Effect of Computer Assisted Instruction in Nape Language on Student Achievement and Retention in Mathematics in Niger State

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Abstract: *The study investigated the effects of computer assisted instruction on students' achievement and retention in Niger State. Three research questions and three hypotheses were formulated to guide the study. The design adopted for the study was a quazi experimental one. Two hundred (200) students from four selected schools within the two educational zones were used as research sample. The sample schools were purposively selected. The experimental group was exposed to computer assisted instruction package in Nupe language while the control group was taught same topics with conventional method. Secondary school mathematics achievement test (SSMAT), the test contained 30 (thirty) multiple choice items with four options (A – D) for each item was used to collect data for both pre and post tests. A reliability coefficient of 0.74 was obtained. The data were analyzed using t-test statistics. The hypotheses were tested at 0.05 level of significance. The findings of the study revealed that students taught mathematics with computer assisted instruction package in Nupe language performed better than those taught with conventional teaching method and gender has no effect on their mathematics achievement scores. It was recommended among others, that mathematics teachers should continuously use computer software in teaching mathematics as it guarantees improvement in student achievement in mathematics.*

Key word: Achievement, Computer, Instruction, Language, Mathematics

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I. Introduction

In the world today, Mathematics has become the central intellectual discipline of all technological societies, this is trace to the fact that it has continued to play significant role in national development. Amoo and Efunbajo(2004) asserted that a strong background in Mathematics is crucial for many careers and job opportunities in today's increasing technological society. Its application in other discipline, mostly in the science is appreciative and without it, knowledge of science often remains superficial Gambari, (2014). The prosperity of any country depends on the volume and quality of mathematics offered in its school system Kure (2012). In the National Policy on Education Federal Republic of Nigeria (FGN, 2004) and 2006 curriculum reform, Mathematics is one of the core compulsory subjects in basic Education curriculum. The importance accorded Mathematics in the curriculum reflects accurately the recognition of the vital role it plays in contemporary society. For instance, in the present Nigeria educational system, mathematics is highly rated that failure in it results to not being admitted into university. It is in realization of it important role that many countries now resorted to making special comprehensive and well programmed efforts, toward the effective teaching and learning of science and Mathematics at all levels of educational system through development and implementation of innovative programmes and projects (Azuka, 2001cited in Odili 2006)

In spite of importance and popularity of mathematics among students, the performance at junior and senior secondary school levels had been poor (Iwendi, 2012; NECO 2012) However, the declining quality of the Nigerian educational system has prompted many educators to raise concern on the future of the country. It is apparent that the distinct quality of the education system of advanced nations of the world distinguished them economically, socially, scientifically, and technology, the abysmal performance of students, therefore, at the final year examinations conducted by various examination bodies is a clear testimony that the education industry in Nigeria is in problem Bashir (2012). The Table1.1 shows the result for eleven consecutive years (external examinations). The record is specifically the performance of students in mathematics in Nigeria at credit level and above

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Table 1.1: SSCE May/June Performance of Students in Mathematics in Nigeria at credit level and above 2001-2011

S/N	YEARS	% Pass at credit level
1	2001	36.50
2	2002	34.50
3	2003	18.70
4	2004	33.97
5	2005	38.20
6	2006	41.12
7	2007	46.75
8	2008	57.27
9	2009	47.04
10	2010	24.94
11	2011	39.98
	Average % pass	38.09

Source: West African Examination Council

From Table 1.1 above it is observed that the average percentage pass of 38.09 WAEC results from 2001-2011 is not encouraging. Recalling from experience of his involvement in the marking of mathematics at WAEC level Adeniyi (1988), stated that it is enough to get anyone sorrowful at the state of the subject in Secondary School level today. Many candidates, according to him, submit their answer scripts without writing anything in them. Some merely recopy the questions, while a high percentage of those who tried to write at all obtain low or failure grades. Obodo (1997) also stated that there is a low interest in the study of mathematics and mathematics related disciplines at all level of education in Nigeria, Students dislike or hate mathematics. Consequently, he explained, that in Nigeria, many students are not studying courses that they wants to study due to their negative attitude towards mathematics. For instance, many candidates have interest in choosing Engineering, Medicine and Accountancy as courses they would like to study, but they could not study such courses because they achieved poorly in mathematics.

Several factors have been attributed to poor academic achievement in mathematics in both primary and secondary schools among which are as classified into three main classes as; mathematical, pedagogical and psychologicalOdili (2006). Under pedagogical problems, he explained factors such as inadequate qualified mathematics teachers, inadequate instructional materials for teaching mathematics and persistent usage of conventional methods of teaching in schools at all levels. Other factors include in-appropriate methods of teaching the students poor interest in mathematics (Obodo 1997; Agwagah 2000; Badmos 2002; obodo 2004; Gambari 2010). It is also observed by the chief examiner of West African Examination Council (WAEC) that, the problem affecting mathematics achievement can be related to teacher's method of presenting the content of the curriculum to students (Chief Examiner, 2002).

