

**EFFECT OF SUM SWAMP GAME ON THE ACADEMIC  
PERFORMANCE OF PRIMARY SCHOOL PUPILS IN NUMBER AND  
NUMERATION IN SOKOTO STATE**

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**Abstract**

*This study aimed to evaluate the efficacy of the Sum Swamp game in enhancing the academic achievement of primary school students in the subject of Number and Numeration in Sokoto State. The sample for this study consisted of 235 kids from 79 primary schools, whereas the population of interest was comprised of a total of 4761 primary school pupils. In this study, a convenient sampling method was employed to select four intact classes. The instrument utilised in the study was the Pupils Sum of Number Performance Test (PSNPT). The reliability of the instrument was determined to be 0.84 through the use of the Pearson Product Moment Coefficient Correlation (PPMCC). The research questions were addressed by calculating the mean and standard deviation, while the null hypotheses were tested using t-test statistics at a significance level of 0.05. The study revealed that the Sum Swamp game had a significant impact on the academic achievement of primary school students who were being taught numbers and digits. Therefore, it was determined that the use of the Sum Swamp game is an efficacious approach for instructing numbers and numbers. Additionally, the study provided recommendations, including the suggestion that including the Sum Swamp game in the instruction of numbers and digits may result in enhanced academic achievement among primary school students. Hence, it is imperative for mathematics educators in Sokoto State to use the game-based approach while instructing students on number and numeration concepts in primary school settings.*

**Keywords:** Sum Swamp Game, Academic Performance and Number and Numeration, Primary Pupils

## Introduction

Considerable concern has been raised by governmental entities, businesses, parents, and educators over the notable inability of a significant proportion of secondary school pupils to effectively execute basic arithmetic and mathematical procedures that are essential for their daily activities and professional endeavours (Odili, 2006). This study posits that the effectiveness of mathematics instruction and learning in primary and secondary schools is heavily influenced by the instructional techniques, pedagogical skills, and capabilities of the teacher. There are numerous challenges associated with the teaching and learning of mathematics in Sokoto State. These challenges include the continued use of traditional teaching methods by teachers, a shortage of qualified mathematics teachers, students' negative attitudes towards learning mathematics, large class sizes, inadequate learning resources, and a lack of utilisation of mathematical games. According to Harbour-Peter (2001), it has been suggested that games require the use of strategies, tactics, and initiative on the part of pupils. The significance of education in fostering the comprehensive advancement of nations worldwide cannot be overstated. However, the educational system in Nigeria has been unable to achieve the anticipated outcomes.

This failure has been attributed to various factors, including the scarcity of competent teachers and essential infrastructure, excessive classroom overcrowding, insufficient funding, inadequate management, and substandard sanitation conditions (Fadiya, 2010). The predominant nature of interactions seen in mathematics classes in Sokoto State is teacher-centred, accounting for around 60–90% of the overall interaction. In contrast, interactions between instructors and students constitute approximately 30–70% of the total interaction. This stands in stark contrast to the prevailing worldwide norm that promotes interactions between teachers and students, as well as among students, in conventional scientific classrooms. According to a study conducted by Matazu and Elizabeth (2018), it can be seen that a significant majority, ranging from 70% to 90%, of mathematics instructors in Sokoto State continue to utilise the conventional lecture style in their instructional practices. According to Wasagu (2001), it is emphasised that science is focused on practical applications, and those aspiring to thrive in science-related fields must prioritise the practical parts of science. According to El-Rufa'i (2013), referring to the UBEC 2010 education profile, the teacher-to-student ratio in Sokoto State was found to be 1:108. This ratio was deemed to be significantly higher compared to other states in the southern region of the country, where the ratio ranged from 1:58. Mathematical games may be described within the context of this research as interactive activities wherein participants engage in contests governed by established rules.

The significance of incorporating mathematical games into educational settings cannot be overstated, as highlighted by Ayotola (2003) and Eze (2006). These scholars emphasise that games serve as a source of motivation and contribute to the development of students' skills, talents, and strategies. According to Harbour-Peters (2001), an educational game refers to an organised activity that involves the interaction of two or more students, following a set of rules, with the aim of achieving certain instructional objectives. The efficacy of incorporating games into mathematics education lies in their capacity to facilitate and reinforce the practical use of mathematical concepts. Games are employed in several ways, such as serving as ice breakers, facilitating the introduction of new concepts, promoting the consolidation of information, alleviating monotony associated with repetitive tasks, and fostering a favourable and passionate climate within educational settings. The use of this teaching method alleviates pupils' apprehension about mathematical concepts. One of the primary advantages of incorporating games into mathematics education is their capacity to effectively engage students and reinforce their understanding of mathematical concepts through practical applications.

