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EFFECT OF LECTURE-ENRICHED WAIT-TIME ON RETENTION OF AVERAGE ACHIEVERS IN ALGEBRA AMONG POLYTECHNIC STUDENTS IN CROSS RIVER STATE

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Abstract
This paper investigated the "Effect of lecture-enriched wait-time on retention ability of average achievers in algebra among polytechnic students in Cross River State. One research question and a corresponding null hypothesis were formulated to guide the study. Two public polytechnics made up the population of the Study consists of all polytechnic students in cross river state during the 2023/2024 academic session with a sample size of 44 students were selected using multi-stage sampling technique. The methodology of the study is pretest, posttest and post-posttest quasi experimental research design was adopted for the study. The experimental and control groups were exposed to Lecture-Enriched Wait-Time and Lecture Method respectively. The experimental group ware taught Algebra using Lecture-Enriched Wait-Time while the control group ware taught algebra using conventional lecture method. Algebraic Achievement Test (AAT) was designed by the researchers for data collection. The reliability coefficient of Algebraic Achievement Test (AAT) was determined to be 0.85. The data collected were analyzed using Mean scores, Standard deviation and t-test at $\alpha = 0.05$ level of significance. The findings revealed that there is significant difference between retention abilities of students taught algebra using Lecture-Enriched Wait-Time and those exposed to conventional lecture teaching method. Better retention ability was recorded on student that were taught algebraic concepts using lecture-enriched wait-time compared to their counterpart that were taught using lecture method. Based on the findings of the study, it is recommended that lecture-enriched wait-time should be used to teach mathematics at national diploma level. Regular training, workshops and seminars should be arranged for teachers to give them knowledge and understanding of lecture-enriched wait-time
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Keyword: Algebra, Lecture-Enriched Wait-Time, Average Achievers, Retention Ability

Introduction
Mathematics is one of the school subjects with wide applications which cannot be separated from our day-to-day activities. It considered as the universal language throughout the world. Its techniques include counting, arithmetic, mensuration, geometry, trigonometry, computations and algebra, with the ability to think about situations related to a given quantity (Cawley *et al,* 1998). Mathematics is a fundamental branch of science that represents the study of basic concepts of Numbers, Space and Quantity as well as application of these concepts in the field of Physics and Engineering (Ale, 2006).

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Retention as defined by Yero in Jamilu *et. al* (2023), is the ability of a learner to recall, remember and recollect a body of Knowledge after passing through instruction. According to Chauchan in Neboh (2012) retention is direct correlate of positive transfer of learning. For students‘ retention, Umar (2011) observed that students‘ experience is a significant factor in retention and that the strategies of improving retention rate can be adopted by the teacher. Idris (2014) observed that, retention is the ability to keep and consequently remember things or materials experienced or learned at a later time. Mukhtar, *et al*, (2021) investigate the effect Jigsaw IV cooperative learning strategy on students retention in geometry among secondary school students in Zaria metropolis, Kaduna state, Nigeria. It was shown that better performance was recorded on those that were thought using Jigsaw IV Cooperative learning. Materials to be learned depend on the strategy used in teaching and have an effect to the quality of retention in terms of their meaningfulness, familiarity and image evoking characteristics. Low academic performance as well as retention amongst students in Sciences seems to be as a result of use of teacher‘s-centered method which lead to poor academic retention, performance and acquisition of requisite skills (Mukhtar, *et. al,* 2021). There are so many devices for effective teaching and an effective technique can ensure effective learning. It is being felt that there should be new techniques of teaching and learning (Iqbal, 2004). The search of teaching and learning devices for effective performance has led to the identification of wait-time (Lee, 2000).

Any behavior, practice or techniques that will enable students develop thinking skills will help them to acquire technology concepts, which will lead to better achievement. Hurd in UNESCO (1995) pointed out that the methodology for teaching must enable students to think and ask questions during classroom lesson. One way of developing students' thinking skill is to ask questions in the classroom to facilitate discussion and to get the students to think (Adsit, 2002). There is therefore a good link between teaching methods and questioning. The importance of question cannot be over emphases, question can be used by teachers in the classrooms to determine whether or not body of knowledge has been impacted and to determine how much has been learned. It can be used for evaluation of method of teaching and for student’s placement.

