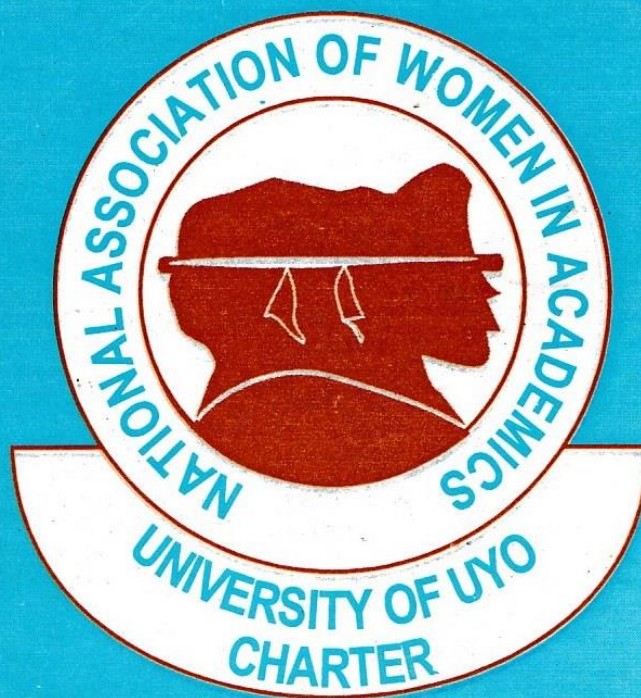


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Relationship Between Students' Attitudes And Performance On Physics Using Computer Assisted Instruction

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Abstract

Attitudes are our mental disposition which determine our next line of response to the stimulus to which attitudes are directed (Okoye 1985). It can spread to other stimuli associated with the target stimulus. Hence, this study sought to investigate the relationship between students' attitudes and performance in physics using computer-assisted instruction. A 25-item instrument assessing the students' attitude towards Computer-Assisted Instruction (ACAIMS) was developed and administered on 164 students drawn from two Federal Government Secondary Schools in Akwa Ibom State. The result of the investigation showed that:

- (i) Computer-Assisted Instruction (CAI) fosters adequate opportunities for the students to interact with the teachers.
- (ii) It enables the students to discover many ideas for themselves on the use of the computer.
- (ii) It helps spend more time doing the lesson on computer.
- (iii) It makes demonstration enjoyable and reinforces students' manipulative skills.

Generally, the 25 items of the instrument that measured attitude have indicated positive significant difference that could be adopted for good performance in physics.

Introduction

The importance of computer as an effective instructional tool is appreciated both in the developed and developing nations. Career opportunities are increasingly dependent upon acquisition of sophisticated technological skills. Therefore, teachers in this age of multimedia instruction have to function more as motivators, mediators, facilitators and designers of lessons rather than mere knowledge providers. Purcell (1996) stated that instead of teachers emphasizing monologue-

style presentations and lectures, they should operate more as communicators or navigators to new educational domains, and as expert guides to instructional situations. The entry of computer application into the business world has created greater challenges for education. These computers are utilized in all the major areas of the society, namely transportation, government, industries, sports, banking, administration and others. The primary goal of the use of computer was not to provide the hardware, but to see whether this computer power could be used to improve the educational experience in a fundamental way. A recent development in the search for more efficient training methods according to Wal and Linde (1991) involves the integration of Computer Assisted Science Instruction Programmes into existing in-service training programmes for teachers. They stated specific objectives as: -

- (i) Introduction of teachers to computer technology
- (ii) Creation of awareness of its possible application in science education.
- (iii) Acceleration of the upgrading of science teachers by means of applicable software modules.
- (iv) Investigation of the possibility of an alternative science teachers education programmes, which will be more relevant to further needs.

The implication of this is to devise a teacher training strategy that is less stressful and learner friendly such that their students will also be taught using similar methods to boost their understanding of science.

Purpose of the Study

The purpose of this study therefore is to determine whether there is a significant difference in the attitude of students taught physics using computer-assisted instrument and those taught through the conventional system.

Significance of the Study

In the first place, the results of this study would be useful to teachers in their presentation using Computer assisted Instruction as instructional material in communication.

Secondly, the study will be useful to the students in enhancing their learning of concepts and manipulation of the computer system.

Thirdly, it will assist instructional designers or programmers of the instructional software in planning their curriculum with the aim of strengthening teaching-learning process and producing the packages to meet different cognitive levels of learners in all subject areas.