A teacher who teaches mathematics as if he is telling a story is sure to cause his students to lose interest in mathematics (Obodo, 2004). According to Agwagah (2006), mathematics teaching in Nigeria still follows the traditional method. Abubakar and Bawa, (2006) attributed students' poor performance in mathematics to the lack of proper or non-use of mathematics games by mathematics teachers. Lack of game exploration by mathematics teachers seems to make mathematics learning more difficult and uninteresting to students. Odili, (2006) claimed that "much attempt had been geared towards exploring mathematics games in complementing primary school mathematics instructions. It is important therefore to consider strategy that may help to improve the performance, with review of considering their effects on teaching and learning mathematics. Such strategies include the use of mathematical games. Teachers have to be careful while choosing mathematical games. The nature of the class, the class level, nature of the children, the topic of interest, the environment of the school (since games can be derived from the culture and the environment) this are some of the paramount factors to be considered while choosing different types of games (Ukeje & Obioma, 2002). There are different types of games that would be generated to stimulate the interest of students in learning mathematics. These mathematical games are of paramount importance to primary school pupils and are very much significant in all branches of mathematics. A creative mathematics teacher takes into account while using mathematics games that such games make maximum contribution to the learning of the topics. The game must allow for active participation of pupils in the class. Informality and over excitement, if not well controlled may lead to distraction. The teacher should know that games are not for entertainment alone rather they are

meant to stimulate pupil's interest to learn mathematics. Despite the importance and usefulness of mathematics in the development of individuals and the nations at large through the study of the science, technology, humanities and all other discipline the mathematics performance of the students is still failing year by year Ezeugo and Agwagah in Datti (2014) this study is aimed at assessing the effectiveness of mathematics sum swamp game on primary school pupils' academic performance in Number and Numeration in Sokoto State. Mathematics sum swamp game is a mathematics game that encourage basic mathematics drills through fun game play, develop fluency in early mathematics skills as kids play the game, engage students as they explore and apply the properties of operations and challenge students to create and mentally solve equations. Furthermore, it helps to grow children's strategy and mathematics skills; the best part is that it's a game that pupils will grow with.

### **Statement of the Problem**

The necessity for a novel approach to the instruction of mathematics has become apparent, particularly in light of the prevailing teacher-centred attitude inside the mathematics classroom. It is widely believed by a significant portion of the populace that mathematics is challenging, unenjoyable, and enigmatic, leading many students to have negative emotions such as hatred or dread towards the subject. Even those who possess strong mathematical skills and often engage in teaching mathematics have a certain level of comfort that is limited in nature. The challenges encountered in mathematics education in Sokoto State can be attributed to several factors. These include a shortage of qualified mathematics teachers, ineffective teaching methodologies, inadequate utilisation of manipulatives in mathematics instruction, a lack of student engagement and interest in the subject, and insufficient incorporation of mathematical games into the teaching and learning process by most mathematics educators. The modern mathematics curriculum has placed significant emphasis on the active engagement of students in the teaching and learning process, particularly through hands-on practical work conducted in laboratory settings (Umar, 2006). The objective of this study is to evaluate the efficacy of the mathematics sum swamp game on the academic achievement of primary school students in mathematics within Sokoto State.

Various scholarly works have emphasised the significance of including mathematical games as instructional tools for enhancing the teaching and learning of mathematics among students. This notion is seen in the following literature sources: In a study conducted by Datti (2022), the impact of mathematical games on students' academic achievement and teachers' perspectives about the integration of games into their instructional practices in the domain of number and numeration

was examined in Kaduna State. A sample size of 800 students in the third year of junior secondary school (JSS III) was employed to investigate the impact of product games on academic performance. The findings indicate a statistically significant difference in the average scores between students who were taught using product games and those who were not. It was further shown that a statistically significant disparity existed in the average academic achievement between male and female students who were instructed to use a product game. Furthermore, it was seen that certain mathematics professors lacked an understanding of the concept of mathematical games.

