

**RELATIONSHIP BETWEEN PLAY-BASED LEARNING
ACTIVITIES AS A FUNCTIONAL PEDAGOGY AND ACQUISITION
OF NUMERACY SKILL AMONG PRIMARY SCHOOL PUPILS IN
CALABAR MUNICIPAL COUNCIL, CROSS RIVER STATE.**

By

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ABSTRACT:

This study was aimed at investigating the relationship between the use of play-based learning activities and the acquisition of numeracy skills among primary education pupils in Calabar Municipal Council, Cross River State. The study employed the Correlational research design; and a sample of 250 pupils and their teachers from various primary schools was selected using a multi-stage sampling technique. The research utilized two main instruments for data collection: A structured observation checklist to assess the frequency and quality of play-based learning activities in each classroom, and a standardized numeracy test to measure pupils' skills in areas such as number sense, basic operations, and geometric concepts. Data analysis involved the use of Simple Linear Regression Analysis to determine the strength and direction of the relationship between the two variables. The findings revealed that there is a significant relationship between the use of play-based learning activities and the acquisition of number sense and basic operations skills among primary school pupils and there is a significant relationship between the use of play-based learning activities and the acquisition of geometric concept skills among primary school pupils. The researcher recommended that teachers and stake holders in education sector should integrate play-based learning activities into their instructional strategies to enhance the acquisition of number sense and basic operations skills among primary school pupils. And Curriculum planners and teachers should incorporate play-based learning activities that focus on geometric concepts to improve pupils' understanding and skills in this area

Keywords: Play-based learning, Numeracy skill, Primary school Pupils, Calabar Municipal.

INTRODUCTION

Numeracy is a foundational competency that underpins not only future success in mathematics but also general cognitive development and everyday problem-solving abilities. In the early years of education, particularly at the kindergarten level, developing numeracy skills such as number recognition, counting, and simple arithmetic is critical for laying the groundwork for more advanced mathematical thinking (Clements and Sarama, 2019). Globally, there has been growing recognition of the importance of early childhood education (ECE) as a vehicle for improving long-term learning outcomes. This recognition is emphasized in global frameworks such as the United Nations Sustainable Development Goal 4.2, which stress ensuring that all girls and boys have access to quality early childhood development and pre-primary education (UNESCO, 2018).

Despite this global emphasis, research has shown that children in sub-Saharan Africa, including Ghana, continue to lag in numeracy proficiency compared to global benchmarks (Akyeampong et al., 2013). The Early Grade Mathematics Assessment (EGMA) reports from Ghana reveal that many children complete kindergarten without being able to recognize numbers or count accurately beyond 10 (USAID, 2017). These challenges are compounded by systemic factors such as overcrowded classrooms, limited teaching resources, and reliance on rote-based instructional methods that do not support meaningful engagement or conceptual understanding (Agyei-Mensah et al., 2020). Prior research on numeracy interventions in early childhood has largely focused on high-income countries with well-resourced classrooms and experienced educators (Clements and Sarama, 2011).

The acquisition of strong foundational numeracy skills in early childhood education is a critical predictor of long-term academic success and functional capability in society (National Mathematics Centre, 2019). Numeracy is a multifaceted construct, extending beyond mere computation to include spatial reasoning and the ability to apply mathematical thinking in real-world contexts. In contrast to traditional pedagogical methods, play-based learning (PBL) has emerged globally as a powerful approach aligned with the developmental needs of young children. Rooted in constructivist theories, PBL posits that children learn most effectively through active, hands-on exploration and meaningful experiences (Van Oers, 2010). In a numeracy context, play-based activities provide a concrete and engaging environment for children to discover mathematical principles, test hypotheses, and develop problem-solving strategies across all domains of mathematics.

This study is underpinned by the constructivist frameworks of Vygotsky (1978) and Piaget (1964), who argued that children actively construct knowledge through social interaction and direct experience. Play provides the ideal context for this construction.

For the acquisition of number sense and basic operations, play is a powerful tool. Activities such as counting games, board games, and role-playing in mock markets allow children to engage with concepts of quantity, one-to-one correspondence, and simple calculations in a meaningful, low-stakes context. Through these playful manipulations of objects like beads or counters, children build the internal cognitive structures related to number that Piaget (1964) described as essential for moving from pre-operational to concrete operational thought.

Simultaneously, play is fundamental for developing geometric and spatial reasoning. Building with blocks, solving puzzles, and engaging with shape sorters are forms of physical and mental experimentation. These activities allow children to explore properties of shapes, test spatial relationships, and develop problem-solving strategies. This aligns with research by Fisher et al. (2013), who found that guided play activities produced significantly better learning outcomes in geometric reasoning compared to direct instruction. In a Nigerian context, while Ezewu (2019) found that games and simulations improved overall mathematics achievement, there is a need to specifically correlate play with these distinct skill sets. However, the implementation of such rich play experiences faces challenges, including large class sizes and a lack of materials, as noted by Ukpepi (2021) in Calabar.

