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Effect of Computer Games on Students' Interest in Mathematics in Secondary Schools in Akwanga Local Government Area, Nasarawa State, Nigeria

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Abstract **Original Research Article**

This study looked at how computer games affected secondary school students' interest in mathematics in Akwanga Local Government Area, Nasarawa State. The purpose of the study was to determine whether using computer games as a teaching tool would increase students' interest in mathematics. A quasi-experimental research method employing pre-test and post-test was used to accomplish this goal. 165 JSS 1 students (95 males and 70 females) from four secondary schools in the Local Government Area made up the study's sample. For the study, two hypotheses and two research questions were developed. Data was gathered using the Mathematics Interest Inventory (MII), which has a reliability rating of 0.90. The two study issues were addressed using the mean and standard deviation, and the hypotheses were tested using Analysis of Covariance (ANCOVA). When compared to students who were taught using a traditional learning strategy, the data analysis revealed that the usage of computer games as a teaching tool greatly increased the students' interest in mathematics. Therefore, it was suggested that computer games be incorporated into the curriculum for mathematics education as a teaching method. It should be possible for students to learn mathematics through computer games by providing them with technological text materials.

Keywords: Computer games, Addition, Subtraction, Multiplication, Division, and Interest.

INTRODUCTION

Having developed over time from the study of natural phenomena like geometrical shapes, mensuration, and trigonometry, and daily arithmetic, mathematics is a fundamental and essential aspect of human endeavors. Symbolic logic, patterns, and the structure of constructions are all part of mathematics, which is the science of structures. In addition to applying mathematics to other fields, it is an abstract study of numbers, quantities, and space. Petti (2019) asserts that mathematics is also seen as a symbolic language of relationships that is used to describe how events interact in real-world and applied contexts, as well as a methodical means of presenting notions (numbers, quantities, ordering, etc.).

It is impossible to overstate how important mathematics is for logical reasoning, problem solving, and thinking in order to promote national progress. Therefore, it is uncommon for mathematics to be taught as a key topic in the educational system. Sound mathematics education policies are essential to the success of intellectual development in advancing scientific and technical advancement to improve national development. According to Adams and Hamm (2017), mathematics is the cornerstone of any significant scientific advancement and is necessary for any country that wants to advance in science and technology to compete in the modern era. Ignoring it would be harmful to the overall development of the different facets of governance.

According to Ugwuanyi and Agwagah (2014), mathematics continues to be a service provider for all disciplines and has a role in determining the course of daily operations in areas including the economy, banking, market transactions, industrial functions, research, and legal domains. Every country's progress depends on better math programs that lay the groundwork for future technological developments. Accordingly, science serves as the foundation for technological advancement, and mathematics is the key to its success (Ifamuyiwa & Ogbemudia, 2014). In their defense of mathematics'

importance and contribution to contemporary science and technology, Ifamuyiwa and Ogbemudia (2014) assert that without mathematics, science would not exist, modern technology would not exist, and modern society would not exist without modern technology. Therefore, the value of mathematics in advancing human development is paramount and necessitates more advanced and contemporary methods of teaching and learning the subject.

Despite the importance of mathematics to the advancement of civilization, it has consistently failed both internal and external tests. Poor teaching strategies by math teachers and students' perceptions of arithmetic challenges are blamed for this failure (Azuka, 2008; Kurumeh, 2008). Numerous scholars and educators (Obodo, 2004; Kurumeh, 2009; WAEC, 2022) concur that low achievement is common among students due to a lack of interest in mathematics. Both male and female students' interest in mathematics is negatively impacted by this subpar performance. According to certain research, students' interest in mathematics significantly increases when they are exposed to contemporary and creative teaching and learning strategies (Kim & Chang, 2022; Miller, 2017). According to Forgasz (2019), there is a sex difference that favors male pupils who are interested in mathematics. There are, nevertheless, other published studies with results that differ from the aforementioned. For example, Guiso, Monte, Sapienza, and Zingales (2018) found that when exposed to better learning strategies, the interest of male and female students in mathematics was similar.

According to other findings on gender-related interest, a significant number of research found that after exposing male and female students to mathematics instruction and learning, gender equality in mathematics interest was achieved (Achor, Imoko & Ajai, 2017). Therefore, it would be crucial to set the students on the right path early in life and prepare them for the challenges of the current modern technologies by conducting research on gender issues outside of the study area that relates to mathematics interest and exposes them to innovative teaching approaches like the use of computer games in the teaching and learning of mathematics.

Although there are more mathematical operations, addition, subtraction, multiplication, and division are the four fundamental ones that children encounter early in life. A movement to the right or upward from the operation's starting point on a number line is called addition. Additionally, it is a series of movements on a number line (Obodo, 2004). The process of subtracting something or a quantity from a larger or smaller whole, depending on the nature of the operation, is the opposite of addition. The process of subtracting involves taking items out of a collection. Repeated addition, or multiplication, is the process of adding a number to itself several times. In this case, multiplying a number by another is equivalent to adding it as many times as necessary to obtain the desired result. On the other hand, division is a method for calculating how many times a given number is added to another. Fair sharing is the cause of it (Artemy, 2014). Students must have a solid grasp of the fundamental operations in order to apply mathematics to solve problems in their daily lives. This can be achieved through the use of computer games in mathematics instruction.

