
**EFFECT OF BLENDED INSTRUCTIONAL STRATEGY ON UPPER
BASIC STUDENTS' ACADEMIC ACHIEVEMENT AND RETENTION
IN BASIC SCIENCE AND TECHNOLOGY IN MAKURDI LOCAL
GOVERNMENT AREA OF BENUE STATE**

*¹Temaaku, T.J., ²Jirgba, M.C., ³Upu, F.T., ⁴Akwaka, J.C and ⁵Shagba M.T.

^{1,2,3,4,5} Department of Integrated Science Education, Joseph SarwuanTarka University,
Makurdi,Nigeria. ⁴Dpartmentof Chemistry ⁵Education, Joseph Sarwuan Tarka University,
Makurdi, Nigeria.

Article Received: 15 April 2026, Article Revised: 05 May 2026, Published on: 25 May 2026

*Corresponding Author: Temaaku, T.J.

Department of Integrated Science Education, Joseph SarwuanTarka University, Makurdi,Nigeria.

DOI: <https://doi-doi.org/101555/ijarp.3286>

ABSTRACT

The study aimed to investigate the effect of Blended Instructional Strategy on Upper Basic Students' Academic Achievement and Retention in Basic Science and Technology in Makurdi Local Government Area, Benue State. two objectives, and two research questions were set and two hypotheses. The study adopted quasi-experimental research design. The study was carried out in Makurdi Local Government Area of Benue State on a population of 1312 Basic Eight (8) students in the twenty-one (21) Upper Basic schools in the study area. The study was conducted on a sample of 173 students drawn randomly from four co-educational schools in the study area. The instrument for data collection was Basic Science and Technology Achievement Test (BSTAT) and Basic Science and Technology Retention test (BSTRT), which were first validated by three relevant authorities. K-R20 method of estimating reliability were adopted to determine the internal consistency of the items of the instrument and it yielded a reliability co-efficient index of 0.90. Descriptive statistics of Mean and Standard Deviation was used to answer the research questions, while inferential statistics of Analysis of Covariance (ANCOVA) was used to test the null hypotheses at 0.05 level of significance. From the findings, it could be concluded that both the blended instructional strategy and the conventional teaching method are effective in improving students' achievement and retention in Basic Science and Technology, as both

groups recorded comparable levels of Academic Achievement and retention. However, the blended instructional strategy proved to be more beneficial in certain aspects, particularly in the academic achievement and retention of female students over their male counterparts. The recommendations emphasize promoting blended instructional strategies in Basic Science and Technology at the Upper Basic level. The Ministry of Education should support this through curriculum review, provision of digital facilities, and teacher training. School heads are to create an enabling environment by ensuring access to ICT tools, reliable power supply, and internet connectivity, as well as organizing workshops for teachers. Teachers should integrate blended learning with traditional methods to improve students' understanding and engagement. Policy makers should establish and fund policies that ensure effective ICT integration, teacher training, and proper implementation in junior secondary schools.

KEYWORDS: Blended instructional strategy Academic achievement conventional teaching methods.

INTRODUCTION

Basic Science and Technology seek to establish the development of scientific knowledge, skills, and attitudes that enable learners to understand and manipulate happenings within their environment. It offers the essential training required for human survival, sustainable development, and societal transformation (Okwara and Upu, 2018). Despite the fact that several instructional approaches have been adopted in teaching the subject, students achievement and retention of the subject matter have been far from encouraging.

Blended instructional strategy is an approach that combines face-to-face interactions with technology-based instruction. Science teaching becomes all the more challenging when integrating technological tools and techniques into instructional process. In this context, blended instructional strategy is relevant in enriching the quality of science instruction by tapping the vast potential of online mode and the richness of 'social presence' in the classroom. This democratization of information has leveled the playing field, enabling students from different backgrounds and locations to access the same knowledge resources through electronic instruction platform. Blended instructional strategy utilizing multimedia presentations, videos, animations, and simulations can bring abstract concepts to life, making learning process more enjoyable and memorable.

Academic achievement and knowledge retention among students in upper basic schools

remains a critical factor in the realization of broader educational goals (Edegbe-Efosa and Ugiagbe, 2024). It serves as a tangible reflection of the effectiveness of the learning process and provides a valid metric for evaluating instructional outcomes. More narrowly, academic achievement is often measured through standardized examinations or assessments conducted at different stages of a student's educational journey. These achievement indicators reflect the degree to which students have achieved instructional objectives within formal learning environments such as schools, colleges, and universities.

