



EFFECT OF BLENDED LEARNING STRATEGY ON RETENTION AND ACADEMIC PERFORMANCE: EVIDENCE FROM KATSINA STATE EARLY CHILDHOOD BASIC EDUCATION SCHOOLS

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Abstract

This study examined the impact of blended learning on retention and academic performance among Early Childhood Education (ECE) pupils in Katsina State, Nigeria. six objectives, research questions and six hypotheses were formulated. A quasi-experimental design was employed with 188 pupils divided into experimental and control groups. The experimental group received instruction through blended learning, while the control group was taught using conventional methods. Data were collected using the Early Grade Mathematics Assessment (EGMA) and Early Grade Reading Assessment (EGRA), and analyzed with ANCOVA and t-tests. Results showed that blended learning significantly improved retention, motivation and academic performance compared to traditional instruction. No significant gender differences were observed in either outcome, indicating that blended learning benefits pupils equitably. These findings are explained by the Technology Acceptance Model (TAM), which posits that perceived usefulness and ease of use of digital tools are not gender dependent. The study concludes that blended learning is a robust and inclusive pedagogical approach that enhances retention and foundational learning outcomes. The study recommended that (i) Classroom practice should adopt a blend learning strategy, so as to encouraging self-paced learning to strengthen retention and deepen understanding. (ii) There should be a collaboration among policymakers, educators, NGOs, and researchers to institutionalize blended learning, and (iii) longitudinal studies should be conducted to examine its sustained impact on motivation, retention and academic performance.

Keywords:

Blended learning, Flipped classroom, knowledge retention, academic performance, Early Childhood Education, Katsina State, Nigeria.

INTRODUCTION

The growing influence of digital technologies has transformed educational practices globally, creating opportunities for innovative teaching and learning approaches like blended learning. Blended learning refers to an instructional approach that integrates traditional classroom teaching with digital technologies to support learning. According to Graham (2019), blended learning combines face-to-face instruction and computer-mediated activities to create

meaningful learning experiences. The approach allows learners to interact with content at their own pace while maintaining direct engagement with teachers. As it integrates face-to-face instruction with digital tools, it also offers flexibility and active engagement. It also has various types of learning model which include; Rotation Model, Flex Model, A La Carte Model, and Enriched Virtual Model, with the flipped classroom particularly relevant to ECE. This model (flipped classroom) provides pupils with pre-class materials (videos, presentations, digital content) and uses classroom time for interactive activities. Globally, flipped classrooms have been proven to enhance collaboration, critical thinking, and creativity (Bergmann & Sams, 2016, Zeqiri et al., 2021).

Conversely, for the purpose of this study, a flipped classroom model as one of the types of blended learning strategy was adopted considering its common similarity with the ECE curriculum. The flipped classroom, with its nature of integrating interactive digital tools, personalized learning experiences, and collaborative activities, offers a promising solution to address challenges such as limited resources, overcrowded classrooms, and traditional teaching methods which may hinder the ability to foster retention and optimal academic performance among young learners. As such, by applying differentiated instruction method which combines the strengths of in-person instruction with technology-enhanced learning, blended learning (flipped classroom) has the potential to create dynamic and motivating educational experiences that cater to diverse learning needs (Gidado, et al., 2024). Moreover, this study deemed it suitable to adopt the WhatsApp platform for the conduct of an experiment to ascertain the effect of integrating blended learning on retention and academic performance among the ECE learners in Katsina state (Kaieski, Grings, and Fetter 2015).

Retention refers to the ability to remember what was taught after some time. Furthermore, Eze, Ezenwafor and Obidile (2016) defined retention as the ability to remember and recall what has been taught after a given period of time as a mark of student's progress. Retention in ECE level, as in most other level of learning is very important as it shows the extent to which pupils can recall and apply the knowledge gained after a period of time. Both retention and academic performance are measurement constructs that every caregiver should be concerned with. Caregivers are therefore, to encourage pupils' participation in the learning process as this may improve their retention and academic performance.

The academic performance of pupils in Early Childhood Education (ECE) is a critical concern for educators, policymakers, and parents, as it lays the foundation for lifelong learning and development.

