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# The Dwindling of Physics as an Examination Subject in Secondary Schools in Garissa District

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## Abstract

*The purpose of the paper was to establish prevalence of internalized stigma among students living with Human Immunodeficiency Virus (HIV). The study assessed the current prevalence of levels of internalized stigma among students living with HIV in institutions of higher learning, the association of social demographic characteristics, health status, social supports, status disclosure and ARV adherence with internalizing stigma among HIV positive students. The study is informed by the PEN3 Model. Mixed-methods sequential explanatory design was adopted. The study target population was 33 HIV positive students drawn from higher learning institutions in Uasin Gishu County, Kenya. A census survey was used. Data of HIV positive students was obtained from counselor officers. Primary data was collected using questionnaires. Data was analyzed using descriptive statistics such as mean and frequencies. In addition, Pearson Correlation was used to test the hypotheses. Findings showed that there is high level of internalized stigma among HIV students in these institutions. Correlation results showed that parents' occupation, age, parents level of education, health status, social supports and ARV adherence were significantly correlated with internalizing stigma in HIV positive students. However, adherences to ARV and social support were negatively correlated with internalized stigma. Based on the study findings, collaborative efforts and policies are necessary to enhance effective interventions aimed at reducing internalized stigma in learning institutions, and for directing government and school-based policies and practices towards improving students with HIV right to education, empowerment and support.*

**Key words:** ***Physics, science, examinations***

## Introduction

Student enrolment in science has always been low whenever there is an option of dropping science subjects (Dekkers, Laeter & Malone, 1991). When the subjects are compulsory, circumstances force students to opt for it. A study in China found that year 12 science students reported that they "have to learn Physics because it is a testing subject"; few knew the value of Physics for future career; and few thought "Physics is interesting" (Ren, 2002). Female students tended to have more negative perceptions of Physics, in terms of career and academic goals, than male students (Ren, 2002).

Senior secondary school students' decisions about taking physics seem to be based on a


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long list of factors that include 'external' reasons which concern influences from outside, like family, school and science teachers, peers, mass media and the society, and 'internal' reasons which relate to students' perceptions and experiences of school science (Zheng, 2007). In Australia, a decline of favourable attitudes towards science was consistently found as students progressed through secondary grade levels (Lyons, 2005).

In many counties the world over, science is not compulsory. In Australia, the study of science is not compulsory at the upper secondary level (years 11-12), where science is taught as a Public Examination Subject (PES) or as a School-Assessed Subject (SAS). Students can opt for PES, SAS or none at all depending on their future courses. (Dekkers, Laeter & Malone, 1991). However, the proportion of secondary school students enrolled in PES science subjects as compared to the total number of year 12 students has been declining over a period of many years in the same place (Dekkers, Laeter & Malone, 1991).

School and science teachers have been identified to exert important external influences on students' decisions about taking physics through providing students with learning environment and career information (Nashon, 2003). Other external reasons reported include peers' attitudes towards science (Panizzon & Levins, 1997), history of the local labour market (Munro & Elsom, 2000) and the influence of mass media and society (Lyons, 2005). Students' early science learning experiences and perceptions of school science affect students' physics enrolment decisions (Hoffmann, 2002). Positive attitudes have been associated with interest and enjoyment of science among secondary school-aged students (Miller et al, 1999).

In Kenya, the number of students enrolling for Physics has been low since the Kenya National Examinations Council (KNEC) changed science subjects selection policy in secondary school examination in the late 1990s (KNEC, 1999). Most students opt to enrol for Chemistry and Biology while leaving Physics with a very small percentage of students (KNEC, 2002). Besides, poor performance in the science subjects has also been a concern, with many students performing poorly in them. In most cases, the low grades of E and D in KCSE (where E is the lowest grade with one point while A is the highest grade with 12 points) characterize national examination results in Physics (KNEC, 1998, 1999 & 2000).

***Objectives of the Study***

a) To investigate the effect of performance in physics on student enrolment in physics.
b) To examine how physics teachers characteristics affect enrolment in physics
c) To determine the effect of school-related practices on student enrolment in physics
d) To assess the effect of students gender characteristics on their enrolment in physics

## Methodology

Descriptive survey was conducted among students in form two and three in four schools in

Central Division, Garissa district. Student enrolment in physics in North Eastern Region (formerly North Eastern Province) has been extremely poor, with the total number of students sitting for physics in KCSE always below 6% of all students in the province from 2001 to 2005. Nationally, the number of students opting for physics in the region has stagnated at 0.08% to 0.12% of national enrolment in Physics.

