EFFECT OF COMPUTER GRAPHICS ON JUNIOR SECONDARY SCHOOL STUDENTS' RETENTION IN STATISTICS IN ENUGU EDUCATION ZONE OF ENUGU STATE.

BY

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Abstract

This study was aimed at investigating the effect of Computer Graphics, a computer aided instruction strategy on junior secondary school students' retention in statistics. It was a quasi-experimental study, pretest-posttest, non equivalent groups design. A total of 389 JSSII students were sampled from four secondary schools in Enugu education zone. The schools were made up of two rural and two urban schools drawn by purposive sampling while eight intact classes were randomly sampled and assigned experimental and control groups. Statistics Achievement Test (SAT) was used for data collection. The instrument had 30 items. It was validated by three research experts. A reliability of 0 .65 was obtained for SAT using Kuder Richardson 20 (KR-20) formula. Two research Questions and three hypotheses guided the study. Mean and standard deviation were used to answer the research questions while the hypotheses were tested at .05 level of significance using analysis of covariance (ANCOVA). Major findings of the study revealed that students in the experimental group taught statistics with computer graphics retained higher than their counterparts who were taught with expository method. There was no significant interaction between teaching strategy and school location with regards to students' retention in statistics. It was recommended, among other things, that mathematics teachers should use computer graphics for teaching statistics in junior secondary schools.

Introduction

Considering the important role of mathematics as a core and compulsory subject through all levels of educational systems in Nigeria, and the worrisome deteriorating state of students' poor retention and their consequent poor achievement in secondary school mathematics, something serious need to be done at no other better time than now. Obviously, students do not achieve high in mathematics because they do not retain very well. No doubt, retention is a very vital concept in education. Precisely, learning cannot be explained fully without reference to retention. Similarly, academic achievement and performance cannot be measured without retention.

Retention is the noun form of the verb "Retain". Stuz (2005) defined retain as "keep"; "continue to have or hold" or "keep in place". In the same vein, Kulik (2009) defined retain as "keep possession of", "absorb and hold" or "keep in place". It follows, therefore, that retention, which is the act of retaining, may be defined as the act of "absorbing and holding" or "to continue having or holding". In the context of this work, retention refers to the act of absorbing, holding, or continuing to hold or have facts or things learned.

Retention and memory can hardly be separated. This is because anything retained is stored in the memory. Sometimes people who retain poorly are said to have poor memories.

Memory and learning are so closely related in meaning and functions that sometimes they are used interchangeably. For example, the definition of learning as adopted by most educators describes it as a relatively permanent change in potential behaviour which is acquired through practice or experience, (Agbo, 2004). The word "relatively permanent" in the definition connotes something stored or locked up somewhere and this is exactly what the memory is all about. Also the word "potential behaviour' implies something for a "later use" and this is the retrieval aspect of memory. Therefore learning implies memory and memory implies learning, (Kulik, 2009).

Several studies have been undertaken to ascertain factors that could enhance or hamper students' retention ability especially in the sciences. Eze and Egbo (2007) investigated the effect of concept mapping method of instruction on students' achievement and retention in chemistry. Pretest – posttest non-equivalent, control groups quasi-experimental design was used for the study. Their findings showed that the students taught with concept mapping method achieved better and retained more of chemistry than those taught with expository method. On problems of retention, Dulton (2000) in Ezeamenyi (2004) asserted that failure to provide enough applications to real life activity and social usage cum poor teaching techniques are strong limiting factors to students' retention in mathematics. Similarly, Gagne (2001) in Ezeamenyi (2004) contended that for improvement of retention of learned materials in mathematics, programmed learning is indispensable. Retention, thus, depends mainly on teaching strategy adopted by the teacher.

Umar (2006) investigated the effect of computer aided drill and practice on students' achievement and retention in mathematics. Results from that quasi-experimental design revealed that students taught through computer aided drill and practice achieved better and retained more of the learned mathematics than those taught with the traditional lecture method. Drill and practice also happens to be one of the characteristics of Computer Graphics used in this study. This computer graphics was used as a game for teaching statistics. Ukeje and Obioma (2002) stated that systematic drills and practical applications are attributes of a good mathematical game. In the same vein, Azuka (2009) made a case for the adoption of instructional methods that promote students' involvement and activity in the teaching of secondary school mathematics so as to enhance students' retentiveness.

Finally Obodo (2004) and Ezeamenyi (2004) on relevance of laboratory techniques in mathematics education hinted that such techniques help students in better retention of information and in the development of positive attitude towards mathematics. Both authors further described mathematics games as a laboratory technique. By implication, this includes the Computer Graphics used as a game in this study. The choice of statistics is informed by the fact that junior secondary school students tend to avoid statistical topics which constitute over 36% of junior secondary school mathematics curriculum in Nigeria, (Adegbenro, 2006). Hence, any effort made to improve students' retention in statistics is worth while.

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taught statistics using the Computer Graphics, while the control group in each school was taught the same topics with expository method.

At the expiration of the treatment period, the SAT was re-administered to all the subjects as posttest. After two weeks of posttest, SAT was further reshuffled and re-administrated to the subjects of the study for retention scores. The pretest, posttest and the retention tests were all scored by allotting one mark to each correct answer. The total scores were later converted to percentage. The computer graphics used in this study was a puzzle (game) in which students were supplied data and then required to plot various statistical graphs. Also in another set, different statistical charts were displayed and students were required to name them within ten seconds. The students were shared into two groups. Each group elected two representatives to avoid chorus answer. The group that had higher scores after fifteen attempts won the game.

Results

Research Question One:

What are the mean retention scores of students in the experimental and control groups?