Furthermore, the study conducted by Justin, Omuorah, and Uchenna (2020) aimed to examine the impact of utilising a game-based teaching strategy on the academic performance and level of interest among students studying algebra at the elementary school level. The study employed a quasi-experimental design with a non-equivalent control group. The population of the study consisted of all JSS II students in the Obio-Akpor local government area of Rivers State. A total of 134 pupils, representing both male and female populations, were selected as the sample for this study from four different schools. The findings of the study indicate that the use of a game-based instructional methodology in the teaching of algebra has an impact on both students' academic performance and their level of interest. Furthermore, the analysis revealed that there is no substantial interaction effect between the teaching method and gender in relation to students' accomplishments and interest in algebra.

In a recent study conducted by Okigbo and Agu (2021), the researchers investigated the impact of mathematical games and instructional analogies on the academic performance of students in junior secondary school mathematics. The research included a cohort of 246 students in the Junior Secondary Two (JSS II) Mathematics programme. The study employed a  $3 \times 2$  factorial design. The results of the study indicate that both the use of game-based learning and analogies have a positive impact on students' progress in the field of mathematics. The use of analogy was determined to be a more effective instructional method for promoting students' academic performance in mathematics compared to the use of games. There was a little disparity observed in the academic performance of male and female mathematics students who were instructed using either game or analogy methods. Additionally, no substantial correlation was found between the use or absence of advanced organisers and gender in relation to the accomplishment of mathematics students. Nevertheless, this current study stands out among existing literature due to its distinct scope. It is the inaugural research conducted in Sokoto State that utilises the mathematics sum swamp game while also considering the

educational level of primary school pupils and focusing specifically on the content area of numbers and numbers.

### **Research Questions**

The following research questions were raised:

1. What is the effectiveness of mathematics sum swamp game on primary school pupils mean academic performance scores in Number and Numeration in Sokoto State?
2. What is the difference in the mean academic performance scores of male and female pupils taught Number and Numeration using mathematics sum swamp game Sokoto State?

### **Null Hypotheses**

The following null hypotheses were formulated and would be tested at 0.05 level of confidence:

**H<sub>01</sub>:** There is no significant difference between the mean academic performance scores of primary school pupils taught Number and Numeration using mathematics sum swamp game and those taught using traditional method Sokoto State.

**H<sub>02</sub>:** There is no significant difference between the mean academic performance scores of male and female pupils taught Number and Numeration using mathematics sum swamp game Sokoto State.

### **Methodology**

This section focused on describing the research methodology in this study. It gives direction to the reader on the processes involved in carrying out the study. Thus, research design, population of the study, sample and sampling technique, reliability of the instrument, approach to data analysis and data presentation. The research design used in this study was quasi experimental design using experimental and control groups. This method was preferred to others because it was one of the best that deals with test significant difference between variables, the testing of hypotheses and the development of generalization that have universal validity. The population of this study comprises of all the primary schools students in Sokoto State. There are seventy nine (79) primary schools across the wards in Sokoto South with a total population of four thousand seven hundred and sixty one (4761) pupils. The pupils are both male and female of between the ages 6–12.

A sample is a subset of individuals from a larger population that is selected to participate in a study. Researchers use samples to collect data and make inferences about the larger population. The sample for this study was drawn from primary school class three (3), the researcher used multi-stage sampling techniques involving simple random sampling which was used to select the schools because it is the method that gives the entire members of the population an equal chance of being selected to represent the population and each choice is independent of any other choice and two intact classes of 56 and 68 pupils at Yakubu Mu'azu model primary school sokoto were used as experimental class while two intact classes of 51 and 60 pupils at Attahiru Bafarawa model primary school sokoto were used as control group. The instrument used in collecting data was researcher's constructed instrument which is Pupils Sum of Numbers Performance Test (PSNPT) that was used in finding out the academic performance of pupils'. The instrument was a 15 items multiple choice questions with options A-D which was drawn from number base. Reliability of the instrument was consistent with what it supposed to measure. The researcher used test retest method to establish the reliability of the instrument. The test was administered to the pupils of Yahaya Abdulkarim model Primary School who are part of the population but out of the sampled and after two weeks' interval, retest was given to the same set of pupil's, and their scores were recorded and subjected to reliability using Pearson Product Moment Coefficient Correlation. And the reliability coefficient was found to be 0.84 for the Pupils Product Number Performance Test. Descriptive statistics was used in answering all the research questions. Pre-test was conducted to determine the equivalence of the two groups while post-test was conducted using t-test statistics to determine whether there is significant difference in the academic performance of the pupils' taught number and numeration using sum swamp game and those taught using traditional methods in Sokoto State.