According to Baba (2022) wait-time is when a teacher waits after a question is asked before calling on a student to rephrase a question or supply the answer. Wait-time is the amount of time a teacher allows, after asking a question, before getting response from students (wait-time I). It is also a period of uninterrupted silence allowed by the teacher after receiving a student's response and before he/she comments or asks another question (wait-time II). Research has shown that for both wait-time I and II, teachers typically wait for an average of one second or less (Kissock and Iyortsuun, 1982; Ouyang, 2000; Cotton, 2001 and Camp, 2002). Increasing wait-time to three seconds or more has been found to increase students' achievement and interest (Stahl as cited in Owodunni, 2013, Rowe as cited in Lee, 2000 & Cotton, 2001). Opateye (2020), study the effectiveness of classroom questioning wait – time on senior secondary school students’ academic performance and reflective thinking in chemistry, it was shown that, chemistry students that were given questioning wait - time performed better and with higher reflective thinking in chemistry.

Effective questioning is an instrument of motivation to raise the interest of students in what is being learnt (Eze, 2008). Raising students' interest helps them to learn better and most likely retain

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what is learnt for a longer period and subsequently, achievement would be enhanced. Owodunni (2013), investigate the comparative effects of long wait - time and shifting interaction questioning techniques on basic electricity students academic achievement in technical colleges. It was showed that shifting interaction questioning technique is more effective in enhancing students' achievement in basic electricity. There are different types of learners including fast learners, average learners, and slow learners (Korikana, 2020). This learning difficulty may arise from poor memory, unawareness about the importance of education and lack of fundamental knowledge and psychological factors.

Dalhatu, *et al* (2023), investigated the impact of wait-time variations on retention ability and gender performance among low achievers in ecology at senior secondary schools in Zaria, it was shown that low achievers that were taught ecology using extended wait-time had better performance compared those that were taught using conventional lecture method. The fact that students continue to fail algebra in tertiary institutions (polytechnics) in large number shows that there is a need for more empirical studies in order to improve the situation. Thus, this research, investigate effect of lecture-enriched wait-time on retention ability of average achievers in algebra among polytechnics students in Cross River State, Nigeria.

As part of the National Board for Technical Education Curriculum, algebra is a core course for all sciences, engineering and environmental technology. Algebra as one of the studied areas that deals with the representation of problems or situations in the form of mathematical expressions. All the branches of mathematics needs algebra. The study of algebra starts with solving of equations such as polynomials equations.

Algebra and elementary trigonometry is almost a general course to all students of sciences, engineering technology, environmental technology and even in some management courses. Despite its importance, there is high level poor performance in subject area. This paper, study the effect of lecture-enriched wait-time on retention ability in algebra among polytechnics students in Cross River State, Nigeria.

Objectives of the Study

i. To determine the effect of Lecture-Enriched wait-time on retention ability of average achievers in algebra among polytechnic students.

Research Questions

1. Is there any significant difference in retention ability of average achievers taught algebraic concepts with wait-time and those taught using conventional method?

Null Hypothesis

Ho_1: There is no significant difference in the retention ability of average achievers taught algebra using lecture-enriched wait-time and that of those taught with lecture method.

Methodology

The research design adopted for this study is quasi-experimental research design, specifically, pre- test, post-test and post posttest non-equivalent control group design. Pre-test was

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administered to both sampled polytechnics so as to determine their academic equivalence. The records were kept, then the control group were taught algebra using conventional method of teaching while the experimental group were taught using algebra using Lecture – Enriched Wait - time for eight (8) weeks. Then, post-test was administered to both the control and the experimental groups. The periods for the teaching of each group is two hours per group. This was done by the aid of research assistants who were given a guide on how to handle the classes as well as the wait-time devices in accordance with the Lecture - Enriched wait –time. The population of the study comprised the two public polytechnics in Cross River State of Nigeria with a total number of 44 National Diploma I students offering algebra at the time that this data was collected. The instrument for this study is Algebraic Achievement Test (AAT). The reliability coefficient of Algebraic Achievement Test (AAT) was determined to be 0.85. For the purpose of generating and analyzing data APT comprises ten (10) essay test questions were developed for the study, which allowed the students to write their understanding on the algebraic concepts.

