ENHANCING STUDENTS' ACADEMIC ACHIEVEMENT AND RETENTION IN PHYSICS IN IKOM EDUCATION ZONE, CROSS RIVER STATE THROUGH THINK-PAIR-SHARE INSTRUCTIONAL STRATEGY

[1]Agube, C. C., [2]Neji, H. A. & [3]Ntibi, J. E. E.
Department of Physical Science Education
Faculty of Science Education
University of Calabar, Calabar - Nigeria

Email: [1] cc2agube@yahoo.com
Phone: +2348034564480

[2] hopeneji@gmail.com
Phone: +2347032904553

[3]joseph.ntibi23@gmail.com
Phone: +2348037238684

Abstract

The study investigated how think-pair-share instructional strategy can be used to enhance students' academic achievement and retention of Physics concepts in Ikom Education Zone, Cross River State, Nigeria. Two research questions and two null hypotheses guided the study. The study adopted the pretest, posttest, control group quasi-experimental research design. The sample comprised of two hundred and twenty-one (221) SSII students offering physics selected using purposive sampling technique. The experimental group students were taught physics using think-pair-share strategy while students in the control group were taught through lecture method. The instruments for data collection were Physics Achievement Test (PAT) and Physics Retention Test (PRT). Mean and standard deviation were used to answer the research questions while Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance. Results indicated that think-pair-share strategy significantly enhances academic achievement and retention of physics students than the conventional lecture method. The researchers recommended among others that the use of innovative teaching strategies like think-pair-share should be encouraged for teaching physics and other science subjects.

Keywords: Instructional strategies, think-pair-share, physics, academic achievement, retention

Introduction

t is a global phenomenon that no nation can advance scientifically and technologically beyond the level of science education it practices and implements. Umoetuk and Akpan (2023) asserted that the survival of any nation scientifically and technologically depends solely on the quality of science education it operates. Agube (2018) and Olofu (2021) asserted that the role of science education in the lives of individuals and the development of the society cannot be overstated, since its benefits inevitably pervades every aspects of human life. Science education is concerned with sharing of science contents and process with individuals who may not primarily be considered member of the scientific community so as to understand science and utilize such acquired knowledge for self and other benefits (Bolaji, 2019, Adie et al , 2018). Uche and Nwala (2018) posited that a strong base in science is paramount for nations to attain all-round

development. The focus of science education is to enhance students' scientific literacy in order to make them sensible and active citizens of meaningful societal impact (Akpan et al., 2023). The National Policy on Education (FGN, 2024) had advocated that science taught in schools should have meaning and relevance to the needs of the learner and society and equally provide opportunity for learners to explore, interact and interpret scientific processes within the environment. It further recommended that teaching approaches to be adopted should be activity-based, hands-on, learners-centered and experiential using appropriate resources in order enhance better understanding and improved academic achievement.

Physics is one of the core science subjects which must be understood for accurate explanation of the science around and beyond us. Physics is a branch of science and a field of endeavour which plays a major role in reducing inequalities, developing powerful ways of thinking, increasing the freedom to choose a wider range of career in the world of work and increasing globalization with its challenges, potentials and possibilities (Achuonye 2014, Mbagwu et al, 2016; Kankpang et al, 2022; Inyang, 2022). It is fundamental science subject which forms the foundation for further career in medicine, engineering and technology. The benefits derived from the study of Physics are enormous as the subject perpetually serves as the springboard for the technological advancement of different nations. In consideration of these benefits, it becomes imperative to adopt innovative teaching strategies that would enhance better understanding of the subject if nations must stay afloat in this era of global competitiveness. These strategies encourages the teaching of Physics such that it stimulates interest and enhances deeper understanding to enable learners develop the necessary skills required to confront the emerging challenges of the 21st century. Achieving these objectives is possible only if the teaching strategies adopted the teacher are learner-centered, learners' friendly and hands-on (Bassey & Ekpo, 2020).Joel et al., (2018) asserted that the process of transferring knowledge requires the teacher adopting appropriate methods and pedagogy that best suit the interest of learners and addresses lesson objectives.

