EFFECTS OF COMPUTER ASSISTED INSTRUCTIONS AND TEACHING EFFECTIVENESS OF MATHEMATICS TEACHERS IN SECONDARY SCHOOLS IN EKET SENATORIAL DISTRICT

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ABSTRACT

The concept of Educational technology has been developed during the last few years. Educational Technology has given a significant contribution in education by taking into consideration the individual differences of the learners and catering to their needs. The emerging trend all over the world is towards more individualized and flexible forms of learning with an emphasis on the individualized methods of instructions. This paper has laid a special emphasis on using computers in the teaching and learning process specially for providing instructions in the classroom situations. It is an experimental work to study the effect of Computer Assisted Instruction (CAI) and teaching effectiveness of Mathematics teachers in secondary schools in Eket Senatorial District

Keywords: *Computer assisted instruction, traditional method, mathematics teachers, school location, experimental group, control group*

INTRODUCTION

Computer Assisted Instruction (CAI) has become very popular today in our educational system. It promotes effective teaching and learning among students and teachers, especially those teaching mathematics both in primary and secondary schools. Computer Assisted Instruction has been observed to encourage self-learning technique. It is an interactive instructional technique whereby a computer is used to present the instructional material and monitor the learning that takes place. In many occasions computer assisted instruction has been carried out with features whose combinations are identified with text, graphics, sound and video in enhancing the learning process. It is mostly utilized to help a student acquire learning as reflected in improved academic performance.

According to Anderson (2008), computer Assisted Instruction (CAI) uses programs such as tutorial, drill and practice, simulation and problem solving approaches to present topics for learning and fors testing learner's understandings. However, CAI has its limitations, which include some students feeling overwhelmed by the information and resources available. Also a system that relies so much on CAI may be limited by non availability of good CIA packages. Advantages of CAI includes Self-pacing which allows students to proceed at their own pace, individual attention by the students and ability for students to learn more and more rapidly. These when applied in learning Mathematics is expected to substitute for inappropriate methods which do not remedy or tackle adequately the perceived problems of students learning Mathematics. The end result of which is poor performance in classroom and in public exams, (Henry, 2009). CAI which focuses on and encourages individualized learning has a capacity to address students' temperamental problems as they negatively affect their learning. It also encourages a student to learn at their own pace, eliminates pressure exerted by some poor conventional learning methods, especially in learning Mathematics. Computer Assisted Instrument (CAI) in Mathematics is a

special avenue or process which allows students, especially the disadvantaged students, to work at their own pace, thus reducing the pressure that might be exerted by the Mathematics teachers, (Maverech and Rich, 1985). The authors explained that "the reduction in perceived need to exert academic pressure on students enable teachers to invest greater efforts in classroom processes which foster enhanced performance of students and effective development of students.

Statement of the Problem

Over the years, there has been an alarming incidence of poor performance or total failure in Mathematics in Nigerian schools, including schools in Eket Senatorial District. For instance, of recent, an observation in some schools in the study area recorded an unpleasant experience as their performance in Mathematics was nothing to write home about.

It is quite unfortunate that Mathematics' teachers in Secondary Schools are yet to overcome the problem of mass failure in the subject as students still see it as a major obstacle to better performance. This unwholesome incidence places the blame on the problem of ineffectiveness in the teaching of Mathematics by the teachers concerned thus causing students' lost interest in the subject. Some school administrators have laid many complaints about poor teaching method and ineffective teaching standards of most mathematic teachers supervised by them and that they lack the rudiments of mathematical skills that rouse students' interest and enhance their academic performance in mathematics. It on this premise that this study is conducted, with the aim of investigating how computer assisted instructions can enhance teaching effectiveness of Mathematics teachers in Secondary Schools in Eket Senatorial District

Purpose of the Study

The main objective of this study was to investigate effect of computer assisted instructions and teaching effectiveness of mathematics teachers in secondary schools in Eket Senatorial District. The study was designed to achieve the following specific objectives.

1) To determine the difference in the performance of mathematics students of junior secondary three (JS3) taught with computer-assisted instructions (CAI) and traditional instructional methods in Eket Senatorial District.
2) To determine the difference in the performance of mathematics students of junior secondary three (JS3) taught with computer-assisted instructions (CAI) and traditional instructional methods in Eket Senatorial District based on school location.

Research questions

The following research questions will be answered:

1) What is the difference in the performance of Mathematics students of junior secondary three (JS3) taught with computer-assisted instructions (CAI) and such taught with traditional instructional methods in Eket Senatorial District?
2) What is the difference in the performance of mathematics students of junior secondary three (JS3) taught with computer-assisted instructions (CAI) and traditional instructional methods in Eket Senatorial District based on school location?