Academic performance in ECE is not merely a measure of students' ability to memorize facts but rather encompasses a breadth of skills, including cognitive development, social interaction, and emotional regulation. Various studies highlight that strong early academic performance translates into better outcomes in later years, such as higher achievement in primary, secondary, and even tertiary education and knowledge retention. Conversely, poor academic performance at this foundational level can lead to a cycle of underachievement and limited opportunities for future success (McClelland et al., 2017; Walker et al., 2024).

In Katsina State, Nigeria, the quality of education and consequently, the academic performance of young learners is increasingly scrutinized, particularly given the unique socio-economic challenges that the region faces. Perhaps, the socio-economic challenges, limited infrastructure,

and reliance on traditional methods are likely to contribute to constrain in pupil's academic performance. Nevertheless, it is also important to note that gender dynamics remain critical when considering the effectiveness of blended learning approaches. Some studies indicate that boys and girls may exhibit differing levels of engagement and academic performance due to socio-cultural expectations and educational experiences (Hadjar et al., 2015).

The Technology Acceptance Model (TAM) developed by Davis (1989). postulates that learners' perceptions of the usefulness and ease of use of technology determine their willingness to engage with technology-based instruction. In the context of blended learning, when pupils perceive digital tools as beneficial and accessible, they are more likely to effectively interact with instructional content, leading to improved knowledge retention and enhanced academic performance. Thus, TAM provides a theoretical basis for understanding how acceptance of technology-mediated learning environments translates into measurable educational outcomes in ECE settings.

Early Childhood Education (ECE) serves as the foundation upon which future academic achievement is built. During this stage, children develop critical literacy, numeracy, communication, and social skills that influence subsequent educational success. However, in many developing countries, including Nigeria, ECE faces numerous challenges such as inadequate instructional resources, overcrowded classrooms, insufficient teacher training, and low learner motivation. These challenges often result in poor academic performance and weak retention of foundational concepts. In recent years, educational stakeholders have increasingly advocated for the integration of information and communication technologies (ICTs) into teaching and learning processes. The COVID-19 pandemic further highlighted the importance of alternative learning approaches capable of sustaining educational continuity.

Blended learning strategy has gained distinction as an effective strategy that promotes learner-centered instruction, increases flexibility, and encourages active participation. Various studies conducted in developed contexts and higher level of learning has consistently demonstrated positive relationships between blended learning and academic achievement (McClelland and Morrison, 2017, Li and Wang, 2022, Han, 2024 and Gidado, et al., 2025)

However, empirical evidence regarding its effectiveness in Nigerian Early Childhood Education settings remains limited, particularly in Northern Nigeria. Katsina State presents a relevant context due to ongoing efforts to improve access, quality, and equity in basic education. Given the importance of foundational learning and the need for innovative instructional strategies, this study investigates the effects of blended learning on retention and academic performance among ECE pupils in Katsina State, Nigeria.

Statement of the Problem

ECE in Nigeria continues to face challenges resulting in weak retention and academic performance, as UNICEF (2022) reports highlighted low enrollment and poor foundational outcomes in Katsina State. Government initiatives like the National Digital Learning Policy (Federal Republic of Nigeria, 2023) promote digital integration, yet it lacks specific provisions for ECE. Furthermore, existing blended learning research focuses mainly on higher education, leaving ECE underexplored. Therefore, these challenges highlighted some critical gaps in understanding blended learning's potentiality in ECE contexts, especially in Katsina State. As

such, this study investigates the effect of integrating blended learning on ECE pupils' retention and academic performance in Katsina State.

Objectives

To determine the effect of blended learning strategy on retention of Early Childhood Education (ECE) pupils in Katsina State;

To investigate the difference in the mean retention scores of pupils taught using blended learning strategy based on gender;

To determine the effect of blended learning strategy on academic performance of Early Childhood Education (ECE) pupils in Katsina State;

To examine the difference in the mean academic performance scores of pupils taught using blended learning strategy based on gender;

Hypotheses

H₀₁: There is no significant effect of blended learning approach on retention of Early Childhood Education (ECE) pupils in Katsina State.

H₀₂: There is no significant difference in the mean retention scores of pupils taught using blended learning approach based on gender.

H₀₃: There is no significant effect of blended learning approach on academic performance of Early Childhood Education (ECE) pupils in Katsina State.