## Results

The data obtained from this research were analyzed using mini tab version 17.0. All the research questions were answered using descriptive statistics (mean and standard deviation) because it showed the rate at which certain values differ from one another. Also the stated hypotheses were tested at 0.05 level of significance using t-test statistics..

**Research question One: What is the effectiveness of mathematics sum swamp game on primary school pupils mean academic performance scores in Number and Numeration in Sokoto State?**

**Table 1**

*Mean and Standard Deviation of Pupil's Pre-test Academic Performance in Number and Numeration*

Groups	N	Mean	Mean Diff.	Std. Dev.
Experimental	113	13.17		4.31
			0.94	3.17
Control	122	14.11		

Table 1 depicts the result of the pre-test conducted on both group to ascertain the equivalence of the two groups before the administration of the treatment on the experimental group. The result indicated that both the control and experimental group are on equivalence level. To answer this question, the academic performance of pupils collected through the Pupils Sum of Number Performance Test was organized, sorted according to experimental and control groups and analyzed using simple descriptive statistics of mean and standard deviation as presented in table 2

**Table 2**

*Mean and Standard Deviation of the Effectiveness of Sum Swamp Game Method on Pupil's Post-test Academic Performance in Number and Numeration*

Groups	N	Mean	Mean Diff.	Sta. Dev.
Sum Swamp	113	18.14		2.58
			-3.67	5.51
Traditional	122	14.48		

Source: Field Work (2023)

Table 2 presents summary of the descriptive statistics of mean and standard deviation conducted to determine the effectiveness of mathematics sum swamp game method on the academic performance of primary school pupils in number and numeration in Sokoto State. The result showed that mathematics sum swamp game is effective in teaching number and numeration in Sokoto State with a mean score of 18.14 and standard deviation of 2.58 when compared with the mean and standard deviation of 14.48 and 5.51 traditional method.



**Research Question Two: What is the difference in the mean academic performance scores of male and female pupils taught Number and Numeration using mathematics sum swamp game Sokoto State?**

To answer this question, the academic performance of pupils collected through the Pupils Sum of Number Performance Test taught using sum swamp game was organized, sorted according to male and female and analyzed using simple descriptive statistics of mean and standard deviation as presented in table 3

**Table 3**

*Descriptive Statistics on the Academic Performance of Male and Female Pupils Taught Mathematics using Sum Swamp Game*

Gender	Sample size	Mean	Standard Deviation	Mean Difference
Male	51	16.04	5.07	2.84
Female	62	13.20	5.56	

Source: Field Work (2023)

Table 3 presents the summary of the descriptive statistics of mean and standard deviation conducted to compare the performance of male and female pupils taught Number and Numeration using Sum swamp game method in Sokoto State. The table showed the mean difference of 2.84 between the mean scores of male (16.04) and that of female (13.20).

**Testing of Null Hypothesis**

Null hypothesis was tested using t-test statistics at 0.05 level of significance, because it is one of the suitable tools for testing differences between two independent samples.

**Null Hypothesis (H<sub>01</sub>): There is no significant difference between the academic performance of primary school pupils taught Number and Numeration using mathematics sum swamp game and those taught using traditional method Sokoto State.**

**Table 4**

*Summary of the T-test Analysis between Mean Post-test Scores of Pupils Taught Number and Numeration Using Sum Swamp Game Method and Traditional Method*

Groups	N	Mean	SD	DF	t-cal	P-Value	$\alpha$ -value	Decision
Experimental	113	18.145	2.5842	234	5.07	0.001	0.05	
Control	122	14.478	5.5131					Rejected

Table 4 is a summary of t-test analysis conducted to compare the academic performance of Experimental and Control groups. The table revealed that, p- value of 0.001 is less than the  $\alpha$ -value of 0.05 ( $p= 0.001 < \alpha= 0.05$ ) hence the null hypothesis which says there is no significance difference in the academic performance of the primary school pupils taught Number and Numeration using sum swamp game and those taught using traditional method in Sokoto State was rejected.