As a result of the identified problems, the attempt of many science educators has continued to be directed towards search for alternative and more appropriate method for science instruction (Orji and Ebele, 2006). Much research efforts have revealed that there are considerable language difficulties and too much theoretical expressions by the mathematics teachers in the learning of mathematics (Fatima, 2006). According toUsman, (2006) there are considerable language difficulties in the learning of mathematics even in the countries such as India, china, Japan etcetera where children are fortunate to learn mathematics in their mother tongue throughout their school days.

Perhaps, one particular innovation that may likely facilitate learning among primary school pupils is the exploration of new technologies that can bring knowledge in the real-life experiences to their door steps (Ajewole and Ogunlusi, 2003). Inyana (2002) cited in Akubuilo and Ndubuiza (2003) maintained that computer are today being used in extremely versatile way to aid the understanding of the wide varieties of subjects, most especially the sciences and technology subjects as well as mathematics. Many researches have been carried out on the effectiveness of Computer Assisted Instruction (CAI). According to studies carried out by Tabasun in Owusu, (2009); Kausar, Chudhry and Gujjar (2008); Harrison in Owusu (2009) revealed that students that were instructed through CAI performed better than those who were instructed through conventional teaching strategy such as lecture method. While other researchers such as Delafuente, Araujo and legg (1998); Owusu (2009); Jenks and springer (2002) affirmed that CAI has little or no effect on students academic achievement. In the context mother tongue, the language theme came under direct scrutiny by science educators. From these studies language has come to be seen as a central dimension of class room processes. Amongst different studies pursued under different perspective concerning language in the class room process are Sutton (1986); Candela (1998), Lanke (1999) and Motimer (2000) cited in (Ardo, 2006). From the results obtained in these studies, it was indicated that students who were taught in mother tongue performed better than those taught in English language. One way of explaining why students taught in mother tongue performed better than those students taught in English language is to suppose that there is more effective communication between the teacher and

students because as Adekunle, (1990) in Ardo, (2006) observed, a child talk, believe and reason in the mother tongue. It was also demonstrated in this study that, the level of participation of students in the mother tongue classroom was higher than in the English language classroom, some of the students in the English language classroom were not eager to contribute to discussion because they could not express themselves in English language.

Gender matters have been associated with achievement of students. Some studies discover that male students performed better than female in sciences (Njoku, 2000). Achuonye (2009) found significant difference in academic achievement of male and female students taught using CAI in favour of male students. Yusuf and Afolabi (2010); Bello cited in Achuonye, (2011); Huynh *et., al* (2005) reported that gender has no influence on performance of male and female pupils exposed to CAI. . In another related development, WAEC (1996-2011) chief Examiners' reports established that boys out performed female in Mathematics. Specer (2004); osemwinye (2009); iwendi (2012) in their separate reports found no gender difference in the academic achievement of male and female in Mathematics. Opposing these report Gimba, (2006) in her work found that female students performed better than male students while expose to geometry.

Retention which is the ability to reproduce the leant concept when the need arises has been research by many researchers. However, osemmwinyen 2009 found that student interests and retention could be aroused and retained through the use of an appropriate instructional media like computer assisted instruction.

In the light of the above, a lot of studies have been carried out with respect to the use of mother tongue as medium of instruction in Nigeria, one of such study is the Ife six years science project (Seyensi) which was actually a part of a large Ife-six year primary project lunched in 1970 at the Institute of Education, University of Ife, Ile-Ife now ObafemiAwolowo University Ile-Ife, Nigeria with financial support from the Ford foundation (Elizabeth, 2004). The project was designed to investigate the effects of teaching primary school children in their mother tongue throughout the primary school years. Similarly, a study in Igbo, Usman&Uju, (2006) in their studies investigated the effect of mother tongue (Igbo) on the achievement of lower universal basic education (UBE) pupils in mathematics where the experimental group was taught using the mother tongue (Igbo) while the control group taught using conventional language of instruction. The result revealed that the experimental group performed better than the control group after the treatment. Available literature revealed that very little studies have been carried out on the use of computer assisted instruction with a specific mother tongue as a medium of instruction in Nigeria (Usman and Uju, 2006).

In view of the above, this study attempted to determine the effects CAI on student's achievement in mathematics at secondary school level. Specifically the study sought to find out the effect of CAI in Nupe language on students achievement in mathematics in Niger State, Nigeria.