H₀₄: There is no significant difference in the mean academic performance scores of pupils taught using blended learning approach based on gender.

METHODOLOGY

Research Design

The study adopted a quasi-experimental design with pre-tests and post-tests in non-randomized groups to compare blended learning with conventional approaches. quasi-experimental design is commonly used in classroom-based studies where experimental and control groups are formed from intact classes that are naturally similar (Reichardt et al. 2023). In this study, the design was chosen to minimize internal validity threats, particularly those concerning initial group equivalence and bias, given the absence of randomization in assigning participants.

Population of the Study

The target population of the study comprised of Nineteen Thousand, One Hundred and Sixty-Eight (19,168) ECE pupils in public co-educational primary schools in Dutsin-Ma Zonal Education Quality Assurance (ZEQA), Katsina State, Nigeria, consisting of Nine Thousand Three Hundred and Eighty-two (9,382) males and Nine Thousand Seven Hundred and Eighty-six (9,786) females. The study area encompassed Three Hundred and Twenty-Three (2,33) co-educational public primary schools from across the four Local governments in Dutsin-Ma Zonal Education Quality Assurance (Dutsin-ma, Kurfi, Danmusa and Safana)

Sample Size and Sampling Procedure

A sample of 188 ECE pupils selected from two primary schools using multi-stage sampling. Firstly, the population was grouped into two strata based on the number of Local Government Areas in the Zone. Proportionate stratified sampling was then employed in selecting one co-educational school from each of the two strata. Thus, one school was selected from Dutsin-Ma

and one school from Kurfi Local Government Areas, respectively. Secondly, in assigning Schools into experimental and control groups, simple random sampling technique was used using coin, School A was assigned as head while School B as the tail. The researcher tossed the coin, which ever appeared as A was assigned as experimental group and B as control group as shown in Table 1.

Table 1: Sample of the Study

Group	Male	Female	Total
Experimental (A)	59	37	96
Control (B)	55	37	92
Total	105	83	188

Instrumentation

The Early Grade Mathematics Assessment (EGMA) and Early Grade Reading Assessment (EGRA) were adopted to measure pupils' academic performance and retention. These instruments were not subjected to validation in this study because they are internationally recognized standardized tools with established validity and reliability. They have been widely applied in Katsina State and other Northwestern regions of Nigeria, particularly in UNICEF- and FCDO-sponsored programs, and were deemed suitable for the local context.

Data Collection Procedure

The data collection process was carefully structured to ensure accuracy, ethical compliance, and contextual relevance. The following multi-stage procedure were considered to ensure that data were collected systematically, ethically, and with sensitivity to the pupils' developmental needs.

1. **Ethical Compliance:** Consent was obtained from the State Universal Basic Education Board (SUBEB), school administrators, and guardians. Formal letters of introduction and approval were secured before data collection commenced, ensuring adherence to ethical standards and informed participation.
2. **Pre-Test:** Baseline measures administered to both groups.
3. **Intervention:** Over a six-week period, the experimental group received literacy and numeracy instruction via a WhatsApp-mediated blended learning model, while the control group received conventional face-to-face instruction.
4. **Post-Test:** Administered at the end of six weeks to measure academic performance.
5. **Delayed Post-Test:** Administered two weeks post-intervention to assess knowledge retention.

Method of Data Analysis

Data analysis was performed using the Statistical Package for Social Sciences (SPSS) version 26. The difference between the means of the pre-test and post-test for both groups was used to determine the effect. To test the hypotheses, independent sample t-test and Analysis of Covariance (ANCOVA) was used. The null hypothesis was accepted where the calculated p-value was greater than level of significance (i.e. $p\text{-value} > 0.05$ = accept null hypothesis) and rejected where the p-value was less than the level of significance (i.e. $p\text{-value} < 0.05$ = reject null hypothesis).

RESULTS

Hypothesis One: There is no significant effect of blended learning strategy on retention scores of Early Childhood Education (ECE) pupils between the experimental and control group in Katsina State.

Table 2. A. ANCOVA Analysis of effect of blended learning strategy on retention scores of Early Childhood Education (ECE) pupils between the experimental and control group in Katsina State (controlling for the pretest).

