EFFECT OF COMPUTER ASSISTED INSTRUCTIONAL APPROACH ON STUDENTS' ACHIEVEMENT IN MATHEMATICS

by

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Abstract

The design adopted for this study was quasi experimental. The study was carried out in Nsukka Educational Zone of Enugu State. The population of the study comprised of 1582 students in Junior Secondary one (JSI). A sample of six schools was selected for the study using simple random sampling. The instrument used for the study was mathematics achievement test. The data collected were mean and standard deviation for the research questions and analyzed using analysis of covariance (ANCOVA) for the hypotheses. The result of the study revealed that Computer assisted instructional approach has significant effect on students' achievement in mathematics. Gender has no significant effect on students' achievement when taught using Computer assisted instructional approach. There is no interaction effect of approach and gender on students' achievement in mathematics

Introduction

God was the first that started mathematics. This is because He started counting during His creation when He mentioned the days of creation from one (1) to seven (7) and also when he was creating living things (like plants and animals), moon, sun, star, water and earth, He introduced shapes. Hence, Mathematics is the science of quantity and space (Odili, 2006). Sule (2006) sees mathematics as a systematized, organized and exact branch of science. This suggests that mathematics is a science, which follows sequential steps in carrying out its activities. Aina (2006) said that mathematics is the queen and servant of all subjects. This means that all field of knowledge depend on mathematics for solving problems, stating theories and predicting outcome directly or indirectly. This also suggests that mathematics is a subject that affects all aspect of human life at different degrees as emphasized by (Tele and Gyang, 2015). Tele and Gyang (2015) added that the inter-relationship between mathematical development and advancement of humans shows the importance of mathematics in life.

The important attached to mathematics made Arua (2007) to state that mathematics is the prime instrument for understanding and for exploring our scientific, economic and social world. Therefore, mathematics can be said to be an indispensable tool in creating new knowledge. Usman (2007), in sharing more light on the important of mathematics, noted that without mathematics, there is no science, without science, there is no technology and without technology, there is no modern society. This agrees with the belief that disciplines where numbers are predominant like statistics, accounting, arithmetic, engineering, economics, geography, and even humanities form integral part of mathematics (Tele & Gyang, 2015).

Despite the importance of mathematics to all the fields and its relevant to life and development, ill continued to plague students' achievement in the subject. That is, students' achievement in mathematics has consistently continues to be poor. This can be evidenced from chief examiner's report 2013 to 2015. Aremu (2003) defined poor achievement as a performance that is adjudged by the examinee/testee and some other significant groups in the society as falling below an expected standard. The poor achievement in mathematics can be observed across all aspects of mathematical contents (Abugu, 2017). The problem of poor achievement in

mathematics according to Okereke (2006), originates as a result of a lot of problems facing effective teaching and learning of mathematics at all levels of Nigerian educational institution. WAEC chief examiner's report (2006) identified that poor teaching approach, inadequate preparation for examination by students and teachers not using appropriate instructional material contributes to students' poor achievement in mathematics. Onyegegbu (2002) also observed that that facilitates students understanding and acquisition of knowledge depend on such factors as learner characteristics, the learning environment, the teachers' knowledge level and the instructional approaches used.

The traditional approach has been widely used in transmitting information to students (Obodo, 2000). In traditional approach, the teacher communicates ideas to learners by direct verbal discourse. Studies have shown that the conventional approach is the pattern in which answers to the previous day's home work are first given, and then teacher directed explanations are used to present materials for the new lesson (Aroh, 2005). This suggests that, the teacher centred, encourages rote learning and fails to motivate students and as such contributes to their poor achievement in mathematics. This is in accordance with Arua (2007)'s observation that the failure of students in mathematics examinations is results from teaching methods which do not inculcate the right scientific skills and processes to the students. The teaching methods which do not inculcate the right scientific skills and processes to the students then gave rise to poor achievement do to the approach(es) employed in teaching mathematics. In view of this, there is need to try out another approach known as computer assisted instruction (CAI) in teaching mathematics.

