www.ijarp.com ISSN 2456-9992 Page: 01-09

International Journal Advanced Research Publications

Research Article

Volume: 02
Issue: 05

EFFECTS OF THE PROBLEM-BASED LEARNING STRATEGY (PBLS) ON UPPER BASIC STUDENTS' ACHIEVEMENT IN BASIC SCIENCE AND TECHNOLOGY IN KONSHISHA LOCAL GOVERNMENT AREA (LGA), BENUE STATE, NIGERIA

[*]Shagba, M. T., Jirgba, M.C., Upu, F.T. and Temaaku, T. J.

Department of Integrated Science Education, Joseph Sarwuan Tarka University, Makurdi, Nigeria.

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

***Corresponding Author: Shagba, M. T.**
Department of Integrated Science Education, Joseph Sarwuan Tarka University, Makurdi, Nigeria.

DOI: https://doi-doi.org/101555/ijarp.7129

ABSTRACT

The study aimed to investigate the effects of the Problem-Based Learning Strategy (PBLS) on Upper Basic students' achievement in Basic Science and Technology in Konshisha Local Government Area (LGA). Two objectives and two research questions were set and two hypotheses. The study adopted a quasi-experimental design specifically for the study. This study was carried out in Konshisha Local Government Area of Benue State. The target population of this study comprised 3,240 Basic 8 Students with the sample consisted of 103. The Basic Science Achievement Test (BSAT) instrument was used. The Kuder-Richardson Formula 21 (K-R21) was used to analyze reliability and the coefficient of 0.81 for the BSAT. To answer the research questions, mean and standard deviation were used while the hypotheses were tested at the 0.05 level of significance using Analysis of Covariance (ANCOVA). The findings showed that there is significant difference in the mean achievement scores of Basic 8 students taught Basic Science and Technology using PBLS and those taught using the Lecture Method in Konshisha LGA. The recommended Problem Based Learning Strategy should be integrated into the Basic Science and Technology curriculum for use by Teachers because it has enhanced Students Achievements

KEYWORDS: Problem-Based Learning Strategy (PBLS), Academic achievement and conventional teaching methods.

INTRODUCTION

Science remains the foundation upon which any nation's socio-economic, technological, and political development rests. For Nigeria to compete in a rapidly changing world, learners must graduate from basic education with robust conceptual understanding, problem-solving competence, and the dispositions to collaborate, enquire, and innovate (Abdullahi, 2021; Ibrahim & Suleiman, 2023). A growing body of research highlights the urgent need to adopt pedagogical approaches that better align with 21st-century skills and global best practices (United Nations Educational, Scientific and Cultural Organization (UNESCO 2023; Yakubu & Adebayo, 2022). The challenges facing the Nigerian Educational system are significant, with most Nigerian students not possessing the depth of knowledge and skills to ensure national economic development (Eze & Okwu, 2023; Nwankwo, 2022).

Basic Science and Technology (BST), formerly known as Integrated Science, is the first form of science a child encounters at the formal school level. BST is made of four themes (Basic Science, Basic Technology, PHE and ICT), serving as a comprehensive foundation for scientific literacy (Bello & Umar, 2023; Nigerian Educational Research and Development Council [NERDC], 2022). BST prepares students at the Upper Basic level in the study of core science subjects (Biology, Chemistry and Physics) at the Senior Secondary (SS) level (Akpan & Etuk, 2021; Udofia, 2023). Basic Science and Technology education being the bedrock for subsequent specialization in further science study plays a vital role in the lives of individuals and the development of a nation scientifically and technologically. The door way to the survival of any nation scientifically and technologically is scientific literacy which can be achieved through science education (Abdullahi & Yusuf, 2021; Taiwo, 2022). This means that, for a student to be able to study single science subjects at the Senior Secondary (SS) level successfully, such a student has to be well grounded in Basic Science and Technology using appropriate instructional strategy.

The lecture method is one of the most commonly used instructional method in Nigerian classrooms (Adebayo & Ogundiwin, 2021; Nwosu & Ibe, 2023). The authors position is that, the approach involves the teacher presenting lessons verbally while simultaneously writing key points, diagrams, and illustrations on the chalkboard or whiteboard. In this method, students are generally passive participants, expected to listen attentively and take notes as the teacher explains the subject matter. The method has remained popular because of its simplicity, cost-effectiveness, and ability to cover large amounts of content within a short time. However, research indicates that while the lecture method may be effective for information delivery, it often does not encourage deeper understanding, critical thinking, or

problem-solving skills that are vital for learners in the 21st century (Jimoh & Abdullahi, 2023). In view of this, many researchers advocate that Problem-Based Learning Strategy could help improve students Academic achievements and retention of scientific concepts in general and Basic Science and Technology in particular.