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	846.574 ^a	2	423.287	77.388	.000
Intercept	1138.404	1	1138.404	208.129	.000
Performance_ Pretest	469.439	1	469.439	85.825	.000
Group	320.729	1	320.729	58.637	.000
Error	1011.894	185	5.470		
Total	30984.000	188			
Corrected Total	1858.468	187			

As shown in Table 2A, an Analysis of variance (ANCOVA) result on the effect of blended learning strategy on retention scores of Early Childhood Education (ECE) pupils between the experimental and control group in Katsina State. When controlling for the pretest was presented. The Table revealed a preperformance-pretest mean square of 469.439 with F – statistic 85.825 and $p = .000 < 0.05$. After controlling for group effect, the Table also revealed main group effect with a mean Square of 320.729 with an F-statistic of 58.637 and a significant value of .000 which is less than 0.05. This indicates that, there is significant effect of blended learning approach on retention of Early Childhood Education (ECE) pupils in Katsina State. Thus, the null hypothesis was rejected.

Table 2.B. Descriptive statistics of the adjusted means and standard deviation After adjusting for the covariate between experimental and control group

Group	N	Mean	SD	Std. Error	95% Confidence Interval	
					Lower Bound	Upper Bound
Experimental	96	13.72	3.11	.239	13.257	14.200
Control	92	11.11	2.49	.244	10.628	11.591
Total	188					

As shown in Table 2B, the descriptive statistics of the adjusted means and standard deviation After adjusting for the covariate was presented. The table revealed a mean of 13.72 and standard deviation of 11.11 for the experimental group, while a mean of 3.11 and standard deviation of 2.49 for control group. After adjusting for the covariate, the Table further shows standard error of .239 for experimental group and .244 for control group respectively.

Hypothesis Two: There is no significant difference in the mean post-test retention scores between male and female pupils taught using the blended learning strategy.

Table 3. Independent Samples t-test analysis of Post-test Retention Scores of Pupils Taught Using Blended Learning Strategy by Gender

Gender	N	$\bar{X}$	SD	Df	t-value	Sig.(2-tailed)	Decision
Male	59	14.56	3.17	94	3.007	.319	Accepted
Female	37	12.68	2.67				

As shown in Table 3, an independent samples t-test to determine the difference in the post-test retention scores of male and female pupils taught using the blended learning strategy was presented. The Table revealed a mean score of 14.56 with a standard deviation of 3.17 for male pupils, and mean score of 12.68 with a standard deviation of 2.67 for the female pupils. The Table further revealed a significant value of .319 which is greater than 0.05. This indicates that, there is no significant difference in the mean retention scores of pupils taught using blended learning approach based on gender in Katsina State. Therefore, the null hypothesis was retained.

Hypothesis Three: There is no significant effect of blended learning strategy on the academic performance of Early Childhood Education (ECE) pupils between the experimental group and the control group in Katsina State.

Table 4.A: ANCOVA Analysis of the Effect of Blended Learning Strategy on Academic Performance of Early Childhood Education (ECE) Pupils between Experimental and Control Groups in Katsina State (Controlling for Pretest Scores).

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	897.658 ^a	2	448.829	73.886	.000
Intercept	1381.297	1	1381.297	227.388	.000
Performance-Pretest	505.794	1	505.794	83.263	.000
Group	332.257	1	332.257	54.696	.000
Error	1123.805	185	6.075		
Total	35827.000	188			
Corrected Total	2021.463	187			

As shown in Table 4A, an ANCOVA result of the effect of blended learning strategy on academic performance of Early Childhood Education (ECE) pupils in Katsina State was presented. The Table revealed a preperformance-pretest mean square of 505.794 with $F = 83.263$ with a table value .000 which is less than ($p < 0.05$). After controlling for group effect, the Table also revealed main group effect with a mean Square of 332.257 with an F-statistic of 54.696 and a significant value of .000 with p-value less than 0.05. This indicates that, there is significant effect of blended learning approach on academic performance of Early Childhood Education (ECE) pupils in Katsina State.

Table 4.B: Descriptive statistics of the adjusted means and standard deviation After adjusting for the covariate between experimental and control group.

