



Impact of Computer Assisted Instruction on the Performance of Secondary Schools in Basic Technology Examination in Gombe State.

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Abstracts

The study was carried out to determine the Impact of Computer Assisted Instruction (CAI) on the Performance of Secondary Schools in Basic Technology Examinations in Gombe State. Two research questions and two hypotheses guided the study. Quasi-experimental using pre-test/post-test randomized non-equivalent design was employed for the study. The population of the study was made up of 109 J.SS II students from Gombe metropolis and 109 J.SS II students from Malala. Computer Assisted Basic Technology Package (CABATEP) which is a teacher-directed interactive instructional package containing lessons structured in accordance with J.SS II Basic Technology syllabus was used for the instruction. Results revealed that Computer Assisted Instruction (CAI) had no impact on the performance of students in Basic Technology in Gombe State. Also, no significant difference found between the performance of JSS students taught Basic Technology with CAI and those taught with traditional method. The reason can be attributed to the fact that skill acquisition in basic technology can be acquired without computer aided instruction (CAI) at the basic level. The study therefore, recommends among others that computer if used adequately and wisely, supplements teaching, make learning more interesting, real and motivating in good enabling environment.

Keywords: Computer Assisted Instruction (CAI), Basic Technology, Gombe State, Junior Secondary School

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Introduction

Basic Technology is an integrated subject offered at the Junior Secondary School Level. According to Olaniyan and Ojo (2014), Basic Technology is an eclectic subject that comprises element of Woodwork, Metalwork, Building Technology, Auto Mechanic, Electrical/Electronics and Technical Drawing at their basic levels. Technology education is taught in the Junior Secondary

Schools as integrated aspect of Introductory Technology designed to expose the students to the application and stimulation of their interest in various areas of industrial technology. The aim is that at the end of junior secondary school, students would have attained technological and solid foundation laid for their entrance into a vocation of their choice (Uwaifo and Edigin 2015; Kennedy 2015). This is in consonance with the statement in the National Curriculum for Junior Secondary

Schools (FRN, 2014), which amongst others states that in order to reduce ignorance about technology, Basic Technology helps to lay a solid foundation for national development and for increase in skill acquisition. Basic Technology was introduced into the Nigerian Education system, 6-3-3-4 in 1982 as a result of the newly defined National Policy on Education that came into being after the National curriculum conference of September, 1969. The conference held in Lagos to review old and identify new national goals for Nigerian education at all levels with respect to:

(i) The needs of individual youth and adult in the task of nation building.

(ii) The social and economic needs, aspiration and well – being of our society (Fakomogbon *et al.*, 2015).

Corroborating this fact is the Comparative Education Study and Adaptation Centre (CESAC, 2014) enunciated Nigeria educational goals as:

(i) To provide pre-vocational orientation for further training in technology.

(ii) To provide basic technology literacy for everyday living .and

(iii) To stimulate creativity.

The most significant aspect of the National Policy on Education (Federal Republic of Nigeria, 2014) is the Focus it gives to Nigerian educational system, the need for the industrialization of the nation in which technical education plays crucial roles and the realization to change from white collar job oriented educational system to science and technological oriented educational system which prepares individuals to be self-reliant and useful to the society. This informed the Federal Government to lay emphasis on technical education. It is however imperative to express that this goal cannot be realized without developing technical education through the adoption of modern pedagogical approaches to learning technology subjects. The policy emphasized that, the specific objectives of the Junior Secondary School Education are to develop in the students' manipulative skills (Manual dexterity) invention, respect for

dignity of labour and above all healthy attitude towards things technical. The achievement of these objectives will in no doubt help to transform Nigeria into a technologically developed country.

The ubiquity of Information and Communication Technology (ICT) in all facets of human endeavor and in education in particular, has improved the situation in our schools; as a result of the Federal Government of Nigeria's launch of the National Policy on Computer literacy in 1998 at Primary, Secondary, and Tertiary levels of education, although it is yet to have the desired impact on the instructional delivery system. There is also the proliferation of Internet infrastructural development across the strata of schools in Nigeria. The broad objectives of the policy on computer literacy (2001), as reported in Chukwuma (2015). Includes:

- To bring about computer literate Nigeria by middle 90's
- To enable the present generations of school children at different levels of education appreciate the potentials of the computer and be able to utilize the computer in various aspects of life and later occupation.

