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# Computer Assisted Learning in Instruction of Fluid flow in Physics: A Case of Wareng and Uasin Gishu High School, in Eldoret, Kenya.

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This paper presents research findings of a study that was undertaken to compare the relative effects of computer assisted learning approach with the conventional methods in teaching Fluid Flow in Physics in High School. The objective of the study was to investigate the level of performance and retention of learned information for each set of students taught using the two different approaches. The research was a case study of two schools, namely Wareng and Uasin Gishu High Schools in Uasin Gishu County in Kenya. The two schools were purposely sampled because they had well equipped computer laboratories. The research was experimental but backed by use of two sets of questionnaire and interview schedule for both teachers and students. The data collected using the questionnaire and interviews were analyzed using descriptive statistics and the experimental data analyzed using analysis of variance statistical technique. We found that the students taught using compute assisted learning out-performed those exposed to conventional teaching methods in both performance and retention. We, therefore recommend the use of computers in teaching physics in secondary schools in Kenya.

*Key words*: Computer Assisted Learning, Conventional Teaching Methods, Fluid Flow

## Introduction

Science has been regarded as a basic subject and is acknowledged as an essential foundation for economic growth, national security and progress (Alters, 1997). However students' performance and interests in science and technology- based subjects in poor (Bogonko 1992, Eshiwani 1985). Further, statistics from the Kenya National Examination shows that performance in Physics has remained poor and enrolment in the subject is on the decline (KNEC 2004:66).

Given that the world is rapidly advancing in science and technology and Physics being a core discipline in this respect, continued poor performance at secondary school level has grave implications for the country. If the trend continues, then it implies that the country will not effectively participate in modern technology either as a consumer or producer (Too, 1996:3).

The low enrolment has had some effect on the number of girls taking Physics (KNEC, 2004). The situation is not limited to Kenya alone; for example in science based faculties in all Nigerian Universities during 1980s, not more than 25%of the total students' enrolment was female.

During the 1988- 89 academic year only 26% of the undergraduate and 23% of the post-graduate students were female (National Universities commission, Nigeria, 1990).
Other studies that evaluated women in science and technology-based training programs and professions in Kenya, Sierra Leone and Swaziland reported that girls and women were marginally represented in these areas (UNESCA, 1988).

The implication in worrying; there is lack of competent technical manpower in Africa which is compounded by the lack of encouragement of girls and women (who make up 50% of the population) to acquire science and technical education. It means 50% of the scientific talent and creativity in Africa lies relatively dormant and untapped. The continent's abundant mineral and petroleum resources demand that the talents of Africans in geophysics should be harnessed for the rapid and effective socioeconomic and technological development of the continent (Ajakaiye, 1993). Therefore in order to increase enrolment in Physics and improve performance, new teaching approaches and learning process must be explored.

## Materials and Method

### *Research design*

The design of the study was experimental. Thirty two Form two students took part in the study. A pre-test was administered and the subjects matched on the basis of their scores so that the experimental group (E) and control group (C) were closely comparable in achievement/ability.

The pretest marks were dismally low, since the topic tested had not been covered by the students. The Computer Assisted Learning Module lessons began with the presentation of the topic lesson. The computer screen would display the topic of the lesson and appropriate key sign to direct the learners on the correct function key to press in order to let the computer relay the statement onto the screen that explained the lesson content text and animated pictures.
The teacher was present throughout the lesson to facilitate, advice, guide and participate where needed. The conduct of the lesson was interactive in that the learners were required to read and follow the content. Questions were given and learners were required to work out some numerical problems whose answers were given elsewhere in the menu where students could access and compare with their answers.

The subjects in the control group were exposed to the same Physics course content through Conventional Methods (lecture, demonstration and experiments) made.
The teacher was directed to teach the content as he normally does. Therefore, the subjects in the control group received instructions in the same sub topics just like the other subjects in the experimental treatment group except for the instructional methods employed.

Immediately after the completion of the topic the two groups were given a post-test.
Two weeks later, an unannounced post-post test was administered. The purpose of this was to determine the amount of information the students had retained.
All the marks are in percentages.

## Results

### *A one way analysis of variance*

An examination of the F-ratio in the table above shows that the value is statistically significant the F-value (F, 1, 30, = 26.26, P< 0.05) far exceeds the critical value of 4.17 needed to reject the hypothesis $HO_1$ which stated:
*"There is no significant difference in the performance between students taught physics using computer assisted learning approach and those taught using conventional methods"*.

