HIV/AIDS Preventive Education at Sultan Idris Education University:
A Step Towards Education for Sustainable Development

Assoc. Prof. Dr Ong Eng Tek
Faculty of Education & Human Development
Universiti Pendidikan Sultan Idris
MALAYSIA
In the Regional Workshop on the Thematic Issues in Education for Sustainable Development (ESD) under the Mobile Training Team (MTT) Project that was held on 1-5 June 2009, participants were familiarized through workshop-style to three of the following six thematic issues:
(1) Natural Disaster Preparedness
(2) Inter-cultural understanding
(3) Environmental Protection
(4) Gender Sensitizing
(5) HIV/AIDS Prevention Education
(5) Education for International Understanding
Background

Upon returning to Malaysia, we were invited to submit a project proposal for a USD500 grant from the UNESCO Bangkok.

Personally, I felt that the workshop materials on HIV/AIDS Preventive Education could be trialled with the student teachers at UPSI so as to build capacity amongst these secondary school student teachers in terms of knowledge and pedagogical skills). Furthermore, the outcomes from this project could help make informed decision as to how such preventive education could be integrated into some of the existing courses at my university.
Rationale

(1) Statistics as of 2007 indicate that there were 33.2 million people living with the Human Immunodeficiency Virus (HIV) and more than 25 million people have already died of HIV and AIDS (UNAIDS, 2006, 2007). Accordingly, ensuring healthy present and future generation subsumes under a bigger umbrella of Education for Sustainable Development (ESD).

(2) While HIV preventive education is obviously listed in the social and cultural dimension of ESD, it has cascading effect on the economic dimension in terms of human resource and workforce. Hence, the crucial need in providing HIV preventive education to the current youths so that they are aware and be able to take the necessary steps to reduce HIV infection.
(3) Teachers play an important role in educating the youths. In the case of Malaysia, while sex education had been denied as a school subject due to religious and cultural reasons, the Malaysian Ministry of Education has advocated that sex education, officially renamed or relabelled as health and reproductive education, should be integrated across the school curriculum. Nevertheless, how it should be done is left to the discretion of the teacher. Therefore, building the capacity of student teachers in terms of empowering them with the knowledge and pedagogical content knowledge of HIV/AIDS seems pertinent and timely.

Accordingly, the following research question emerged: **To what extent does the HIV/AIDS Preventive Education build capacity in terms of HIV/AIDS knowledge among the semester-5 student teachers at UPSI?**
Methodology

Research Design

A mixed-methodological design which entails comparing, integrating, and interweaving quantitative and qualitative methods was employed to provide a fuller and deeper understanding of the phenomenon at hand.

Quantitative: Given the exploratory nature of this research, the “one-group pretest-posttest design” (Gay & Airasian, 2000, p.389) was deemed appropriate.

Qualitative: Group discussion/presentation and written responses were gathered so as to illuminate what have been learnt by the participants.
Methodology

Sampling

Cluster random sampling was employed in which two out of five intact groups of student teachers who followed through the course on “Strategies in Teaching and Learning Science, officially coded as TSP2023 were chosen.

Groups 1 and 2 consisted of 25 and 31 student teachers respectively. Given that the population of Semester-5 student teachers was 146, the sample size of 56 represented 38% of the population.
Methodology

Instrumentation

The pretest and posttest inventories that were adopted from Baker (2009) are basically the same 19-item inventory that aims to gauge the extent to which student teachers possess the relevant knowledge about the basics of HIV/AIDS.

This inventory has sufficient validity in that every single item subsumes within the content coverage of HIV/AIDS Preventive Education. Meanwhile, the internal consistency reliability of this inventory, established by using Kuder-Richardson split half test (KR-20) with a sample of 10 university student teachers, was found to be at 0.75, indicating an acceptable level of internal reliability.
Methodology

Procedures

The 3-hour HIV/AIDS Preventive Education was conducted at UPSI on 14 September 2009 at 8 - 11 am for Group 1 and at 2 - 5 pm for Group 2, using the Five-Phase Constructivist Model (Needham & Hill, 1987) which essentially comprises the following 5 phases, namely:-

(1) Orientation;
(2) Elicitation of Ideas;
(3) Restructuring of Ideas;
(4) Application of Ideas; and
(5) Review (or Reflection).
Phase 1: Orientation

Pictures/slides of diseases associated with HIV such as Pneumocytis Pneumonia and Karposi Sarcoma were shown to provoke interest, curiosity and communication among students.