The Federal Government of Nigeria's "Computer - for - All" programme which was launched in early 2000 aimed at integrating computer into teaching and learning to reduce age long chalk -talk method "which renders learners passive; making teaching to be ineffective against the learner-centered approach as recommended by National Policy on Education (Adeyemi, 2016). The consequences include low student interest to learning especially technology contents which are characterized by technicalities, poor learner motivation and less appropriate feedback in teaching and learning with attendant poor performance in examinations, particularly Basic technology.

Academic performance is said to be the result of education, it is the extent to which a student, teacher, or institution has

achieved their educational goals. It is about how students deal with their studies, cope with academics' tasks, and how they fared in the overall school activities. Academic performance is student's level of pass and failure over a period of time at the end of any academic activity across disciplines, it is measured in a number of ways such as; oral and written tests; presentations, assignments, class work, projects and continuous assessment. Other forms of evaluating student's academic performance include; standardized tests and teacher-made tests (Noeth and Volkov, 2014).

It is a daunting task to separate the impact of computer technology from the effects of other factors that influence teaching and learning. Results and conclusions must be considered in the context of the interdependent set of variables in which the use of technology is embedded. These variables include access, teacher preparation and experience, student background, gender, school type, school location, curriculum content, and instructional methods. This study attempts to remedy some of the foregoing problems by exploring the impact of Computer Assisted Instructional (CAI) on the performance of Junior Secondary School Students in Basic Technology in Gombe State.

Statement of the Problem

The 21st Century philosophy of teaching and learning is "child-centered" as such; Computer Technology is deployed to compliment the teacher whose role is that of a guide on the side not a sage on the stage" (Yusuf, 2014) as it was the practice. However, most teachers in Nigeria are used to the traditional (chalk-talk) method of teaching which renders students' passive listeners and make teaching ineffective, consequently affecting the students' performance in Basic Technology especially.

Similarly, the state of knowledge explosion with increasing specialization, increase in student-teacher ratio and increase in workload of teachers, classroom instruction alone does not in most cases bring out the

desired goals from the teaching and learning process, this causes some drawbacks in student performance in Basic Technology. Hence, these reasons necessitate the researchers to investigate the Impact of CAI on the performance of secondary schools in Basic Technology examinations.

Purpose of the Study

The specific objectives of this study were to:

1. Find out the Impact of Computer Assisted Instruction on the performance of students in Basic Technology.
2. Ascertain difference in Performance in Basic Technology between secondary school students in a rural school location and students in urban school location.

Research Questions

1. What is the Impact of Computer Assisted Instruction on the performance of students in Basic Technology?
2. Is there any difference between the performance of students in Basic Technology between secondary school students in a rural school location and students in urban school location?

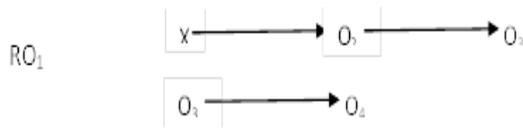
Hypotheses

Ho₁: There is no significant difference on the impact of CAI on performance of students between those taught Basic Technology using CAI and students taught using traditional method.

Ho₂: There is no significant difference on the performance of students in Basic Technology between secondary school students in rural school location and students in urban school location.

Methodology

This study employed quasi-experimental design, using the pre-test/post-test, on randomized, non-equivalent control group design. It is quasi because the schools and subjects for the study are randomly sampled or selected into groups. In this study, the independent variable is the treatment involving the use of computer assisted instruction (CAI) package, while the dependent variable is students' academic performance. The design for this study may be graphically represented as follows:



R, stands for random assignment of subjects, but in this study the subjects will be purposively assigned. **O** stands for observation or test, and **X**, stand for the treatment. O_1 , O_3 is the pre-test before and after treatment, while O_2 , O_4 is the Post-test before and after treatment.