II. Statement of the Problem

Several studies have reported poor students' academic achievement in mathematics despite the importance attached to the subject in the national policy on education (Odili, 2006). The students' performances continue to deteriorate year after years (Odili, Ibid). This have become a source of concern to all stakeholder in Nigeria education system, because no teacher in Nigeria that teaches mathematic at any stage, from primary upward can prove that all is well in the teaching of the subject. Those who teach subjects requiring the application of mathematics complained of the challenges they face. One of such challenges was attributed to lack of interest as a result of insufficient language of expression, (Idoko, 2009). Furthermore mathematics teaching in Nigeria today still follows the traditional pattern such as lecture methods, inquiring method etcetera which has been identified as being ineffective methods (Odili, 2006). Non-utilization of necessary techniques in teaching mathematics is another contributing factor (Odili, Ibid). It is against this background that this study investigated the effects of Computer Assisted Instruction (CAI) in Nupe language on pupils' achievement in mathematics.

1.2 Purpose of the Study
The main aim of this study is to develop an instructional package in mathematics in Nupe language, while the specific objective is:
1. To find out the effects of Computer Assisted Instruction (CAI) in Nupe language on the mathematics achievement of secondary school students.
2. To examine whether there is any difference in mathematics achievement of male and female secondary school students.
3. To find out effect of computer assisted instruction on retention

1.3 Research Questions
The study provided answers to the following research questions

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1. Would there be any difference in the academic achievement of secondary school students taught mathematics using computer assisted instruction in Nupe language and those taught with conventional teaching method using English language.
2. Is there any difference in the academic achievement of male and female secondary school students taught mathematics using computer assisted instruction in Nupe language and those taught with conventional teaching method using English language?
3. Is there any difference in the retention level of secondary school taught mathematics using computer assisted instruction in Nupe language and those taught with conventional teaching method using English language?

1.4 Null Hypotheses
The Null hypotheses were formulated from the corresponding research questions raised above.

HO_1: There is no significant difference between the academic achievement of secondary students taught mathematics using computer assisted instruction package in Nupe language and those taught with conventional teaching method using English language.

HO_2: There is no significant difference between the academic achievement of male and female secondary students taught mathematics using computer assisted instruction package in Nupe language and those taught with conventional teaching method using English language.

HO_3: There is no significant difference in the retention level of secondary school taught mathematics using computer assisted instruction in Nupe language and those taught with conventional teaching method using English language

III. Methodology

The study adopts a pretest, posttest and delayed posttest design. Two groups (Experimental and Control) were used comprising of two subjects male and female students. The experimentalgroup was taught using computer assisted instruction in Nupe language while the control group was taught using conventional teaching strategy.The targeted population for the study is Senior Secondary School Students (SSS1) of the two educational zone of Niger State, Bida and kutigi waspurposively selected for the study, this is because they are the Nupe speaking zones. There are total of one hundred and fifty three (153) senior secondary schools with the population of thirty six thousand five hundred and thirty seven SSS one students in these zones.

It is from this population that two hundred (200) student randomly selected consisting of one hundred and twenty three (123) males and seventy seven (77) females. Two instruments, the Secondary School Mathematics Achievement Test (SSMAT) developed by the researcher and Computer Assisted Instruction Package in Nupe Language (CAIP) also developed by the researcher with assistance of a professional programme developer with mathematics orientation was used for the study.

The tests item wasvalidated by a team of four experts.The test item was corrected and modified on the basis of suggestions and recommendations by the experts. The reliability coefficient for the SSMAT was found to be 0.74 after using test retest method. The test was administered to 200students by the researcher with the help of research assistant. The data collected were analyzed using t-test statisticsat 0.05 level of significance.

Table 1: Summary of t-test analysis for Experimental and Control Group on Pre-test

Group	N	Mean	SD	Df	t-value	P-value
Experimental group	100	61.19	10.54			
				198	1.44*	0.15
Control group	100	58.88	11.99			

*: Significant at 0.05 level

Table 1 shows the t-test comparison of achievement scores of experimental and control group on pre test. The table reveals that the calculated t-value (t=1.44, df=198, p>0.05) was not significant at 0.05 alpha level. This implies that there was no significant difference between the experimental and control group on pre test. Hence, hypothesis one is retained.

Table 2: Summary of t-test analysis of Experimental and Control Group on Post test

Group	N	Mean	SD	Df	t-value	P-value
Experimental group	100	66.29	13.12			
				198	11.818*	0.000
Control group	100	46.87	9.89			

*: Significant at 0.05 level

Table 2 shows the t-test comparison of achievement scores of experimental and control group on post test. The table reveals that the calculated t-value (t=11.818, df=198, p<0.05) was significant at 0.05 alpha level. This implies that there was significant difference between the experimental and control group on post test. Hence, hypothesis two is rejected.

