



EFFECT OF THINK-PAIR-SHARE STRATEGY ON STUDENT ACHIEVEMENT IN SENIOR SECONDARY SCHOOL MATHEMATICS

^{*1}Abiodun, T.O., ²Asanre, A. A., ³Ogundeji, M.A., ⁴Odupe, T. A & ⁵Rasaki, M. G

¹⁻³Department of Mathematics, Tai Solarin University of Education, Ijagun. Ogun-State NIGERIA

^{4,5}Department of Mathematics, Micheal Otedole College of Primary Education, Lagos State, NIGERIA

*Corresponding Author(email): preciousabiodun4@gmail.com

Abstract

This study examined the effect of the Think-Pair-Share strategy on student achievement in secondary school Mathematics in Ogun State Nigeria. The study adopted a pretest, posttest, and control group quasi-experimental design using 2x2 factorial matrix. The population of the study was made up of all twenty-two thousand and seventy (22,070) Senior Secondary Schools 2 (SSS2) students in Ogun State, Nigeria. Three hypotheses guided the study. Purposive Sampling Technique was used to select four (4) Senior Secondary Schools in Ijebu-Ode and Ijebu-North East Local Government Areas respectively. Twenty students were selected from each of the schools by using the Simple Random Sampling Technique. Eighty students participated in the study which was made up of forty (40) males and forty (40) females respectively. The instrument used for data collection is titled Mathematics Achievement Test (MAT) with a Reliability Coefficient of 0.78 by using Pearson Correlation. The collected data were analysed using descriptive statistics (Mean and Standard Deviation) and inferential statistics (Analysis of Covariate was used to analyze the stated hypotheses at a 0.05 level of significance. Findings revealed that there is the main effect of the strategy on the student's achievement in Mathematics. Also, it was established that there is no significant main effect of gender on the achievement of the students in Mathematics. Therefore, the researcher recommends among others that, the Think-Pair-Share method of teaching should be incorporated into the learning and teaching of Mathematics in Senior Secondary Schools.

Keywords: Think-Pair-Share, strategy, student achievement, secondary school, Mathematics

Introduction

One of the major subjects taught in Nigerian secondary schools and throughout the globe is Mathematics. This is as a result of its importance in other school subjects and also, in Science and Technology (Akinsolu, 2014). Mathematics is an integral part of life because it is needed by everyone for everyday activities and interactions. Mathematical skills are needed in the study of Sciences, Technology, and Humanities. In Nigeria, the Federal Government is quite aware of the important role of mathematical knowledge in other school subjects, hence, the subject is made a mandatory subject at the post-Basic level of education (Federal Republic of Nigeria, FRN, 2014). The importance attached to Mathematics at the secondary school level is to equip the learners with competencies that will prepare them for entry into Higher Institutions of learning (Salau, 2013). Without a basic knowledge of Mathematics, progress in Sciences and Technology may be impossible. Research has established that many students at the secondary school level considered Mathematics as abstract and also see it as a subject that is difficult to understand. Bolaji (2015) stated that Mathematics is abstract in nature and teaching and learning it should follow the students' Centre. The most frequently used strategy in teaching and learning Mathematics in Nigerian secondary schools and other parts of the world are taught' centered teaching strategy. The inability of Mathematics teachers to make use of students centered teaching methods and also, the abstract nature of Mathematics have caused most of the students to be performing below average in Mathematics.

Students' continuous deteriorating achievements in Mathematics are glaring and alarming. Reports and Observations from the West African Examination Council (WAEC) and National Examination Council (NECO) from 2014-2020 revealed that the achievement of the students in Mathematics in WAEC and NECO has been persistently below

average. Researchers have linked this poor performance to some teachers' factor which includes teachers' method of teaching. The teacher should put in place an effective method of teaching for purpose of arousing and sustaining students' achievement. Hence, the need to shift from conventional ways the subject is being taught by exploring more innovative learner-centered teaching-learning approaches. Such approaches include Think-Pair-Share, which the present study used as a teaching strategy for enhancing the achievement of students in Mathematics.