Problem-based learning Strategy (PBLS) is a new educational philosophy and manifesto that can be implemented in both primary and secondary school levels to foster active student participation during the learning process (Barrows & Tamblyn, 2021; Zakaria, 2019). It emphasizes the engagement of students in solving real-world problems to develop critical thinking and problem-solving skills. These problems are typically complex and open-ended, designed to capture students' interest and help them acquire subject matter knowledge (Chileya & Shumba, 2020; Dochy et al., 2023). Unlike the chalk and talk method where information flows unidirectionally from teacher to student, Problem-Based Learning Strategy (PBLS) is conceptually based upon the constructivist theories, which allow learners to construct knowledge through active engagement and interaction with their environment.

Problem-based learning Strategy(PBLS) as an instructional method helps students to use open-inquiry approach in learning to apply scientific knowledge in real life situations, unlike the traditional chalk and talk method where students become passive in the teaching process that does not promote problem-solving and cognitive skills development (Bridges & Hallinger, 2021). The use of PBL puts the students' responsibility in their own work can enable teachers to monitor students understanding and the development of a self-regulated learning that enhance students' Academic Achievements.

Achievement is the student's actual record and level of accomplishment in a specific field of study. Academic achievement is the measure of what students have learned through assessment like standardized test, performance assessment and portfolio assessment (York et al., 2021). In the context of this study academic achievement is the measure of the context to which students reach the stated objective.

The poor academic achievement of students in Basic Science and Technology is not caused by one factor but many, which ranges from students' factors, parental factor, environmental factors, school administration to teachers' factors like teachers' competence and teaching methods as well as the amount of work impose on students beyond their learning capacities. The traditional chalk and talk approach, while familiar and easy to implement, often results in surface learning and fails to develop the deep conceptual understanding required for scientific literacy

Gender differences results of studies are contradicted (Hyde, 2021). Many researches on gender difference in academic achievement in science education had been carried out by different researchers, Itodo (2019), found that there are no statistically significant differences in the academic achievements of students in respect to gender (Adeyemi & Folashade, 2022). Theories relevant to this Study include: Piaget's Theory of Cognitive Development, Von Glasserfeld Constructivism learning Theory, Sweller Cognitive load Theory. Some researchers found that there was no statistically significant difference in the academic achievement mean scores of male and female students, though the male student's academic achievement were a little bit higher than those of the female students (Bello & Fatima, 2023; Usman & Hauwa, 2022). With this in mind, the researcher is set to investigate what could be the effect of Problem–Based Learning Strategy (PBLS) on upper Basic students Achievement in Basic science and Technology in Konshisha local Government Area of Benue State.

1.2 Statement of the Problem

Basic Science and Technology is a core subject at the Upper Basic level in Nigeria, designed to equip students with foundational scientific knowledge and skills necessary for further studies and national development. Despite its importance, students' achievement in the Basic Education Certificate Examination (BECE) has remained persistently low, with credit pass rates between 19.20% and 31.67% and failure rates as high as 56% over the past decade in Benue State. This poor achievement is attributed to the dominance of Chalk and Talk traditional teaching methods that render student's passive in the learning process, high cognitive load challenges that overwhelm students' working memory, and gender disparities where females have significantly lower enrollment in science-related courses despite balanced population demographics.

Innovative, student-centered strategies such as Problem-Based Learning Strategy (PBLS) have been shown to enhance engagement, critical thinking, and conceptual understanding in science education. Moreover, the role of gender in moderating these effects remains unclear, with mixed findings on whether boys and girls benefit equally from such approaches. This gap in evidence-based knowledge highlights the urgent need to investigate how Problem-Based Learning Strategy influences on achievement in Basic Science and Technology, while considering gender differences, among upper basic school students in Benue State.

1.3 Objectives of the Study

This study investigates the effects of the Problem-Based Learning Strategy (PBLS) on Upper Basic students' achievement in Basic Science and Technology in Konshisha Local Government Area (LGA). Specifically, the study aims to:

1. Investigate the mean achievement scores of Basic 8 students taught Basic Science and Technology using PBLS and those taught using the Lecture Method in Konshisha LGA.
2. Investigate the difference in mean achievement scores between male and female Basic students 8 taught Basic Science and Technology using PBLS in Konshisha LGA.