Fourthly, it will serve as a springboard for further study in computer-assisted instruction and innovative approach in the teaching of physics.

One hypothesis was outlined for this study and that is: to determine whether there is a significant difference in attitudes of physics students taught using computer-assisted instruction and those taught through the conventional system.

Background of the Study

According to Okoye (1985), "attitudes are our mental dispositions which determine our next line of response to the stimulus to which these attitudes applied." Morgan (1934), and Gagne (1977) observed that attitudes can be spread to other stimuli associated with the target stimulus. In the school situation, therefore, student's attitude toward computer-assisted learning may spread to the teacher, other related instructional materials, subjects and even the whole idea of school learning and education. There is a positive relationship between achievement and attitude of learners (Jegede (1981), Leake (1982), Ali & Aigboman (1990), and Ovute & Nworgu (1997).

Lauterbauch and Frey (1987), found out that the use of computer software motivates the teachers in solving problems as well as do experiments. This indicates that learners too will likely be motivated to use computer-assisted learning to solve problems and do experiments because of the in-built power of repetition. In summarizing the role of CAI Jacobsen (1997) stated that it could be used to:

- (1) explain complex experimental techniques that would require expensive equipment;
- (2) carry out experiment of very long or short duration;
- (3) study situations where certain dangers are involved;
- (4) outline practical situations of chemical plants.

If students' exposure to this system is not dangerous to them, great interest will be generated in the learners. Kish (1996) noted that the computer is quite "user friendly" and a learner centered learning resource, which should be exploited for leaning purposes. Wal & Linde (1991), further stressed that computer simulations allow learners to study a problem repeatedly until complete understanding is reached, especially in cases where abstract concepts are difficult to teach at secondary school level. This would eliminate a situation where students may give correct answers while still not understanding the concept or processes involved. Students' attitude towards computer aided learning is also seen as being highly motivated where they have access to the use of the computer at their own time. The role of the computer is that of facilitation of data collection and presentation, not one of eliminating a student's experience in this area. The implication of this is that students should not be completely involved in computer application due to interest and forget about personal physical experience in experiments.

Students' attitude on computer learning had been considered quite high due to demand for constant and consistent use by the students. In an institution where

there are 750 workstations, Cohen (1988) reported that students complained that workstations were unavailable 24% of the time. McConnell (1990) noted that for 'scholars' workstation, a hypertext/hypermedia has been developed called intermedia. The intermedia provide a 'user-level' hypermedia application which allows teacher/students to create exploratory teaching and learning courseware. The intermedia applications allow programmers to add new applications and media to the system. With students' interest in computer assisted instruction their attitude is bound to incline to the new technology the more. They are eager to explore more by using the intermedia to modify instruction text for efficient, effective, convenient and ensure retention learning. This will at the same time help link information together and create paths through the learning material.

The system permits text to be annotated, footnotes added bibliographies appended in ways that allow students to weave through the database of the lessonware, creating their own picture of the material. In addition, other media such as static graphics, animated graphics, and interactive sound effects utilized with the system for instructional purposes. Yankelovich (1988) stressed that the learning possibilities of such a freestanding open system are deemed to be enormous. Motivation is already enhanced, cooperation in the instructional situation is achieved and positive attitude on computer-assisted communication is concurred. The effect of computer-assisted communications on students learning is tremendous. Nathan (1984) observed that a class which was exposed to computer-assisted instruction developed positive attitude and were enthusiastic about their studies. Computer-based individualized multi-mediated instruction makes increased competency of learners whereby their attitude is positively affected. In support of this finding Ofiesh (1984) enumerated the following guidelines for measuring attitudes. He stressed:

- (i) Learners know what to expect, therefore establish the learning domain, place the lesson under the control of the learners, involve them, and give feedback on their progress;
- (ii) Measure the learner's performance on the job related competencies at the end of each segment of the instruction;
- (i) Clearly show that learner what skill or information is to be learned;
- (ii) Provide opportunities for learners to practice skills and internalize the acquired knowledge;
- (iii) Provide opportunities for learners to test themselves by performing the skills or using the knowledge under conditions that simulate reality;
- (iv) Provide for alternative learning strategies;
- (v) Provide for open entry to and open exit from course instruction;
- (vi) Use the results from the training programme to improve the instruction.