Table 1: Mean Retention scores of Experimental and control groups

Group	N	Pretest Mean	SD
Experimental	199	61.85	9.10
Control	190	46.90	11.81

The mean retention score and standard deviation of the experimental group were 61.85 and 9.10 respectively while those of the control group were 46.90 and 11.81 for mean and standard deviation respectively.

Research Question Two:

What are the mean retention scores of urban and rural junior secondary schools' students?

Table 2: Mean Retention Scores and Standard Deviations of Urban and Rural Schools' Students.

Group	N	MEAN	St. Dev.
Urban (Experimental)	104	65.82	2.31
Rural (Experimental)	95	66.01	2.16
Urban (control)	117	46.82	4.18
Rural (control)	73	46.13	4.53

From Table 2, in the experimental group, urban students had mean retention scores of 65.82 and standard deviation of 2.31 while rural students had mean retention score of 66.01 and standard deviation of 2.16. Similarly, in the control group urban students had mean retention score of 46.82 and standard deviation of 4.18 while rural

From Table 2, in the experimental group, urban students had mean retention scores of 65.82 and standard deviation of 2.31 while rural students had mean retention score of 66.01 and standard deviation of 2.16. Similarly, in the control group urban students had mean retention score of 46.82 and standard deviation of 4.18 while rural students had mean retention scores of 46.13 and standard deviation of 4.53. In the experimental group, the mean scores of urban and rural students are greater than those of their counterparts in control group.

Hypotheses

1. There is no significant difference between the mean retention scores of students in the experimental and control groups
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2. There is no significant difference between the mean retention scores of urban and rural schools' students due to

Table 3: ANCOVA analyses of the students' retention scores

Source	Sum of Squares	DF	Mean Square	F	Sig.
Corrected Model	2268.425	3	756.1417	.002	.967
Intercept	61234.101	1	61234.101	4.211	.807
Location	8.324	1	8.324	.075	.785
Method	7451.213	1	7451.213	67.128	.000
Location * Method	142.908	1	142.908	3.291	.258
Error	16717.47	385	43.422		
Total	494336.000	389	1270.7866		
Corrected Total	8299.785	387			

Method (Experimental and control) as main effect gave an F value of 67.128 which is significant at .000. Since .000 is less than .05, this means that the F value of 67.128 is significant. Therefore, hypotheses 1 is rejected as stated indicating that there is a significant difference between the mean retention scores of the experimental and control groups. The sum of squares arising from method (7451.213) is highly significant when compared with the sum of squares arising from error (16717.47) showing that the observed difference was due to the treatment administered.

In the table above, location as main effect gave an F value of .075 which is significant at .0785 but insignificant at .05 since .785 is greater than .05. Hence, hypotheses 2 is not rejected as stated indicating that there is no significant difference between the mean retention scores of Urban and rural schools students in the study. The sum of squares arising from location (8.324) is highly insignificant in comparison with the sum of squares arising from error (16717.47) showing that any observed difference is due to extraneous variables.

The interaction effect between location and method gave an F value of 3.291 which is significant at .258. Since .258 is greater than .05, this means that at .05 level, the F value of 3.291 is not significant. Therefore, hypotheses 3 is not rejected as stated indicating that there is no significant interaction effect between school location,

teaching method and students' retention in statistics. The sum of squares arising from location *Method (142.908) is highly insignificant in comparison with (16717.47) arising from error, indicating that any observed difference is due to extraneous variable.

Discussion of Findings

Findings of this study show that the experimental group retained far better than the control group. Computer graphics strategy enhanced the retention ability of the students better than the expository strategy. This result agrees with the famous Chinese proverb which stated "what I hear I forget, what I see I remember, what I do I understand." In the same vein, this result further authenticates the findings of Umar, (2006) and that of Eze and Egbo (2007) whose reports revealed that students taught through computer-aided drill and practice retained better than those taught with the traditional lecture method.

Also, Ukeje and Obioma (2002); Ezeamenyi (2004); Obodo (2004) and Azuka (2009) all made cases for the adoption of instructional methods that promote students' involvement in activity in the teaching of secondary school mathematics so as to enhance students' retentiveness.

Retention is indispensable in the teaching and learning process. People who retain poorly are usually judged as poor learners. Learning as defined by Agbo (2004) is a relatively permanent change in potential behavior which is acquired through practice or experience.Agbo argue that "relatively permanent" in the definition connotes something stored or locked up somewhere, in other words, something retained. Furthermore, "potential behavior" in the definition implies something for a later use and this is the retrieval of something retained.

On problems of retention, Miller (2010) wrote that two major problems exist concerning learners' effort to retrieve learned material. They are Tip-of-th-Tongue phenomenon and confabulation. In Tip-of-the-Tongue phenomenon, sometimes the learner tries to remember something such as a name, a formular, etc. such name or formular he has at the tip of his tongue but not in his memory. Part of the name or formular may be remembered but the rest keep going back. Confabulation is due to over-excitement or high motivation to remember something. In the process he excitedly manufactures a report that seems appropriate and he tends to believe it to be true, whereas it in false or wrong. Infact everyone confabulates to some extent. It therefore follows that any CAI mode such as the computer graphics used in this study, that elicits higher retention is carefully designed and well utilized to avoid the above problems of retention.

Mathematics has been described variously as "the most perfect of all sciences"; "the mother of all sciences and a science in its own right"; "Queen of all sciences"; "the gate and key to the sciences" and "the science of numbers" (Lakatos, 1986; Mura, 1995; McGinnis, 1996; and Obi, 2001 all in Miller, 2010). According to Kulik (2009), Galileo Galilei (1564-1642) posited that "perfect knowledge is always mathematical".

The federal government of Nigeria on realization of the significance of mathematics made it a core and compulsory subject all through our educational systems. Most importantly, mathematics is not just a pre-requisite for progress through the educational system. It is also a tool for educating the mind.

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