Purposive sampling was employed to select four of the five provincial schools using proximity as the only criterion, that resulted in two girls' and two boys' schools. Systematic random sampling technique was used to select 20% of students, using the class register and a sampling fraction of five. All Physics teachers, heads of science departments and head teachers of schools studied were automatic purposive samples due to the positions they occupy. A total sample of 243 was studied.

The instruments used were interview schedules to obtain data from head teachers, heads of science departments and teachers of physics, and questionnaire and focused group discussion (FGD) guides to collect data from students. Students from each class were divided into groups of eight to twelve participants as advocated by Mwiria & Wamahiu (1995), and interviewed separately. Teachers and other administrators were interviewed individually on availability.

Descriptive statistics were used to analyse quantitative data (Nwana, 1981), while qualitative data was analysed by thematic discussion and content analysis (Orodho, 2005). Excel computer program was used to draw graphs from the data (UNESCO, 2005). Triangulation of responses was performed to determine the divergence and/or convergence of views from different respondents.

## Results

### *Effect of Students Performance Profile on Physics Enrolment*

Performance profile was a major reason for dropping Physics. Results of previous physics students were always poor, which discouraged students from registering for Physics. Schools A and B were boys' schools while C and D were girls' schools.

***Table1: Students' Performance Profile in Science Subjects for School A, 2002-2005***

| | | | Grade | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | C+ | C | | | | | | X/Y | M.S | M.G |
| | Phys | 13 | - | - | - | 1 | - | 1 | - | 2 | - | 2 | 6 | - | 1 | | 3.7 | D+ |
| 2002 | Chem. | 83 | 2 | 1 | - | - | 2 | 3 | 4 | 6 | 11 | 17 | 26 | 9 | 2 | | 3.5 | D |
| | Bio | 70 | - | 1 | - | 2 | 2 | 7 | 3 | 5 | 4 | 23 | 15 | 7 | 1 | | 3.8 | D+ |
| | Phys | 6 | - | - | - | - | 1 | 1 | 1 | - | 1 | - | 2 | - | - | | 4.8 | C- |
| 2003 | Chem. | 106 | - | 1 | 2 | 1 | 3 | 3 | 1 | 2 | 2 | 30 | 32 | 27 | 1 | | 2.8 | D |
| | Bio | 103 | - | 1 | 2 | 3 | 8 | 3 | 12 | 13 | 8 | 27 | 22 | 3 | 1 | | 4.3 | D+ |
| | Phys | 3 | - | 1 | - | - | - | - | - | - | 1 | - | - | 1 | - | | 4.8 | C- |
| 2004 | Chem. | 115 | - | 1 | - | 2 | 2 | 2 | 8 | 5 | 12 | 22 | 34 | 27 | - | | 2.7 | D |
| | Bio | 114 | 1 | 3 | 6 | 10 | 8 | 7 | 6 | 9 | 7 | 18 | 13 | 26 | - | | 4.3 | D+ |
| | Phys | 7 | - | - | - | - | 1 | - | - | - | 1 | 1 | 4 | - | - | | 2.1 | D- |
| 2005 | Chem. | 114 | 1 | - | - | - | 2 | 4 | 4 | 4 | 7 | 19 | 41 | 33 | - | | 2.6 | D |
| | Bio | 115 | - | 2 | 2 | 5 | 9 | 7 | 9 | 19 | 14 | 25 | 14 | 6 | - | | 4.5 | C- |

Source: NEP Examinations Office, 2002-2005

From Table 1, performance in both Biology and Chemistry started from A or A-, that of Physics started from grade B or below, with the highest concentration of students being at grade D.