Population of the Study

The target population for this study will be the Junior Secondary School Students in Gombe State, especially the JSS II students, this class is the most suitable for this study because they are a consistent middle class in the JSS stream, they have less tendency for distraction because they have only the terminal examination ahead of them and have covered the most of the Basic Technology syllabus. The JSS IIIs are examination classes, therefore inappropriate for this study.

The sample for the study was determined by purposive selection of two intact classes (i.e. The actual number of students in the classes at the time of the study constituted the sample) from the JSSII stream of the two schools purposively selected for this study. These schools are purposively selected because they benefited from the Nigerian Communications Commission's (NCC) Secondary school's ICT project fully equipped with solar facilities, impliedly the students have some level of computer appreciation. A Performance Test, named Basic Technology Performance Test (BATPET) *Computer Assisted Basic Technology Package (CABATEP)*: Computer Assisted Basic Technology Package is a teacher-directed interactive instructional package which contains lessons structured in accordance with JSSII, Basic Technology syllabus. Computer Assisted Basic Technology Package contain the following topics: Lines, Angles, Quadrilaterals, Polygons, Metal work hand tools, Energy and Power, in conversion devices conformity with the Nigerian Basic Secondary School

curriculum. CABATEP was developed by the researcher, with the assistance of professional Computer Programme developers using programming tools such as Dream Weaver, Structural Query Language (MySQL), Hypertext Processor (php), Wamp Server, and Microsoft words. It is structured into four modules; each module will contain two topics per week. Module one contained Technical drawing aspect (Lines, Angles, Triangles, Quadrilaterals, and Polygons), The second module contains Metal work aspects of the syllabus namely, Metal Work hand tools, Marking and Measuring tools, cutting tools, driving tools and Metal Work Holding devices. The third Module contains Energy Conversion Appliances namely; Electrical energy devices, e.g. Electric iron, water heater etc. chemical energy; e.g. charcoal, gas cooker, kerosene, etc. While the fourth module contained Mechanical/Electrical engineering aspects namely; Motors and generators, Magnet and Magnetism and electromagnetism. Week eight was used to administer the test instrument BATPET (basic technology performance test).

Basic Technology Performance Test (BATPET) was validated by experts in measurement and evaluation lecturers in the Department of Science Education in Federal College of Education (Tech) Gombe and experienced teachers of Basic Technology in the two Schools i.e. GGSS Malala and GSSS Gombe.

Data for this study was collected from a pre-test conducted after a week of the introduction in the schools to determine the homogeneity of the sample. A post-test was collected after teaching both groups (control and experimental) for seven weeks each. Students of GGSS Malala Dukku were used as the control group while the students of GSSS Gombe were used as the experimental group. The groups were taught the aspects of Basic Technology in Technical Drawing, Metal work hand tools and electrical energy conversion appliances using traditional method of teaching, as well as using CAI for the experimental group. The test instrument (BATPET) was thereafter be administered on the groups.

Scores from the tests were recorded and analyzed accordingly.

Descriptive statistics (mean and standard deviation) of independent samples was the statistical tool that was used to analyze the data obtained from the respondents while, t-test at a significant level of 0.05 using SPSS version 23 was used to test the hypotheses.

Results and Discussion

Research question one: What is the impact of computer assisted instruction (CAI) on performance of students in basic technology examination?

To determine the impact of CAI on performance of students in basic technology, the basic technology performance test was administered as pre-test and post-test

Table 1. Shows that at pre-test; the control group had a mean score of 7.13 and standard deviation of 2.88, while at post-test a mean of 9.93 and standard deviation of 3.00 was recorded this indicate a marginal increase of 2.80. The experimental group had a mean score of 7.15 and standard deviation of 3.70 at pretest, and a mean score of 9.50 and standard deviation of 3.44 at post-test, the experimental group has a 2.45 mean difference.

However, the difference between the mean scores of the control and experimental group is 0.35 in favour of the control group. Impliedly, CAI has not had impact on the performance of the experimental group in Basic Technology. This may be either because they are familiar with computer and therefore computer could not stimulate much of their interest and improve their performance or the intervention of computer was overwhelming to them, or probably more time was needed to meet up with the intellectual skills and cognitive ability of the respondents as required in technical education.