Knowledge retention is the term used to denote a demonstration that meaningful learning has been maintained and sustained over time, which can be proven through recall, recognition, recitation and practice (Abu and Flowers, 2019). Unfortunately, low retention rate is frequently ascribed to the continued use of traditional, teachers-centered lecture -methods that treats students as passive recipients of information. (Ameh, 2014). When blended instructional strategy is incorporated at the Upper Basic level of education through the use of audio-visual activities, it is likely that, students will become motivated and gain autonomy over their learning, consequently leading to durable knowledge retention.

Gender is another factor that could influence students' retention and overall academic success. It is a variable that significantly affect both teachers and students within the teaching and learning processes. Gender issues often manifest as the real or perceived differences, between boys and girls regarding their relative achievements and opportunities (Mankumari and Ajay, 2017). While various studies have explored gender gaps in students' learning attitude, the results remain inconsistent.

Statement of the problem

Basic Science and Technology (BST) is a core subject in the upper basic school curriculum, strategically, designed to equip students with scientific knowledge and technological skills required for advanced learning. Despite its critical importance, upper basic students in Makurdi Local Government Area of Benue State continue to record poor academic achievement and low retention of BST content. This deficit is clearly evident in students' consistently poor performance in school-based assessments and promotional examinations and the Basic Education Certificate Examination (BECE) in Upper Basic Co-educational school in Benue State over the last five years, which has not been encouraging. Furthermore, teacher reports indicate that students are frequently unable to recall or apply taught concepts shortly after instruction.

Purpose of the Study

The study sought to investigate the effect of blended instructional strategy on students' academic achievement and retention in Basic Science and Technology in Upper Basic Schools in Makurdi Benue State. Specifically, the study seeks to:

1. Determine the effect of blended instructional strategy on Upper Basic Students' academic achievement in Basic Science and Technology in Makurdi, Benue State.
2. Determine the effect of blended instructional strategy on Upper Basic students' retention in Basic Science and Technology in Makurdi, Benue State.

Research Questions

The following research questions were posed to guide the study.

1. What is the effect of blended instructional strategy on Upper Basic Students' academic achievement in Basic Science and Technology in Makurdi, Benue State?
2. What is the effect of blended instructional strategy on Upper Basic students' retention in Basic Science and Technology in Makurdi, Benue State?

Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance:

H01 There is no significant difference in the mean achievement scores of Upper Basic Students taught Basic Science and Technology using blended instructional strategy and those taught using conventional method in Makurdi Local Government Area, Benue State.

H02 There is no significant difference in the mean retention scores of Upper Basic Students taught Basic Science and Technology using blended instructional strategy and those taught using conventional method in Makurdi Makurdi Local Government Area, Benue State.

METHODOLOGY

The study adopted quasi-experimental research design making use of the non-randomized pre-test post-test control group design. The study area was Makurdi Local Government Area of Benue State. The population of the study was 1312 made up of Basic Eight (8) students in the twenty-one (21) Upper Basic schools in Makurdi Local Government Area of Benue State. The sample for this study was 173 students.

Two instruments were used for data collection namely; Basic Science and Technology Achievement Test (BSTAT) and Basic Science and Technology Retention Test (BSTRT).

Two experts validated the instrument. The reliability coefficient of 0.90 was obtained. The research questions were answered using mean and standard deviation while the hypotheses formulated were tested using Analysis of Covariance (ANCOVA) at 0.05 level of significance.

RESULTS

Table 1: Mean Achievement Score and Standard Deviation of Students Taught Basic Science and Technology using Blended Instructional Strategy and the Conventional Method

Method Group	N	Pretest	Posttest	SD	Mean Gain	SD
Experimental	83	26.76	63.89	1.42	37.13	2.19
Control Group	90	26.68	63.79	1.37	37.11	2.06
Mean Difference	173	0.08	0.10	0.02		

