EFFECT OF COMPUTER GAME ON STUDENTS' ACHIEVEMENT IN SECONDARY SCHOOL MATHEMATICS

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Abstract

It is very worrisome despite the important role of mathematics in actualizing Nigeria's scientific and technological aspirations, students at all levels of our educational system, especially secondary school level, fear and achieve poorly in mathematics, largely because they still see mathematics as abstract. This has lead to a fast growing search for the best method of teaching mathematics especially in secondary schools. The purpose of this study was to investigate the effect of the use of computer game as a teaching strategy on students' achievement in secondary school Mathematics. The design used was quasi-experimental. Specifically a pre-test-post-test control group design was used. A sample of 55 students consisting 30 male and 25 female from two intact classes were used for the study. The two intact classes were randomly assigned experimental and control groups. Three (3) research questions and three hypotheses guided the study. Mathematics Achievement Test (MAT) was used for data collection. Data so-collected were analyzed using mean, standard deviation, and t-test statistics. Specifically mean and standard deviation were used to answer the research questions while t-test statistics was used to test the hypotheses at .05 level of significance. Results obtained revealed that computer game strategy was more effective than lecture method. No significant difference was found between the performance of male and female students in the groups. It was recommended that secondary school Mathematics teachers should employ the use of computer game to enhance students' achievement in mathematics.

Encarta Encyclopedia (2005) defines mathematics as the study of relations among quantities, magnitudes, and properties and of logical operations by which unknown quantities, magnitudes, and properties may be deduced. Thus, mathematics do not only use numbers but it also uses the properties of those numbers and the operations on these numbers to describe phenomena, hence, facilitating reasoning and helping us to visualize the relationship between objects and processes. Mathematics gives us a fuller understanding of the world around us and this understanding can be applied to solving our day to day problems.

Variously, mathematics have been described as "the most perfect of all sciences" (Lakatos, 1986), "the mother of all sciences" (Mura, 1995), "the queen of all sciences (McGinnis, et al, 1996), "a science in its own right" (Mura 1995) while Ihejieta (1989) in Ezenwani (1999) observed that one cannot speak realistically of a sound science curriculum without considering the important role played by mathematics, just as science itself would not have developed in its present stage without mathematics. So it is unrealistic to think that true character of science can be portrayed without mathematical thinking.

It is disheartening that despite the indispensable role of mathematics in realizing Nigeria's scientific and technological aspirations, students at all levels of our educational system, especially secondary school level, fear and achieve poorly in mathematics, largely because they still see mathematics as abstract.

WAEC (1999-2003) Chief Examiners' reports indicated that candidates achievement in mathematics were generally poor.

Researches have variously implicated teaching method as a major determinant of students' achievement in mathematics, hence, WAEC (1992) Chief examiners' report recommended the use of effective teaching method which is in tune with the modern science and technological dispensation as the only remedy to students' poor achievement in mathematics for senior secondary school examinations.

The fast-growing use of computers in almost all fields of life has also influenced science education, hence Ellis (1984) and Marks (1982) believed that computer animation or computer simulation in particular, has tremendous potential for the enhancement of the teaching and learning of science concepts.

From the fore-going, this study on the effect of use of computer game as instructional strategy for teaching secondary school mathematics is worthwhile. The theoretical framework underlying the design and implementation of this study comes from constructivist theory. Constructivism posits the notion that learners create or construct new knowledge (Von-Glasersfeld, 1984). Learning is therefore seen as an adaptive and experiential process rather than a knowledge transference activity (Candy, 1991). As learners access information through their senses, the construction of new knowledge comes from as interaction between their existing knowledge and new experiences and ideas with which they come in contact in the natural world and their culture (Richardson, 2003).

Statement of the Problem

Now that there have been lots of hues and cries, and consistent calls to improve on the method of teaching mathematics in order to enhance students' achievement and interest in mathematics, the exploration of new methods especially in computer systems become obvious (Ozofor, 2001)

Nwosu (1982), Akapo (1990), Ajiboye (1996) and Balogun (1996) all alleged that the persistent poor achievement of students in mathematics emanate from inappropriate teaching methods adopted by teachers. Also Eze (2002) implicated teaching methods as responsible for the observed poor interest and achievement in secondary school mathematics.

Undoubtedly, there are better methods for teaching mathematics that are yet to be identified and investigated, hence, this study is an attempt to proffer solution to the problem of poor teaching methods and the resultant poor achievement of students in secondary school mathematics.

Purpose of the Study

The purpose of this study was to investigate the effect of the use of computer game as a teaching strategy on students' achievement in secondary school mathematics.

Specifically, this study sought to determine:

1. The effect of computer game on students' achievement in selected topics in JSS 3 Mathematics.
2. The effect of computer game on male and female students' achievement in JSS 3 Mathematics.

Research Questions

The following research questions were formulated to guide the study:

1. What are the pretest mean achievement scores of the students in experimental and control groups?
2. What are the post-test mean achievement scores of the students in experimental and control groups?

3. What are the post-test mean achievement scores of male and female students in experimental groups?

Hypotheses

Consequently, the following hypotheses were formulated to further validate the research questions:

1. There is no significant difference between the pre-test mean achievement scores of students' in the experimental and control groups.
2. There is no significant difference between the post-test mean achievement scores of the experimental and control groups.
3. There is no significant difference between the post-test mean achievement scores of the male and female students in the experimental group.