CAI approach refers to the use of computer to give course content instruction in the form of drill and practice, tutorials and simulations (Sedega, Mishiwo, Fletcher, Kofi & Awudetsey, 2017). In the words of Suleman, Hussain, Din and Iqbal, (2017), CAI is an instructional approach where a computer is used to communicate the instructional materials and evaluate the learning outcomes. Gana(2013) said that CAI refers to virtually any sort of computer application in instructional settings comprising of drill and practice, simulations, instructional exercises, supplementary exercises, instructional management, database development, programming, composing using word processors, and other different applications. Computer assisted instruction capable of providing adaptive teaching programmes and also stimulates a living dialogue between students and teacher in which the students' relations determine the sequence of presentation, the amount of explanation, assistance and practice which the teacher gets (Arua, 2007). That is why Sedega, Mishiwo, Fletcher, Kofi& Awudetsey(2017) opined that CAI allows students to direct their own progress.

Computer-Assisted Instruction (CAI) is based on the principles of programmed instruction. Suleman, Hussain, Din and Iqbal, (2017) stated that the major aim of the programmed instruction is to provide individualized instruction to meet special needs of individual learners. Arua (2007) observed that computer assisted instruction is a versatile medium for individualized instruction. In support of this Sedega, Mishiwo, Fletcher, Kofi & Awudetsey, (2017) said that the students might be given various degrees of control over their own learning, instruction could be tailored according to individual student's needs and Feedback on student performance could be used for further reference under CAI instructional approach. Pedagogic experience has shown that the didactic functions of the computer are by no means limited to simple presentation of information, enabling students to acquire and understand a body of knowledge (Sedega, Mishiwo,

Fletcher, Kofi & Awudetsey, 2017). CAI uses the computer essentially as assistance for teacher, that is; the students' interact with the computer directly, usually at a terminal (keybo and/or video) (Arua, 2007). The advantages of CAI method according to Orjika in Sulem Hussain, Din and Iqbal, (2017) include, ensuring the application of proven teaching methods students; offering equal educational opportunities for students by using the same programn changing the role of the teacher from teaching capacity to that of a guide; also when prope handled, removing fright and embarrassment on students and bringing about meaningful learni and academic achievement (Orjika as cited in Suleman, Hussain, Din and Iqbal, 2017). CA instruction may also motivate both male and females (both gender) for better achievement mathematics.

Danjuma (2015) investigated the effects of computer-assisted instruction on academ achievement among NCE physics students of different abilities in Niger State, Nigeria an discovered that there is no significant difference between male and female achievement in physic by Using CAI. On the other hand, the study carried out by Olanrewaju, Better, and Ugwuany (2016) on the effects of computer-assisted instruction on senior secondary students' achievemen in chemical reaction and equilibrium in Egbeda local Government Area of Oyo State, the resu agreed with Danjuma (2015) that there is no significant difference between male and femal achievement on exposure to CAI approach. **Mchiri, (2018)** observed that males achieved highe than females on exposure to CAI approach when the author carried out a study on the effect o computer assisted teaching strategy on students' achievement by gender in agricultural education Julius, Twoli, and Maundu, (2018) on their experiment on the effect of computer aided instruction on students' academic and gender achievement in chemistry among selected secondary school students in Kenya identified that females achieved better than their male counterparts. Among all these studies reviewed, none that involved gender was carried out in mathematics and CAI has been proved effective in those subjects.

Therefore, due to inconsistency on the result of effect of gender and students' poor achievement in mathematics, the researchers carried out this research to verify if the use of computer assisted instruction will close the gap between male and female and make provision high students' achievement in the mathematics.

Statement of the Problem

It has been observed that students' achievement in mathematics is consistently poor. The poor achievement in mathematics has been attributed to approaches, teaching materials and methods employed in teaching and learning of the subject. Some studies suggest that instructional approach is the major contribution to the poor achievement in the subject (Danjuma, 2015). This is because no method or material for teaching serves best if the approach employed is not proper.

Conventional approach which has been discovered to be teacher centred has made the teaching and learning of mathematics not to achieve its purpose from the students. However, computer assisted instructional approach which is a technological developed instructional approach for teaching and learning has been introduced by Sydney Pressey in1925 (http://woulibrary.wou.edu.my/weko/eed502/computerassisted in struction cai.html). Many studies in other fields have proved it to be effective in advancement (Danjuma, 2015; Olanrewaju, Better, & Ugwuanyi, 2016). Therefore, the

researcher wants to verify if the computer assisted instructional approach which makes the teaching and learning students centred will improve students' achievement in mathematics.