According to Agwagah (2001), a game is a scenario in which two or more players compete with one another in an attempt to win. Thus, computer games are games in the form of computer software that are played by one or more students, either separately or sequentially, on computers or game machines. According to Kent (2019), computer games are electronic games that use interactive hardware or software and are played for amusement, educational reasons, or challenges. Computer games are organized electronic activities where players use computers to create competition and score points for study purposes. To achieve the learning content embedded in the computer games, they integrate cognitive, mental, and physical engagement in the game-play scenario.

The importance of science and math skills for both teachers and employees has grown as a result of new technologies that have developed and expanded the range of uses of scientifically based materials in the workplace. The concepts of mathematics are the foundation of the art of technological invention. Since science and mathematics are essential for creativity and power in the modern world, it makes sense to advance them in order to improve one's capacity for success in the global economy (Grouws & Cebulla, 2023). Early in a student's education, the primary focus should be on mathematics since it serves as the cornerstone and basis for both creative thinking and cognitive growth. Therefore, will using computer games as a teaching tool increase students' interest in mathematics at the Junior Secondary School level in Nasarawa State's Akwanga Local Government Area?

Purpose of the Study

The study's primary goal is to find out how computer games affect secondary school pupils' interest in fundamental number operations. The study specifically aimed to:

1. Determine whether playing computer games affects students' interest in fundamental mathematical operations.
2. Assess how computer games affect students' interest in fundamental number operations, both male and female.

Research Questions

1. How do students who learn basic operations through computer games compare in terms of mean interest ratings to those who study using traditional methods?
2. How do the mean interest ratings of male and female students who were taught basic operations using computer games differ from one another?

Hypotheses

H_{O1}: The mean interest ratings of pupils taught basic operations through computer games and those taught

using traditional learning strategies do not differ significantly.

H_{O2}: The mean interest ratings of male and female students learning basic operations using computer games do not differ significantly.

METHOD

The research design used in the study was quasi-experimental. In particular, the study employed nonequivalent pre- and post-test groups without sample randomization. To prevent the school system from being disrupted, intact classes were utilized and divided into experimental and control groups. There were 165 pupils in the study's sample. For this investigation, two of the four secondary schools that had computers in their computer labs were specifically chosen. Three secondary schools from Akwanga Municipal Local Government Area and one from Akwanga-West Development Area were chosen, both of which have computer facilities. Simple random sampling was used to choose two intact classes of JSS 1 pupils from each of the four chosen schools. Two schools were randomly assigned to the experimental group while the other two schools were assigned to the control group.

The Mathematics Interest Inventory (MII), which has 20 items covering the four fundamental operations, was the tool utilized to collect the data. Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD) are the four rating points on the MII. The item has a rating scale of 4, 3, 2, and 1 for SA, A, D, and SD, respectively. The Cronbach Alfa value for the instrument's reliability was 0.90. Pre-MII was given prior to therapy, and post-MII was given following treatment. While the students in the control group received instruction using the traditional technique, the students in the experimental group received instruction using computer games. The sampled kids' normal teachers served as study assistants, who received training on how to manage both the experimental and control groups.

The mean and standard deviation were used to answer the study questions, and analysis of covariance (ANCOVA) at the 0.05 level of significance was used to evaluate the null hypotheses.

RESULTS

Research Question One:

What is the difference between students who were taught basic operations through computer games and those who were taught using traditional learning strategies in terms of mean interest ratings?

Table 1: Mean Interest Ratings and Standard Deviation of the Experimental and Control Groups in Pre-MII and Post-MII

Group	N	Pre-MII		Post-MII		Mean Gain
		Mean	SD	Mean	SD	
Control	89	2.67	0.63	2.84	0.72	0.17
Experimental	76	2.58	0.71	3.88	0.76	1.3
MD		0.09		1.04		1.13
MD-Mean Difference			**SD-Standard Deviation**			

The experimental and control groups' mean interest ratings on pre-MII were 2.58 and 2.67, respectively, with a mean difference of 0.09, according to Table 1's results. This demonstrates that prior to the experiment, the subjects in the experimental and control groups were almost equally interested in mathematics. Additionally, Table 1's results showed that the experimental and control groups' mean interest ratings in the post-MII were 3.88 and 2.84, respectively, with a mean difference of 1.04. Although additional testing would be necessary to ascertain whether or not this difference in interest ratings is meaningful, the mean difference of 1.04 between the experimental and control groups does seem to be significant enough.

Hypothesis One

The mean interest ratings of pupils taught basic operations through computer games and those taught using traditional learning strategies do not differ significantly.