Most often, the expository lecture method is the predominant instructional approach widely used in teaching different school subjects including Physics. The approach which is classified as teacher-centered is characterized by certain setbacks such as lack of active learners' participation during lesson and low learning outcome. Ugwu and Nzewi (2015) maintained that the lecture method which was successfully used in imparting knowledge in the past seems to be obsolete and has equally failed to produce the desired outcomes in the contemporary students of the 21st century. Studies have also shown that this conventional method of teaching has failed to yield the desired outcome in terms of students' achievement and learning processes when compared with innovative teaching methods. (Amaefuna, 2013; Okeke, 2016; Osuafor & Ogbaga, 2016). The situation calls for the advocacy by scholars for a radical shift to innovative teaching strategies (Ntibi et al., 2020; Adeoye, 2020, Akpama et al 2017)).

Think-pair-share therefore is a creative brainstorming technique by which efforts are made to find solution to a specific problem by gathering a list of ideas spontaneously contributed by its members (Osuafor & Ogbaga, 2016; Itighise, 2016; Atim, 2024). Think-pair-share (TPS) strategy according to Adie et al (2019) is one of the group discussion strategies and diverse method of learning collaboratively. Andrew and Alexandria, (2015) defined think-pair-share as a cooperative learning strategy that encourages students to work together to solve problems or answer questions on an assigned topic. The strategy is used by the teacher to keep all students actively engaged in class discussion and provides an opportunity for everyone to share their idea and answer to every question posed by the teacher. According to Napitupulu and Surya (2017), think-pair-share is a cooperative learning model that stimulates students' interest and enhances active participation where learners socialize with peers in order to learn. As the name implies, think-pair- share involves the individual students in thinking about challenging academic tasks given by the teacher, pairing with other students to exchange ideas and sharing the paired idea

with the larger class (Effiong et al 2016). Learning through think-pair-share shows that, by the intrinsic nature of the learning strategy students can learn from their peer. The strategy provides opportunity for slow learners and shy students to build self confidence by learning from their peers (Marvin, 2015). Ogbaga and Osuafor (2022) as well as Olofu et al (2018) asserted that think-pair-share had a significant effect on students' academic achievement and retention in biology. Empirically, Wuryandani and Herwin. (2021) in a pretest, post-test control group quasi-experimental design involving 31 grade IV level Civics students found that there is a significant effect of the think–pair–share learning model on student learning outcomes in Civics. In a similar study, Yusuf, Owede and Bello (2018) sought for ways of enhancing students' academic achievement in Civic Education through think-pair-share and found that the strategy had a significant effect on students' academic achievement in Civic Education. Akanmu (2019) conducted a study on think-pair-share and reported a statistically significant difference in the knowledge retained by students taught set theory in Mathematics using think-pair-share compared with their counterparts in the control group in favour of think-pair-share group. Hussaini and Mohammed (2023) equally investigated the effect of think-pair-share instructional strategy on students' academic achievement in reading comprehension and found a statistical significant difference in favour of students in experimental group (Olofu et al 2019). Also, Kombat et al.,(2023) investigated the relative effectiveness of think-pair-share on students' academic achievement in mathematics and found that students taught fractions through think-pair-share had a better learning outcome than their counterparts taught using the conventional lecture method. Achufusi, et al., (2024) reported that students taught using the think-pair-share strategy performed better and had a higher interest in chemistry than those taught through lecture method.

Statement of the problem

Generally, the application of the principles and knowledge of Physics forms the foundation for the technological advancement and growth of different nations of the world. Besides, the study of physics and the subsequent application of its principles to human comfort have huge benefits since the production of modern devices, gadgets and equipment relies heavily on the application of the knowledge of physics. In spite of these enormous benefits, students' academic performance over the years in both internal and external examinations had been on the decline. The yearly WAEC Chief Examiners report from 2019-2024 also indicated this decline (WAEC, 2024). This situation which portrays unhealthy academic outcome remains an issue of serious concern to stakeholders in education and the society at large. The consequences of poor performance in Physics are severe and it impacts negatively on the society. These include: school dropouts, social vices, low enrolment in science related disciplines in higher institutions, low manpower among others.