Research questions four: Is there any difference between the performance of students in Basic Technology between secondary school students in rural school and students in urban school location?

To ascertain the difference in performance of students in basic technology between students in urban based school and those in rural based school the descriptive statistics of their performance is presented as follows:

The results in Table 2 shows that the control group obtained a mean score difference of 2.80 and difference in standard deviation of 0.22 while the experimental group has a mean difference 2.35 and standard deviation of -0.36. However, the mean difference of the two groups is +0.45 in favour of the school located in the rural area, consequently the level of significance of the difference is determined by test of the corresponding hypothesis.

Hypothesis one Ho1: There is no significant difference in the impact of CAI on performance of students between those taught Basic Technology using CAI and students taught using traditional method.

This hypothesis was tested using independent t-test statistics as follows:

Table 3 Indicate that the experimental group, which is also a day school and located in the urban center, had a significantly lower score (mean=9.51, SD=3.44) at the end of treatment compared to the control group (mean=9.93; SD= 2.97) $t(168) = 0.854$. Therefore, there is statistically no significant difference between the academic performance of students taught with CAI and those taught using traditional method of teaching after treatment, consequently the hypothesis which says that: There is no significant difference on the Impact of CAI on performance of students between those taught Basic Technology using CAI and students taught using traditional method. is retained.

Table 1: Mean scores and Standard deviation of respondents in experimental and control group on the impact of CAI on performance of students in Basic Technology Examination.

	Control Group				Experimental group			
	N	X	Sd	Md	N	X	Sd	Md
Pre-test	61	7.13	2.88	2.80	109	7.15	3.70	2.35
Post-test	61	9.93	3.00		109	9.50	3.44	

High mean gains in favour of post -test High mean gains in favour of post -test.

N: Number of respondents, X: Mean. S d: Standard Deviation. Md: Mean difference.

Table 2: Mean scores and Standard deviation of respondents in experimental and control group according to School location.

	Control Group			Experimental Group				
	School Location	N	X	SD	School Location	N	X	SD
Pre-test	Rural	61	7.13	2.88	Urban	109	7.15	3.70
Post-test	Rural	61	9.93	3.00	Urban	109	9.50	3.44

N: Number of respondents, X: Mean., SD: Standard deviation.

Table 3: Difference in t-test between students taught Basic technology with CAI and students taught Basic technology with traditional method.

	Groups	N	X	SD.	Df	P<0.05	Significance
Pre test	Experimental	109	7.15	3.69	168	0.031	Not significant
	Contol	61	7.13	2.87			
Post-test	Experimental	109	9.51	3.44	168	-0.854	
	Contol	61	9.93	2.97			

Table 4: T-test difference in Basic Technology performance with CAI and Traditional teaching based on school location.

	School Location	N	X	SD	D _f	T	P<0.05	Significance
Pre-test	Urban	109	7.15	3.70	168	0.031	0.79	Not significant
	Rural	61	7.13	2.90				
Post-test	Urban	109	9.51	3.44	168	-0.85		
	Rural	61	9.93	3.00				

Hypothesis four Ho4: There is no significant difference in the performance of students in Basic Technology between secondary school students in rural school location and students in urban school location taught using CAI and Traditional method.

This hypothesis was tested using independent t-test; the result is presented as follows:

Table 4 Shows that the urban school has a statistically significantly lower scores (mean=9.51, SD= 3.44) at the end of the treatment compared to the rural school's (mean= 9.93, SD= 3.00) $t(168) = -0.85$ $p < 0.05$. Consequently, the Hypothesis which states that: There is no significant difference on the performance of students in Basic Technology between secondary school students in rural school location and students in urban school location is therefore sustained.

Findings of the Study

The major findings of this research were as follows:

1. The study revealed no significant difference between the performance of junior secondary school students taught basic technology with CAI and those taught with traditional method.
2. There was no evidence to establish a significant difference between the mean score of secondary school students in basic technology in urban and rural school in Gombe State.
3. There was no evidence from the study to establish that computer assisted instruction has significant impact on academic performance of secondary school students in Gombe State.