Purpose of the Study

The purpose of this study is to determine the effect of CAI on students' achievement in mathematics. Specifically, this study seeks to determine the:
1. Effect of Computer Assisted Instructional approach on students' achievement in mathematics.
2. Influence of gender on students' achievement in mathematics.

Research Questions
1. What is the difference in the mean achievement score of students in mathematics exposed to computer assisted instructional approach and those exposed to conventional approach?
2. What is the difference in the mean achievement score of male and female students in mathematics?

Hypotheses

Ho$_1$: There is no significant difference in mean achievement scores of students taught using computer assisted instructional approach and those taught using conventional approach.

Ho$_2$: There is no significant difference in the male and female students' mean achievement score in mathematics.

Ho$_3$: There is no significant interaction effect of method and gender on students' achievement in mathematics.

Research Method

The design adopted for this study is quasi experimental. The study was carried out in Nsukka Educational Zone of Enugu State. The population of the study comprised of 1582 students in Junior Secondary one (JSI). The population was made of 538 males and 1044 females from thirty one Governments owned schools in Nsukka Local Government Area during 2018/2019 academic session. A sample of six schools was selected for the study using simple random sampling. The instrument used for the study was mathematics achievement test which consists of twenty (20) multiple choice questions. The instrument was validated by three experts, two from measurement and evaluation and one from mathematics education both in the department of science education, University of Nigeria, Nsukka. The instrument was trial tested using 30 students from a school, outside the sampled schools. The reliability index of the instrument was established using Kudar-Richardson 20 (KR 20) which was determined to be 0.706. For the experiment, the students were pretested before the experiment and post tested after the experiment with re-arrangement of the instrument. The data collected were analyzed using mean and standard deviation for the research questions and analysis of covariance (ANCOVA) for the hypotheses.

Results

The result of this study is presented in line with the research questions and the hypotheses.

Research Question 1

What is the mean achievement of students exposed to computer assisted instructi
approach and those exposed to conventional approach?

Table 1

Mean and standard deviation scores of Mathematics Achievement Test (MAT) of the subje
in experimental and control group.

Group	No of subjects	Pre GAT		Post GAT	
		Mean	SD	Mean	SD
Experimental group	80	8.72	2.37	24.70	6.28
Control group	80	8.00	2.25	15.05	3.41

Table 1 shows that the mean achievement scores of the experimental group in pre MAT w
8.72 with standard deviation of 2.37 while that of the control group was 8.00 with standar
deviation of 2.25.

In the post GAT, the mean achievement score for the experimental group was 24.7
with standard deviation of 6.28 while the mean for the control group was 15.05 and standar
deviation of 3.41. Therefore the mean gain of the experimental group over the control group
in the post test is 9.65.

Research Question 2

What is the mean achievements scores of male and female students in mathematics?

Table 2 Mean and standard deviation of male and female students in mathematics

Gender	No of subjects	Pre MAT		Post MAT	
		Mean	SD	Mean	SD
Male	80	8.31	2.16	22.65	5.73
Female	80	8.51	2.33	22.96	5.59

Table 2 shows that the mean scores of the experimental group in the Pre-MAT was 8.31
with standard deviation of 2.16 while that of the control group was 8.51 with standard deviation
of 2.33.

In the post MAT, the mean achievement score of the experimental group was 22.65 with
standard deviation of 5.78 while that of the control group was 22.96 with a standard deviation of
5.59. This shows that the mean gain of the male students over the female students in the post test
is -0.29. This reveals that the performance of the male students and that of the female students
taught mathematics using CAI approach has slight difference in their performance.

Hypothesis

Ho_1: There is no significant difference in the mean achievement scores of students taught
mathematics using computer assisted instruction and those taught using conventional approach.

Table 3

Analysis of Covariance (ANCOVA) of students scores in mathematics achievement test.