In Table 1, the mean pre-test scores for the experimental group which was exposed to blended instructional strategy in the teaching and learning of Basic Science and Technology is 26.76 with standard deviation of 1.42 and the mean pre-test scores for the control group which was taught Basic Science and Technology using the conventional method was 26.68 with a standard deviation of 1.37. The mean difference between the pre-test scores of students in the experiment and control group was calculated to be 0.08. This means that before the administration of the test, the students in two groups showed similar level of knowledge in Basic Science and Technology. However, the mean post-test scores for the experimental and control group are 63.89 and 63.79 with standard deviation of 2.19 and 2.06 respectively. The mean difference in their post-test scores was 0.10. However, the mean gain for the experimental group was found to be 37.13 while the mean gain for the control was found to be 37.11. The difference in the mean gain between the experimental and control group is 0.02. This clearly shows that, students who were taught Basic Science and Technology using the blended instructional strategy improved greatly in their achievement in Basic Science and Technology compare to those who were taught using the conventional method during this period.

Research Question 2: What is the difference in the mean retention scores of Upper Basic Students taught Basic Science and Technology using blended instructional strategy and those taught using conventional method in Makurdi Local Government Area, Benue State?

Table 2: Mean Retention Score and Standard Deviation of Students Taught Basic Science and Technology using Blended Instructional Strategy and Conventional Method.

Group	N	Posttest Mean	Posttest SD	Mean Gain	SD
Experimental	83	63.89	2.19	54.94	4.45
Control	90	63.79	2.06	53.43	2.17
Mean Difference	173	0.10			1.51
					1.41

Table 2 shows that, the mean post-test scores of students in the experimental and control group are 63.89 and 63.79 with standard deviation of 2.19 and 2.06 respectively. However, the mean retention score for the experimental and control group is 54.94 and 53.43 with standard deviation of 4.45 and 2.17 respectively. The mean difference in the retention scores of the two groups is 1.51. The mean gain for the experimental group is -8.95 and the mean gain for the control group is -10.36. However, the difference in the mean gain between the experimental and control group is 1.41. This shows that the students that were exposed to the blended instructional strategy in the teaching and learning of Basic science and technology showed higher level of retentive ability as compared to the students that were taught Basic science and technology using the conventional method.

Research Hypothesis 1: There is no significant difference in the mean achievement scores of Upper Basic Students taught Basic Science and Technology using blended instructional strategy and those taught using conventional method in Makurdi Benue State

Table 3: Summary of ANCOVA Result of Students' Achievement by Group.

Source	Type III Sum	df	Mean
Square	F	Sig.	Partial Eta Squared
Corrected		3.681 ^a	2
.840	.405	.667	.003
Model			
Intercept		3511.514	1
14	772.558	.000	.722
Pretest	2.982		1
2.982	.656	.419	.002
Group	.792		1
.972	.174	.677	.001
Error	1349.956		170
4.545			
Total	1224145.000		173
Corrected	1353.637		172
Total			

a. R Squared = .003 (Adjusted R Squared = -.004)

In Table 3, $F(1, 297) = .174$ with p-value of 0.677. Hence $p > 0.05$, the null hypothesis was retained. This implies that, there was no significant difference in the mean achievement scores of Upper Basic Students taught Basic Science and Technology using blended instructional strategy and those taught using conventional method in Makurdi Benue State. It therefore means that, both the students that were taught Basic Science and Technology using the Blended Instructional Strategy and those that were taught using the Conventional method showed similar level of achievement in basic science and technology. The partial eta squared (η^2) value is 0.001. This means that the effect size is extremely small, indicating minimal practical significance of the method of instruction on students' achievement scores in this context.

Research Hypothesis 2: There is no significant difference in the mean retention scores of Upper Basic Students taught Basic Science and Technology using blended instructional strategy and those taught using conventional method in Makurdi Benue State.

Table 4: Summary of ANCOVA Result of Students’ Retention by Group.

Source	F	Type III Sum Sig.	df	Mean Square
--------	---	-------------------	----	-------------

Corrected Total	204.496 ^a		2	102.248
Model	8.012	.000	.051	
Intercept		638.458	1	638.458
	50.029	.000	.144	
Posttest		35.256	1	35.256
	12.981	.000	.009	
Group		165.660	1	165.660
	487.090	.000	.042	
Error		3790.224	170	12.762
Total	886588.000		173	
Corrected Total	3994.720		172	

a. R Squared = .051 (Adjusted R Squared = .045)

In Table 4, $F(1, 297) = 487.09$ with p-value of 0.000. Hence $p < 0.05$, the null hypothesis was rejected. This implies that, there is a significant difference in the mean retention scores of Upper Basic Students taught Basic Science and Technology using blended instructional strategy and those taught using conventional method in Makurdi Benue State. This simply means that, the students in the experimental group who were exposed to the blended instructional strategy in the teaching and learning of basic science and technology demonstrated a greater level of retentive ability as compared to their counterparts who were taught using the conventional method. The partial eta squared (η^2) value is 0.042. This means that the effect size is relatively small, indicating a modest impact of the instructional method on students’ retention scores.