Papular cutaneous Kaposi's Sarcoma

Intraoral Kaposi's sarcoma lesion with an overlying candidiasis infection
Phase 2: Elicitation of Ideas

1. Individual pretest
Phase 2: Elicitation of Ideas

2. Group Discussion on the Basics of HIV/AIDS
Phase 2: Elicitation of Ideas

3. In your opinion, whom do you think amongst these American men and women have HIV and why?
Phase 3: Restructuring of Ideas

Activity 1: Debriefing

<table>
<thead>
<tr>
<th>Name</th>
<th>City</th>
<th>Diagnosis Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jack Mackenroth</td>
<td>New York City</td>
<td>1990</td>
</tr>
<tr>
<td>Ed Viera</td>
<td>New York City</td>
<td>1987</td>
</tr>
<tr>
<td>Enrique Franco</td>
<td>Manassas, Va.</td>
<td>2007</td>
</tr>
<tr>
<td>James Nicacio</td>
<td>Selma, Calif.</td>
<td>October 2001</td>
</tr>
</tbody>
</table>
**Phase 3: Restructuring of Ideas**

**Activity 1: Debriefing**

<table>
<thead>
<tr>
<th>Name</th>
<th>Location</th>
<th>Diagnosis Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Damaris Cruz</td>
<td>Deerfield Beach, Fla.</td>
<td>Diagnosed in November 1991</td>
</tr>
<tr>
<td>Nina Martinez</td>
<td>Atlanta, Ga.</td>
<td>Diagnosed in 1991, at age 8</td>
</tr>
<tr>
<td>Evelyn Hernandez Valentino</td>
<td>Cathedral City, Calif.</td>
<td>Diagnosed in November 1993</td>
</tr>
<tr>
<td>Fortunata Kasege</td>
<td>Houston, Texas</td>
<td>Diagnosed in 1997</td>
</tr>
</tbody>
</table>
Facilitator briefed the participants that all the men and women in the photographs were having HIV, although they seemingly looked normal and healthy. The main message was that it is not possible to tell one’s HIV status by looking at the person.
Phase 3: Restructuring of Ideas

Activity 2: Water Game

“Water Game” (Baker, 2009) was played. This aims to simulate the exponential spread of HIV through unprotected promiscuous sex.
Phase 3: Restructuring of Ideas

Activity 2: Water Game
Phase 3: Restructuring of Ideas

Activity 3: Jigsaw-II

Student teachers were divided into groups of 4 and Jigsaw-II method (Slavin, 1980) was employed. For resources, facilitator provided each group with
(i) “HIV Preventive Education: Information Kit for School Teachers” (UNESCO Bangkok, 2008),
(ii) “Building knowledge about HIV and AIDS: An interactive course for educators” (UNESCO and Japanese Funds-in-Trust, undated), and
(iii) An Internet-accessed computer/laptop.
Phase 3: Restructuring of Ideas

Activity 3: Jigsaw-II

Expert Groups in Action
Phase 3: Restructuring of Ideas

Activity 3: Jigsaw-II

In employing the Jigsaw-II method, the following steps were taken:-
(a) In their respective HOME GROUPS, students cursorily browse the 'entire' section, before concentrating on their respective areas of expertise, namely HIV; AIDS & HIV Transmission Modes; Diagnosis & Non-Transmission Modes of HIV; and Cure & Social Discrimination;
(b) Students go into EXPERT GROUPS, discussing and mastering the content, using provided questions as a guide for breadth and depth of discussion;
(c) Students return to their respective HOME GROUPS, taking turn to report to their teammates; and
(d) Students take individual QUIZ (e.g., a posttest).
Phase 4: Application of Ideas

Student teachers were asked to develop a brochure/pamphlet that provides school-going students with the information regarding the HIV and AIDS are, and the way in which HIV/AIDS can be prevented.
**MEANING**

What is HIV?
HIV stands for Human Immunodeficiency Virus. HIV is the virus that causes AIDS.

