

**EFFECTS OF SIMULATION GAMES AND ROTE LEARNING STRATEGIES ON
NUMERACY RETENTION AMONG LOWER BASIC PUPILS IN PLATEAU STATE,
NIGERIA**

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Abstract

This study was conducted to determine the effect of simulation games and Rote Learning Instructional Strategies on Retention among Numeracy pupils in Lower Basic Schools in Plateau State, Nigeria. Two main objectives were set, two research questions, and two null hypotheses made up this study. The study used Quasi-experimental research design. Three hundred and sixty-eight thousand and thirty-six (368,036) Pupils from Plateau State in Nigeria Basic two public

primary schools made up the study's population. The study used a sample of 218 pupils from three complete Lower Basic School classes. An instrument called the Numeracy Retention and Retention Test (NPRT) was employed for the study. Pilot test was carried out with thirty (30) copies of the instrument; a reliability index of 0.697 was obtained. Mean and Standard Deviations was used to analyse the research questions. At the same time, both sample-paired and independent t-test statistical tools were utilized to examine the hypotheses at a significance level of 0.05 Hypotheses one and two rejected while hypothesis three was retained. The findings indicated that pupils instructed in numeracy through the Simulation-Games strategy exhibited a substantial improvement, as evident by the noteworthy difference between the pre-test and post-test scores at ($p = .324$). The Retentions of pupils taught numeracy using rote learning strategy is better because there is a significant difference between the pre-test and post-test Retention scores at ($p = .271$). However, both simulation games and rote learning can be used to teach numeracy as they improved Retention, than the Conventional Strategy.

Keywords: Simulation Games, Rote learning Strategies, Retention and Numeracy.

Introduction

One of the main courses taught at the Lower fundamental School is numeracy, which exposes the student to a solid understanding of numbers, fundamental operations, and fractions, to name a few. Numeracy instruction is very beneficial to students' intellectual development, particularly in elementary schools. However, a lot of students require assistance in comprehending and remembering numerical ideas, which can impede their overall accomplishment and retention. In order to improve students' learning outcomes and experiences in numeracy, educators and researchers have recently investigated a variety of instructional methodologies.

The majority of countries have progressed as a result of the role that educators play in their educational endeavors. Therefore, in order to record better scores of meaningful application of information in various scenarios, education must be done such that students see, comprehend, and retain what has been taught. In order to accomplish the specified goals and objectives and produce long-lasting learning results, educators should be prepared with the most recent methods, approaches, and methodical processes and procedures. (Guga, 2019).

Simulation games have emerged as a promising tool in Numeracy education. These games provide pupils with interactive and engaging learning environments that simulate real-world mathematical scenarios. Pupils can enhance their problem-solving abilities and better comprehend mathematical ideas by actively engaging in the game's problem-solving activities. Moreover, simulation games

offer opportunities for immediate feedback, which can help pupils identify and correct their mistakes, leading to enhanced learning and Retention, (Ajai 2020).

However, the Rote Learning Strategy has long been used in the teaching of numeracy. Rote learning entails the teacher imparting a lot of knowledge to students, with a focus on memory and repetition of mathematical methods, formulas, and facts. Although this method can lead to rapid material recall, more is required to foster in-depth comprehension and conceptual mastery. However, proponents of Rote Learning contend that it can be useful in some situations, especially when learning procedural information and fundamental mathematical truths (Iwuji, 2012).

The theoretical framework on which this study was built upon is the theory of constructivism. The significance of educational theory is paramount, serving as the guiding framework or blueprint to be interpreted and implemented for effective teaching. This study's foundational theories are rooted in constructivism and constructive controversy. Key proponents of these theories whose models were applied include John Dewey, Jean Piaget, Jerome Brunner, and Vygotsky, who are often regarded as philosophical pioneers in this approach. John Dewey, in particular, is recognized for his contributions between 1973 and 1978. Among cognitive constructivists, Brunner (1990) and Piaget (1954) are prominent theorists, while Vygotsky (1978) is a major figure in the realm of social constructivism. Therefore, the cognitive constructivism models of Brunner and Piaget were applied for this study.

Fundamentally, constructivism is a theory grounded in empirical observation and scientific study that explains how individuals learn. It posits that, people construct their knowledge and comprehension of the world by actively engaging with experiences and reflecting upon them. The theory is about people using their experiences and cognitive abilities to study problems and learn skills or concepts. Learners use their senses to construct new ideas actively using existing knowledge and skills. Constructivism is a major learning theory and is particularly applicable to the learning of Mathematics. It is a theory grounded in empirical observation and practical application.

The researcher, a teacher, saw pupils in Plateau State, Nigeria's basic schools consistently failed internal and placement exams over time. Inadequate instructional materials, teachers' negative attitudes toward teaching, poor strategy selection, and poor application of chosen tactics could all contribute to this. Among many of these, numeracy has a tendency to affect students' retention in Lower Basic Schools. When teaching lower basic numeracy, a variety of instructional techniques are used.