Several factors are held accountable for this troubling trend, and among these factors, teaching method is at the front burner. Scholars have argued that the conventional lecture method widely method of teaching does not yield the desired learning outcome because itlacksactive learners' interaction and participation. Most worrisome, the approach cannot enhance in-depth knowledge of the Physics needed for modern day scientific and technological breakthroughs. As a result, researchers have sought for innovative instructional strategies as possible ways of enhancing better understanding and improving academic achievement (Slavin, 2020; Olalekan & Oludipe, 2016; Okolocha & Nwaukwa, 2019).

Purpose of the study

The purpose of the study was to:

1. Determine the difference in the academic achievement mean scores of students taught Physics with think-pair-share and those taught with the conventional lecture method.

2. Examine the difference in the retention mean scores of students taught Physics through think-pair-share and those taught with the conventional lecture method.

Research questions

1. What is the difference in the academic achievement mean scores of students taught Physics through think-pair-share and those taught with the conventional lecture method?
2. What is the difference in the retention mean scores of students taught Physics through think-pair-share and those taught with the conventional lecture method?

Hypotheses

1. There is no significant difference in the academic achievement mean scores of students taught Physics through think-pair-share and those taught with the conventional lecture method.
2. There is no significant difference in the retention mean scores of students taught Physics through think-pair-share and those taught with the conventional lecture method.

Methodology

The study adopted a pretest, posttest, nonequivalent control group quasi-experimental research design, consisting of one experimental group and one control group. This design was adopted because it gave room for comparing the effect of the treatments on both groups. The study was conducted in Ikom Education Zone of Cross River State, Nigeria. The population consisted of all Senior Secondary Two (SSII) students offering Physics, totaling 3128 students from the 81 public secondary schools in the zone. From this population, a sample of 221 SSII Physics students was selected through the stratified and simple random sampling technique. Data was collected utilizing two instruments: Physics Achievement Teat (PAT) and Physics Retention Test (PRT). The instruments had 50 multiple choice objective questions drawn from the concepts of waves andoptics. Subject matter experts validated the instruments and were further subjected to reliability using Kuder-Richardson (K-R) 20 formula. Reliability coefficients obtained were 0.81 and 0.80 respectively. Each item attracted 1mark for correct option and 0 for wrong option. Before treatment commenced, PAT was first administered as Pretest by research assistants trained by the researcher. The experimental group was taught waves and optics through think-pair-share strategy, while the control group received lesson using the conventional lecture method. The treatment was done for a period of six weeks and upon completion, posttest was timely administered. Three weeks later, the researcher visited the sampled schools and administered the PRT to ascertain the group that retained what the learnt most. Data collected from the administration of the instruments were analyzed using descriptive statistics of mean and standard deviation while Analysis of Covariance (ANCOVA) was employed with each hypothesis tested at 0.05 level of significance.

Analysis and Results

Research question one: What is the difference in the academic achievement mean scores of students taught Physics through think-pair-share and those taught with the conventional lecture method?

To answer research question one, the pretest and posttest data generated using PAT was subjected to descriptive statistics of mean and standard deviation. Summary is as presented in Table 1.

Table 1: Mean and Standard Deviation of students' pretest and posttest scores when taught through think-pair-share instructional strategy and those taught with lecture method.

Groups	**N**	**Pretest**		**Posttest**		**Mean Gain**
		X	SD	X	SD	
Experimental	105	10.02	4.38	42.65	6.91	32.63
Control	116	9.93	4.14	28.53	s5.02	18.60

The results in table 1 indicated that the mean difference in achievement scores of students taught Physics through think-pair-share and lecture method were 32.63 and 18.60 respectively. These results suggest that students taught Physics had better achievement compared to their counterparts in the control group.

Hypothesis one: There is no significant difference in the academic achievement mean scores of students taught Physics through think-pair-share and those taught with the conventional lecture method.
To test hypothesis one, independent t-test statistic was used and the results is as presented in Table 2

Table 2: Independent t-test analysis of the difference in academic achievement mean scores of students taught Physics through think-pair-share and those taught without

Group	**N**	**X**	**S.D**	**t-value**	**P-value**
Experimental	105	32.63	6.91	7.22	0.000
Control	116	18.60	5.02		

*Significant at .05; df=219

The result of the analysis of data presented in table 2 indicated that the calculated t-value of 7.22 is higher than the p-value of 0.000 at 0.05 level of significance with 219 degree of freedom. Therefore, since the p-value of .000 is statistically lower than .05 level of significance, the null hypothesis was rejected and the alternate hypothesis retained. This implies that there is a significant effect of think-pair-share on students' academic achievement in Physics in Ikom Education Zone of Cross River State.