SOURCE	TYPE III SUM OF SQUARE	DF	MEAN SQUARE	F	SIG
Corrected model	23284.590[a]	1	113.270[b]	1.627	1.384

Intercept	22474.690	1	22474.690	19.983	.106
Pretest	1159.195	1	1159.195	10.234	.631
Group (method)	19225.382	1	19225.382	3.887E3	.000
Gender	14.770	1	14.770	10.670	.210
Group * gender	.032	1	.032	.000	.987
Error	223.252	161.281	.132		
Total	19029.404	168			
Corrected total	18806.148	139			

a. R Squared = 0.053 (Adjusted R Squared = 0.018)

The resulet in table 3 indicate that there is a significant difference in the mean achievement score of students taught with CAI and those students taught with conventional approach since the probability value of 0.000 is less than 0.05 level of significance. Thus, the null hypothesis of no statistically significant difference is rejected. The direction of the difference in mean is in favour of CAI.

Ho$_2$: There is no significant influence of on students' achievement in mathematics.

Table 3 shows that there is no influence of gender on students' achievement in mathematics when exposed to CAI instructional approach. This is because the probability value of 0.210 is greater than 0.05 level of significance. Therefore we uphold the null hypothesis of no statistically significant influence of gender on students' achievement in mathematics.

Ho$_3$: There is no significant interaction effect of method and gender on students' achievement in mathematics.

The result in table 3 shows that there is no significant interaction effect between method and gender on students' achievement in mathematics as measured by the achievement test. This is due to the fact that probability value of 0.987 is greater than the 0.05 level of significance. Hence we retain the null hypothesis and conclude that there is no interaction effect of method and gender.

Discussion of Findings

The findings of this study were discussed under the following subheadings:

- The effect of computer assisted instruction on students' achievement in mathematics.
- Influence of gender on students' achievement in mathematics
- The interaction effects of method and gender on students' achievement in mathematics.

The Effect of computer assisted instruction on Students' Achievement in Mathematics

The result of this study indicated that computer assisted instruction has a significant effect on students' achievement in mathematics. The group (experimental) taught mathematics using computer assisted instruction performed significantly better than the group (control) taught mathematics using conventional approach. This result is in agreement with the earlier research finding on the effect of computer assisted instruction on students' achievement in mathematics which was conducted by Suleman, Hussain, Din and Iqbal (2017).

Students' better academic achievement could be attributed to the strategy adopted in using of computer assisted instruction. During the instruction, the students were actively involved and had control of their learning. This sorts the learning towards a student-centred instruction.

The significant difference in mathematics achievement of the experimental groups as compared to the control groups indicates that the computer assisted instruction has positive

implications for the teaching of mathematics in senior secondary schools. The si improvement of mathematics achievement on the account of computer assisted instruction this study also suggests that there is need to teach students mathematics using techn approach.

Influence of Gender on Students' Achievement in Mathematics

The result of the study revealed that there is no significant influence of gender on s achievement in mathematics. Therefore, the findings of this study had shown that gender significant influence on students' achievement in mathematics using computer assisted instr The finding of this study is in agreement with the finding of Danjuma (2015) who found that has no significant influence on students' achievement in mathematics. It also corresponds findings of Olanrewaju, Better and Ugwuanyi (2016) who reported that gender has no sign influence on students' achievement in mathematics.

The findings of this study could be attributed to the fact that computer assisted instr provides equal opportunity of learning to both male and female. The difference in the achievem males and females are reduced due to equal opportunity provided for both gender.

The interaction effects of method and gender on Students' Achievement in Mathematics

The finding of this study revealed that there is no significant interaction effect of method and ge on students' achievement. This shows that there is no significant interaction effect of method gender on students' achievement in mathematics when students are exposed to computer ass instructional approach.

The findings of this study is in agreement with Olanrewaju, Better and Ugwuanyi (20 who found that there is no significant interaction effect of approach and gender on stude achievement on exposure to computer assisted instructional approach. This suggests that comp assisted instructional approach can be used at all levels of education and provides education for and creates equal opportunity for all (males and females).

Conclusion

Computer assisted instructional approach has statistical significant effect on students' achievement in mathematics. Gender had no statistically significant effect on students' achievement when taught using Computer assisted instructional approach. The interaction effect of approach and gender on students' achievement in mathematics is not statistically significant. This implies that CAI approach is found viable in teaching mathematics and can be used for teaching both male and female students.

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