It shows that using Computer Assisted Learning approach in teaching Physics has a positive and significant effect on performance.

**Table 1: Pretest scores**

| Experimental | Control |
|---|---|
| 4 | 4 |
| 6 | 6 |
| 0 | 0 |
| 2 | 0 |
| 10 | 8 |
| 4 | 4 |
| 0 | 0 |
| 2 | 2 |
| 6 | 6 |
| 2 | 2 |
| 6 | 8 |
| 4 | 5 |
| 2 | 2 |
| 18 | 10 |
| 4 | 4 |
| 6 | 6 |
| $N_E = 16$ | $N_C = 16$ |

**Table 2: Post Test Score**

| Experimental | Control |
|---|---|
| 34 | 20 |
| 68 | 50 |
| 52 | 34 |
| 42 | 26 |
| 84 | 80 |
| 48 | 28 |
| 36 | 22 |
| 28 | 14 |
| 30 | 18 |
| 54 | 34 |
| 54 | 38 |
| 72 | 50 |
| 75 | 50 |
| 60 | 50 |
| 50 | 32 |
| 42 | 26 |
| $N_E = 16$ | $N_C = 16$ |

**Table 3: Post – Post Test**

| Experimental group | Control group | Difference |
|---|---|---|
| 28 | 24 | 4 |
| 60 | 46 | 14 |
| 68 | 24 | 44 |
| 56 | - | 56 |
| 60 | 46 | 14 |
| 40 | - | 40 |
| 25 | 20 | 5 |
| 20 | - | 20 |
| 24 | - | 24 |
| 42 | 34 | 8 |
| 60 | - | 60 |
| 58 | 28 | 30 |
| 55 | 28 | 17 |
| 35 | 26 | 9 |
| 23 | 22 | 1 |
| $N_E = 15$ | $N_C = 10$ | |

**Table 4: Comparison of mean scores (MS), Standard deviation (SD) and Mean Gain (MG) obtained on achievement tests**

| SCALE | E | C |
|---|---|---|
| PRE-TEST MEAN | 4.75 | 4.19 |
| S.D | 4.23 ($N_E = 16$) | 3.12 ($N_C$=16) |
| POST-TEST MEAN | 51.8 | 35.75 |
| S.D | 17 | 15.84 |
| MEAN GAIN | 47.06 ($N_E$=15) | 31.56 ($N_C$=10) |
| POST-POST TEST MEANS | 40.88 | 27.0 |
| S.D | 15.89 | 8.88 |

**Table 5: Analysis of variance (ANOVA) of the Post-Test scores**

| SOURCE | DEGREE OF FREEEDOM | VARIANCE | F-RATIO | SAMPLE SIZE | SIGNIFICANCE |
|---|---|---|---|---|---|
| BETWEEN GROUPS | 1 | 512 | 26.28 | 32 | 0.05 |
| WITHIN GROUPS | 30 | 19.19 | | | |

*Significance at 0.05 level, P(F, 1, 30 = 4.17) = 0.05*

**Table 6: Analysis of variance of the Post-Post test**

| SOURCE | DEGREE OF FREEDOM | VARIANCE | F RATION | SIGNIFICANCE P |
|---|---|---|---|---|
| BETWEEN GROUPS | 1 | 1280 | 89.95 | 0.05 |
| WITHIN GROUPS | 25 | 14.23 | | |

*Significance at 0.05 level P(F, 1 25 = 4.24) = 0.05*

The calculated F value (F 1, 25 = 89.95, P< 0.05) far exceeded the critical value of 4.24 needed to reject the hypothesis. It is therefore statistically significant and the null hypothesis $HO_2$:
*"There is no significant difference in retention by students taught using computer assisted learning approach and those taught using conventional method"*. was not accepted at 0.05 level of significance.

The findings show that Computer Assisted Learning has a positive and significant effect on the level of retention of the students.

## Discussion

The use of Computer Assisted Learning approach in teaching Fluid Flow in Form two Physics not only achieves better performance by students on criterion reference tests but it also has positive effect on retention of learned information.
The findings is consistent with related studies by Kiboss (1997), Robyler and Castine (1988), Altin (2002).

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