Effects of Reflective Instructional Strategy on Secondary School Students' Achievement in Mathematics in Nnewi Education Zone, Anambra State, Nigeria

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Abstract

The effects of reflective instructional strategy (RIS) on academic achievement of SS 2 students in mathematics in Nnewi Education Zone of Anambra State was determined. Two research questions and three hypotheses tested at 0.05 level of significance guided the study. The research adopted a quasi-experimental design, specifically, pre-test and post-test non- randomized control group design. The population comprised 4006 students in the public secondary schools in the Nnewi Education Zone of Anambra State, Nigeria. The sample size was 97 students (47 male and 50 female) students selected from two of the 37 co-educational public secondary schools in the Zone through multistage sampling procedure. Mathematics Achievement Test (MAT) was used as instrument for data collection while researcher-developed RIS lesson plan was used as instructional tool. The reliability co-efficient value for MAT was 0.90 which was established using Kudder-Richardson Formula 20. Experimental group was taught using RIS while the control group was taught using Lecture method (LM). Mean and standard deviations were used to answer the research questions while the hypotheses were tested using Analysis of covariance. The findings showed among others that, RIS significantly improved students' achievement in mathematics and gender does not have significant effect on the achievement of students' taught mathematics using RIS and LM. The study concludes that RIS is effective in improving the achievement of SS 2 students in mathematics Based on the findings, it was recommended among others that; Mathematics teachers should adopt RIS while teaching to enhance students' interaction with each other and the learning materials to facilitate effective learning of mathematics and that mathematics teachers should use RIS in teaching mathematics for improved achievement.

Keywords: *Reflective, Mathematics, Achievement, SS 2 Students.*

I. Introduction

Mathematics is a science of quantity and space, and it also occupies a key position in Nigeria's Education System (Ezeugwu, Onuorah, Asogwa and Ukoha, 2016). It is a subject that cuts across primary and secondary schools as a compulsory subject probably because mathematics has direct relationship with other subjects especially technical and sciences. Mathematics is the bedrock of science and technology and the pivotal role of mathematics to science and technology is multifarious and multifaceted, that no area of science, technology and business enterprise escapes its application (Okereke, 2018).

Irrespective of the great importance of mathematics in nation building, scientific and technological development, it is still evident that students' achievement in mathematics at internal and external examinations has remained not encouraging. Zalmon, (2021) opined that achievement in Mathematics is a measure of learner's cognitive development after instruction. Zalmon &_ Charles-Ogan, (2021) asserted that poor achievement of students in both internal and external examinations in Mathematics have been on the increase in recent time. Analysis of the students' achievement in WASSCE Mathematics between the years 2012 – 2024 reveals that performances of students in mathematics fluctuates, but generally below average in 7years out of the 13 years in view. This phenomenon has remained a source of concern to the researchers, science educators, education administrators, parents and the nation at large.

Moreover, much researches had offered several reasons for the students' fluctuating achievements in mathematics. According to Awodun (2020) and Boris (2019), a number of factors have been identified as militating against students' attainment of the objectives of science instruction, and the most pronounced factor identified by researchers is the inappropriate and uninspiring instructional strategies adopted by science teachers. This may be because, most science teachers' method of teaching is characterized by the lecture method of teaching which involves one directional flow of information from the teacher to the students. Many research studies suggested a complete refurbishment of the public education system (Makinde, 2019), yet others like Makinde & Yusuf (2019) suggested that educators explore substitutes to the lecture method.

Instructional Strategies are techniques utilized by teachers to promote mastery of objectives, understanding of content, and independent learning in students According to Makinde (2019), Nigeria has witnessed persistent students' low achievement in Mathematics at the senior school certificate level. This has been linked to the adoption of instructional strategies which did not give enough consideration to learners' previous knowledge and how they reasoned in order for learners to construct their knowledge based on these (Zalmon & Wonu, 2017). The need for improved performance in mathematics has driven teachers and researchers to seek appropriate instructional strategies. According to Sunday, Abiodun & Olaoye (2021), these instructional strategies would avail the students the opportunity to control their learning process as well as develop the required interest in mathematics. Reflective instructional strategy is one of such strategies.

