EFFECT OF COMPUTER SIMULATION INSTRUCTIONAL PACKAGE ON SENIOR SECONDARY SCHOOL MATHEMATICS STUDENTS' RETENTION IN ARITHMETIC PROGRESSION IN LAVUN LOCAL GOVERNMENT AREA OF NIGER STATE, NIGERIA

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Abstract

This study investigated the effect of computer simulation instructional package on senior secondary school mathematics students' retention in arithmetic progression in Lavun Local Government area of Niger State. Quazi-experimental design was employed and the sample for the study consists of 156 SSII students from two intact classes in two purposively selected public schools in the study area. Mathematics Achievement Test consisting of 25 multiple choice items was used as instrument for data collection. Test retest method was used to ascertain the reliability of the instrument and a reliability coefficient of 0.76 was obtained. The data collected were analyzed using Analysis of Covariance (ANCOVA) statistics. Findings revealed that students taught arithmetic progression through computer simulated instructional package retained the concept learnt more than their counterparts taught using conventional lecture method. However, there was no significant difference in the retention of boys and girls taught using the package. It could be deduced that the use of computer simulation instructional package can serve as a viable alternative or supplement to conventional lecture method of teaching. The package was therefore recommended to be used by mathematics teachers to supplement conventional lecture method in the teaching and learning of arithmetic progression with a view to improving students' retention of the concept.

Keywords: Arithmetic Progression, Computer, Mathematics, Retention, Simulation

Introduction

In this modern world, science and technology advancements have been used as a yardstick for measuring development, developed countries such as China, USA, Russia and many more are examples of countries where innovations in Science, Technology and Mathematics have placed them among the first five strongest economy in the world (Imoko & Agwagah, 2006). Mathematics remain a core subject in both the primary and secondary schools (National Policy on Education, 2004), for without a credit pass in mathematics at the senior secondary school level, no student can access the tertiary education in Nigeria. One of the reasons for the review of the National Policy on Education 1998 was to expand the National mathematical centre (NMC) whose role, is to enhance mathematics learning through research (NPE, 2004).

In spite of the importance attached to mathematics as a core subject in our schools today and its application in everyday life there have been consistent poor performances at all levels starting from the primary school level to the tertiary level (Agwagah, 2004, Ije & Harbor-Peters, 2005; Gambari and Fagbemi 2008). This poor performance could be as a result of poor retention of the concept learnt on the part of the students.

Retention is the ability to reproduce the learnt concept when the need arises (Demirel, 2004). However, students' retention could be retained through the use of an appropriate instructional material like computer simulation package in teaching. Learning could be made more effective, lasting and enjoyable and topics that are abstract to students could be made clearer, easier and meaningful for better performance of the concept learnt. Computer simulation package could also reduce the perceived stereotyped status of female students in the learning of Mathematics particularly Arithmetic Progression (AP) in the sense that every student in the study will have access to the package and learn it at his/her convenient time and pace.

The West African Examinations Council (WAEC, 2002; 2003; 2004 & 2007) Chief Examiners reports highlighted poor knowledge on the Arithmetic Progression (AP) as one of the area of student's weakness. In mathematics, an Arithmetic Progression (AP) (also known as linear sequence or

arithmetic sequence) is a sequence of numbers such that the difference between the consecutive terms is constant. That is the increase or decrease between any two consecutive terms is the same throughout. The increase or decrease is called the common difference which can either take a positive or negative value. For instance, the sequence 5, 7, 9, 11, 13, 15,... is an Arithmetic Progression with common difference of 2. If the initial term of an arithmetic progression is a_1 and the common difference of successive members is d then the nth term of the sequence (a_n) is given by: $a_n = a_1 + (n - 1)d$, and in general

$$a_n = a_m + (n-rn)d$$

The nth term is referring to any term in the arithmetic progression Therefore a sequence of an A.P can be written thus a, a +d, a+2d, a+3d, a+4d... from the above, it is noted that, the number of common difference that must be added to a particular term in order to get the next term is one less than the tern being sought.

Given that an nth term is given by T_n

Then $T_n = a+(n-1)d$

This is the formula for finding an nth term of an Arithmetic Progression. The sum of term in any A.P is the addition of all the terms involved in the particular A.P. This concept could be made easy to students with the use of Computer Simulation Package.

Computer Simulation package is a non-human device which is responsible for the carefully structured presentation of new materials and the seamless incorporation of drill and practice into the learning process. It could also be applied as a strategy for effective learning of Arithmetic Progression. Skinner believed that with help of teaching machines and programmed instruction, "students could learn twice as much in the same time and with the same classroom (Skinners 1968). Therefore, the use of Computer Simulation Package could be an effective way of improving students' performance in Arithmetic Progression than the conventional lecture method.

It is on these backgrounds that necessitate the study on the use of Computer Simulation Package on Senior Secondary School Student's Retention in Arithmetic Progression in Lavun Local Government Area of Niger State.

Statement of the Problem

The teaching and learning of Mathematics in secondary schools still remain a serious problem to mathematics teachers due to the abstract nature of the subject. The high rate of failure in Senior School Certificate Examination (SSCE) has become a subject of constant comment by many people who discovered that the traditional principle of learning establish by experimental psychologists are inadequate in solving practical problems. The trend in science and Mathematics teaching over the last few years has been towards emphasizing problem solving and students' centered learning. Several strategies were employed to improve students' performance in school subjects in Nigeria among them is the use of computer simulation package in classroom instruction. Based on this, the researchers decided to determine whether computer simulation instructional package would improve mathematics students' retention of arithmetic progression.