The situation was no different in school B as depicted in the following Table 2

***Table 2: Students Performance Profile in Science Subjects in School B, 2002-2005***

| | | | G | | | R | | A | | | D | | | E | | S | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Subject | Entry | A | A- | B+ | B | B- | C+ | C | C- | D+ | D | D- | E | X/Y | M.S | M.G |
| | Phys | 9 | - | - | - | - | 1 | - | 2 | - | 3 | 2 | 1 | - | - | 4.4 | D+ |
| 2002 | Chem. | 111 | - | - | 2 | 4 | 5 | 11 | 10 | 7 | 6 | 21 | 32 | 11 | 2 | 4 | D+ |
| | Bio | 111 | - | - | 4 | 5 | 8 | 12 | 9 | 10 | 14 | 23 | 16 | 8 | 2 | 4.6 | C- |
| | Phys | 10 | - | 1 | - | 2 | 2 | 1 | 1 | 1 | - | 2 | - | - | - | 6.9 | C+ |
| 2003 | Chem. | 107 | 5 | - | 1 | 6 | 6 | 5 | 9 | 5 | 7 | 18 | 25 | 14 | 2 | 4.5 | D+ |
| | Bio | 107 | 1 | 2 | 6 | 8 | 13 | 8 | 10 | 7 | 9 | 22 | 12 | 6 | 3 | 5.1 | C- |
| | Phys | 14 | - | - | 1 | - | 1 | 4 | 2 | 3 | 1 | 1 | - | 1 | - | 5.8 | C |
| 2004 | Chem. | 115 | 1 | 2 | 2 | 2 | 8 | 14 | 11 | 9 | 18 | 24 | 21 | 4 | - | 4.5 | D+ |
| | Bio | 115 | 3 | 5 | 21 | 18 | 11 | 15 | 8 | 9 | 3 | 15 | 7 | - | - | 5.1 | C- |
| | Phys | 8 | - | - | - | - | 4 | 1 | 1 | - | - | 2 | - | - | - | 6.6 | C+ |
| 2005 | Chem. | 116 | 1 | 1 | 2 | 3 | 8 | 4 | 12 | 11 | 8 | 27 | 30 | 9 | - | 4.1 | D+ |
| | Bio | 116 | 8 | 11 | 12 | 12 | 15 | 12 | 5 | 17 | 3 | 11 | 7 | 3 | - | 7.1 | C+ |

Source: NEP Examinations Office, 2002- 2005

From Table 2, the number of registered students in physics is low; physics grades start below those of Chemistry and Biology in all the years, but physics mean grade is better than, or equal to those of Biology and Chemistry. This situation was even graver in the two girls' schools as depicted in the following Table 3 for school C.

***Table 3: Students Performance Profile in Science Subjects in School C, 2002-2005***

| | | | G R A D E S | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Subject | Entry | A | A- | B+ | B | B- | C+ | C | C- | D+ | D | D- | E | X/Y | M.S | M.G |
| 2002 | Phys | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | Chem. | 66 | - | 1 | 2 | 1 | 1 | - | 2 | 4 | 2 | 15 | 29 | 9 | - | 3.03 | D |
| | Bio | 66 | - | 1 | 1 | 2 | 2 | 7 | 2 | 5 | 8 | 18 | 14 | 6 | - | 4.00 | D+ |
| 2003 | Phys | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | Chem. | 90 | - | - | - | - | 1 | 2 | 4 | 4 | 8 | 16 | 38 | 16 | 1 | 2.64 | D |
| | Bio | 90 | - | - | - | 1 | 4 | 7 | 10 | 12 | 13 | 23 | 16 | 3 | 1 | 4.07 | D+ |
| 2004 | Phys | 4 | - | - | - | - | - | - | 1 | 1 | - | 2 | - | - | - | 4.25 | D+ |
| | Chem. | 89 | - | - | - | - | 2 | 2 | 3 | 4 | 8 | 25 | 37 | 9 | - | 2.64 | D |
| | Bio | 72 | - | 2 | 1 | 6 | 8 | 5 | 8 | 13 | 8 | 8 | 9 | 4 | - | 4.07 | D+ |
| 2005 | Phys | 7 | - | - | - | 1 | - | - | - | 1 | - | 4 | 1 | - | - | 4.00 | D+ |
| | Chem. | 82 | 1 | - | 1 | 3 | 6 | 3 | 10 | 3 | 24 | 14 | 1 | - | - | 3.29 | D |
| | Bio | 83 | 3 | 4 | 3 | 5 | 3 | 6 | 8 | 11 | 6 | 24 | 10 | - | 1 | 5.30 | C- |

Source: NEP Examinations Office, 2002-2005

Table 3 presents results of one of the girls' schools, school C. The school had just a few students registered for physics in only two of the years, 2004 and 2005. Physics grades started from C in 2004 while those of Chemistry and Biology started from grades B- and A- respectively. This is an indication of girls' performance being worse than boys. Two of the registered students in 2004 attained C and C-, while the other two grade D. The situation in the second girls' school is depicted in the following Table 4.