Table 3: Summary of t-test Analysis on gender

Group	N	Mean	SD	Df	t-value	P-value
Male	57	63.46	11.58			
				98	2.555*	0.251
Female	43	70.05	14.08			

*: Significant at 0.05 level

Table 3 shows the t-test comparison of the achievement scores of male and female students taught Mathematics using CAIP in Nupe language. The table reveals that the calculated t-value (t=2.555, df=98, p>0.05) was not significant at 0.05 alpha level. This implies that there was no significant difference between the achievement scores of male and female students taught Mathematics through CAIP in Nupe language. Hence, hypothesis 3 is retained. This implies that computer assisted instruction package in Nupe language is gender friendly.

Table 2: Summary of t-test analysis of Experimental and Control Group on retention

Group	N	Mean	SD	Df	t-value	P-value
Experimental group	100	61.19	10.54			
				198	18.452*	0.000
Control group	100	34.53	9.88			

*: Significant at 0.05 level

Table 4 shows the t-test comparison of achievement scores of experimental and control group on retention. The table reveals that the calculated t-value (t=18.452, df=198, p<0.05) was significant at 0.05 alpha level. This implies that there was significant difference between the experimental and control group on retention. Hence, hypothesis four is rejected.

IV. Discussion
From Table 1, the results of t-test on the achievement of students taught Mathematics using computer assisted instruction in Nupe language indicates that there is no significant difference between the achievement of the experimental and control groups on pre-test. This showed that the pupils in the two groups had equivalent mathematics background as entry behavior. However, the finding indicated that there is significant difference in the academic achievement of student taught using Computer Assisted Instruction Package in Nupe Language and those taught with conventional method using English Language. In other words there is significant difference infavour of those taught with CAIP. This finding agree with theearlier finding of Tabassum in Owusu (2009) who found that students who used CAI scored significantly higher in mathematical concepts and computation than students who went through the traditional approach. This reveals that the students that were instructed through CAI performed better on the mathematical concepts as compared to those students who were instructed through teaching strategies such as lecture or question and answer method.

The findings of Harrison in Owusu (2009) on computer assisted instruction in basic arithmetics concept also corroborated the findings of this study. The result reveal that students who recieved computer assisted instructions show greater increase in their achievement scores in multiplication and subtraction than students who recieved traditional mathematical instructions. The study also reveals that CAI is capable of improving students achievement. The findings of this study also corroborated the findings of Kausar, choudhry and Gujjar (2008) who revealed that CAI proved to be significantly superior to classroom lecture in terms of achievement in knowledge, analysis and synthesis of the Bloom's taxonomy when they conducted a comparative study to evaluate the effectiveness of computer-assisted instruction versus classroom lecture for computer science students. In terms of evaluation and application skills, they found that CAI proved to be very much effective in increasing those skills as compared to classroom lecture. This study suggests that CAI is able to improve students achievement and performance. In the same vein, this study supported the position of Usman and Umo (2006) on the effect of mother tongue (Igbo) on the achievement of lower universal basic education pupils in mathematics. Their findings revealed that pupils who were taught in Igbo Language performed better than those taught with conventional method in English Language.

However, the findings of this study are in contrast with the findings of Delafuente, Araujo and Legg (1998) who reported no significant difference in final exam score between students taught by CAI and those

taught by the traditional instruction. The finding of Owusu (2009) on a comparative study of traditional instruction modes with CAI modes indicated that the results suggested that CAI is not as useful for instruction as previously believed because students in the CAI group did not perform better than those in traditional instruction mode. This study has proved that the use of CAIPNL is very effective in contrast to Owusu (2009)

The result shows that there is significant difference in the achievement scores of both male and female pupils taught CAIPNL and those taught with lecture method in English Language. Ducan test used as post hoc to locate the observed significant difference indicated that there was significant difference between male and female pupils exposed to CAI in favour of male pupils. This finding is in agreement with the finding of: Spotts et al (1997) Achuonye and Olele (2009) who noted that there is significant difference between male and female pupils exposed to CAI. Huynh *et., al* (2005) found that there is no statistical significant validating difference in the pattern of online interaction between male and female students. Also Yusuf and Afolabi (2010) Bello cited in Achuonye (2011) noted that gender has no influence on performance of male and female pupils exposed to CAI .These were however disapproved by the result of this study which showed that the male gender achieved better scores with CAIPNL than the female gender.

V. Conclusion

Based on the findings of this study it was concluded that:The innovative technology using computer package in mother tongue for teaching mathematics seems to be the answer to the poor performance problem. Computer assisted instruction in Nupe language was more effective in teaching mathematics concept, improve learners' performance, enhanced their retention, and is also gender friendly.

Recommendations

In view of the findings, it was recommends that:
1. Teachers should be trained in the use of computer application packages for teaching through workshops, seminars and induction courses.
2. Government and stakeholders in Education should provide functional computer laboratories equipped with adequate backups, equipments and power supply to boost teaching and learning with computer applications.
3. The use of mother tougue should be adopted in teaching Mathematics at all levels of education and writers should be encouraged to write Mathematics textbooks in the language of the environment(Mother Togue).

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