Discussion of Findings

Research question one sought to find out the impact of computer assisted instruction on performance of secondary students in basic technology examination, Evidence from the study shows that computer assisted instruction had no impact on students' performance in basic technology, the table shows that the control group has a higher improvement in their mean score

than the experimental group after the tests. This outcome lends itself with the position that CAI is considered as effective as conventional teaching method (Jenks and Springer, 2015) and is inconsistent with other findings Gambari (2017), Yaki (2017) and Bello (2016) which affirmed that the use of CAI as supplement to conventional instruction produces higher achievement than the use of conventional instruction alone. The implication of this finding is that teaching and learning will be devoid of technology with the consequence of being uninteresting, boring and less motivating.

The undesirable outcome of the study may be ascribed to students familiarity with computer hence, its introduction in the classroom could not stimulate their interest, it could also be that the use of computer to teach the subject matter of basic technology overwhelmed the students and hence could not positively influence their performance in Basic technology examination, It could perhaps be the time invested (Seven weeks, precisely) to teach the students was not enough to foster knowledge and understanding of the Basic Technology contents. However, the performance of the students may be placed on absence of certain conditions of learning, that is required for effective teaching and learning; these conditions which are both internal and external (Gredler, 2015) include; learner's cognitive strategies, intellectual skills and factual or verbal information.

As a major finding, this study revealed that most of the students could not write, read, and understand. This may account for the low scores obtained from the examination, ability to write, read, comprehend and assimilate is an integral learning condition without which learning goals is not attainable. This position is supported by the outcome of a study conducted by the United State Agency for International Development (USAID) in 2011, they studied the reading ability of junior secondary school students and reading ability of primary school pupils, in some selected junior secondary and primary

schools in Gombe state which revealed that; 73% of the pupils could not read words correctly either in Hausa or English. Another factor that may have influenced the outcome of this study may be that most of the learners are not new to computer, they may have been manipulating computers, and therefore the use of computer for this study may not make significant impact on them. Also, other reasons can be attributed to the fact that skill acquisition in basic technology can be acquired without computer aided instruction (CAI) at the basic level. This result raises some questions with regards to research methodology, the learning environment (study setting), learner's characteristics/intellectual ability, instrument and duration of treatment for both groups.

Conclusion

Researchers believe and general perception of the impact of computer in teaching and learning in general and basic technology in particular seems to be proved wrong by the outcome of the study. Based on the data collected, the results from the analysis of the data suggest that computer does not improve learning, this is a departure from the position and global trends of the 21st century which in general parlance is referred to as the "Digital age" most outcomes of similar studies, and current trends in education advocate the use of technology in education because of its "imposingly dynamic" ability to facilitate teaching and learning. The negative outcome of the study may be ascribed to certain confounding variables that are central to the success of such study, these variables are the learners' intellectual skills that are ability to read, write, recall past experience and relate to new information, learners' cognitive style and the longevity of the treatment thus, seven weeks was used for this study. However, the researcher's substantive believe and position remain as there is no better intervention for poor performance in schools than technology, it offers greater opportunities to achieve

learning objectives whether in short term or long term.

As a major finding of this study, technology alone does not optimize and actualize teaching and learning unless learning conditions such as good learning environment, willingness and readiness to learn, time/duration of teaching and learning process, learner's intellectual skills, and learner's cognitive styles are adequately secured.

Recommendations

Based on the findings of this study, the following were therefore recommended;

1. Computer if used adequately and wisely, supplement teaching; make learning more interesting, real, and motivating. Therefore, Nigeria Educational Development and Research Council (NEDRC) should research how to develop and create subject based instructional software for all subjects to encourage the use of computer technology in education.
2. Governments at all tiers must ensure continuous capacity building of teachers and educators across disciplines most specially in appreciation of current trends and issues in Information and Communication Technology (ICT) in education.
3. Enabling learning/teaching conditions such as good learning environment, willingness and readiness to learn and motivating should put in place by the stakeholders.

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Impact of Computer Assisted Instruction on the Performance of Secondary...

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