***Table 4: Students Performance Profile in Science Subjects in School D, 2002-2005***

| | | | G | | | R | | A | | D | | E | | S | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Subject | Entry | A- | B+ | B | B- | C+ | C | C- | D+ | D | D- | E | X/Y | M.S | M.G |
| A | | | | | | | | | | | | | | | | | |
| 2002 | Phys | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | Chem. | 77 | - | - | - | - | 1 | 2 | 2 | 4 | 4 | 18 | 30 | 16 | 1 | 2.3 | D |
| | Bio | 77 | - | - | - | - | - | 3 | 5 | 8 | 5 | 18 | 21 | 15 | - | 3.1 | D+ |
| 2003 | Phys | 4 | - | - | - | - | - | - | - | - | - | - | 2 | 2 | - | 1.5 | D- |
| | Chem. | 60 | - | - | - | - | - | - | - | 2 | 4 | 7 | 24 | 21 | 2 | 1.9 | D- |
| | Bio | 62 | - | - | - | - | - | - | 1 | 1 | 6 | 27 | 17 | 8 | 2 | 2.6 | D |
| 2004 | Phys | Not gradec | | | | | | | | | | | | | | | |
| | Chem. | Not gradec | | | | | | | | | | | | | | | |
| | Bio | Not graded | | | | | | | | | | | | | | | |
| 2005 | Phys | 2 | - | - | - | - | - | - | - | 1 | - | 1 | - | - | - | 3 | D |
| | Chem. | 95 | - | - | 1 | - | 1 | 1 | 5 | 1 | 2 | 14 | 41 | 29 | - | 2.3 | D- |
| | Bio | 93 | - | - | - | 2 | 1 | - | 7 | 8 | 10 | 27 | 23 | 9 | - | 3.1 | D- |

Source: NEP Examinations Office, 2002; 2003; 2004; 2005; 2006

School D registered four students in physics in 2003, but all failed. Two got D- while the others got E. The following Table 5 depicts students' views on factors contributing to the reduction in students opting for Physics.

***Table 5: Students' Reasons for Not Taking Physics***

| S/NO. | REASON | NUMBER OF STUDENTS | PERCENTAGE |
|---|---|---|---|
| 1. | Poor performance by self/previous students | 156 | 86.2 |
| 2. | Too much Mathematics | 134 | 74 |
| 3. | Physics selected with Geography/History/Commerce | 95 | 52.5 |
| 4. | Discouragement by various people | 83 | 45.9 |
| 5. | Biology/Chemistry compulsory/Physics optional | 81 | 44.8 |
| 6. | Fewer practical compared to Biology/Chemistry | 68 | 37.6 |
| 7. | Syllabus not covered | 59 | 32.6 |
| 8. | Not handling equipments in the lab | 54 | 29.8 |
| 9. | Problem with taking notes | 48 | 26.5 |
| 10. | Physics is difficult compared to Biology/Chemistry | 35 | 19.3 |
| 11. | Career not Physics related | 24 | 13.3 |
| 12. | There is only one teacher in the school | 15 | 8.3 |

From Table 5, the most prevalent reason for students dropping physics was poor

performance.

***Effect of School-Related Practices on Student Enrolment in Physics***

Factors considered subject selection policy, textbook policy, learning resources/equipment purchasing policy, teaching and learning processes. The study found that all schools treated Physics as the only optional subject while Biology and Chemistry were taken to be compulsory. However, different school stakeholders had different views about science subjects' selection policy. Learners were more aware about physics being optional while others knew biology and chemistry as compulsory. In this way, subject selection criterion greatly influenced students dropping physics. Physics was considered last after the students had selected the first seven subjects as required by KNEC rules, and was then clustered with Geography, History and/or Commerce.

***Effect of Physical Facilities on Students Enrolment in Physics***

Textbooks were not provided in all schools studied in all subjects. However, most students bought non-science books. There were more Chemistry and Biology text books among students than there were Physics books. In fact, physics text books were generally missing from most classes. Students who bought science books preferred either chemistry and/or biology books. This was because students were not sure whether they would proceed with physics or not, and that physics textbooks were more expensive biology or chemistry books. However, the three subjects suffered similar shortage of text books.

All the schools studied had a science laboratory, but one (school B) had two laboratories. All the schools had laboratory assistants except school A. In the school with two laboratories, chemistry & biology laboratory was well maintained and well equipped, but physics laboratory was in a dilapidated condition. This discouraged students from physics.

There were inadequate practical equipments in physics and hence most physics practical sessions were reduced to teacher demonstration sessions or at best students working in groups of five or more. Demonstration method was cited as a reason for lack of confident enough to register for physics. In contrast, equipments for biology and chemistry were more abundant. The two share similar equipment for many of the experiments.

***Effect of Students' Gender on Choice of Physics after Form Two***

Schools C and D were girls' while A and B were boys' schools. The following Table 6 shows physics enrolment trends in each of the four schools by gender.

From Table 6, girls' enrolment has been quite low. From the observation, it is evident that the students' gender characteristics play a role in determining enrolment in Physics. Thus, students' gender characteristics affect enrolment in Physics.