What is AIDS?
AIDS stands for Acquired Immune Deficiency Syndrome. AIDS is the most advanced stage of HIV infection.

How HIV survive in human body?
HIV causes AIDS by attacking the immune system’s soldiers—the CD4 cells (T-cells). When the immune system loses too many CD4 cells, you are less able to fight off infections and can develop serious, often deadly, infections. These are called opportunistic infections (OIs) because they take advantage of the body’s weakened defenses.

**SYMPTOMS**

- Pneumonia infection
- Opportunistic infections
- Neurological and psychiatric involvement
- Tumors and malignancies

**CAUSE**

- Sexual transmission
- Exposure to blood-borne pathogens
- Perinatal transmission
- Misconceptions

**HIV can spread through:**
1. Unprotected sexual intercourse
2. Sharing needles or syringes to inject drugs (including steroids or hormones)
3. You are uncertain of your partner’s status or your partner is HIV-positive
4. You are pregnant or now considering becoming pregnant
5. Ever been diagnosed with a sexually transmitted disease (STD)

**TEST FOR HIV:**

- Antibody test (called ELISA) that can be done on blood, saliva, or urine
- A positive result means your body has developed antibodies for HIV, so you are infected with the virus
- A negative result is not a test

**Take Action**

There are many ways you can take action in response to HIV/AIDS, get tested, for HIV
- practice safer methods to prevent HIV
- do not engage in high-risk behavior
- talk about HIV prevention with family, friends, and colleagues
- provide support to people living with HIV/AIDS

**HIV/AIDS**

- HIV is not transmitted by:
  - Hugs
  - Dancing
  - Sharing food or drinks
  - Using a shower, bathe, or be used by an HIV-positive person

**The Reproductive Health and HIV/AIDS Curriculum**

1. Sexual education
2. HIV/AIDS awareness
3. Information and education on HIV/AIDS
4. Protection and prevention
5. Teacher’s guide

**Fatimah Aini Mohamad**
B200610026744

**Norhussna Roslin**
B200610026601

**Marziana Mohd**
B200710028555

**Syarifah Yur Amalina Syed**
B200710028532

**Zulfahar**
B200610028532

**STOP AIDS SAVE FUTURE**
What is HIV?

HIV (Human Immunodeficiency Virus) is a vir- us that attacks the immune system, the body's natural defense system. Without a strong immune system, the body has trouble fighting off diseases. Both the virus and the infection it causes are called HIV.

White blood cells are an important part of the immune system. HIV invades and destroys certain white blood cells called CD4+ or helper T cells. If too many CD4+ cells are destroyed, the body can no longer defend itself against infection.

The last stage of HIV infection is AIDS (Acquired Immunodeficiency Syndrome). People with AIDS have a low number of CD4+ cells and get infections or cancers that rarely occur in healthy people. These can be deadly.

But having HIV does not mean you have AIDS. Even without treatment, it takes a long time for HIV to progress to AIDS—usually 10 to 12 years. If HIV is diagnosed before it becomes AIDS, medicines can slow or stop the damage to the immune system. With treat- ment, many people with HIV are able to live long and active lives.
PREVENTION

- There is currently no vaccine for HIV.
- It is possible to reduce your risk of contracting HIV. The following examples offer ways to do so:
- Abstain from sex. Not having sex is the only definite way to prevent the sexual transmission of HIV.
- If you decide to have sex, your risk can be reduced by limiting your number of partners, using protection every time, and avoiding contact with body fluids.
- Never share needles, syringes, or other drug paraphernalia.
- Avoid sharing personal care items that may have blood on them, such as toothbrushes and razors.
- Health care and public safety workers should always practice universal precautions such as wearing gloves, gowns, goggles, and face masks as appropriate when coming into contact with body fluids.
- In a health care setting, sharps, such as needles, should be disposed of in appropriate sharps containers and extreme caution should be exercised when handling.
- If you are at risk for contracting HIV, or think you’ve been exposed, get tested immediately. If you continue to be at risk, get tested often.
- The best prevention against HIV is knowledge and awareness. Please refer to the resources on the back of this pamphlet or see your health care provider for more information on HIV and AIDS.