**Null Hypothesis 2 (H<sub>02</sub>):** There is no significance difference between the academic performance of male and female pupils taught Number and Numeration using Demonstration Method in Danmusa Local Government of Katsina state.

**Table 5**

*Summary of Differences between Mean Post-test Scores of Male and Female Pupils Taught Number and Numeration Using Sum Swamp Game Method*

Gender	N	Mean	SD	DF	t-cal	P-value	$\alpha$ -value	Decision
Male	51	16.04	5.07	112	2.81	0.074	0.05	
Female	62	13.19	5.57					Not Rejected

Source field work (2023)

Table 5 is a summary of t-test analysis conducted to compare the academic performance of male and female pupils taught using sum swamp game method. The results showed the p-value of 0.074 is greater than the  $\alpha$ -value of 0.05 at 0.05 level

of significance hence the null hypothesis which says there is no significant difference between the academic performance of male and female pupils taught number and numeration using sum swamp game in Sokoto State.

### **Discussion of Finding**

The results of this study indicated a statistically significant difference in the academic performance of primary school students who were instructed in mathematics using the sum swamp game compared to those who were taught using traditional methods. The findings favoured the use of the swamp game. The results of this study are consistent with those of Datti (2022), who conducted a study on the impact of three mathematical games on the academic achievement of junior secondary school pupils in Number and Numeration in Kaduna State. The findings indicated that students who were instructed using the sum swamp game exhibited superior performance compared to those who were taught using the traditional lecture method for mathematics instruction. This outcome aligns with the research conducted by Justin, Omuroh, and Uchena (2020), who examined the impact of mathematical games on the academic achievement and interest of students in algebra at the elementary level. The findings of the study indicate that the incorporation of mathematical games into instructional practices yields favourable outcomes in terms of the academic performance of students in the subject of algebra. The experimental group in this study most likely outperformed their counterparts because the game method of teaching is a powerful and effective way to teach mathematics. Games can help students to learn and retain information, develop their mathematical skills, and think critically and creatively.

From the findings of the study it was found that, there was no significant difference between the academic performance of male and female pupils taught mathematics using mathematics sum swamp game. This shows that, sum swamp game of teaching number and numeration is not gender dependent. This is in line with the finding of Umar (2018) who conducted research on the topic Comparison of Gelosia and Chinese Method of Multiplication on Primary School Pupils Mathematics Performance in Kebbi State, Nigeria. The results show that there was no significance difference in the mean performance between male and female pupils taught multiplication using Gelosia method. This shows that Gelosia method is gender free method. This was also in agreement with the findings of Okigbo and Agu (2021) who carried out a research on the effects of mathematical games and instructional analogy on student's achievement of junior secondary school mathematics in Algebra. From the finding it was found that a non-significance difference existed between male and female students taught using either analogy or mathematical games. Overall this result shows that sum swamp game method is an effective method of teaching number and numeration to primary school pupils in

sokoto state, this is because, when students are playing games, they are actively using their math skills to solve problems and make decisions. This type of active learning is more effective than passive learning methods, such as traditional, lectures and readings.

### **Conclusion**

The following conclusions were drawn from the findings of the study:

1. Mathematics sum swamp game is an effective tool for teaching number and numeration in Primary Schools
2. There is no significance difference between the academic performance of male and female primary school pupil that taught number and numeration using sum swamp game.
3. There is significance difference in the academic performance of pupils taught number and numeration using sum swamp game and those taught using traditional method in Sokoto State.

### **Recommendation**

Based on the findings and conclusions drawn from this research, the following recommendations are made:

1. Teachers should make use of sum swamp game to teach pupils because it develops a better understanding of concept, application of mathematics and it reduce the level of mathematics abstraction
2. Textbooks writers should include sum swamp in their textbooks, guideline on how to develop the game and how to use the game to teaching mathematics.
3. Government should ensure that adequate and qualified mathematics teachers are employed to teach the subject. Seminars and workshops should be organized for mathematics teacher on how to develop and use game to teach number and numeration at primary schools.

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