Purpose of the Study

The main purpose of this study is to investigate the relationship between the use of play-based learning activities as a functional pedagogy and the acquisition of numeracy skills among primary education pupils in Calabar Municipal Council, Cross River State. Specifically, this study seeks to:

1. investigate the relationship between play-based learning activities as a functional pedagogy and the acquisition of number sense and basic operations skills among primary school pupils.
2. determine the relationship between play-based learning activities as a functional pedagogy and the acquisition of geometric concept skills among primary school pupils.

Research Questions

The following questions guided the study:

1. What is the relationship between the use of play-based learning activities as a functional pedagogy and the acquisition of number sense and basic operations skills?
2. How do play-based learning activities as a functional pedagogy relate to the acquisition of geometric concept skills?

Statement of Hypotheses

1. There is no significant relationship between the use of play-based learning activities as a functional pedagogy and the acquisition of number sense and basic

operations skills among primary school pupils.

2. There is no significant relationship between the use of play-based learning activities as a functional pedagogy and the acquisition of geometric concept skills among primary school pupils.

Methodology

The study employed a correlational research design to investigate the relationship between play-based learning activities as a functional pedagogy and numeracy skills among primary school pupils. A multi-stage sampling technique was used to select a sample of 250 pupils and their teachers from various primary schools in Calabar Municipal Council. Data collection involved a structured observation checklist to assess the frequency and quality of play-based learning activities in each classroom over a period of 5 days. The population consisted of all primary three (3) pupils in public and private primary schools within Calabar Municipal Council. A sample of 250 pupils was selected through a multi-stage sampling technique. Data were collected using two main instruments: a structured observation checklist (The Play-Based Learning Activity Inventory - PBLAI) and a standardized numeracy proficiency test adapted from the Trends in International Mathematics and Science Study (TIMSS). The PBLAI was used to rate the frequency and quality of play-based activities. The numeracy test was a 25-item instrument scored along two sub-scales: (a) Number Sense and Basic Operations and (b) Geometric Concepts. Both instruments were validated by experts in early childhood education. Using Cronbach's Alpha, the reliability of the PBLAI was 0.82, and the reliability index for the numeracy test was 0.79. Permission was obtained from school authorities, and informed consent was secured from participants. Data were analyzed using Pearson's Product-Moment Correlation Coefficient to test each hypothesis separately. The research assistants were trained to administer the data collection instruments and ensure that they were properly completed and collected from the field. The study used simple linear regression to determine the strength and direction of the relationship between the two variables...

Results

Research Question One

What is the relationship between the use of play-based learning activities as a functional pedagogy and the acquisition of number sense and basic operations skills among primary school pupils?

To answer the research question, mean and standard deviation were used and the result is presented in Table 1.

TABLE 1: Mean and standard deviation of the relationship between the use of play-based learning activities as a functional pedagogy and the acquisition of number sense and basic operations skills among primary school pupils (N=250)

Variables	N	Mean	SD
Play-based learning activities	250	15.62	3.41
Number sense and basic operations skills	250	14.38	2.87

The result presented in Table 1 showed that pupils exposed to play-based learning activities had improved acquisition of number sense and basic operations skills, as indicated by the mean scores of 15.62 for play-based learning activities and 14.38 for number sense and basic operations skills respectively. The relatively high mean scores suggest that pupils who frequently participated in play-based learning activities were more likely to develop better understanding of counting, number recognition, addition, subtraction, and other basic mathematical operations. The standard deviation values further indicated that the responses of the pupils did not vary widely from the mean, showing consistency in the observed relationship. This implies that play-based learning activities positively relate to pupils' acquisition of number sense and basic operations skills among primary school pupils.

Hypotheses one

There is no significant relationship between the use of play-based learning activities as a functional pedagogy and the acquisition of number sense and basic operations skills among primary school pupils. The result of the analysis is shown in Table 2.