In the Think-Pair-Share teaching strategy, the teacher gives the students some mathematical task or question with specified time duration to think about the task or question individually. The students then share their observations in pairs and finally with the larger class. This teaching technique enhances students' participation in the classroom by promoting their level of positive engagement and interaction instead of the rote or recitation method in which the teacher asks a question and a student would be asked to provide information for the question (Simon, 2013). Think-Pair-Share encourages the students to actively participate in-class activities. The think-Pair-Share method of teaching is also one of the active cooperative learning strategies whereby the students activate their previous knowledge to tackle the present mathematical problem (Mahmoud, 2013). Scotts and Palincsar (2013) argued that when learners are grouped to learn, they acquired socially shared experiences and related effects such as improved learning and also gain valuable methods of solving problems. In addition, the grouping of students with different academic abilities to learn together might have impacted the learning gains.

Think-pair-share consists of three steps that include the following: **Thinking**-here, the teacher asked a question related to the topic and then asks the learners to spend a few minutes thinking alone on the possible answer to the stated question. **Pairing**- here, the learners are asked to pair with another learner to discuss together the concept that they have been thinking about. Information gathered by the learners during this period can be shared through interaction with one another. **Sharing**- this is the final step where the teacher asks the paired learners to share the experiences and the ideas that they have acquired about the problem with the class as a whole. (Kitaoka, 2013). He stated further that Think-Pair-Share encourages;

- (i) Positive interdependence: encourages learners to learn from one another.
- (ii) individual accountability: learners are accountable to one another for sharing information they have gathered. Learners may also be asked to share the idea of their partner with the other pair or the whole group.
- (iii) Equality in participation: every learner in each group has an equal chance to share information or idea. In a case where a learner seems to be dominating, the teacher comes in and controls the situation.
- (iv) Simultaneous interaction: there must be a high level of interaction among the learners. At any point of learning, the learners will be actively involved in purposeful speaking and listening. This negates the usual practice where the teacher and few learners dominate the teaching and learning process and other students are passive.

Therefore, the study employed the use of the Think-Pair-Share teaching method to concretize the abstract nature of Mathematics and also, to place the learners at the center of the learning and teaching process when learning Mathematics. There are conflicting reports concerning the effectiveness and the efficacy of Think-Pair-Share when teaching and learning Mathematics in senior secondary school. Some findings reported that the Think-Pair-Share learning method is capable of enhancing the achievement of students in Mathematics (Ifamuyiwa & Onakoya 2013; Mahmoud, 2013). Other researchers established that the effectiveness of the Think-Pair-Share teaching method can only be guaranteed if the method is used in collaboration with another strategy (Esther & Abubakar, 2019)

Gender difference issue has been something of serious concern. Some researchers have traced the issue to the origin of man-kind (Kurumeh, 2014; Ezeliora, 2014). Many studies have been carried out in and outside the country, Nigeria to investigate the effects of gender differences on the performance of students in Mathematics. Some of these studies revealed that the male students performed better when compared to their female counterparts (Forgasz,, et al, 2017). Others revealed that females do better in Mathematics (Hydea, and Mertz, 2016). None of the studies above indicated the effects of Think-Pair-Share on the gender of the learners. Hence, the need to establish the effects of gender on students' outcomes in Mathematics when Think-Pair-Share is used as a teaching method.

The following hypotheses were generated for this study. The hypotheses were tested at a 0.05 level of significance.

- (i) There is no significant effect of Think-Pair-Share on the achievement of students in Mathematics.
- (ii) There is no significant effect of gender on the achievement of students in Mathematics.
- (iii) There is no interaction effect of Think-Pair-Share and gender on the achievement of students in Mathematics.

Materials and Methods

Participants

- The sample for this study was selected from the public Senior Secondary School 2 (SSS2) students in Ogun-State, Nigeria.
- Purposive Sampling Technique was used to draw four (4) public secondary schools in Ijebu North East and Ijebu ode Local Government Aras of the state.
- Twenty (20) respondents were selected from each of the sampled schools.
- The samples were made up of forty (40) males and forty (40) females respectively.
- Pretest was administered to the respondents in the experimental groups and also to the respondents in the control groups before the intervention started.
- After the intervention that lasted for four (4) weeks, the posttest was administered to the experimental and the control group respectively.

Instruments

- The instrument for data collection is titled Mathematics Achievement Test (MAT).
- The MAT was made up of forty (40) items of multiple choices containing five (5) options per item.
- MAT was validated by giving it to experts in Mathematics education who keenly scrutinized its appropriateness and correctness. MAT was designed to measure the achievement of students in Mathematics.
- The reliability coefficient of 0.78 was estimated by using Pearson Correlation.