CONCLUSION

The study concluded that students exposed to the blended instructional approach developed

stronger retentive ability, suggesting that the integration of digital and traditional learning experiences can significantly support long-term understanding and recall of concepts in Basic Science and Technology.

Recommendation

It recommended that teachers should adopt the blended instructional approach developed when teaching Basic Science and Technology.

The Ministry of Education should support this through curriculum review, provision of digital facilities, and teacher training. School heads are to create an enabling environment by ensuring access to ICT tools, reliable power supply, and internet connectivity, as well as organizing workshops for teachers. Teachers should integrate blended learning with traditional methods to improve students' understanding and engagement. Policy makers should establish and fund policies that ensure effective ICT integration, teacher training, and proper implementation in junior secondary schools.

REFERENCES

1. Abu, R.B., & Flowers, J. (2019). The effects of cooperative learning methods on achievement, retention and attitudes of students in North Carolina. *Journal of Vocational and Technical Education*, 13(2), 16-22.
2. Akper, G.I., Gire, P.T., & Orshi, A. (2014). Gender as a challenge to educational development in Nigeria: Ubuntu as an ethic for taking up the challenge. *Journal of Women in Academics*, 4(91), 316-324.
3. Ameh, Z.I. (2014). Students' achievement drops as WAEC releases 2014 results. Retrieved may 2023 from <https://dailypost.ng/2014>.
4. Anari, M.I. (2015). Blended instructional strategies and achievement of senior secondary II students in chemistry in Calabar Education Zone, Cross River State, Nigeria. *Prestige Journal of Education*, 4(1), 13-23.
5. Astutik, H.S., Cholily, Y.M., & In'am, A. (2023). Interest and learning achievement of mathematics on blended learning in West Papua. *Mathematics Didactic. Jurnal of Pendidikan Matematika*, 8(3), 281-289.
6. Cai, L., & Cao, Y. (2019). A literature review on the academic achievement of college students. *Journal of Education and Social Sciences*, 20(1).
7. Edem, U.P., & Mary Ideba Anar, M.I (2021). Blended instructional strategy and students' achievement and retention in chemistry in Uyo L.G.A, Nigeria. *Noble*

- International Journal of Scientific Research*, 5(03), 22-28.
8. Lamas, H.A. (2021). School performance. *Journal of Educational Psychology-Propositosy Representaciones*, 3(1), 351-385.
 9. Maccoun, H.S. (2016). The effect of using blended learning on the achievement of students and information retention of fifth graders in the biology course. *Faculty of Education Journal*, 22(95): 209-40.
 10. Mankumari, P., & Ajay, T. (2017). Gender differences in the academic achievement of students. *Journal of development and social engineering*, 3(1), 39-47.
 11. Okwara, O.K. and Upu, F. T. (2018) Perceived effects of environmental factors on teaching and learning of Basic Science and Technology in Benue State, Nigeria. *International Journal of Scientific Research in Education*, 11(5).
 12. Sariterpeci, M., and Yildiz, H.D. (2014). Effect of blended learning environments on high school students' engagement and motivation. *Kirsehir Egitim Fakultesi Dergisi (KEFAD)*, 35(1), 115-129.
 13. Singh, R. (2010). Information and communication technology usage among distance learners and their academic performance: A multidisciplinary study. *International Journal of Enhanced Research in Educational Development*, 1(7), 7-12.
 14. Suleiman, M, Salaudeen, B. and Falode, O. (2017). Effects of computer-based blended learning strategy on secondary school chemistry students' retention in individuallised and collaborative learning settings in Minna, Niger State, Nigeria. *Bulgarian Journal of Science and Education Policy (BJSEP)*, 11(2), 267-278.
 15. Zhang, Z., & Mustapha, S.M. (2022). A literature review on the academic achievement of college students. *Journal of Education and Social Sciences*, 20(1), 11-18.