Computer in instruction functions as a digital resource, reference and research centre for both teachers and students. It can streamline advising, assessing, communications network that attracts the attention of the learner. Purcell (1996) revealed that most students appreciate the electronic media because it helps them with authentic materials in the form of text, sounds, symbols, images and moving pictures. Likewise for many teachers, the increased use of multimedia resources in foreign language programmes prompted revision of teaching styles and techniques. With the introduction of computer-based learning strategy therefore, the established roles of teachers and students started to transform quite rapidly towards a more participatory communication classroom model. The paradigmatic transformation allows student to respond better to their own intellectual direction as well as to diverse interest among their classmates and peers. Their learning centres have now developed from passive, drill based instructional facilities to interactive and interdisciplinary environments where students function as self-motivating centres of activity. Moreover, students through computer-assisted learning facility can now publish their writings for a wider audience and thus experience a sense of authorship, which can be quite exhilarating.

Methodology

The population for this study included all Senior Secondary two (SS11) students of the two Federal Government Colleges in Akwa Ibom State, which are located at Ikot Ekpene in Ikot Ekpene Local Government Area and Ikot Obio Itong in Mkpaf Enin Local Government Area. In each school, two classes were randomly selected which yielded a sample size of 164 subjects. The same technique was used in assigning a particular class to either the experimental or the control group. The design adopted was pre-test – post-test control groups having a structural design presentation of

$$\begin{array}{ccc} RO_1 & O_2 & (E) \\ & X & \\ RO_3 & O_4 & C. \end{array}$$

This design allows the provision of randomization, which ensures compatibility and equivalence of the concerned groups.

Instrumentation

There are three instruments namely:

- (1) Basic Physics Achievement test (BPAT),
 - (2) Physics Achievement Test (PAT) and
 - (3) Attitude to Computer-Assisted Instruction Measuring Scale (ACAIMS)
- were developed, validated and used for gathering the necessary data for the study.

Attitude To Computer-Assisted Instruction Measuring Scale (ACAIMS)

Some of the instruments in this tool were adapted from Ovute and Nworgu (1997:268). The language was modified to suit the level of SS11 students. It consisted of two sections i.e. A and B.

Section A gives the demographic data of all the subjects. Section B aimed at measuring students' attitude towards computer-assisted instruction on a four point likert scale of: - Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD). The respondents were asked to indicate the level of agreement on each of the items. The items ranged from 1 to 25 on attitudinal behaviours covering interest, motivation, interaction and logical thinking.

Computer-Assisted Instruction Lessons

The physics Achievement Test (PAT) was first administered to the two groups. The experimental group had their Physics lessons through computer assisted instruction on series, parallel circuits and magnetism, while the control's lesson followed the normal traditional method on teaching. After the treatment, the Physics Achievement Test (PAT) and the Attitude to Computer Assisted Instruction Measuring Scale (ACAIMS) were re-administered to obtain post-test scores.

TABLE 1: Test Analysis of Pre and Post Test Scores of Experimental and Control Groups Using ACAIMS

GROUP		PRE - TEST			POST - TEST		
	n	X	SD	t	X	SD	T
EXPERIMENTAL	82	72.03	11.71		79.59	16.23	
CONTROL	82	71.71	10.98	0.74	74.18	12.17	6.23

Table 1 shows the mean, standard deviations of pre-test and post-test of the experimental and the control groups as well as the t-test scores. The means of the experimental group are slightly higher than that of the control group. The standard deviations of the experimental group are also slightly higher than that of the control group. This is an indication that the scores of the students in the experiment group did not differ significantly from the mean scores of the control group. The observed t-value of 0.74 is much less than the critical value of 1.64 at .05 level of alpha. This result implies that there is no significant difference in attitude between the experimental and control groups.

