots, exponential growth/decay; Measurement precision and error.

10. Report on Sensitization Workshop and Progress on Integration of HIV and AIDS, department of Nursing Kenya Methodist University (KEMU) - Kimani Wairiri

    The presentation focused on the following key issues:-

    - Report on sensitization workshop held in November 2006
    - Development of undergraduate common course on HIV and AIDS
    - Module on HIV and AIDS

11. R***ationale for Integrating HIV and AIDS into University Curricular*** - Dr. Zipporah Ng'ang'a, JKUAT/ AWSE.

    The presenter emphasised the need to provide lecturers and students with adequate and accurate information on HIV and AIDS.

    The presentation focused on the following key issues:-

    - Severity of the AIDS crisis globally
    - The deep roots of HIV and AIDS
    - Why the global Epidemic has got out of hand?

- How to Integrate HIV and AIDS into curricular
- Rationale for Integration of HIV and AIDS in the curriculum.

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

    The presentation focused on the following key points:-

- Curriculum reforms: teaching
- Presentation of the Educational CD
- General HIV and AIDS Test
- CD demonstration
- HEAIDS(Higher Education HIV and AIDS program)
- Introduction and purpose for integration
- The process for incorporating HIV and AIDS into curriculum
- Evaluation of the process
- Evaluation of the student
- Challenges and successes

13. ***Integration of HIV and AIDS into Biological Sciences*** - Prof. Zipporah Ng'ang'a

    The presenter pointed out the key issues to be addressed while integrating HIV and AIDS in both Biological and Science courses. She then asked the following questions:-

- Is it necessary to integrate HIV and AIDS in the curricular?
- When and how should the integration be done?
- How do lecturers and students cope with information fatigue?
- How should the process be evaluated and coordinated?

    It was stressed that for effective integration, there is a need for basic knowledge on public health and hygiene.

    Examples of courses where integration is possible are:

- Structure of Bio molecules.
- Molecular Genetics,
- Biochemistry,
- Biostatistics.

14. ***Positive Strides in the War against HIV and AIDS: The Kenyan Situation*** - Prof. Miriam Were, Chairman, National AIDS Control Council

    The presentation focused on the following key issues:-

    Global statistics of HIV and AIDS

- Decline in adult prevalence in Kenya
- Provision of voluntary counseling and testing services (VCT)
- Progress in provision of Anti-Retroviral Therapy
- Prevention of Mother to Child Transmission
- Role of commission on Higher Education and National AIDS Control Council for universities.

15. ***Mainstreaming HIV and AIDS in the Academic Curricula*** - Dr. Genevieve A. Mwayuli, Catholic University of Eastern Africa

The presentation focused on the following key issues:-

- University Sensitization Workshop
- Held on 19th January 2007
- Integration and HIV and AIDS into the science courses
- Methodology
- Assessment of courses
- Fundamentals and challenges of mainstreaming HIV and AIDS

Group Discussions and Presentations

Entry Points for Integrating of HIV and AIDS into Biological, Physical and Engineering Sciences

Courses Identified for Integration

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

BOTANICAL TECHNIQUES

Entry points (in italics)

- 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 (in italics)

- 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 methodology

- 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 BIOCHEMSTRY AND PHYSIOLOGY

Entry points (in italics)

- 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 sols as nutrient sources; elemental analysis of plant tissues; nutritional disorders; chemical fertilizers in crop production; foliar nutrition. Biosynthesis: primary and secondary metabolites (metabolite diversity: usefulness of secondary metabolites in management of HIV and 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 and AIDS (Use electronic and bibliographic literature)

FINAL YEAR

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

Biochemistry Team

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 and AIDS
- Muscle wasting and atrophy due to HIV and AIDS.
- Nutrition in relation to HIV and muscle function

SBH 2200: Structure of Biomolecules

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

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 2300: Basic metabolism

Entry points

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

SBH 2325: Biochemistry of muscle contraction

Entry points

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

SBH 236: Pharmacognosis

Entry points

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

SBH 2400: metabolic regulation and integrated metabolism in Mammalian Tissues

Entry points

- The effects of HIV and 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

Entry points

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

SBH 2421: Applied microbial biochemistry.

Entry points

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

Zoology Team

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.

Entry points

- 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.

Entry points

- 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,

Entry points

- 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.

Entry points

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

Experimental design.

Entry points

- Experimental design in HIV research, vaccine testing etc
- Methods of data collection
- Epidemiological surveillance
- Error reduction techniques in relation to HIV and 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.

Entry points

- 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.

Entry points

- Various religious perspectives towards HIV – role of the church Christian, Islamic and frican
- 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.

Entry points

- 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.

Entry points

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

SZL 410 Population ecology

Growth and regulation of populations,

Entry points

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

Intra specific and inter specific interactions;

Entry points

- Polygamy and its impact on HIV transmission

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

Entry points

- Geographical variations in HIV prevalence, locally and worldwide

Determinants of community structures and diversity,

Entry points

- Cultural practices e.g. polygamy

Topics will be given a mathematical treatment whenever appropriate.

Entry points

- Modeling of population dynamics
- Survival analysis

Chemistry Team

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 Hunds 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 Lande 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.

Entry points

- 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 and 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 whish are holding the molecules together. (Antigen and antibodies in HIV and AIDS) hydrogen bond or some cases.
- Lattice energy: A HIV and AIDS patients 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, Cp and Cv 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, Kc and Kp interrelationship; ionic equilibria and solubility product principle; aqueous solutions of weak acids, weak bases and their salts; dissociation constant, hydrogen ion.

Entry points

- The irreversibility of infected host cells.
- Catalysis; bioorganic enzymes that facilitatates 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;

Entry points

- 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).

Entry points

- 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.

Entry points

- 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 □ 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.