Results Presentation

The result of the analysis was used to answer the research question using descriptive statistics while inferential statistics was used to test the null hypothesis at alpha $(\propto) = 0.05$ level significance.

1. **Research Question:** Is there any significant difference in retention ability of average achievers taught algebraic concepts with wait-time and those taught using conventional method?

Table 1: Mean and Standard deviation of students' retention ability of Experimental and control groups

Group	N	post-test mean	SD	Post post-test mean	SD
Experimental	16	27	4.3	28.7	4.9
Control	28	19	3.2	20.3	3.5
Mean difference		8		8.4	
Total	44				

The result from table 1 shows that there is significant difference in retention ability of students taught with algebra using lecture-enriched wait-time approach and those taught with conventional lecture method by looking at the mean difference of post post-test which is 8.4. This shows that there is a positive effect of lecture-enriched wait-time and hence it enhances students' retention ability.

Hypothesis 1:

There is no significant difference in the retention ability of average achievers taught algebra using lecture-enriched wait-time and that of those taught with lecture method.

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Table 2: Wilcoxon sign rank test of retention ability among students taught Algebra with lecture-enriched wait-time and those taught with conventional lecture method

Total number of students(N)	Mean Var.	$T_{statistic}$	$Z_{cal.}$ $Z_{crit.}$	
44	**5365.5 511.5**	**1341.24**	**- 7.87**	**1.96**

Significant $(p < 0.05)$

Table 2 shows that the absolute value of Z calculated (7.87) is greater than the value of Z critical (1.96) which reject the hypothesis. Thus, this conclude that there is significant difference in retention ability among students taught algebra using lecture-enriched wait-time and that of those taught with lecture method.

Discussion of the Findings

The paper studied the effect lecture-enriched wait-time on retention ability of average achievers in algebra among public polytechnics students in Cross River State. One hypothesis was stated and tested based on lecture – enriched wait – time and Algebra Achievement Test (AAT) was developed and administered to the sampled groups consisting of 44 students. The data collected from the sampled population was analyze using both descriptive and inferential statistics.

The research question was answered by testing the corresponding hypothesis which state that "there is no significant difference in the retention ability of average achievers taught algebra using lecture-enriched wait-time and that of those taught with lecture method". The student retention ability is higher when exposed to lecture-enriched wait-time at the national diploma level. The retention levels are 28.7 and 20.3 average achievers exposed to lecture – enriched wait – time and those that were not exposed respectively. Which shows that, there was a positive effect in retention ability when lecture – enriched wait – time was used on the experimental group, which reject the null hypothesis. This is inline with the study of Owoddunni (2013) and Dalhatu, *et al* (2023) which shown that low achievers that were taught ecology using extended wait-time had better performance compared those that were taught using conventional lecture method.

Conclusion

The paper study the effect of lecture-enriched wait-time on retention of average achievers in algebra among polytechnics students in Cross River State, Nigeria. It was shown that better retention ability was recorded on student that were taught algebraic concepts using lecture-enriched wait-time compared to their counterpart that were taught using lecture method.

Recommendations

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

1. The use of lecture-enriched wait-time should be encouraged among lecturers teaching algebra more especially at ND level.
2. Government agencies such as Federal and State Ministry of Education, NBTE and other stakeholders in educational sector should organize workshop on lecture-enriched wait-time to all lecturers taking lower-level students.

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References

Adsit, K. I. (2012). Integrating inquiry – based field investigation into an environmental science curriculum. *Journal of the Tennessee Academy of Science* 87(2), 105 - 115.

Ale, S.O, (2006). Key note address presented at 4th Zonal workshop on the use Primary Mathematics Kits project held at Federal College of Education (Technical) Omoku Rivers States.

Baba, H., & Abdul Talib, C. B. (2022). Effect of lecture-enriched wait-time on the performance of average and high ability SSII chemistry students in mole concept. *International Journal of Academic Research in Business and Social Sciences. 12*(7), 738 – 747.