No	STATEMENT	A	D
1	It fosters adequate opportunities for me to interact with my teacher.	(88)72	(12)10
2	I usually do not like to spend much time doing lessons on computer-assisted instruction.	(12)10	(88)72
3	In our class, we are expected to discover many ideas for ourselves on the use of computer-assisted instruction.	(88)72	(12)10
4	Physics demonstration with computer is enjoyable.	(87)71	(13)11
5	Computer-assisted instruction has improved my performance in Physics.	(87)71	(13)11
6	It does not reinforce my manipulative skills.	(13)11	(87)71
7	It assists me to consolidate learning.	(15)12	(85)70
8	I usually feel calm during computer-assisted lessons.	(85)70	(15)12
9	My observable skills are better concreted by computer instruction.	(85)70	(15)12
10	The use of computer exposes me to new technology	(84)69	(16)13
11	I find it difficult to understand lessons taught using the computer.	(16)13	(84)69
12	It presents richer materials for me.	(83)68	(17)14
13	Computer Instruction provides immediate feedback for me.	(83)68	(17)14
14	It leads students from surface-to-deep learning.	(83)68	(17)14
15	I feel good when I use the computer to solve problems.	(83)68	(17)14
16	Computer assisted instruction helps me solve problems.	(82)67	(18)15
17	It enables me to work at my own pace.	(82)67	(18)15
18	Computer lessons are harder for me than conventional lessons.	(82)67	(18)15
19	I work for a long time in order to understand a new idea in computer-assisted instruction.	(18)15	(82)67
20	I spend extra time on computer-assisted instruction.	(77)63	(23)19
21	It saves me time with experiment/record retrieval.	(77)63	(23)19
22	I look forward to taking more computer-assisted lessons.	(77)63	(23)19
23	Computer-assisted lessons help me to think logically.	(77)63	(23)19
24	It frightens me to have to take computer-assisted lessons.	(72)59	(28)23
25	Computer assisted instruction motivates me.	(70)57	(30)25

The result on Table 2 shows that all the 25 items of the instrument that measured attitude have indicated positive significance difference. The attitudes are listed below in a ranking order:

- (1) It fosters adequate opportunities for me to interact with my teacher.
- (2) It leads students from surface learning to deep learning.
- (3) Spend extra time on computer assisted instruction
- (4) It saves time with experiment/record retrieval
- (5) Computer assisted instruction helps students solve problems
- (6) Computer assisted instruction motivates students
- (7) It presents richer materials
- (8) It exposes students to new materials
- (9) It assists students to consolidate science learning.

A significant difference was observed in the post-test, ($t=6.23P > .05$). Therefore the change in behaviour that might occur is attributed to the treatment provided to subjects in the experimental group. The study was designed to determine the effects of computer-assisted instruction on students' attitude and performance in physics. The finding from the investigation showed that student's attitude and achievement in Physics is enhanced by computer-assisted instruction as a learning resource.

The under-listed show areas where computer-assisted influenced attitude for the achievement in Physics:

- (1) Explanation of complex experimental techniques frequently as desired by students.
- (2) Enhanced simulation of science experiment.
- (3) Presentation of richer materials.
- (4) Students working at their own pace.
- (5) Exposure of students to new technology.
- (6) Provision of speedy feedback.
- (7) Consolidation of students' learning.
- (8) Rapid evaluation of students' work.
- (9) Adequate opportunity for student/teacher interaction.
- (10) Students' preference over the traditional lecture method.

Also findings lend credence to Burke (1982); Lauterbach & Frey (1987) and Crooks (1988) who found out that computer-assisted instruction facilitates learning and motivates learners with positive effects on deep learning. The results further showed that interaction, positive attitude and interest were developed by students on computer-assisted instruction. These findings lend credit to Olaniyan (1990); Akinyemi (1988); Udousoro & Abimbade (1997) and Ovute (1997) who all Reported that students developed favourable attitudes towards Physics when the

computer was used to enhance teaching. They also opined that significant difference in learning achievement and attitude of students were established by students who were exposed to computer-assisted instruction.

These findings may be accounted for due to the fact that students find computer-assisted instruction interesting, motivating, exciting and helpful in attitudinal areas with the following effects:

- (1) It leads students from surface to deep learning.
- (2) Could be used to store personal work.
- (3) Could be used for data/information on-line search.
- (4) It saves students time on experiments and record retrieval.
- (5) It assists students to learn Physics pleasurablely and motivates them at it.

Thus, this medium makes students spend extra time on the computer reworking complex problems, abstract concepts and acquiring new data and information. Also, as pointed out by Kish (1996), computer-assisted instruction is user friendly and student-centered learning resources, including satellite system, network software, electronic entertainment and portable classroom tools. Computer-assisted instruction functions as a digital resource, reference, and a research centre for students as well as teachers.

Implications of the Study

The computer-assisted instruction has been found to be more effective in teaching Physics than the conventional method. This instructional material has been found to improve to students' attitudes towards Physics and further enhances their performance. It should be adopted at all levels of learning as it has been found to enhance individualized instruction and gainfully occupy students during teacher's absence. The study showed that students taught using computer-assisted instruction differed significantly in attitude from those taught using the traditional approach.

Recommendations

In view of the findings of the study, the following recommendations were proffered in order to improve the attitude and the performance of the students in Physics. Computer should be made available in schools and teachers should use them as instructional tools.

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