Hypotheses

The following null hypotheses will be tested:

1) There is no significant difference in the performance of Mathematics students of junior secondary three (JS3) taught with computer-assisted instructions (CAI) and traditional instructional methods in Eket Senatorial District.
2) There is no significant difference in the performance of Mathematics students of junior secondary three (JS3) taught with computer-assisted instructions (CAI) and traditional instructional methods in Eket Senatorial District based on school location.

Literature Review

Computer Assisted Instrument (CAI) and Students' Performance in Mathematics

According to Wiki (2008), there are many benefits of Computer Assisted Instrument (CAI). CAI functions as a set of programs such as tutorials, drill and practice, simulation and problem solving approaches to present topics for learning. This method of learning also makes use of discovery approach and games, but tutorial programs include both the presentation of information and its extension into different forms of work including drill and practice, game and simulation. Drill and practice as a component of CAI provides opportunity for students to repeatedly practice the skills that have previously been presented, indicating that further practice is very necessary for mastery (Mautone, 2015).

The practice of CAI in learning is further shown on its program (Discovery and problem solving). In discovery, the program is designed by the software developer to provide a large database of information specific to a course or content area. These challenge the learner to analyze, compare, infer and evaluate based on their exploration or the data. The author also explained that problem solving as an approach to learning helps students develop specific problem solving skill and strategies. The advantages of Computer Assisted Instruction (CAI) in the learning and teaching Mathematics, as enumerated by Adams (2009) are many and quite interesting; it provides a platform for one to one interaction. It acts as a great motivator. It provides freedom to experiment with different options. It creates room for instantaneous response and immediate feedback to the answers elicited. It enables learning on self pacing capacity; which allows students to proceed at their own pace. CAI also helps teachers to see the need to devote more time to individual students. For those students with poor learning attitude, CAI creates privacy that helps the shy and slow learners to learn as it gives individual attention.

Ifeanyi (2002) states that since CAI promotes self-directed learning, students decide when, where and what to learn. And the resultant effect is that students learn more and more rapidly, having identified the weakness of the present learning methods in Mathematics which, thus far, usually results into mass failure of students. It is quite imperative that a new and better approach be adopted to enhance student performance. Considering the importance of Mathematics, especially in the sciences and of course, as a requisite to further course of study at the university, the need to improve upon the performance of students has brought about the emerging idea of Computer Assisted Instruction in Mathematics.

Students' problems in learning and understanding Mathematics vary from conceptualization, speed of processing and use of learning strategies. Lott and Zydney (2006) assert that one of the deficiencies that can negatively affect the performance of Mathematics student in Secondary Schools is fact retrieval. In order to buttress this claim, the authors further explained that, based on research findings, the ability to succeed in higher level Mathematics skills is directly related to the students' ability to effectively use lower Mathematics skills such as basic facts. This assertion gives a true and undisputable picture of what prevails in the performance of students in Mathematics in our schools today. Poor performance of students in Mathematics cuts across both Junior Secondary School Examinations (JSCE) and Senior Secondary School Certificate Examinations (SSCE). This claim in essence, could be blamed on the fact that, the educational system as regards learning

Mathematics has failed to recognize students' attitudinal problems towards solving problems in Mathematics as a subject of study. Students cannot achieve learning when inappropriate teaching methods that are at variance with their identified problems continue to apply. It therefore becomes absolutely imperative that instructional methods be varied. Computer Assisted Instrument (CAI) has become one of the most acceptable means of learning Mathematics in recent times.

According to Mautone, (2015), CAI has been ascertained to have a positive effect on both Mathematics performance and students' attitude toward the subject. In our society today, in fact in all spheres of human endeavor, computer has been accepted as a tool aimed at enhancing effectiveness by ways of easing operation of tasks. This technological advancement when properly harnessed in learning Mathematics in our Secondary Schools can also ease learning Mathematics. In many countries of the world and many educational systems, the use of CAI seems to overwhelm the use of conventional instructional materials and methods. Thus as advocated by Soun (2006), the ever increasing use of computer technology in the classroom demands that students be as knowledgeable about the computer as they are about a television set. Computers are no longer considered as a technology of the future. The future has already arrived. It is imperative that educators re-evaluate their teaching methods so that CAI can be effectively incorporated into the main stream of education.

Computer Assisted Instruction in Mathematics and Academic Performance of Students based on School Location

Before now, the influence exerted by the environment on the academic performance of students in Secondary Schools has not been given adequate consideration; hence this factor had little or no attention in educational discourse, (Journal of Economic and Sustainable, 2013). However, remarkable studies have been done over the past decade, the results indicate a correlation between the environment and academic performance of students (Oti, 2002). Obviously the environment plays a major role in the life of every individual whether students or teachers.