Reflective Instructional Strategy (RIS) is a broad based instructional strategy that engages the learners to think deeply, discuss, collaborate and share their experiences together on a particular subject matter (Oguezue & Osuafor, 2021). It affords learners the opportunity of thinking, discussing and sharing their experiences and wealth of knowledge together in small groups on particular subject matter (Agbasi & Okeke, 2020). Reflective teaching can also serve as a tool for learning from observation when a student places himself in the shoes of the person he or she is observing and asks, "Why did he/she do that?" (Gupta, Shree & Mishra, 2019). According to Ogbuanya & Owodunni in Agbasi & Okeke (2020), reflective instructional strategy is an innovative strategy that draws from certain skills. These skills include: (a) assertive questioning, (b) thinking skills, (c) scaffolding, (d) oral discourse and (e) collaborative learning. . The inclusion of the various skills of this strategy may imply that reflective instructional strategy could sustain students' interests and also draw their attention which may lead to better achievement in the subject of mathematics.

Academic achievement is students' mastery of intended mathematics objectives as recorded by course letter grades and percentages. Odagboyi (2015) defined academic achievement as the learning outcome of students which include the knowledge, skills and ideas acquired and retained through their course of studies within and outside the classroom situation. In any given subject, achievement is one of the basic indices used in assessing the progress of students in an academic programme hence Cheng and Liu (2019) stated that academic achievement is one of the explicit indicators of students' achievement in school. Despite the fact that researchers attribute the low achievement of students in science to teaching methods, other science educators are of the view that gender is one of the determining factors of low achievement in science (Agbasi & Okeke, 2020). Hence, this study also determined the influence of gender on students' achievement when taught mathematics with reflective instructional strategy.

Godpower-Echie & Owo (2019) defined gender as the stratification and assignment of roles along sex line which may be culturally determined, and is ascribed to male and female. According to them, gender inequality in education has remained a perennial problem of global scope. There is a growing recognition that there are psychological differences between gender which affect the way the males and females think, communicate and behave. In the same vein, the gender difference in achievement of students in mathematics has been a thing of worry to mathematics educators and researchers. Gender disparity in mathematics achievement is one that cannot be swept under the carpet.

Gender as a variable in students' achievement and interest in mathematics has received research attention over the years. Modern psychology studies have shown that gender as a variable relates to achievement. Ossai (2023) and Amatobi and Amatobi (2020) in their different studies discovered that there is no significant difference on the academic achievement of male and female students, while some others established significant difference particularly during early education (Tarfa & Dike, 2022). Although most researchers have found boys performing better than girls especially on higher order knowledge (Yar'adua, 2021). Allahnana et *al* (2018) posited that the achievement of girls in mathematics are worse than that of the boys on the average because of their lack of interest in the subject. This calls for serious attention and if unchecked it would be a great

challenge to gender equality in Mathematics. This necessitated the present study which tries to attend to such a gap that has been introduced in literature. Hence, this study determined the effect of reflective instructional strategy on secondary school male and female students' academic achievement in mathematics in Nnewi Education zone, of Anambra State, Nigeria.

II. Purpose of the Study

The study determined the effect of reflective instructional strategy on secondary school students' achievement in mathematics in Nnewi Education Zone of Anambra State. Specifically, this study determined:

1. Mean achievement scores of students taught mathematics using reflective instructional strategy (RIS) and that of those taught using lecture method (LM).
2. Mean achievement scores of male and female students taught mathematics using RIS and that of those taught using LM.

III. Research Questions

The study was guided by the following research questions:

1. What are the differences in mean achievement scores of students taught mathematics using RIS and that of those taught using LM?
2. What are the differences in the mean achievement scores of male and female students taught mathematics using RIS and that of those taught using LM?

IV. Hypotheses

The following hypotheses were stated to guide the study at 0.05 level of significance:

1. There is no significant difference in the mean achievement scores of students taught mathematics using RIS and that of those taught using LM.
2. There is no significant difference in the mean achievement scores of male and female students taught mathematics using RIS and that of those taught using LM.
3. There is no significant interaction effect of instructional strategies (RIS & LM) and gender on students' achievement in mathematics.