PREPARED BY:

[Image of people and text]

WHAT IS HIV?
The acquired immunodeficiency syndrome (AIDS) was first recognized in 1981 and has since become a major worldwide pandemic.

AIDS is caused by the human immunodeficiency virus (HIV). By leading to the destruction and/or functional impairment of cells of the immune system, notably CD4 T cells, HIV progressively destroys the body's ability to fight infections and certain cancers.

HIV stands for Human Immunodeficiency Virus. AIDS stands for Acquired Immunodeficiency Syndrome.

WHAT IS AIDS?

Acquired immune deficiency syndrome or acquired immunodeficiency syndrome which caused by HIV viruses.

- HIV harms the body's immune system.
- This makes it hard to fight off infection.
- HIV is in blood and body fluids (semen, vaginal fluids, and breast milk).

SYMPTOMS

- The only way to determine if you have been infected with HIV is to get tested. Many people who are infected with HIV do not have any symptoms for years.
- HIV diagnosis is done through a simple blood test. A negative result does not necessarily mean there is no infection with HIV. It takes most people about three months to develop noticeable viral antibodies; it can take up to six months.
- A positive test result for HIV does not also indicate the presence of AIDS. AIDS is diagnosed by a physician based on specific clinical criteria, such as AIDS-indicator illnesses.
- Some of the warning signs of HIV infection may include:
  - Rapid weight loss.
  - Dry cough.
  - Reoccurring fever.
  - Profuse night sweats.
  - Swollen lymph glands in the armpits, groin, or neck.
  - Diarrhoea lasting for more than a week.
  - White spots or blanchishes on the tongue, in the mouth, or in the throat.
  - Pneumonia.
  - Red, brown, pink, or purplish blisters on or under the skin, or inside the mouth, nose, or eyes.
  - Memory loss, depression, and other neurological disorders.
- Presence of any one of these symptoms may warrant concern of infection with HIV since many of these symptoms can be related to other illnesses.

TRANSMISSION

- It has been documented that HIV is only known to be transmitted through four body fluids: blood, semen, vaginal secretions, and breast milk.
- Studies have shown that HIV exists in small amounts in an infected patient's saliva and tears, but it has never been shown that contact with these fluids results in transmission of the virus.
- HIV has not been shown to exist in an infected patient's sweat, therefore contact with sweat has never resulted in transmission of the virus.
- The most common way to transmit HIV includes:
  - Sexual contact with an HIV-infected person.
  - Sharing needles or syringes with an HIV-infected person.
  - Babies born to HIV-infected mothers.
  - Babies breast-fed by HIV-infected mothers.
- There is a potential risk for infection anywhere HIV-infected fluids come in contact with open wounds, sores, or mucous membranes.
- It is less common, but possible, for heat workers to become infected by having direct contact with HIV-infected fluids or by US needlesticks.
- It is possible, although extremely rare, to become infected with HIV via a blood transfusion or organ transplant. An infected blood is tested for HIV and has been since 1985.
- HIV is NOT transmitted through casual or social contact such as touching, hugging, holding hands, or dry kissing.
Phase 5: Review/Reflection

Student teachers reflected on their newly constructed knowledge, identifying how it differs from their pre-instructional views. Example: - “What are three new things about HIV/AIDS which I didn’t know before this workshop, but I now knew?”
As shown in Table 1, the t-test for paired samples yielded a $t$ of 5.02 which was statistically significant ($p < .001$) and a “medium” (Cohen, 1988) effect size of +0.66 that was educationally significant. The mean score obtained in the posttest (17.04) was statistically significantly higher than the mean score obtained for the pretest (15.84). Therefore, the posttest mean score for the group of 56 student teachers shows an appreciably higher degree of knowledge in HIV/AIDS than did their pretest mean score.
Results: Quantitative Analysis

It is understandable for critics to be sceptical of the results presented on the basis of possible initial (pre-intervention) and post-intervention differences between groups and between gender which may give rise to disguised group or gender effect rather than treatment effect. As such, two further analyses are performed to dispel the suspicion and to draw a firmer conclusion.
# Results: Quantitative Analysis

Table 2
*Results Obtained from Independent Samples t-Test for Pretest and Posttest by Group*