Camp, W. G. (2002). Improving your teaching through effective questioning techniques. http://www.aged.vt.edu/meth-ods/que-skil.htm.on.line07082023.

Cawley, J. F., Parmar, R., Yan, W., & Miller, J. H. (1998). Arithmetic computation performance of students with learning disabilities: Implications for curriculum. *Learning Disabilities Research and Practice 13*(2), 68-74

Cotton, K. (2001). Instructional Reinforcement. http://www/nwre/.org/scpd/sir/2/cu3.html

Dalhatu, H. U., Salisu, Z. I. & Abdulkarim, M. M. (2023). Impact of wait-time variations on retention ability and gender performance among low achievers in ecology at senior secondary schools in Zaria. *African Journal of Humanities & Contemporary Education Research, 11*(1),212 – 223.

Eze, C. C. (2008). Comparative effects of two questioning techniques on students' achievement and retention in Chemistry. Unpublished M.Ed thesis, University of Nigeria, Nsukka.

Idris, Y.(2014). Impact of problem solving strategy in academic achievement and retention on basic science concept among varied ability students, Kaduna State Nigeria. Unpublished M.Ed Thesis, Department of Science Education, Ahmadu Bello University, Zaria. 3-44.

Iqbal, M. (2004). Effect of cooperative learning in academic achievement of secondary school students in mathematics. Unpublished P.hD. thesis University of Arid Agriculture Rawalpindi (Pakistan).

Jamilu, A. A., Mukhtar, N. & Lawal, L. (2023). Impact of Finley-Jensen problem solving model on retention in algebraic concepts among students in public polytechnics, North West Nigeria. *Zamfara International Journal of Education (ZIJE),* 3(4), 85 – 89. DOI: https://doi.org/10.5281/zenodo.10072813

Korikana, A. (2020). Slow Learners- A Universal Problem and Providing Educational Opportunities to Them to Be a Successful Learner". PEOPLE: *International Journal of Social Sciences*, *6*(1), 29-42.

Kissock, C. & Iyortsunn, P. T. (1982). *A Guide to Questioning: Classroom procedure for Teachers*. London: Macmillan Press limited.

Lee, R. W. (2000). Questioning as an instructional method: Does it affect learning from lectures. *Applied Cognitive Psychology, 23*(6), 747 – 759.

Lowestan, D. (2002). *Best practice in facilitating school reform: Best practice in school psychology Iv*. National Association of School Psychologists.

Mukhtar, N., Jamilu, A. A. & Sabo, A. K. (2021). Effects of Jigsaw IV Cooperative Learning Strategy (J4CLS) on students' retention in Geometry among Secondary School Students in Zaria Metropolis. *Innovation and Technology for Sustainable Educational Development (LASU) 17 – 24.*

Neboh, O.I. (2012). Effect of learning activity package (LAP) on male and female students' achievement in secondary school biology. *Journal of Science and Computer Education, 2(1) 1-13.*

Opateye, J. A. (2020). Effectiveness of Classroom Questioning Wait Time on Senior Secondary School Students' Academic Performance and Reflective Thinking in Chemistry. *Nigerian Journal of Educational Research and Evaluation, 18*(2), 59-73.

Owodunni, A. S. Comparative Effects of Long Wait -Time and Shifting Interaction Questioning Techniques on Basic Electricity Students Academic Achievement in Technical Colleges. Proceedings of International Conference on Mathematics, Science and Technology Education, held at Limpopo, South Africa from 21st – 24th October, 2013.

Umar, A. A. (2011). Effects of biology practical activities on students' process skills acquisition in Minna, Niger State Nigeria. JOSTMED, 7, (2),118-126.

Ouyang, J. R. (2000). Questioning Techniques. https//pigseye.kennesaw.edu/~rouyang/ece4473/q-techni. Htm.l

Rowe, M. (1987). Wait-time: Slowing down may be a way of Speeding up. *Journal of Teacher Education, 37*(1), 38 – 43.

Stahl, R. J. (1994). Using Think Time and Wait-time skilfully in the classroom. ERIC Development Team. www.eric.ed.gov

UNESCO (1995). *Integrated Science in African Schools, Ibadon.* Heine,ann Education Books Nigerian PLC.

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