To help lower-basic learners succeed academically, teachers are expected to employ a range of teaching strategies. In the modern educational environment, a successful system should encourage a great deal of social interaction and engagement between educators and students in order to

produce favorable results. Establishing a welcoming, transparent, and engaging atmosphere for students is crucial. An atmosphere like this promotes knowledge acquisition, improving retention and raising academic retention, especially in numeracy among pupils at lower levels. Karan (2017).The Federal Ministry of Education, curriculum creators, textbook authors, numeracy instructors, students, and researchers in the subject can all benefit from the study's conclusions.

The main objective of the study was to evaluate the effects of simulation games and rote learning strategies on numeracy Retention and retention among lower basic pupils in Plateau state Nigeria. While three specific objectives were to:

1. assess the difference between the post post-test Retention scores of pupils taught Numeracy using the Simulation Games strategy in Lower Basic Schools in Plateau State, Nigeria.
2. compare the post post-test Retention scores of pupils taught Numeracy using the Rote learning strategy in Lower Basic Schools in Plateau State, Nigeria

The following research questions were used to investigate this study:

1. What are the differences in the post post-test Retention scores of pupils taught Numeracy using the simulation-game strategy in Lower Basic Schools in Plateau State, Nigeria?
2. What are the differences in the post post-test Retention scores of pupils taught Numeracy using the Rote learning strategy in lower basic Plateau State, Nigeria?

Based on the research questions, the following null hypotheses were formulated to and were tested in the study:

HO₁: There is no significant difference between the post post-test Retention scores of pupils taught Numeracy using Simulation-Games in Lower Basic Schools in Plateau State, Nigeria.

HO₂: There is no significant difference between the post post-test Retention scores of pupils taught Numeracy using Rote learning in Lower Basic Schools in Plateau State, Nigeria.

Methodology

The study adopted the Quasi-experimental research design, which employed two experimental groups and one control group with intact classes. All groups underwent a pre-test to assess the pupils 'entry capacity. The first experimental group (EG1) received instruction in Numeracy using the Simulation-Games strategy, and the second experimental group (EG2) was taught Numeracy through Rote Learning. In contrast, the control group (CG) received conventional instruction in Numeracy. Following a six-week treatment period, a post-test was administered to evaluate the effectiveness of the Simulation-Games and Rote Learning strategies on pupils' performance in lower basic Numeracy schools in Plateau State, Nigeria. Then a postpost post test was administered

with to evaluate pupils retention ability in numeracy in plateau State Nigeria This approach aligns with Aliyu (2016), as quasi-experimental design allows for investigating cause-effect relationships between independent and dependent variables.

The study population comprised four hundred and twenty three thousand and thirty-six (423,036) Lower Basic two Numeracy pupils from all Lower Basic Schools in Plateau State, Nigeria.

A sample size of two hundred and eighteen (218) Lower Basic two Numeracy pupils was selected using purposive sampling technique. With intact classes of the sampled Lower Basic Schools which were assigned. This is in line with Aliyu (2016), who recommended that, the sample size be at least 30 and less than 500 for experimental research. A purposive sampling technique was adopted to select the three Lower Basic Schools in Plateau State, Nigeria, based on a similar Curriculum as the Federal Ministry of Education prescribed.

A simple random sampling technique was however, used to assign experimental group one group (EG₁), which was taught Numeracy using simulation games, experimental group two (EG₂), which was taught Numeracy through Rote learning strategy then control group(CG) which was taught using Conventional Strategy.

The instrument "Numeracy Performance Test (NPT)" developed by the researcher was based on the content of lower basic two, which included the following topics: identification of numbers 1-50, Addition of whole numbers, subtraction, division, multiplication, and Introduction to fractions. NPT comprises thirty (30) objective questions with four multiple-choice item options A-D each, which carried equal marks of two (2) marks and was rewarded for each correct answer and zero (0) effects for a wrong answer, making sixty (60 marks).

The treatment was administered by the researcher (self) and the whole exercise lasted for six weeks (6). In the experiment, Experimental Group 1 (EG1) received instruction through the Simulation-Games Strategy, Experimental Group 2 (EG2) was taught using the Rote Learning strategy, and the Control Group (CG) was instructed using the Conventional Strategy. Subsequently, a post-test was immediately conducted for all the groups using the data collection instrument (NPT). The scores obtained from this administration were used as post-test performance scores for the study. t-test statistics at 0.05 level of significance were used to test the two null hypotheses. The null hypotheses were rejected when t-calculated values were greater than the t-critical values, while the null hypotheses were accepted when t-calculated values were equal to or less than t-critical values

Result

To address the three research questions posed in this study, the collected data were subjected to analysis using mean and standard deviation, as outlined below:

Research Question One:

What is the post post-test Retention of pupils taught Numeracy using Simulation Games Strategy (SGS) in Lower Basic Schools in Plateau state?

To address this research question, the data obtained from the pre-test and post-test were analyzed using mean and standard deviation. A summary of the analysis was presented in Table 1.

Table 1: Post-test Retention of Pupils taught Numeracy using Simulation Games Strategy.