Research Questions

The following research questions guided the study:

1. Is there any difference in the mean retention score of mathematics students taught arithmetic progression using computer simulation instructional package and those taught using conventional lecture method?
2. Does gender influence mathematics students' retention of arithmetic progression when taught using computer simulation instructional package?

Research Hypotheses

The following null hypotheses were formulated and tested:

HO_1 There is no significant difference in the mean retention score of mathematics students taught arithmetic progression using computer simulation instructional package and those taught using conventional lecture method.

HO_2 There is no significant difference in the mean retention score of male and female mathematics students taught arithmetic progression using computer simulation instructional package.

Methodology

This research adopted quasi- experimental design using non- equivalent control group design. The population for the study comprises all the 19,879 students from 18 co-education public senior secondary schools class two (SSII) in Lavun Local Government Area of Niger State. Purposive sampling technique was used to select two senior secondary schools that are well equipped with computer facilities in the study area before they were randomly grouped as experimental (76 students) and control group (80 students). Intact classes of SS II students (76 and 80 students to experimental and control group respectively. A total of 156 students (comprising 97 male and 59 female) was sampled for the study.

Mathematics Achievement Test (MAT) was the research instrument used in collecting data to answer and test the hypotheses. MAT has 25 multiple choice items with four options (A-D) from where a student is expected to indicate the correct option to each of the items. The instrument covers different levels of understanding based on Blooms Taxonomy of Educational Objectives. MAT was subjected to face and content validity by three computer programming experts, two, mathematics education experts and two test and measurement experts. A test retest method was used to determine the reliability of the instrument and a reliability coefficient of 0.76 was obtained using Spearman Correlation Coefficient.

Students in the experimental group learnt arithmetic progression using computer simulation instructional package while their counterparts in the control group were taught using conventional lecture method. Data collected from the administration of research instrument were analyzed using inferential statistics. Analysis of Covariance (ANCOVA) in Statistical Package for Social Sciences (SPSS) 20.0 Version was used to test the two hypotheses while the level of significance was ascertained at 0.05 level.

Results

Hypothesis 1: There is no significant difference in the mean retention score of mathematics students taught arithmetic progression using computer simulation instructional package and those taught using conventional lecture method.

Table 1 reveals the main effect treatment on retention score of students taught Arithmetic Progression using the Computer Simulation Package (experimental) and those taught the same Arithmetic Progression using the conventional method (control) produced $F = 5.730$ and this value is significant at 0.017. The value of F is equally significant at 0.05. That is ($p = 0.017$; $p < 0.05$). The treatment using computer package produced significant difference on retention. Hence, hypothesis one which states that there is no significant difference in the mean retention score of students taught Arithmetic Progression using the Computer Simulation Package and those taught the same Arithmetic Progression using the conventional method was rejected. The result indicated that treatment using Computer Simulation Package produced significant difference on students' retention in Arithmetic Progression. This result agrees with Kara (2008) who reported that students taught with CAI package retained more than students taught with the conventional method. More so, Altin (2002), observed that students who used computer assisted experimental method (CAEM) retained more than students who used conventional method.

Table 1: ANCOVA result of the mean retention score of experimental and control groups

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	55967.351[a]	2	13991.838	117.617	.000
Posttest (covariate)	5462.146	1	5462.146	45.915	.000
Group	681.681	1	681.681	5.730	.017
Error	35093.565	153	118.961		
Corrected Total	91060.917	155			

a: Adjusted value

Hypothesis 2: There is no significant difference in the mean retention score of male and female mathematics students taught arithmetic progression using computer simulation instructional package.

Table 2: ANCOVA result of the mean retention score of male and female students taught arithmetic progression using computer simulation instructional package

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	358.997[a]	2	179.498	1.202	.303
Posttest (covariate	5462.146	1	5462.146	45.915	.000
Gender	348.819	1	348.819	2.336	.128
Error	22993.312	73	149.307		
Corrected Total	23352.309	75			

a: Adjusted value

Table 2 reveals that the main effect treatment on the retention score of male and female students taught with computer instructional package produced F = 2.336, and this value is not significant at 0.128. The value of F is equally not significant at 0.05. That is ($p = 0.128$; $p > 0.05$). The treatment using Computer Simulation Package produced no significant difference on the mean retention score of male and female students. Therefore, the hypothesis which states that there is no significant difference in the mean retention scores of male and female students taught Arithmetic Progression using the CAI package is hereby not rejected. This result agrees with Kara (2008) who investigated the effect on retention of Computer- Assisted Instruction package on students' academic achievement for teaching physics to 7th grade elementary school students in the City of Denizli. At the end the result revealed that there was no significant difference in gender retention of the students.

Conclusion

The result of this study provides empirical evidence that the use of computer simulation instructional package enhances students' retention in arithmetic progression more than the use of conventional teaching method and that gender does not influence students' retention in the concept

when taught using the package. Computer simulation instructional package can therefore serve as a viable alternative or supplement to conventional lecture method of teaching.

Recommendations

1. Since the use of computer simulation instructional package enhances retention of students in arithmetic progression, mathematics teachers are therefore encouraged to employ its usage in teaching and learning of the subject.
2. Government and school authorities should provide computer facilities needed to support school usage of computer simulation instructional package. This will give teachers and students the opportunity to be ICT compliant.
3. Seminars, workshops and trainings on learning technologies should be organized frequently for teachers and educational administrators in order to be updated on innovations in teaching and learning of science, technology and mathematics education.

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