Table 2: ANCOVA on Post-test Interest Ratings of Students in Mathematics (Post-MII)

Source	Type III Sum of Square	df	Mean Square	F	Sig
Corrected Model	126.117[a]	4	31.529	133.402	.000
Intercept	14.535	1	14.535	61.499	.000
Pre	117.042	1	117.042	495.211	.000
Group	1.902	1	1.902	8.047	.005*
Gender	.002	1	.002	.008	.930
Group · Gender	.146	1	.146	.616	.433
Error	87.212	160	.236		

Total	3431.000	165
Corrected Total	213.329	164

* **Significant**

According to Table 2's results, technique has a considerable impact on students' interest in mathematics, with a F value of 8.047 at p = 0.005 < 0.05. Thus, hypothesis 1, according to which there is no discernible difference between the mean interest ratings of students taught using computer games and traditional learning methods, is disproved. Thus, students' interest in mathematics was greatly boosted by the employment of computer games as a teaching tool.

Research Question Two:

How do the mean interest ratings of male and female students who were taught basic operations using computer games differ from one another?

Table 3: The Mean Interest Ratings and Standard Deviation of Male and Female Students in the Experimental Group in Post-MII

Group	Gender	Pre-MII		Post-MII		N	Mean Gain
		Mean	SD	Mean	SD		
Experimental	Female	2.68	0.74	3.21	0.81	32	0.53
	Male	2.72	0.72	3.16	0.77	44	0.44
Mean Difference		0.04		0.05			0.05

The mean interest ratings of the male and female students in the Post-MII were 3.21 and 3.16, respectively, with standard deviations of 0.81 and 0.77, according to the results from Table 3. The mean difference between the male and female students is 0.05, which seems to be slight; additional testing will be done to see if the mean difference is significant.

Hypothesis Two

The mean interest ratings of male and female students learning basic operations through computer games do not differ significantly.

Table 4: ANCOVA on Post-MII Mean Interest Ratings of Male and Female Students in the Experimental Group

Source	Type III Sum of Square	df	Mean Square	F	Sig
Corrected Model	70.108[a]	2	35.054	143.761	.000
Intercept	9.835	1	9.835	40.336	.000
Pre	70.025	1	70.025	287.182	.000
Gender	.094	1	.094	.383	.534
Error	46.572	73	.244		
Total	1960.000	76			
Corrected Total	116.680	75			

The ANCOVA results of the Post-MII mean interest ratings of the male and female students in the experimental group are summarized in Table 4. The null hypothesis is not rejected because Table 4 demonstrated that the F value of 0.383 is not significant at p = 0.534 > 0.05. The mean interest ratings of the male and female students who were taught basic operations using computer games did not differ significantly, according to this study.

DISCUSSION

The study compared the traditional teaching method with the learning methodology of computer games. The purpose of this study was to determine whether playing computer games will increase students' interest in learning mathematics more than traditional lecture methods. According to the study's findings, which are displayed in Tables 1 and 2, JSS 1 pupils who played computer games during the learning process considerably improved and showed a greater interest in mathematics than those who received instruction using the traditional method. This outcome supports the findings of Kebritchi, Hirumi, and Bai (2021), who found that computer games have an impact on mathematics instruction and learning and greatly increase students' interest in the subject. According to this study, using computer games to teach mathematics in secondary schools can help pupils become more engaged and actively participate in the learning process. This supports the claims made by Kim and Chang (2022) that playing video games helps pupils develop their retentive skills and boosts their interest. pupils who played the games demonstrated a greater interest in mathematics than those who never did. Thus, the kids' interest in mathematics was heightened by the activity-based

scenario provided by the computer games.

Finding out if there are gender differences in secondary school pupils' interest in mathematics was another goal of the study. As can be seen in Table 4, the study's findings showed no discernible difference in the mean interest ratings of male and female students in mathematics before and after the usage of computer games as a teaching tool. This conclusion contradicts the findings of Koller, Baumert, and Schnabel (2017), who found a sex difference favoring male students who were interested in mathematics. Nonetheless, the study supports the findings of Kattan and Khan (2022) and Chipman (2020), who demonstrated that female students are astonishingly performing well in mathematics, as shown in the mean interest ratings in Table 4 did not differ significantly, indicating that the ladies and males were equally interested in mathematics.

CONCLUSION

According to the study's findings, computer games have the power to influence, get over, and eliminate the perceived challenges in mathematics that make the subject so awful. According to the study's findings, using computer games as a teaching tool can greatly increase students' interest in mathematics. One of the main causes of pupils' ongoing failure in mathematics may be a lack of enthusiasm in the subject. Additionally, the study demonstrates that there is no discernible gender difference in secondary school students' interest in mathematics.

RECOMMENDATIONS

The following should be mentioned in order to make the computer game learning approach popular in secondary schools, as the study's findings indicate that it significantly increases students' interest in mathematics.

1. Math teachers should receive ongoing training on the requirements of the computer game learning approach. At every educational level, computer games should be incorporated into the mathematics teacher education curriculum. Teachers of mathematics should regularly attend seminars and workshops and be computer competent.
2. The use of computer games as a teaching tool would be made easier and better by the construction of computer labs in all secondary schools and the provision of computer equipment.
3. Math teachers should help students and parents reorient themselves to the necessity of providing their children with a personal computer (PC) so that they can practice computer games as a learning tool at home after school.

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