V. Methodology

The researchers adopted pretest-posttest non-randomized control group quasi-experimental design. Thus, intact classes were used in each school. The study was conducted in Nnewi Education Zone of Anambra State, Nigeria. The population consisted of 4,006 senior secondary class two (SS 2) students (1,936 males and 2,070 females) offering mathematics in all the public secondary schools in the Nnewi Education Zone. The study's sample consisted of 97 (47 male and 50 female) SS 2 students offering mathemaics, selected from two out of the 37 co-educational public secondary schools in the Zone. A multistage sampling procedure was used to sample the participants namely: purposive sampling, simple random sampling and lucky dip without replacement techniques. Mathematics Achievement Test (MAT) was used for data collection. The MAT contained 50 item multiple choice objective questions with options A – D

adapted from three testing organizations: the West African Examination Council (WAEC), the National Examination Council (NECO), and the National Business and Technical Examinations Board (NABTEB) for the years 2018 - 2022 and each correct answer attracted 2 marks. Research assistants who are the regular mathematics teachers taught the students in each group using researchers' developed lesson plans on RIS and LM. Three experts validated the instruments, each from Departments of Science Education, Educational foundations (Measurement and Evaluation Unit) and Mathematics, from Nnamdi Azikiwe University, Awka. The reliability of the MAT was established using Kudder-Richardson 20 Formula. The coefficient of internal consistency obtained was 0.90.

The regular mathematics teachers in the sampled schools were trained by the researchers to serve as research assistants, which lasted for one week over three contacts. They taught their students in each school using regular school time table, of two contacts per week. The experimental group (RIS) was taught by the research assistant using reflective instructional strategy as guided by the researchers-developed RIS lesson plan. The following components of reflective instructional strategy were applied by the research assistant in teaching the experimental group: Thinking skill, Questioning, Collaborative learning, Oral discourse and Scaffolding. The control group (LM), on the other hand, was taught using the usual lecture method, with lesson notes developed by the researcher to reflect the same learning objectives as the RIS equivalent. The group was evaluated at the appropriate time with the same test instrument: MAT used for the experimental group. The actual treatment lasted for five weeks (week 2 – week 6) in each of the schools. The first week was for administering the pre-test (MAT) while the sixth week was for the revision and administering of the post-test. Mean and Standard deviation were used to answer the research questions while the hypotheses were tested using Analysis of Covariance at 0.05 level of significance because addresses the imbalance of non-equivalence in groups caused by non-randomization of participants. The p-value and alpha level ($\alpha = 0.05$) were compared to determine whether to retain or reject the null hypotheses tested. When the precise probability value was less than or equal to the 0.05 level of significance, the null hypothesis was rejected; but, when the exact probability value was more than the 0.05 level of significance, the null hypothesis was not rejected.

VI. Results

Research question 1: What are the differences in mean achievement scores of students taught mathematics using RIS and those taught using LM?

Table 1: Mean Achievement Scores of students taught Mathematics using Reflective instructional strategy (RIS) and those taught using Lecture method (LM)

Method	n	Pretest Mean	Pretest SD	Posttest Mean	Posttest SD	Mean Gain
LM	41	22.73	7.49	23.46	14.62	0.73
RIS	56	24.21	6.02	41.29	21.06	17.08
Mean difference		1.48		17.83		16.35

Results in Table 1 show that the experimental group taught Mathematics using reflective instructional strategy had a pre-test achievement mean of 24.21 and a post-test achievement mean of 41.29 with a mean gain of 17.08. Also the group taught using lecture method had a pre-test achievement mean of 22.73 and post-test achievement mean of 23.46 with a mean difference of 0.73. This shows that the students taught mathematics using RIS achieved higher than those taught using LM group. Also, Table 1 also shows that students RIS group has a higher standard deviation of 21.6 in their post-test against their counterpart in LM group (14.62) indicating that students taught mathematics using RIS had a less homogeneous score in their post-test than those taught using RIS. The difference between the mean gained achievement scores of the students in both groups is 16.35 in favour of RIS.

Research question 2: What are the differences in mean achievement scores of male and female students taught mathematics using RIS and those taught using LM?

Table 2: Mean Achievement scores of male and female students taught Mathematics using Reflective instructional strategy (RIS) and those taught using Lecture method (LM)

Method	Gender	n	Pretest Mean	Pretest SD	Posttest Mean	Posttest SD	Mean Gain
LM	Female	16	24.88	7.59	24.00	14.31	
	Male	25	21.36	7.25	23.12	15.00	0.88
RIS	Female	34	25.00	6.33	30.47	19.28	
	Male	22	23.00	5.45	58.00	9.77	27.53

From Table 2, the mean achievement score of male students, 24.00 is higher than the mean achievement score of their female counterparts, 23.12 taught mathematics with LM with mean difference of 0.88 in favour of the female students. Also, female students taught mathematics using RIS had mean achievement score of 30.47 in the post-test while the male students had 58.00 given a mean difference of 27.53 in favour of the male students. Table 2 further reveals that the post-test SD (19.28) of female students taught mathematics using RIS is higher than male students (9.77) showing more spread of scores than male while the spread of scores in LM is more in male scores with post-test SD of 15.00 than in female 14.31 post-test SD. In general, female students achieved higher than their male counterparts when taught mathematics using LM while male students achieved higher when taught mathematics using RIS.