Studies have shown that environmental factors to a large extent affect both the physical and psychological potentials of an individual. This has led to the contention that many students have failed to develop their potentials due to inadequate environmental stimulations. There are some environmental factors which have contributed to the poor performance of students and can by implication negatively affect the use of computer assisted instruction (CAI) in Mathematics. One of such environmental factors is school location (urban or rural). This is in agreement with the Journal of Economics and Sustainability Development, (2013) which states that "one of the factors that influence academic performance is school location or site of the school". For instance, in a situation whereby the school is cited in a noisy area like the motor park or in the heart of the City, like Uyo, serious business activities will definitely disrupt the learning of the students. As suggested by Juhun and Momoh (2004), one will not expect such students in that noisy area to do well academically.

Students feel happy in a peaceful and friendly environment, whereas schools cited in noisy urban streets are associated with shortfalls in mental concentration, resulting in students' poor performance. Anything that interferes with the teaching/ learning process constitutes noise. Noise has a negative influence on students' information processing strategies, feeling of personal control as well as their level of arousal. Computer Assisted

Instruction (CAI) as it applies in learning Mathematics may not achieve its purpose in an environment where the pressure produced by noise is high. As presented by David (2016), Computer Assisted Instruction (CAI) encourages individualized process of learning where the pressure exerted by the teachers is reduced or discouraged. This enables the students to learn more and more rapidly to achieve learning, especially in Mathematics. However, this would become impossible when the school or learning environment especially a noisy street in a city produces so much pressure through noise, to interfere with students' concentration.

Computer Assisted Instruction (CAI) in Mathematics involves a set of programs which actually incorporate the subjects' contents such as Arithmetic, Integers, Algorithm, etc, that enhance learning Mathematics at ease (Ronald and Lewis, 2011). With CAI, students can sit and interact with computer. This process requires absolute concentration, as noise from the environment brings distraction. This substantiates the claim by David (2016), that location of schools in an urban area (a noisy and busy environment) can exert a negative influence in the students' learning process. It also can affect students who use CAI in learning Mathematics.

The neglect of our rural areas has caused a lot of harm to students' academic performance in our rural schools. This is because people in the rural area find it difficult to provide for themselves, where government does not provide for them. In view of this, Nwabor (2002) observes that one of the greatest problems of rural schools is the attitude of some parents who live in such rural areas. Given the economic situation (hardship) in the rural area, parents cannot afford to pay the high school fees of urban schools. Consequently, school administrators, especially the private schools operating in these areas, resort to hiring unqualified teachers with meager pay packages to cope with the situation in the area. This factor also has a negative effect on the quality of teachers so employed. In essence, teachers who are not competent in the use of some teaching methods and even the use of Computer Assisted Instruction (CAI) method in Mathematics may not be employed being that quality teachers demand good pay packages. As such, it is evidently clear that backwardness in education, not just in the area of using CAI, to improve students' performance in Mathematics is experienced mostly in the rural areas.

Computer Assisted Instruction and teaching experience on students' performance in Mathematics

The purpose of teaching students in Mathematics must be for the students to experience Mathematics (Nobles and Bowles, 2015). A principal aim of a Mathematics teacher is to try to create and facilitate effective learning. According to Ronald (2011), Computer Assisted Instrument (CAI) makes use of a set of computer program which include, games, simulations, drill and practices, discovery and problem solving approach. Another important concept that applies in the use of CAI by the experienced teacher is in the "context". According to Reeves (2004), Mathematics can be taught in the abstract, a semi-reality, or through real world applications of all with equal level of engagement and success, but when CAI is brought in to play in Mathematics learning, then abstract concepts can be explored through games, puzzles and well phrased questions where the games provide the context. Also, as pointed by David (2015), a semi–reality can be constructed to give an indication of a possible application to provide a context for exploring Mathematics. Also within the context of CAI in Mathematics, real world applications can be used to demonstrate the need for and purpose of the Mathematics.

It is also important to consider "interest" and "relevance" for students in task design. As pointed out by Henrich et al., (2002), it can of course, be a great challenge to understand what a student perceives as interesting and relevant and one obvious solution to this, is to ask

the students regularly about it and certainly to pay attention to have the received idea presented to them. For example, a lesson presented by the teacher in Mathematics comparing mobile phone tariff through linear functions is more likely to be relevant to a class full of mobile phone users than a similar lesson on taxis tariff. This of course depends on who pays the bills. Looking for a correlation before height and arm span, could be more interesting to a class using data about themselves than wait for another class or fictional data.