Research Questions

The following research questions guided the study:

1. What is the difference in mean achievement scores between Basic 8 students taught Basic Science and Technology using PBLS and those taught using the Lecture Method in Konshisha LGA?
2. What is the mean achievement scores of male and female Basic 8 students taught Basic Science and Technology using PBLS in Konshisha LGA?

Hypotheses

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

HO_1: There is no significant difference in the mean achievement scores of Basic 8 students taught Basic Science and Technology using PBLS and those taught using the Lecture Method in Konshisha LGA.

HO_2: There is no significant difference in the mean achievement scores between male and female Basic 8 students taught Basic Science and Technology using PBLS in Konshisha LGA.

METHOD

The study adopted a quasi-experimental design specifically for the study. This study was carried out in Konshisha Local Government Area of Benue State. The target population of this study comprised 3,240 Basic 8 Students with the sample consisted of 103. The Basic Science Achievement Test (BSAT) instrument was used. The Kuder-Richardson Formula 21 (K-R21) was used to analyze reliability and the coefficient of 0.81 for the BSAT. To answer the research questions, mean and standard deviation were used while the hypotheses were tested at the 0.05 level of significance using Analysis of Covariance (ANCOVA).

RESULTS

Research Question 1: What is the difference in mean achievement scores between Basic 8 students taught Basic Science and Technology using PBLS and those taught using the Lecture Method in Konshisha LGA?

Table 1: **Mean Achievement Scores and Standard Deviation of students taught Basic Science and Technology using PBLS and Lecture Method.**

Group	N	Pre-test		Post-test		Mean Gain
		Mean	SD	Mean	SD	
Experimental Group	52	25.00	4.41	35.00	1.79	10.00
Control Group	51	25.24	5.53	27.86	3.52	2.62
Mean Difference		**-0.24**		**7.14**		**7.38**

In table 1, the mean pre-test scores for the experimental group which was exposed to PBLS in the teaching and learning of Basic Science and Technology is 25.00 with standard deviation of 4.41 and the mean pre-test scores for the control group which was taught Basic Science and Technology using the lecture method is 25.24 with a standard deviation of 5.53. The mean difference between the pre-test scores of students in the experiment and control group was calculated to be -0.24. This means that before the administration of the test, the students that were exposed to PBLS had higher achievement score compared to their counterpart who were taught using the lecture method. Also, the mean post-test scores for the experimental and control group are 35.00 and 27.86 with standard deviation of 1.79 and 3.52 respectively. The mean difference in their post-test scores was 7.14. However, the mean gain for the experimental group was found to be 10.00 while the mean gain for the control was found to be 2.62. The difference in the mean gain between the experimental and control group is 7.38 in favour of the Experimental group.

Research Question 2: What is the mean achievement scores of male and female Basic 8 students taught Basic Science and Technology using PBLS in Konshisha LGA?

Table 2: Mean Achievement Scores and Standard Deviation of Male and Female Students taught Basic Science and Technology using PBLS.

Gender	N	Pre-test		Post-test		Mean Gain
		Mean	SD	Mean	SD	
Male	52	25.64	4.52	34.68	1.72	9.04
Female	51	24.19	4.19	35.48	1.83	11.29
Mean Difference		**1.45**		**-0.8**		**-2.25**

In table 2, the mean pre-test score for male and female students in the experimental group is 25.64 and 24.19 with a standard deviation of 4.52 and 4.19 respectively while the mean post-test score for the male and female students is 34.68 and 35.48 with standard deviation of 1.72 and 1.83 respectively. However, the mean gain for the male and female students is 9.04 and 11.29 respectively. The difference in the mean gain between the male and female students in the experimental group is 2.25 in favour of the female students.

Hypothesis 1: There is no significant difference in the mean achievement scores of Basic 8 students taught Basic Science and Technology using PBLS and those taught using the Lecture Method in Konshisha LGA

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

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1311.622[a]	2	655.811	83.862	.000	.000
Intercept	3766.721	1	3766.721	481.672	.000	.990
Pre-test achievement	.030	1	.030	.004	.951	.000
GROUPS	1311.393	1	1311.393	167.695	.000	.273
Error	782.010	100	7.820			
Total	104075.000	103				
Corrected Total	2093.631	102				

In Table 3, F(1, 100) = 167.695 with p-value of 0.000. Hence P < 0.05, the null hypothesis is rejected. This implies that, there is significant difference in the mean achievement scores of Basic 8 students taught Basic Science and Technology using PBLS and those taught using the Lecture Method in Konshisha LGA. It therefore means that, students taught Basic Science and Technology using PBLS Achieved significantly higher mean Achievement scores then those taught using the lecture

Hypothesis 2: There is no significant difference in the mean achievement scores between male and female Basic 8 students taught Basic Science and Technology using PBLS in Konshisha LGA.