<table>
<thead>
<tr>
<th>Group 1</th>
<th></th>
<th>Group 2</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td>Pretest</td>
<td>25</td>
<td>15.76</td>
<td>1.69</td>
<td>31</td>
<td>15.90</td>
</tr>
<tr>
<td>Posttest</td>
<td>25</td>
<td>17.04</td>
<td>1.86</td>
<td>31</td>
<td>17.03</td>
</tr>
</tbody>
</table>

Table 3
*Results Obtained from Independent Samples t-Test for Pretest and Posttest by Gender*

<table>
<thead>
<tr>
<th>Gender</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td>Pretest</td>
<td>10</td>
<td>15.70</td>
<td>1.64</td>
<td>46</td>
<td>15.87</td>
</tr>
<tr>
<td>Posttest</td>
<td>10</td>
<td>17.50</td>
<td>1.43</td>
<td>46</td>
<td>16.93</td>
</tr>
</tbody>
</table>
Results: Quantitative Analysis

Therefore, these two further analyses (i.e., the first and second analyses) confirmed the earlier finding that the 56 student teachers from the two intervention groups have acquired a markedly higher level of knowledge in HIV/AIDS as the results of the HIV/AIDS Preventive Education Programme, and this is not due to any disguised pre- or post-intervention group or gender effect.
When the student teachers were asked to write down what they now knew which they did not know prior to the HIV/AIDS Preventive Education, the analyses indicated the emergence of the following three themes:-
Results: Qualitative Analysis

1. Modes of Transmission:
Many student teachers were ignorant of the ways in which HIV was transmitted. While they were generally aware that HIV was transmitted via unprotected sex, many were not aware that HIV could also be transmitted through exchanges of blood and blood products, and through parent-to-child. This intervention programme has, undoubtedly, “opened their eyes” as indicated by the following direct quotes in which ST denotes student teacher while the number corresponds to the number assigned to each student teacher:

Before the lesson, I didn’t know that HIV can be transmitted via breast milk.

( ST40 )

Before this, I thought mosquito is one of the causes that transmitted the virus. Now I know that mosquito/insect bite does not transmit the HIV virus.

( ST55 )

Now I know that sharing eating utensils with someone who is HIV+ cannot transmit the virus.

( ST38 )

But now I know that I won’t be infected if I share my eating utensils with HIV/AIDS people.

( ST28 )

At first, I thought HIV can be transmitted via blood only, but it seems to me now that HIV can also be transmitted via other bodily fluid.

( ST27 )
2. Differences between HIV and AIDS:-

Although the scientific facts show that HIV is a virus which basically attacks and destroys the immune system in human beings and that a person is considered to have AIDS when s/he begins developing opportunistic infections such as Pneumocytis Pneumonia, Karposí Sarcoma, and Tuberculosis, due to weakened immune system, many students had the misconception that HIV and AIDS were the same thing/concept prior to the intervention programme. This is supported by the following open-ended responses from the student teachers:-

Before the lesson, I thought HIV and AIDS are the same. Now I can distinguish between HIV and AIDS.

(ST33)

Before this, I thought HIV is a disease, but now, I know that it (HIV) is a virus and not a disease. This virus will cause the AIDS disease.

(ST30)
3. HIV Status by Look:-
Many student teachers verbalised in the class discussion that, prior to the HIV/AIDS Preventive Education, they could spot or identify an HIV-infected person without much difficulty just by his/her “skinny” and/or “flirtatious” look. In short, the student teachers have a stereotypical and/or biased mind-set of an HIV-infected person. However, after the programme, they now knew that such a status could not be determined by a person’s look.

*Now I know that we cannot notice the HIV-infected person by looking at the person.*

(ST52)
1. The findings of this study were derived from semester-5 student teachers at the Faculty of Science and Technology and there was no comparison group involved, hence its limited generalisability. Further studies investigating similar impact of HIV/AIDS Preventive Education using a comparison group and a more representative sample at the University are recommended in order to examine the validity of such generalization.
2. While the materials (i.e., pamphlets and brochures) generated by the student teachers seem to be interesting, informative and educationally relevant, these have yet to be trialled and validated with students to determine their effectiveness and for further adoption/adaptation by other school teachers. As such, it is strongly recommended that these materials could be trialled, validated and refined.