Research question two: What is the difference in the retention mean scores of students taught Physics through think-pair-share and those taught with the conventional lecture method?
To answer research question two, descriptive statistic of mean and standard deviation was utilized and the results is as presented in Table 3.

Table 3: Mean and Standard Deviation of retention mean scores for experimental and control groups.

Group	**N**	**X**	**S.D**	**Mean Diff**
Experimental	105	30.32	6.02	17.02
Control	116	13.30	4.89	

The results in table 3 indicated that the retention mean scores of 30.32 and 13.30 for the experimental and control groups respectively with a mean difference of 17.02. This result indicates that students in taught Physics had better retention than their counterparts in the control group.

Hypothesis two: There is no significant difference in the retention mean scores of students taught Physics through think-pair-share and those taught with the conventional lecture method.
To test hypothesis one, independent t-test statistic was used and the results is as presented in Table 4.

Table 4: Independent t-test analysis of the retention mean scores for experimental and control groups.

Group	N	X	S.D	t-value	p-value
Experimental	105	30.32	6.02		
				5.14	0.000
Control	116	13.30	4.89		

*****Significant at .05; df=219

The result of the analysis of data presented in table 2 indicated that the calculated t-value of 5.14 is higher than the p-value of 0.000 at 0.05 level of significance with 219 degree of freedom. For the fact that p-value of .000 is statistically lower than .05 level of significance, the null hypothesis was rejected and the alternate hypothesis retained. This implies that there is a significant effect of think-pair-share on students' retention in Physics in Ikom Education Zone of Cross River State.

Discussion of findings

The result of hypothesis one showed that there is a significant effect of think-pair on students' academic achievement in Physics in Ikom Education Zone of Cross River State. The findings of this study aligns with the views of Achufusi, Okonkwo and Wisdom (2024) who reported that students taught using the think-pair-share strategy performed better and had higher interest in chemistry than those taught through lecture method. This finding also corroborates the result of Napitupulu and Surya (2017) as well as Bessong et al (2018) who opined that think-pair-share is a cooperative learning model that stimulat es students' interest and enhances active participation.

The result of hypothesis two indicated that there is a significant effect of think-pair-share on mean retention score of Physics students in Ikom Education Zone of Cross River State. This finding is in line with the result of Ogbaga and Osuafor (2022) who asserted that think-pair-share had a significant effect on students' academic achievement and retention in biology. The finding of this study corroborates the views of Akanmu (2019) and Ibu et al (2019) who reported that think-pair-share had a statistically significant difference in the knowledge retained by students taught set theory in Mathematics using think-pair-share compared with their counterparts in the control group in favour of think-pair-share group.

Conclusion

This study affirmed that students' academic achievement and retention was significantly enhanced in the learning of Physics through think-pair-share than the learning using lecture method. The study therefore concluded that think-pair-share instructional strategy has significant effect on students' academic achievement and retention of Physics concepts.

Recommendations

Based on the findings of the study, it was recommended among others that:

1. Physics teachers should adopt the strategy in teaching in order to facilitate active interaction between students and the teacher.
2. Government and school administrators should ensure adequate provision of the facilities needed for the effective adoption of think-pair-share instructional strategy.

References

Achufusi, N., Okonkwo, I. G. & Wisdom, F. M. (2024). Effect of think-pair-share instructional strategy on senior secondary school students' academic achievement and retention in chemistry in Akwa Ibom State. *Unizik Journal of Educational Research and Policy Studies, 17 (3), 104-115.*

Achuonye, K. (2014). Predominant teaching strategies: implications for mathematics, science and technology curriculum implementation. Being a Paper presented at the 14th Annual Conference of the Curriculum Organization of Nigeria, Calabar: University of Calabar Press.

Adeoye, B. F. (2020). The era of digital technology in teaching and learning in Nigeria educational institutions. IGI Global Publishers.