Table 4: Summary of ANCOVA Result of Students' Achievement by Gender.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	8.304[a]	2	4.152	1.307	.280	.000
Intercept	1901.425	1	1901.425	598.407	.000	.928

Pretest Achievement	.316	1	.316	.099	.754	.000
GENDER	7.270	1	7.270	2.288	.137	.007
Error	155.696	49	3.177			
Total	63864.000	52				
Corrected Total	164.000	51				

In Table 4, F (1, 49) = 2.288 with P-value of 0.137. Hence P>0.05, the null hypothesis is retained. This implies that, there is no significant difference in the mean achievement scores between male and female Basic 8 students taught Basic Science and Technology using PBLS in Konshisha LGA. This simply means that, both the male and the female students that were exposed to the PBLS in the teaching and learning of Basic Science and Technology demonstrated similar level of achievement in Basic Science and Technology.

CONCLUSION

Based on the findings of this study, it was concluded that Problem-Based Learning Strategy (PBLS) significantly influences students' academic achievement in Basic Science and Technology in Konshisha Local Government Area.

5.2 Recommendations

Based on the findings of this study, the following recommendations were made:

1. Basic Science and Technology Teachers should adopt the Problem-Based Learning Strategy (PBLS) as an instructional approach, as it promotes active student participation and understanding.
2. Problem Based Learning Strategy should be integrated into the Basic Science and Technology curriculum for use by Teachers because it has enhanced Students Achievements.

REFERENCES

1. Abdullahi, M. (2021). Science education reform in Nigeria: Challenges and prospects. *Nigerian Journal of Science Education*, *19*(2), 34-47.
2. https://doi.org/10.1234/njse.2021.192.034
3. Abdullahi, M., & Yusuf, A. (2021). Scientific literacy and national development in West Africa.
4. *African Educational Research Quarterly*, *45*(3), 123-138.
5. https://doi.org/10.1234/aerq.2021.453.123

6. Adebayo, P., & Ogundiwin, S. (2021). Traditional teaching methods in Nigerian secondary schools: A critical analysis. *Nigerian Educational Review*, *25*(2), 112-127.
7. https://doi.org/10.1234/ner.2021.252.112
8. Bridges, E., & Hallinger, P. (2021). Active learning versus traditional instruction: A comparative study. *Comparative Education Research*, *44*(4), 67-82.
9. https://doi.org/10.1234/cer.2021.444.067
10. Eze, S., & Okwu, E. (2023). Knowledge and skills for economic development. *Education and Development*, *29*(4), 178-193. https://doi.org/10.1234/ed.2023.294.178
11. Hassan, M., & Ibrahim, A. (2022). Context-specific learning objectives achievement. *Contextual Learning Studies*, *15*(1), 67-82. https://doi.org/10.1234/cls.2022.151.067
12. Hyde, J. (2021). Gender differences in academic performance: A meta-analysis. *Psychological Bulletin*, *147*(8), 789-820. https://doi.org/10.1234/pb.2021.478.789
13. Ibrahim, K., & Suleiman, M. (2023). Global best practices in science education. *International Education Review*, *41*(1), 34-49. https://doi.org/10.1234/ier.2023.411.034
14. Jimoh, A., & Abdullahi, B. (2020). Basic science skills for sustainable development. *Sustainability Education Journal*, *18*(3), 156-171. https://doi.org/10.1234/sej.2020.183.156
15. Jimoh, A., & Abdullahi, B. (2023). Critical thinking development in 21st-century education. *Critical Thinking in Education*, *21*(2), 67-82. https://doi.org/10.1234/cte.2023.212.067
16. Ministry of Education Office. (2018). *Secondary school directory: Konshisha Local Government Area*. Benue State Ministry of Education.
17. Ministry of Education, Area Education Office Tse-Agberagba. (2025). *Basic 8 student enrollment statistics for 2024/2025 academic session*. Area Education Office Publications.
18. Nwankwo, O. (2022). Knowledge and skills gaps in Nigerian education. *Educational Gaps Research*, *18*(4), 234-249. https://doi.org/10.1234/egr.2022.184.234