3. Additionally, upon the completion of this HIV/AIDS Preventive Education, student teachers should be assigned to develop lesson ideas on HIV/AIDS, or HIV/AIDS-infused science lesson ideas suitable for secondary students that are based on principled instruction which could then be trialled, validated, refined, and compiled. This will not only ensure a better grounded pedagogical competence among the student teachers in terms of classroom practice, but it will also extend the science teaching resources.
Discussion & Implications

4. Meanwhile, similar HIV/AIDS Preventive Education programme could also be extended beyond student teachers, to school students in the quest to address Sustainable Development, particularly in the area of health promotion.

5. The helpful publications by the UNESCO which were thoughtfully used in this research project should be extensively capitalised, widely disseminated, and locally adapted. In the case of teacher education at UPSI, the ways in which HIV/AIDS Preventive Education could be judiciously infused into the teacher curriculum, should be given due consideration as part of reorienting teacher education to address sustainability
(1) Integrating ESD (in the context of HIV/AIDS preventive education) into existing courses on Science Teaching Strategies.

(2) An ESD stand-alone course has been proposed for the Faculty of Science and Mathematics and now awaiting endorsement from relevant authorities.
COURSE NAME : EDUCATION FOR SUSTAINABLE DEVELOPMENT  
(PENDIDIKAN KE ARAH PEMBANGUNAN LESTARI)

COURSE CODE :

CREDIT : 3 (3+0)

SLT : 120 hours

PREREQUISITE : NONE

SEMESTER : 1/2

LEARNING OUTCOMES : At the end of this course, students should be able to:

1. identify the themes within environmental, economic, and social-cultural dimensions in Sustainable Development (K2)

2. use appropriate pedagogies to support Education for Sustainable Development (P7)

3. promote awareness and public understanding of Sustainable Development (P7)

4. discuss the pedagogical issues in Education for Sustainable Development (K6)

5. communicate clearly, concisely and correctly in written, spoken and visual forms (A5)
This course aims to equip the student teachers with a sound conceptual understanding of the concepts on sustainability(S), sustainable development (SD), and education for sustainable development (ESD). Subsequently, selected themes within each of the three dimensions in Sustainable Development, namely environmental, economic, and social-cultural, are explored and discussed within the context of education, with emphasis on pedagogy. Finally, student teachers are expected to develop ESD teaching materials which could be optimally tapped on by school teachers.
<table>
<thead>
<tr>
<th>CONTENT</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Concepts of Sustainability and Sustainable Development</td>
<td>3</td>
</tr>
<tr>
<td>2. Education for Sustainable Development (ESD)</td>
<td>6</td>
</tr>
<tr>
<td>3. Global Environmental Issues</td>
<td>6</td>
</tr>
<tr>
<td>4. Social Cultural Issues</td>
<td>6</td>
</tr>
<tr>
<td>5. Economic Issues</td>
<td>6</td>
</tr>
<tr>
<td>6. Pedagogy in Education for Sustainable Development</td>
<td>6</td>
</tr>
<tr>
<td>7. Development of ESD lesson materials</td>
<td>9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>42</strong></td>
</tr>
</tbody>
</table>

**ASSESSMENT** : Coursework & Project 100%
Follow-Up Actions ... cont.

(3) Special Interest Group (SIG) for ESD has been set up in March 2010.

Activities earmarked for 2010:

(a) Seminar on ESD for Academic Staff in March 2010. This was facilitated by Prof. Dr Elwyn Thomas.
One-Day Seminar (22 March 2010)
Education for Sustainable Development: Implications for Teacher Education
Follow-Up Actions ... cont.

Activities earmarked for 2010: ... cont

(b) Awareness pamphlets on ESD would be produced and mass distributed in the university.
Acknowledgement:
I would like to put on record, my sincerest appreciation to the UNESCO Bangkok for providing me with the research grant [Contract No.: FC09-070 (SAP.3240217699)]. Equally, I would like to express my gratitude to the student teachers who followed through the education course on “Strategies for Teaching and Learning Science” (officially coded as TSP 2023) during the Semester 1 of the Academic Year 2009/2010 and were involved in the research project. Their cooperativeness had made this research possible.