Hypothesis 1: There is no significant difference in the mean achievement scores of students taught mathematics using RIS and that of those taught using LM.

Table 3: ANCOVA Test of significance of difference between the Mean Achievement Scores of students taught Mathematics using RIS and those taught using LM.

Source	**Type III Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**	**Decision**
Corrected Model	3772.972[a]	3	1257.657	5.345	.002	
Intercept	165236.506	1	165236.506	702.241	.000	
Gender	.010	1	.010	.000	.995	Not sig.

Method	3333.052	1	3333.052	14.165	.000	Sig.
Gender * Method	270.086	1	270.086	1.148	.287	Not. sig
Error	21882.780	93	235.299			
Total	214417.000	97				
Corrected Total	25655.753	96				

Table 3 reveals that there is significant difference in the mean achievement scores of students taught mathematics using RIS and that of those taught using LM, F (1, 97) = 14.165, P =0.000 < 0.05. Therefore, the null hypothesis is rejected meaning there is significant difference in the mean achievement scores of students taught mathematics using RIS and that of those taught using LM**.**

Hypothesis 2: There is no significant difference in the mean achievement scores of male and female students taught mathematics using RIS and that of those taught using LM.

Table 3 further reveals that, there is no significant difference in the mean achievement scores of male and female students taught mathematics using RIS and that of those taught using LM, F (1, 97) = .000, P = . .995 > 0.05. Therefore, the null hypothesis is not rejected meaning there is no significant difference in the mean achievement scores of male and female students taught mathematics using RIS and that of those taught using LM.

Hypothesis 3: There is no significant interaction effect of instructional strategies (RIS & LM) and gender on students' achievement in mathematics.

Table 3 also reveals that there is no significant interaction effect of instructional strategies (RIS & LM) and gender on students' achievement in mathematics, F (1, 97) = 1.148, P = .287 > 0.05. Therefore, the null hypothesis is not rejected meaning there is no significant interaction effect of instructional strategies (RIS & LM) and gender on students' achievement in mathematics.

VII. Discussion

The findings from the results revealed that the students taught mathematics using RIS achieved more than the students taught mathematics using lecture method. This difference in achievement is confirmed by the test of hypothesis which showed that there was significant difference in the mean achievement scores of students taught mathematics using reflective instructional strategy (RIS) and those taught using lecture method. This implies that RIS was found to be effective in improving students' achievement in mathematics. This probably may be due to the fact that reflective instructional strategy (RIS) encourages students' active involvement and participation in the learning through collaborative learning, use of questions, scaffolding, oral discourse and thinking skill. The finding is consistent with the findings of Shaheen *et al* (2022) and Ombuguhim *et al* (2021), that those students exposed to reflective instructional strategy achieved significantly higher than those exposed to lecture learning method. However, the result is in disagreement with the findings of Awodun (2020) which revealed that no significant difference exists between the mean achievement scores of the students taught mathematics using RIS and those taught using LM.

Furthermore, gender was not significant in the achievement of students based on the instructional strategy. The result was in agreement with Ossai (2023), Amataobi & Amatobi (2020) and Musa & Samuel (2019) and who concluded that there exists no significant difference in achievement of male and female students in mathematics. On the other hand, the result was in

disagreement with the findings of Tarfa & Dike (2022), Wordu & Iwok (2018) and Yar'adua (2021), who found out that significant difference exists by gender on mathematics achievement of students.

The interaction effect of instructional strategy and gender was examined on students' achievement in mathematics. The findings revealed that instructional strategy and gender have no significant interaction effect on students' achievement in mathematics. In other words, the instructional strategies used in the study did not impart the male and female students differently based on their academic achievement in mathematics. This is inconsistent with the findings of Ogoke & Okigbo (2021), Chiakwelu & Okigbo (2020) and Wordu & Iwok (2018) who averred that gender and treatment have significant interaction effect on students' achievement in mathematics. However, the finding agrees with Eze (2023) and Okigbo & Anyanwumelu (2021) who concluded that there is no significant interaction effect of methods and gender on achievement in mathematics. The above discussion implies that male and female students did not react differently to the instructional strategies in terms of their academic achievement in mathematics

VIII. Conclusion

Based on the findings of this study, it was concluded that the use of RIS in teaching mathematics is more effective than LM in improving students' achievement in mathematics. However. RIS is not gender biased as it relates to achievement in mathematics.