Group	N	Mean	SD	Std. Error	95% Confidence Interval	
					Lower Bound	Upper Bound
Experimental	96	14.82	3.24	.252	14.217	15.211
Control	92	11.93	2.63	.257	11.541	12.556
Total	188					

As shown in Table 4B, the descriptive statistics of the adjusted means and standard deviation After adjusting for the covariate was presented. The table revealed a mean of 14.82 and standard deviation of 3.24 for the experimental group, while a mean of 11.93 and standard deviation of 2.63 for control group. After adjusting for the covariate, the Table further shows standard error of .252 for experimental group and .257 for control group respectively.

Hypothesis Four: There is no significant difference in the mean post-test academic performance scores between male and female pupils taught using the blended learning strategy.

Table 5: Independent Samples t-test Analysis of Post-test Academic Performance Scores of Pupils Taught Using Blended Learning Strategy by Gender

Gender	N	$\bar{X}$	SD	Df	t-value	Sig. (2-tailed)	Decision
Male	59	15.59	3.23	94	3.068	.617	Accepted
Female	37	13.59	2.90				

As shown in Table 8, an independent samples t-test was conducted to determine the difference in the post-test academic performance scores of male and female pupils taught using the blended learning strategy was presented. The Table revealed a mean score of 15.59 with a standard deviation of 3.23 for male pupils, and mean score of 13.59 with a standard deviation of 2.90 for the female pupils. The Table further revealed a significant value of .617 which is greater than 0.05. This indicates that, there is no significant difference in the mean academic performance scores of pupils taught using blended learning approach based on gender in Katsina State. Therefore, the null hypothesis was retained.

DISCUSSIONS

The study established that pupils taught through blended learning achieved significantly higher retention scores compared to those taught conventionally. This finding corroborates earlier evidence (e.g., Kufre et al., 2017) that blended learning strengthens memory and recall, and importantly extends such evidence to Early Childhood Education, where retention is critical for foundational learning. No gender differences were observed in retention outcomes, consistent with Gambari et al. (2017), confirming that the benefits of blended learning are equitably distributed across male and female pupils.

Similarly, blended learning was found to significantly enhance academic performance among pupils in the experimental group compared to the control group. This result aligns with prior studies across diverse contexts (Tabassum et al., 2024; Saadu, 2024; Gambari et al., 2017), underscoring the robustness and adaptability of blended learning in fostering superior academic outcomes. Importantly, no gender differences were observed in performance, supporting the inclusivity of this approach. These gender-neutral outcomes are explained by the Technology Acceptance Model (TAM), which posits that perceived usefulness and ease of use of digital tools are not gender dependent. Thus, both male and female pupils benefited equally from the accessibility and flexibility of blended learning resources, reinforcing its role as an inclusive pedagogical strategy that enhances retention and academic success at the foundational stage.

CONCLUSION

The study concluded that blended learning is a powerful pedagogical approach is capable of enhancing retention and academic performance, among Early Childhood Education pupils in Katsina State regardless of gender. Its effectiveness appears consistent across different educational levels and contexts, underscoring its generalizability and adaptability. By integrating digital interactivity with structured face-to-face engagement, blended learning

offers a balanced instructional model that supports learner-centered education. The evidence presented affirms its potential to address persistent educational disparities in Nigeria, fostering inclusivity and equity in early childhood education. Ultimately, this study contributes to the growing body of evidence supporting blended learning as a transformative educational strategy. It demonstrates that when thoughtfully implemented, blended learning can serve as a catalyst for improved learner achievement, and long-term retention, thereby advancing the quality of Early Childhood Education in Katsina State and beyond.

RECOMMENDATION

Based on the findings of this study, several recommendations are proposed for policymakers, educators, curriculum developers, and future researchers:

1. Education stakeholders should integrate blended learning into early childhood classrooms to strengthen pupils' retention of knowledge, making learning more lasting and effective.
2. Retention gains were similar across genders; therefore, interventions should focus on improving retention generally, without needing gender-specific adjustments.
3. Blended learning should be institutionalized as a teaching strategy to raise academic performance outcomes, with policymakers embedding it into curriculum frameworks.
4. Since academic performance gains were consistent across male and female pupils, blended learning can be confidently applied across diverse classrooms without bias.

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