The importance of teachers in the meaningful education at all levels is reflected in the National policy on education (2004) as it declares that, no education system, even CAI, may rise above the quality of its teachers. This policy is basically stressing on teachers effectiveness. From this policy document, it can be deduced that, teachers' effectiveness is a product of teaching experience. It is not then out of place to submit that teachers' teaching experience enhances teachers' effectiveness. And one of the factors that contributes to teachers' effectiveness is teaching experience; thus it is not out of place to assert that teachers' effectiveness is a product of teaching experience.

This policy further conceptualized teachers' effectiveness as the managerial skills essential for enhanced academic performance. It takes a teacher with some wealth of experience to maximize his competence and teaching ability by utilizing the appropriate language, methodology, available up-to-date and relevant instructional materials to bring out the best from learners in terms of academic performance. Teachers are said to be effective when their teaching can lead to students' learning (Abimbose, 2003). Basically, Computer Assisted Instrument (CAI) in Mathematics refers to the use of computer in learning or teaching Mathematics. No teacher would embrace or flow effectively with the use of CAI if they are not well groomed in the use of computer in dispensing Mathematics lessons. Teachers' inexperience in the application of computer software constitutes a major set-back in the acceptability of CAI as a means of improving the students' performance in Mathematics in Eket senatorial district. Competence in computer usage plays an important role in teachers' effectiveness as regards CAI in Mathematics.

According to David (2006), an understanding of the teacher's role in a classroom where CAI is used is essential to meeting the needs of reluctant learners. Basically, observation reveals that students detest the learning of Mathematics, not just because of the subject itself, but the handlers of the subject as well. Professionalism demands that teachers do not teach for teaching sake, but must teach to ensure learning which calls for the application of appropriate teaching methods. And so, teaching experience plays an important role in the successful application of computer assisted instrument (CAI). It is obvious, based on available results that, whatever method has been used teaching Mathematics in Eket senatorial district has not yielded good students' performance as reflected in the mass failure of students, It becomes necessary that urgent measures be taken to arrest this poor performance in Mathematics. Consequently, CAI should be given a trial, where it has not been in operation, and for it to be successful, teachers' experience must be considered a requisite.

Methods

Research design

The Pretest-Postest non-randomized control group design of quasi-experimental study will be adopted for this study.

Area of the Study

The area of this study is Eket Senatorial district.

Population of the Study

The population of the study will comprise all the 28,378 JSS3 students in Secondary Schools in Eket Senatorial District.

Sample and Sampling Technique

The sample size of 720 JSS3 students will be used for the study using proportionate stratified random sampling technique.

Instrumentation for Data Collection

Two instruments will be used for the study. The Researcher-Developed Computer Instructional Package on Mathematics (CIPM) and Mathematics Performance Test (MPT).

Validation of the Research Instrument

The face validation of the research instrument will be made by the researcher's supervisor and an expert in test and measurement. The items in the questionnaire will be properly worded to meet the respondent's level of understanding and each variable will be properly measured.

Reliability of the Instrument

In order to establish the reliability of the instrument, test-retest reliability analysis will be carried out on the research instrument, using 40 pre-primary school-pupils who will not form part of the main work.

Method of Data Analysis

Mean score rating will be used in answering the research questions while independent-test analysis and Two-way analysis of variance will be used to test hypotheses formulated for this study at 0.05 alpha level.

Discussion of the Finding

The result of the data analysis was significant due to the fact that the calculated F value 123.17 was greater than the critical F value of 3.86 at 0.05 level with 1 and 314 degree of freedom. The result implies that there is significant difference in academic performance of J.S.S. 3 Mathematics students taught with CAI and those taught with traditional methods. The result therefore was in agreement with the research findings of Ifeanyi (2002), who stated that since CAI promotes self-directed learning, students decide when, where and what to learn. The significance of the result caused the null hypotheses to be rejected while the alternative one was accepted.

The result of the data analysis was not significant due to the fact that the calculated F value 0.52 was less than the critical F value of 3.86 at 0.05 level with 1 and 314 degree of freedom. The result implies that school location does not significantly affect academic performance of J.S.S. 3 Mathematics students when taught with CAI and those taught with traditional methods in public Secondary Schools in Eket Senatorial district. The result

therefore was not in agreement with the statement made in the Journal of Economic and Sustainable 2013, which was read that apart from Computer Assisted Instrument (CAI), location has been seen as another important factor which affects student's performance in Mathematics. The significance of the result caused the null hypotheses to be rejected while the alternative one was accepted.