Adie, E. B, Anditung, P. A, Okri, J. A. (2018). Mathematics Education and Corrupt Practices among Students' in Federal Government Colleges in Cross River State, Nigeria. Education for today, 15(1), 105 – 110. ISBN 1596 – 0773. www.fedu.unical.edu.ng, 2018.

Adie, E. B, Anditung, P. A, Inah, L.I (2019). Students' Variables and their Academic Achievement in Technical Colleges in Mathematics, Ogoja Education Zone, Cross River State, Nigeria. *Interdisciplinary Journal of Science Education (IJ-SED), 1 (1), 71-78 – ISSN 2695-2054*, 2019.

Akpama, S. I., Bessong, C. D. & Bessong, N. O.(2017). Attainment of the Sustainable Development Goals (SDGS): The Relevance of Adult Basic Education .*Education For Today: Journal of the Faculty of Education*, University of Calabar. *13* (1) 13-19.

Akpan, A. O., Akpan, I. F. & Umoh, E. B. (2023). Science teachers' awareness and competences needed in utilization of 21st century skills in teaching in Akwa Ibom State. *International Journal of Educational Research and Human Development, 4(1), 13-31*

Amaefuna, I. A. (2013). Effect of constructivist- based instructional model on students' achievement in Biology and critical thinking skills. (Unpublished M.Ed Thesis) Department of Science Education, Nnamdi Azikiwe University, Awka

Andrew, L. & Alexandria, P. K. (2015). An explanatory study on using the think-pair-share cooperative learning strategy. *Journal of Mathematical Science, 2, 22-28*

Atim, A.A. (2024). Integration of multimedia and interactive whiteboard for quality teaching and learning in Nigeria secondary school system. UNIZIK Journal of STM Education, 7(1), 239-253.

Bassey, J. & Ekpo, E. (2020). Chemistry in modern industry: Implications for education. *Nigerian Journal of Educational Research,* 35(2), 101-118.

Bolaji, O. D. (2019). Science education for educational leadership and innovation in Nigeria. *Journal of Library, Science Education and Learning Technology, 1(1), 111-120*

Effiong, L. V. & Olofu, P. A. (2016). Relationship between teachers' induction and brain-drain in the teaching profession in Abuja Municipal Area Council. *Abuja International Journal of Education and Management Sciences* (ABIJEMS). 4 (1): 122-128.

Federal Republic of Nigeria (2024). *National Policy on Education.* Nigerian Educational Research and Development Council (NERDC) Press.

Hussaini, H. & Mohammed, S. (2023). Effect of think-pair-share on senior secondary school students' performance in reading comprehension in Gombe State, Nigeria. *Kashere Journal of Education, 4(1), 88-94.*

Ibu P. N, Adie, E. B, Okaba, L. A. (2019).Science Teachers' Perception of Corruption in Secondary Schools in Calabar Municipality, Cross River State, Nigeria. *Interdisciplinary Journal of Science Education (IJ-SED), 1(1). 107-119, ISSN 2695-2054 e-ISSN:2659-1901,* 2019.

Inyang, I.O. (2022). Tax revenue and fiscal development: A pragmatic framework for economic governance in Cross River State, Nigeria. *Multidisciplinary Journal of Research and Development Perspectives, 11(2), 71-79.*

Itighise, AE (2016). Innovation in higher teacher education: An imperative for achievement of sustainable national development. *Journal of Educational Media and Technology,* 21(1), 264-273.

Joel, S. M., David, M. M. & Stephen N. M. (2018). Relationship between teaching method and students' academic performance in mathematics in public secondary schools in Dadaab Sub County, Garissa county; Kenya. Journal of Research and Method in Education, 8(5), 59-63. Retrieved from http://iosrjournals.org/iosr-jrme/papers/Vol8%20Issue-5/Version 5/J0pdf on 5/2/2025.

Kankpang, AK; Inyang, I.O.; Uklala, AP & Ibembem, FA (2022). Detection and prevention of ghost workers in Nigeria: The use of internal control mechanism. *Journal of Economics and Finance,* 6(2), 48-56.