TABLE 2: Simple regression analysis of relationship between the use of play -based learning activities as a functional pedagogy and the acquisition of number sense and basic operations skills among primary school pupils (N=250)

Source of variation	SS	Df	MS	F	p-value
Regression	98.112	1	98.112	16.331*	.000 ^b
Residual	3221.043	248	6.612		
Total	3319.155	249			

*Significant at .05 level, $R=.636$; $R^2=.405$; Adj. $R^2=.402$

To analyse the data in Table 1 Simple Linear Regression Analysis was used. The analysis in Table 1 indicated that the Adj R^2 is 0.402. This implies that 40.2% of the variance in acquisition of number sense and basic operations skills among primary school pupils could be accounted for by play-based learning activities. Though the percentage contribution is small, a cursory look at the table showed that the $F=16.331$ ($p<.05$) is significant at 1 and 248 degrees of freedom. And since $p(.000)$ is greater than $p(.05)$, it

implies that there is a significant relationship between the use of play-based learning activities as a functional pedagogy and the acquisition of number sense and basic operations skills among primary school pupils.

Research Question Two

How do play-based learning activities as a functional pedagogy relate to the acquisition of geometric concept skills among primary school pupils?

To answer the research question, mean and standard deviation were used and the result is presented in Table 3.

TABLE 3: Mean and standard deviation of the relationship between the use of play-based learning activities as a functional pedagogy and the acquisition of geometric concept skills among primary school pupils (N=250)

Variables	N	Mean	SD
Play-based learning activities	250	15.62	3.41
Geometric concept skills	250	13.94	3.02

The result presented in Table 3 showed that pupils exposed to play-based learning activities demonstrated improved acquisition of geometric concept skills, as indicated by the mean scores of 15.62 for play-based learning activities and 13.94 for geometric concept skills respectively. The relatively high mean scores suggest that pupils who frequently participated in play-based learning activities were more likely to develop better understanding of shapes, spatial relationships, patterns, and other geometric concepts. The standard deviation values further indicated that the responses of the pupils did not vary widely from the mean, showing consistency in the observed relationship. This implies that play-based learning activities positively relate to pupils' acquisition of geometric concept skills among primary school pupils

Hypotheses 2: There is no significant relationship between the use of play-based learning activities as a functional pedagogy and the acquisition of geometric concept skills among primary school pupils. The result of the analysis is shown in Table 2.

TABLE 4: Simple regression analysis of relationship between the use of play-based learning activities as a functional pedagogy and the acquisition of geometric concept skills among primary school pupils (N=250)

Source of variation	SS	Df	MS	F	p-value
Regression	104.719	1	104.719	10.021*	.000 ^b
Residual	3214.436	248	8.228		
Total	3319.155	249			

*Significant at .05 level, $R=.460$; $R^2=.212$; Adj. $R^2=.210$

To analyse the data in Table 4 Simple Linear Regression Analysis was used. The analysis in Table 1 indicated that the Adj R^2 is 0.210. This implies that 21.0% of the variance in acquisition of geometric concept skills among primary school pupils could be accounted for by play-based learning activities. Though the percentage contribution is small, a cursory look at the table showed that the $F=10.021$ ($p<.05$) is significant at 1 and 248 degrees of freedom. And since $p(.000)$ is greater than $p(.05)$, it implies that there is a significant relationship between the use of play-based learning activities as a functional pedagogy and the acquisition of geometric concept skills among primary school pupils.

Discussion of findings

The result of hypothesis one revealed that play-based learning as a functional pedagogy has a significant positive relationship with the acquisition of number sense and basic operations skills. This result is not surprising, as the hands-on, contextualized nature of play allows children to internalize abstract numerical concepts in a way that rote memorization cannot achieve. This supports Vygotsky's (1978) theory of social learning, where children negotiate rules and co-construct understanding during collaborative games.

Similarly, the result of hypothesis two revealed a strong positive relationship between play-based learning as a functional pedagogy and the acquisition of geometric skills. This finding suggests that when pupils engage with materials like blocks and puzzles, they are developing stronger abilities to visualize, analyze, and understand spatial relationships. This directly supports the work of Fisher et al. (2013) and underscores the need for a pedagogical shift away from worksheet-only instruction. These findings, taken together, underscore the need for systemic pedagogical reforms and teacher capacity development aimed at aligning instructional methods with the developmental needs of young learners across all mathematical domains.

Conclusion

Based on the data analyses and results, the researcher concludes that play-based learning activities have a significant relationship with the acquisition of numeracy skills among primary school pupils in Calabar Municipal Council, Cross River State. The findings suggest that pupils who are exposed to play-based learning activities tend to perform better in numeracy skills, including number sense, basic operations, and geometric concepts. This study highlights the importance of incorporating play-based learning activities in primary school mathematics instruction to enhance pupils' numeracy skills and academic achievement.

Recommendations

1. Teachers and stake holders in education sector should integrate play-based learning activities into their instructional strategies to enhance the acquisition of number sense and basic operations skills among primary school pupils.
2. Curriculum planners and teachers should incorporate play-based learning activities that focus on geometric concepts to improve pupils' understanding and skills in this area..

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