Conclusions

Based on the findings of the research work, the researcher concludes that public Secondary Schools in Eket Senatorial District hardly use computer-assisted instruction (CAI) in teaching J.S.S. 3 Mathematics students. Academic performance of J.S.S. 3 Mathematics students taught with CAI is significantly higher than that of their colleagues taught with traditional method. School location does not significantly affect academic performance of J.S.S. 3 Mathematics students when taught with CAI and those taught without it in public Secondary Schools in Eket Senatorial district.

Recommendation

The following are recommended:

1. Public schools should not only install but effectively utilize computer aided instruction in teaching their students. This is very necessary because computer aided instruction is a very useful tool for improved academic performance in Mathematics.
2. The teacher should use computer as a media of instruction in classroom. CAI can be arranged to be presented in large classroom as it provides maximum amount variety and flexibility by maintaining the quality and quantity of education.
3. Policy makers as well as school directors should invest both resources and time in the training of teachers.

REFERENCES

Abimbose, B. (2003) *Influence of personality factors on biology lecturers' assessment of difficulty levels of genetics concepts in Nigerian colleges of education.* Unpublished PhD thesis, University of Ilorin, Ilorin.

Adams, K. S. (2009). Vocational / Technical Education in Ghana: Problems and Remedies. *International Journal of home Economic Research, 20(1), 189-197.*

Anderson, E. (2008). Against the wall: poor, young, black, and male. *Philadelphia, PA: University of Pennsylvania Press.*

David, A. (2006) A field test of computer assisted instruction in first grade mathematics. *Educational Leadership*, 28, 170-180.

David, A. (2015) An evaluation of computer assisted instruction using a drill and practice program. *Dissertation Abstracts International*, 32, 6970B. (University Microfilms No. 72-18,627)

David, A. (2016) Computer-assisted instruction program. A three year report covering July 1, 1971 through June 30, 1974. Rockville, MD: Montgomery County Public Schools. *(ERIC Document Reproduction Service No. ED i00 361)*

Henrich, R. & Suilvan, H. J. (2002) Student Performance and Attitudes Using Personalized Mathematics Instruction; *Educational technology research and development* 50(1) 21-33.

Henry, M. K. (2009). Unlocking literacy. Effective decoding and spelling instruction. *Developmental Psychology* (29:5), pp. 17-24.

Ifeanyi, R. (2002) *Recommendations to the Dutch Platform RIO 20+: ICT for a greener economy.*

Journal of Economics and Sustainability Development, (2013) Sustainable development without ICTs is not sustainable. Open Society Initiative ICT and Civil Society Consultative Meeting.

Jahun, I. U. & Momoh, J. S. (2004). The Effect of Environment and Sex on Mathematics achievement of JSSIII students in Kwara State. ABACUS: *Journal of Mathematics Association of Nigeria* 26(10) 53 – 58.

Mautone, R. J. (2015). The art and science of teaching: A comprehensive framework for effective instruction. *Developmental Psychology* (28:5), pp. 771-775.

Mevarech, Z. R. & Rich, Y. (1985). A 2 2 achievement goal framework. *Journal of Personality and Social Psychology, 80, 501–519.*

National policy on education (2004) *A comparison study of the learning effectiveness of computer aided instruction vs classroom lecture.* Retrieved December 22, 2007, from http://wwwconcentric.net/~Walwpr/thesis/4_result.html

Nobles, J. & Bowles, R. (2015) *Agenda 21- Chapter 36 Promoting Education, Public Awareness and Training.* Retrieved on 9 March 2012 from www.un-documents.net/a21-36.htm

Nwabor, W. (2002) Cooperative learning or individualized instruction: *Which is best for computer based instruction of the adult learner?* http://www.coedu.usf.edu/itphdsem/Eme7938/sn899.pdf

Oti, C. V (2002). The Level of Understanding of Selected Ecology Concept Among Nigerian School Certificates. *Journal of the Science Teachers Association of Nigeria.* 25 (1), 6 – 102.

Reeves, D. (2004) Toward's the thinking curriculum: Current cognitive research. Alexandria, VA: *Association for Supervision and Curriculum Development.*

Ronald, H. (2011). Achievement goal orientations and subjective well-being: A person-centred analysis. *Learning and Instruction, 18,* 251–266

Ronald, R. & Lewis, K. (2011) The importance of motivation as a predictor of school achievement. *Learning and Individual Differences, 19,* 80−90.

Soun, R. (2006) Self-efficacy for self-regulated learning: A validation study. *Educational and Psychological Measurement, 68,* 443–463.

Wiki (2008) Investigating self-regulation and motivation: historical background, methodological developments, and future prospects. *American Educational Research Journal, 45*(1), 1618.