IX. Recommendations

Based on the findings, the following recommendations are made that:

1. Mathematics teachers in secondary schools should adopt the use of RIS in teaching mathematics
2. Mathematics teachers should adopt RIS while teaching to enhance students' interaction with each other and the learning materials to facilitate effective learning of mathematics.
3. Curriculum planners should adopt RIS as an innovative teaching strategy when reviewing mathematics curriculum.
4. The Science Teachers Association of Nigeria in collaboration with the ministry of education should organize seminars and workshops to train teachers on how to use RIS in teaching and learning of mathematics and other science subjects.

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REFERENCES

[1] Agbasi, S. O., & Okeke, S. O.C. (2020). Effect of Reflective Instructional Strategy on Secondary School Students' Achievement and Interest in Chemistry in Awka Education Zone, Anambra State. *UNIZIK Journal of STM Education*, 3(2), 161-168.

[2] Allahnana, K. M., Akande, M. T., Vintseh, I. M. U., .Alaku, E. A., & Monica, E. A. (2018). Assessment of gender and interest in mathematics achievement in Keffi Local Government Area of Nasarawa State, Nigeria. *International Journal of Operational Research in Management, Social Sciences & Education | IJORMSSE,* 4 (1), 127-140.

[3] Amatobi, V. E & Amatobi, D. A. (2020). The influences of gender and attitude differences to students' achievement in mathematics in Nigerian secondary schools: a case study of Comprehensive Secondary School Amurie-Omanze in South Eastern Nigeria. *American Journal of Research Communication,* 8(2): 1-8. Retrieved on October 20, 2023 from www.usa-journals.com.

[4] Awodun, A. O. (2020). Effects of Reflective Teaching strategy on Students' Academic Performance in Secondary School Physics in Ekiti State, Nigeria. *International Journal of Scientific Development and Research*, 5(8), 470-476. Retrieved from www.ijsdr.org on December 17, 2022.

[5] Boris, O.O. (2019). Effects of reflective teaching on secondary school students' academic achievement in Chemistry in Ondo State Nigeria. *International Journal of Research and Analytical Reviews.* 6(3), 32-39.

[6] Cheng, H., Wang, Y., & Liu, W. (2019). Exploring the Related Factors in Students' Academic Achievement for the Sustainable Education of Rural Areas. *Department of Information Management, National Yunlin University of Science and Technology*, 7(5), 58-67.

[7] Chiakwelu A. B & Okigbo .E .C. (2020). Effect of jigsaw team-pair-solo reciprocal teaching strategies on secondary school students' achievement in mathematics in Onitsha education zone. *IOSR Journal of Mathematics (IOSR-JM)*, 16(1), 50-57. DOI: 10.9790/5728-1601045057.

[8] Eze .I .L. (2023). *Effect of Flipped Learning on Nigeria Certificate in Education (NCE) Mathematics Students' Interest and Achievement in Trigonometry in Kano State, Nigeria.* Retrieved October 10, 2023 from https://www.researchgate.net/publication/372273384_Effect_of_Flipped_Learning_on_Nigeria_Certificate_in_Education_NCE_Mathematics_Students'_Interest_and_Achievement_in_Trigonometry_in_Kano_State_Nigeria. DOI: 10.37745/bje.2013/vol11n87691.

[9] Ezeugwu, J.O.,Onuorah, J.C.,Asogwa, U.D & Ukoha, I.P. (2016). Effect of Mathematics Game-based Instructional Techniques on Students 'Achievements and Interest in Algebra at Basic Education Level. *Global Journal of Pure and Applied Mathematics*, 12(4), 3727-3744. Retrieved from http://www.ripublication.com/gjpam.htm on December 17, 2022.

[10] Godpower-Echie, G., & Owo, W. J. (2019). Gender Differences in Basic Science Achievement of Private Junior Secondary School Students in Obio/Akpor Local Government Area, Rivers State. *International Journal of Scientific Research in Education*, 12(2), 320-329.Retrieved from http://www.ijsre.com

[11] Gupta, T., Shree, A., & Mishra, L. (2019). Reflective Teaching as a Strategy forEffective Instruction. *International journal of Education and Applied Social Science*, 10(1), 37-43

[12] Makinde, S.O. (2019*). Effects of a developed flipped classroom package on senior secondary School students' performance in mathematics in Lagos,Nigeria.* Retrieved on December 17, 2022, from https://www.researchgate.net/publication/334046113 DOI: 10.13140/RG.2.2.36614.01609

[13] Makinde, S.O. & Yusuf, M.O. (2019). *The Flipped Classroom: Its Effects on Students' Performance and Retention In Secondary School Mathematics Classroom.* Retrieved on December 17, 2022 from: https://www.researchgate.net/publication/334046424.