Method

A total sample of 55 students made up of 30 male and 25 female in JSS 3A and JSS3B students of Community Secondary School Obuoffia-Awkunanaw-Enugu were used in the study. The two intact classes were sampled by simple random sampling. One intact class was randomly assigned to the experimental group while the other was assigned to the control group.

The experimental group consisted of 13 boys and 14 girls making it 27 students while the control group consisted of 17 boys and 11 girls making it 28 students.

Instrument

Mathematics Achievement Test (MAT) consisting 10 essay test items on basic statistics was used for data collection. This instrument was developed by the researcher for both groups.

Validity/Reliability of the Instrument:

It was validated by two experts in mathematics education and an expert in measurement and evaluation. A reliability co-efficient of 0.83 was obtained for the instrument using the split-half method.

Design

The design of this study was quasi-experimental. Specifically a pre-test – post-test, control group design was used.

Experimental Procedure

The researcher trained the regular mathematics teacher of the selected school on the use of computer game instructional strategy for a period of two weeks. Foremost, the Mathematics Achievement Test (MAT) was administered to all the subjects of the study as pre-test. Thereafter, the treatment was given for four weeks as follows; experimental group was taught the selected topics using computer game while the control group was taught same topics using lecture method. Both groups were taught by the regular mathematics teacher of the school. At the end of the treatment, MAT was re-arranged and re-administered to the groups as post-test. The researcher provided all lesson notes and guides used for the experiment, scored and recorded all tests and provided the necessary computer softwares. Deliberate efforts were made to control Hawthorne effect and other extraneous variables.

Data Analysis

Mean and standard deviation were used to answer the research questions while t-test statistics was used to test the hypotheses.

Results and Discussion

Research Question 1: What are the pretest mean achievement scores of the students in the experimental and control groups?

Hypothesis 1: There is no significant difference between the pre-test mean achievement scores of the experimental and control groups.

Table 1: Analyses of research question 1 and hypothesis 1 (pre-test)

Group	Number (N)	Mean (X)	Standard Deviation (SD)	t-Calculated	t-Critical (.05 level)
Experimental	27	38.30	2.48	0.28	2.02
Control	28	38.10	2.71		

Table 1 shows that the mean achievement score and standard deviation of the experimental group were 38.30 and 2.48 respectively while the mean achievement score and the standard deviation of the control group were 38.10 and 2.71 respectively.

Table 1 also shows the result of the test of hypothesis one at .05 level significance, t-calculated was 0.28 which is by far less than 2.02 the t-critical value.

These results simply show that there was no significant difference in the pre-test mean achievement score of the experimental and control groups. This implies that both groups had the same entry behaviour. The result supports hypothesis one and also answers research question 1. Hence hypotheses 1 is not rejected as stated.

Research Question 2: What are the post-test mean achievement scores of students in the experimental and control groups?

Hypothesis 2: There is no significant difference between the post-test mean achievement scores of the experimental and control groups.

Table 2: Analyses of Research Question 2 and Hypothesis 2 (post-test)

Group	Number (N)	Mean (X)	Standard Deviation (SD)	t-Calculated	t-Critical (.05 level)
Experimental	27	77	7.59		
Control	28	42	6.89	17.59	2.02

From table 2 above the post-test mean achievement scores of the experimental and control groups were 77 and 42 respectively.

Testing hypothesis two at .05 level of significance, the result contained in the table also shows that t-calculated was 7.59 which is by far greater than the t-critical, 2.02, hence, a significant difference between the post-test mean achievement score of the experimental and control groups. The experimental group apparently performed far better than the control group. The result answers research questions 2 and empowers us to reject hypothesis two as stated.

Research Question 3: What are the post-test mean achievement scores of male and female students in the experimental groups?

Hypothesis Three: There is no significant difference between the post-test mean achievement scores of the male female students in the experimental groups.

Table 3: Analyses of Research Question 3 and Hypothesis 3 (Post-Test by Gender)

	Number (N)	Mean (X)	Standard Deviation (SD)	t-Calculated	t-Critical (.05 level)
Male	13	75.3	7.22		
Female	14	76.1	7.38	-0.34	2.02

Table 3 answers research question 3, the post-test mean achievement score for male and female students in the experimental group were 75.3 and 76.1 respectively.

At .05 level of significance, the result in table 3 also indicates that t-calculated was -0.34 which is less than the t-critical, 2.02, hence there was no significant difference between the post-test mean achievement scores of male and female students in experimental group.

Therefore, gender influence on the performance of the students in the experimental group was insignificant. Hence, do not reject hypothesis three as stated.

Summary of Findings

1. The academic ability of the experimental and control groups were equal before the experiment.
2. The academic achievement of the groups differed, with the experimental group performing better than the control group.
3. Computer game influenced both gender equally.

Conclusion

Computer game method of instruction was found more effective than lecture method on students' achievement in secondary school mathematics. Computer game benefit comprehension and learning, and fosters insight. They may be aesthetically appealing or humorous, attracting attention, stimulating and retaining interest, providing additional way of representing information with pictorial visual elements. Also there was no significant interaction between method and gender on students' achievement in mathematics.

Recommendation

It is recommended that secondary school mathematics teachers should be encouraged to use Computer game to enhance their teaching through active engagement of students. The government should also organize in-service training/workshop for mathematics teachers on the use of computer game and as well provide the necessary facilities (mainly computers) for practical implementation of this technique in secondary schools.

Furthermore, teacher training institutions should include computer game instructional strategy in the mathematics education curriculum.

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