Variable	N	Mean	SD	Mean Diff.	Decision
Post-test SGS	52	10.17	2.13	14.79	Significant
Post Post-test SGS	52	24.96	2.80		

Source: (Field survey, 2023)

Key: Simulation Games Strategy (SGS)

Table 1 showed the pre-test of pupils taught Numeracy using simulation games. The result revealed a post-test mean score of 10.17 and a post post-test score of 24.96 with a mean difference (improvement) of 14.79. This indicated that the Simulation-Games Strategy effectively taught pupils Numeracy in Lower Basic Schools in Plateau State, Nigeria.

Research Question Two:

What is the post-test and post post-test Retention of pupils taught Numeracy using the Rote Learning Strategy (RLS) in Lower Basic Schools in Plateau state, Nigeria?

To address this research question, the data collected from the post-test and post post-test were analyzed using mean and standard deviation. The summary of the analysis was presented in Table 2 below.

Table 2: Post-test of Retention of Pupils taught Numeracy using Rote Learning Strategy (RLS).

Variable	N	Mean	SD	Mean Diff.	Decision
Post-test RLS	72	10.56	1.87		

				14.10	Significant
Post post-test RLS	72	24.66	2.30		

Source: (Field survey, 2023)

Key: Rote Learning Strategy (RLS)

Table 2 showed the post-test mean score of pupils taught Numeracy using Rote Learning as a 10.56 pre-test mean score and a post post-test score of 24.66 with a mean difference of 14.10. This indicated that Rote Learning also effectively taught Numeracy to pupils in lower-basic schools.

Three null hypotheses were tested using t-test as the statistical tool at 0.05 level of significant as follows:

Null Hypotheses One:

No significant difference exists between the post-test and posttest Retention scores of pupils taught Numeracy using Simulation-Games Strategy.

The post-test and post post-test data administered to the pupils were analysed using the paired sample t-test. The summary of the tested hypothesis is presented in Table 4.

Table 4: Summary of paired sample t-test analysis on post-test and post post-test Retentions of pupils taught Numeracy using Simulation-Games Strategy.

Variable	Mean	SD	N	t-cal.	Sig.	Decision
Pre-test SGS	10.17	2.13				
			52	11.23	.000	Rejected
	24.96	2.80				

Post-test SGS

Source: (Field survey, 2023)

Table 4 showed a significant difference in the pre-test and post-test Retentions of pupils taught Numeracy using Simulation-Games Strategy in Lower Basic Schools. The result revealed t-cal. of 11.23 with a p-value of .000. The null hypothesis was rejected because the p-value of .000 is less than 0.05 level of significant. By implication, the difference of 14.79 between the pre-test and post-test Retention of pupils taught Numeracy using the Simulation-Games Strategy is significant in favour of post-test. This meant that the Simulation Games Strategy effectively enhances Numeracy in Lower Basic Schools in Plateau State, Nigeria.

Null Hypothesis Two: No significant difference exists between the pre-test and post test Retention scores of pupils taught Numeracy using the Rote Learning strategy.

Data from the pre-test and post-test administered to the pupils were analysed using a paired sample t-test. The summary of the tested hypothesis is presented in Table 5.

Table 5: Summary of paired sample t-test analysis on pre-test and post-test Retentions of pupils taught Numeracy using Rote Learning strategy.

Variable	Mean	SD	N	t-cal.	Sig.	Decision
Pre-test RLS	10.56	1.87				
			72	10.12	.000	Rejected
	24.66	2.30				
Post-test RLS						

Source: (Field survey, 2023)

Table 5 indicated a significant difference in the pre-test and post-test Retentions of pupils taught Numeracy using Rote Learning strategy in Lower Basic Schools. The result shows a t-cal. of 10.12 with a p-value of .000. The null hypothesis was rejected since the p-value of .000 is less than the 0.05 significance level. This implied that the observed difference (14.49) between the pre-test and post-test Retention of pupils taught Numeracy using Rote Learning strategy was significant. Therefore, the Rote Learning Strategy effectively enhanced the learning of Numeracy at the lower basic level in Plateau State, Nigeria.

Summary of Findings

Based on the data analysis, the following findings were obtained:

1. Simulation Games strategy effectively taught pupils Numeracy because there is a difference between pre-test and post-test Retention of pupils taught Numeracy, and the difference is statistically significant at $P\text{-value} = .000 < 0.05$ level of significance.
2. Rote Learning strategy effectively taught pupils Numeracy because there is a difference between pre-test and post-test Retention of pupils taught Numeracy, and the difference is statistically significant at $P\text{-value} = .000 < 0.05$ level of significance.

Conclusion

Based on the above findings and recommendations the study concluded that, simulation games and rote learning strategies improved the teaching and learning of numeracy among lower-basic school pupils in Plateau State, Nigeria. The retention results also favored the pupils treated with simulation games and rote learning strategies. Therefore, it implies that pupils, will continue to understand numeracy better and retain the knowledge as long as simulation games and rote learning strategies were adopted to teach at Lower Basic Schools in Plateau state, Nigeria.

Recommendations

1. Simulation games strategy should be used by teachers of numeracy since Retention improved after treatment.
2. Rote learning strategy should be used by teachers of numeracy since Retention improved after treatment.

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