**Table 6: Enrolment in Physics by Gender**

| PAST ENROLMENT IN PHYSICS IN KCSE | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 2002 | | 2003 | | 2004 | | 2005 | |
| School Code | Type of school | Phy enrol | Total enrol | Phy enrol | Total enrol | Phy enrol | Total enrol | Phy enrol | Total enrol |
| A | Boys | 13 | 83 | 6 | 106 | 3 | 115 | 7 | 114 |
| B | Boys | 9 | 111 | 10 | 107 | 14 | 115 | 8 | 116 |
| C | Girls | - | 66 | - | 90 | 4 | 89 | 7 | 83 |
| D | Girls | - | 77 | 4 | 62 | Not graded | | 2 | 95 |
| **Total** | | **22** | **337** | **20** | **365** | **21** | | **24** | **408** |

## Discussion

Several factors were found to be contributing to the dwindling of physics as an examination subject. Due to poor performance in physics, many students avoided physics as they believed they would likewise fail.

The designation of physics as the only optional science subject, which is not the correct position of KNEC, greatly reduced enrolment in physics. Preferential equipment of laboratories, in which biology and chemistry have more equipments than physics, repelled students from taking physics. Most female students opted to drop physics, leaving a very small proportion registering for physics. The proportion of females registering for physics was much lower than that of males.

## Recommendations

The study recommends that schools should adhere to the KNEC regulations regarding registration and learning of science subjects. The subjects should be treated equally and students left free to make their choices. Also, physics teachers should explain the importance of the subject, including careers available in the field of physics, and encourage students to opt for it. Girls in secondary schools should be sensitized about their equality to boys especially in academic cycles. Career masters should stress the importance of physics for future studies on technology related fields, and the need for technology in the development in Kenya, and to the students' future development. Similar studies should be carried out in other districts in other provinces, including mixed schools, to gauge similarities and differences in the findings.

National policies should be formulated, such as those recommended above for similar findings, but region-specific policies should be formulated to tackle regional issues individually. The study should also find out factors outside schools such as religion, social, cultural and ecological variables since this study did not have the capacity to cover these external school factors. Extra-school influences found to affect enrolment in physics should then be tackled alongside the influences identified above.


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## References

Dekkers, J., De Laeter, J. R. & Malone, J.A. (1991). Science and Mathematics Enrolment Patterns in Australia, 1970-1989. Curtin University of Technology, Perth

Hoffmann, L. (2002). Promoting Girls Interest and Achievement in Physics Classes for Beginners. Learning and Instruction, 12, 447-465.

KNEC (1998). KCSE Candidate Performance Annual Report, Government Printer, Nairobi

KNEC (1999). KCSE Candidate Performance Annual Report, Nairobi, Government Printer

(2000). The Year 2000 KCSE Examination Report, Nairobi, Government Printer

(2002). The Year 2001 KCSE Examination Report, Nairobi, Government Printer

Lyons, T. (2005). The Puzzle of Falling Enrolments in Physics and Chemistry Courses:Putting Some Pieces Together, Research in Science Education, 36, 285-311. Http://www.Rse.Com

Miller, D., Parkhouse, P., Eagle, R. & Evans, T. (1999). Pupils and the Core Subjects. Paper presented at the British Educational Research Association Annual Meeting.

Mwiria K. & Wamahiu P. S. (1995): Issues in Educational Research in Africa. East African Educational Publishers Limited, Brick Court, Mpaka/Woodvale Grove, Westlands, Nairobi

Nashon, S. M. (2003). The Status of Physics 12 in BC: Reflections from UBC Science Teacher Candidates. Paper Presented At The Annual Meeting of The National Association For Research In Science Teaching, Philadelphia, PA.

NEP Examinations Office, (2001; 2002; 2003; 2004; 2005; 2006). KCSE Examinations Analysis Report

Nwana O. C. (1981): Introduction to Educational Research for Student Teachers. Heineman Publishers, Ibadan

Panizzon, D. & Levins, L. (1997). An Analysis of the Role of Peers in Supporting Female Students Choices in Science Subjects. Research in Science Education, 27(2), 251-270.

Orodho J. A. (2005). Elements of Education and Social Science Research Methods. Masola Publishers, Kenya, Nairobi

Ren, C. N. (2002). Investigation and Analysis of Senior Middle School Students Physical Study (in Chinese). Journal of Hubei Normal University (Natural Science), 22(13), 82-88.

UNESCO (2005). Challenges of Implementing Free Primary Education in Kenya, Assessment Report, Nairobi.

Zheng Z. (2007). A Comparison Study of Students Reasons for Taking Physics between Two Australian High Schools and Two Chinese High Schools. School of Education, the University of Queensland