Entry points

- 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)

Entry points

- 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.

Entry points

- 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.

Entry points

- Application of organometallic compounds as catalysis in drug synthesis (e.g. ARVs/ART).
- Zeigler-Natta catalysis in polymerisation alkenes for making polythene (condoms).

Mathematics, Physics and Engineering Team

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

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 and 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 of not
- Types of sampling; systematic sampling, whereby after a number of known people, someone has the virus
- 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 and 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 and AIDS in the country has been discussed as one of the case studies from the CBS

SPH 2202 Thermal Physics I

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" hey 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

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 and AIDS in humans

1. Thermodynamic system: a region of fixed (definite) identity i.e. whose state is well defined Human system: 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 process. The process can either be reversible or irreversible. 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 process of infection. The infection process is irreversible i.e. the initial uninfected state cannot be recovered
3. In all natural processes, a property called entropy can either increase or remain the same – it never 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 entropy has increased.

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:

- 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.
- Growth and decay; the very introductory concepts of growth curves may capture the manner in which HIV and 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.
- Statistics; in this topic, the methods of displaying data like histograms, pie charts, ogives etc, may be plotted using HIV and AIDS data in relation to any aspect of the pandemic

- 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^B) or even pr(~A/~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 and 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 hyperboilic 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:

- 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
- 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
- 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 and 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 Rn (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:

- 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 modle is constructed to optimize a particular HIV and AIDS aspect like cost of living for a patient,
- 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
- 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 and 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
- 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:

- Principal steps in organizing a survey; one may request the students to write down these steps in view of a research that involves HIV and 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 of not
- Types of sampling; systematic sampling, whereby after a number of known people, someone has the virus
- 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 and 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 and 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:

- Random phenomena in time
- 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.
- 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.
- 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
- Random walks; highlight to the students the fact that the HIV and AIDS virus is indiscriminate in its actions of infection
- Pure birth, pure death, and the birth – death processes; here one may discuss examples involving population changes with respect to HIV and AIDS

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

Introduction to computers, typing tutor and operating systems,

- Word processing
- Core
- Advanced
- Internet, E-mail, Networking

Entry Point

- Students will be encouraged to browse the internet on HIV and AIDS when practicing their browsing skills.
- The Computer viruses will be compared to the HIV and 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.

Graphic Presentation Tools

Entry Point

- The students will be required to make graphic presentations on HIV and AIDS topics researched on Internet browsing.
- Spreadsheets

Entry Point

- The statistics researched above can be used to draw different types of charts using MS Excel.

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 and 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, digitizing 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 and AIDS behavior e.g. replication, transmission etc, to facilitate easy comprehension of the HIV and AIDS to lay-people.

Evaluation

After the in-country workshops an evaluation will be carried out in all participating universities to determine the following:-

1. Establish whether the ToTs have been able to train faculty colleagues on how to integrate HIV and AIDS into their respective courses.

2. Identify obstacles to training of Faculty colleagues by ToTs and suggest possible solutions and strategies.

3. whether courses in Mathematics, Physics, Engineering and Biological courses have been integrated or where entry points have been identified

4. Establish the extent to which the Universities in general and the faculties of science and Engineering in particular have embraced the concept of mainstreaming and what has changed as a result of the UNESCO/AWSE Project.

5. Establish if the integrated courses are actually being taught and identify any obstacles that have so far been encountered by the lecturers in the process of doing their work.

Conclusion

This initiative Higher education, science and curriculum reforms: African Universities responding to HIV and AIDS has involved four countries – Ghana, Rwanda, Botswana and Kenya. A total of 26 universities and colleges participated in the In-country training workshops and about 171 academic staff have been trained to be trainer of trainers for their institutions. Twenty of the universities held sensitization seminars at their universities prior to the in-country workshops for university management, senior officials and academic staff on the importance of mainstreaming HIV and AIDS and integrating it into the Science and Engineering curriculum. Hence about 600 university academic staff and senior management have been sensitized on the importance of integrating of HIV and AIDS into the science and engineering university curriculum. During the in-country workshops, the resource persons took the participants through key functions of mainstreaming and integration. Individual curriculum/course outlines from participating universities were used to train on integration into the curriculum as part of the hands on experience to sharpen the participant's skills and instill confidence in their ability to integrate and teach HIV and AIDS.

HIV/AIDS is a multidisciplinary subject hence approaches to teaching ought to be multidisciplinary to enrich the courses. Team teaching using experts in HIV/AIDS, NGO's. and other relevant department should work together to teach the integrated courses. CDs, videos and other resources on HIV and AIDS to be developed or purchased for students and staff.

To ensure continuity, there should be forums for those who have been trained at the workshops to enable exchange and sharing of experiences. A web site should be developed by AWSE/UNESCO for information dissemination on HIV and AIDS integration at the various universities. Links can be made to participating institutions in the countries concerned.

Integrating HIV and AIDS into the curriculum is one prevention program that universities can provide leadership in. It is anticipated that universities will pick up this challenge in order to instill positive and meaningful impact on staff and student behaviour aimed at reducing HIV infection rates and preventing new infections through curricular reforms on the campuses. It is also envisaged to develop competence in the graduates to respond to and manage HIV and AIDS in the world of work.

As a result of this program twelve integrated course modules have been developed for universities in the four countries. Three modules were developed in each country in the following subjects (i) biological Science; (ii) chemistry (iii) engineering, mathematics and physics. Three other generic integration course modules for Universities in Africa also in CD form were developed in the three subject areas with inputs from all the participating universities in the four countries. All the modules have course description in selected courses followed by a list of entry points for HIV and AIDS integration. All the modules have been disseminated to participating institutions. In-country training reports for each country with details of each workshop were prepared.

United Nations
Educational, Scientific and
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la science et la culture

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