[14[Musa, D. C., & Samuel, I. R. (2019). Influence of Gender and School Location on Science and Mathematics Students' Achievement in Western Senatorial District of Nasarawa State, Nigeria. *East African Scholars Multidisciplinary Bulletin*, 2 (8), 259-264. DOI: 10.36349/EASMB.2019.v02i08.001.

[15] Odagboyi, I.A. (2015). Effect of gender on the achievement of students in Biology using Jigsaw Method. *Journal of Education and Practice*, 1(23), 55-67.

[16] Ogoke .J .C & Okigbo .E.C. (2021). Effect of two modes of lesson study techniques on senior secondary school students' achievement in mathematics in Okigwe education zone two. *AJSTME,* 6(2), 68-78.

[17] Oguezue, N. K., & Osuafor, A. M. (2021). Effect of Reflective Instructional Strategy on Students' Retention in Basic Science in Onitsha Education Zone. *South Eastern Journal of Research and Sustainable Development*, 6(1), 75-90.

[18] Okereke, I. (2018). Perceptions of teachers regarding the strategic learning activities and media for primary science teaching. *Journal of Perspectives on Crucial Issues on Nigerian and African Education 1,* 104- 111.

[19] Okigbo .E .C & Anyanwumelu .O. (2021). Effect of scaffolding instructional strategy on secondary school students' academic achievement in mathematics in Otuocha education zone. *Unizik Journal of Educational Research and Policy Studies,* 8, 52-60.

[20] Ombuguhim, S. U.1., Alhassan, Y.A., Alhassan, N. U & Ahmed, T.A. (2021). Reflective teaching strategy on students' achievement and interest in basic technology. *Journal of Public Value and Administrative Insight*, 4(1), 37-44. Available at: https://doi.org/10.31580/jpvai.v4i1.1575 .

[21] Ossai, P. A. U. (2023). Gender variations in mathematics achievement in Nigerian post-secondary institutions. *Journal of Science Technology and Education*, 11(2), 121-126.

[22] Shaheen, G., Khan, M. S. & Khan, S. I. (2022). Impact of Reflective Teaching Practices of University Teachers on Academic Achievement of Students. *Global Educational Studies Review*, 7(2), 147-155. DOI: 10.31703/gesr.2022(VII-II).14.

[23] Sunday, A. O., Abiodun, T. R. & Olaoye, A. E. (2021). *Effects of flipped classroom and reality pedagogy approaches on secondary mathematics students' achievement in Kuje, Federal Capital Territory, Nigeria.* Retrieved from: https://www.research gate.net /publication /351936428 on December 17, 2022.

[24] Tarfa, F. S. & Dike, C. O. (2022). Gender Differences in the Academic Performance of Students in Senior Secondary School Mathematics. *International Journal of Innovative Science and Research Technology*. 7 (3), 424-430.

[25] Wordu, H., & Iwok, U. A. (2018). Influence of Gender and Learning Environment on Students' Academic Achievement in Mathematics in Akwa Ibom State. *International Journal of Innovative Social & Science Education Research*, 6 (1), 30-37.

[26] Yar'adua, A. S. (2021). Comparative analysis of male and female students' academic performance among senior secondary school mathematics in Katsina State, Nigeria. *A paper presented at the 57th Annual Conference of the Mathematical Association of Nigeria (M.A.N),* held in B.U.K. from 29t h August - 3rd September, 2021.

[27] Zalmon, I.G. & Charles-Ogan, G.I. (2021). Polya's problem solving strategy and students' retention in calculus. *Journal of Education and Training Technology*, 10(1), 123-139.

[28] Zalmon, I.G. & Wonu, N. (2017). Comparative analysis of students Mathematics Achievement in West African senior secondary Certificate Examination in Nigeria. *European Journal of Research and Reflection in Educational Sciences*, 5(1), 24-31.

[29] Zalmon, I.G.(2021). *Effects of Polya's and Schoenfeld's problem solving strategy on Secondary Students' Performance and Retention in Mathematics in Obio-Akpor, Rivers State.* Unpublished Ph.D Thesis, University of Port Harcourt.