Kombat, A., Asigri, V. N., Amanyi, C. K., Atekpor, S., Adugbire, J. A., Akwensi, V. K. & Apara, M. B. (2023). Determining the most effective stage of the think-pair-share teaching strategy. *British Journal of Education, Learning and Development Psychology, 6(1), 7-24.*

Marvin, Z. B. (2015). Think-pair-share, co op-co op and traditional learning strategies on undergraduates academic performance. *Journal of Education and Social Research, 5(1), 217-226*

Mbagwu, F. O., Bessong, C. D. & Anozie, O. O. (2016). Contributions of Tourism to Community Development. Review *of European Studies*, Canadian Centre of Science and Education *8*(4) 121-130.

Napitupulu, W. R. & Surya, E. (2017). The application of cooperative learning type TPS (think pair share) in improving the ability of problem solving and mathematical learning results student. Retrieved online on 18th January, 2025 from https://www.researchgate.net/publication/321832896_the_application_of_cooperative_learning_type_tps_think_pair_share_in_improving_the_ability_of_problem_solving_and_mathematics_learning_results_student.

Ntibi, J. E. E., Agube, C. C. & Neji, H. A. (2020). Effect of concept mapping, gender and school location on students' academic achievement in physics in Calabar, Nigeria. Journal of the Social Sciences, *48(3), 1393-1405.*

Ogbaga, O. A. & Osuafor, A. M. (2022). Relative effectiveness of brainstorming and think-pair-share strategies on students' academic achievement and retention in biology. *NAU Journal of Technology and Vocational Education, 7(1), 37-48.*

Okeke, I. S. (2016). Effect of problem-solving instructional Technique on interest and achievement in Biology of Secondary School students in Awka Education zone. Unpublished Msc(ed) thesis, submitted to faculty of Education, Nnamdi Azikwe University, Awka.

Olofu, P. A., Opara, J.C., Ihekoronye, E.O. & Hur-Yagba, C. N. (2018). Attitudes and secondary school teachers' job performance in the Federal Capital Territory, Abuja. *International journal of the Forum for African Women Educationalists*. 6 (1): 115-120.

Olofu, P. A. & Patrick, E. (2019).Teenage pregnancy: Implications for education of the girl child in the 21st century in Nigeria. *International Journal of Continuing Education and Development Studies* (IJCEDE), 5 (1):164-176.

Olofu, M. A. & Olofu, P. A. (2021). Edmodo as an online instructional delivery technique for sustaining teaching and learning activities in covid-19 era in public universities in North-central, Nigeria. *Journal of Digital Learning and Education*. 1(2): 54-61.

Okolocha, C. C. & Nwaukwa, F. C. (2020). Effect of think-pair-share instructional strategy on secondary school students' academic achievement and retention in Financial Accounting in Abia State. International Journal of Arts and Social Science Research,*2(3), 52-66*.

Olalekan, A. A. & Oludipe, O. (2016). Effect of computer simulation instructional strategy on biology students' academic achievement in DNA replication and transcription. *Asian Journal of Educational Research,4(2), 16-24.*

Osuafor, A. M., & Ogbaga, O. A. (2016) effect of Nominal Group technique of Brainstorming on the achievement of secondary school Biology students in Anambra State, Nigeria. *International Journal of Social Science 1(2), 76-84*.

Slavin, R. E. (2020). Cooperative learning: What makes group work? In Dumont, H., Istance and Benavides. *The Nature of Learning using Research to Inspire Practice*, *161-178*

Uche, S. C. & Nwala, L. (2018). Laboratory work: Its essence and the associated skills. *Fundamentals of Science Laboratory. Calabar: University of Calabar Press.*

Umoetuk, E. & Akpan, A. O. (2023). Computer graphics, flipped classroom instructional strategies and students' academic performance in Basic Science and Technology in Akwa Ibom State. *Inter-Disciplinary journal of Science Education, 5(1), 34-41*.

Wuryandani, W & Herwin. (2021). The effect of the think pair share model on learning outcomes of Civics in elementary school students. *Cypriot Journal of Educational Science. 16(2), 627-640.*

Yusuf, A., Owede, V. C. & Bello, M. B. (2018). Effect of think-pair-share on students' academic in Civic Education in Bayelsa, Nigeria. *Anatolian Journal of Education, 3(2), 47-62.*