Procedure

- **Stage 1:** Orientation for the participant
- **Stage 2:** Pre-test was administered by the researchers
- **Stage 3:** The pre-test involves administration of the Mathematics Achievement Test (MAT)
- **Stage 4:** The treatment took place at this stage. The participants in each group were exposed to the strategy meant for the group only. This was being done by the researchers. The treatment lasted for four weeks in each of the groups.
- **STAGE 4:** The post-test of MAT and AAT was administered with the assistance of the trained teachers.

Results

Descriptive statistics

Table 1: Means and Standard Deviations of pretest and posttest achievement scores in the experimental and the control groups.

Group	N	Pre-achievement score		Post-achievement score	
		Mean	S.D	Mean	S.D
Experimental	40	12.32	6.34	16.55	4.65
Control	40	11.89	5.23	16.43	4.34

The results in table 1 show that the experimental group has a mean pre-achievement score of 12.32 and a mean post-achievement score of 16.55. Similarly, the control groups had a mean pre-achievement score of 11.89 and a mean post-achievement score of 16.43. This shows that the group that was taught by using think-pair-share as a teaching method recorded higher achievement scores than the group that was taught using the conventional method of teaching.

Table 2: Means and Standard Deviations of Males and Females student after exposing to Think-Pair-Share method of teaching.

Group	Gender	N	Mean	S.D
Experimental	Male	20	16.30	2.371
Group	Female	20	13.81	2.720

Figures in Table 2 shows that the achievement means scores of the male respondents in the experimental group is 16.30 while the female respondents had an achievement mean score of 13.81 in the experimental group. The mean of the male respondents was slightly higher than that of the female respondent.

Testing of the hypotheses

Hypothesis one: There is no significant effect of Think-Pair-Share on the achievement of students in Mathematics.

Table 3: Two-way Analysis of Covariance (ANCOVA) of the students' achievement scores on the treatment, gender, and their interactions.

Source	Type 3 sum of square	D.F	Mean Square	F	Significance
Corrected model	421.095	4	203.162	62.132	.000
Intercept	291.01	1	291.01	22.132	.000
Covariate	433.13	1	433.13	161.120	.000
Strategy	.321	1	.321	17.322	.004
Gender	.832	1	.832	.132	.673
Strategy * Gender	65.21	1	65.21	23.123	.002
Error	328.10	75	5.21		
Total	11255.00	80			
Corrected total	564.87	79			

R-Squared = .556 (Adjusted R-Squared =.532)

The ANCOVA of the students' achievement scores presented in Table 3 showed that the effect of the intervention (Think-Pair-Share) on students' achievement is significant at 0.05 level of significance. Furthermore, the F-value of 17.322 for the intervention is significant at 0.004, which is less than 0.05 alpha levels. Hence the null hypothesis was rejected. It is then concluded that there is a significant effect of Think-Pair-Share on the achievement of students in Mathematics. This implies a significant difference in the mean achievement scores of the students that were taught using Think-Pair-Share as an instructional guide and those students taught using the conventional teaching as an instructional guide.

Hypothesis Two: There is no significant effect of gender on the achievement of students in Mathematics.

The F-value of 0.132 from Table 3 for the gender difference is not significant at 0.672 since the value is greater than the 0.05 alpha level hence, the null hypothesis is accepted and then concluded that there is no significant effect of gender on the achievement of students in Mathematics.

Hypothesis Three: There is no interaction effect of Think-Pair-Share and gender on the achievement of students in Mathematics.

The F-value of 0.132 from Table 3 for interaction effects of Think-Pair-Share and gender is significant at 0.02 since the value is less than 0.05 alpha levels hence, the null hypothesis is therefore rejected and then concluded that there is an interaction effect of Think-Pair-Share and gender on the achievement of students in Mathematics.

Discussion of Findings

The findings show a significant difference in the achievement of those students that were taught using Think-Pair-Share as a strategy. The students that were exposed to the strategy achieved better than those students that were taught using the conventional method of teaching. This result indicated that the treatment was statistically significant in the achievement of the students in Mathematics. Hence, the use of Think-Pair-Share as a teaching method enhances students' achievement in Mathematics. This result is in agreement with the study of Esther & Abubakar (2019) which revealed that the Think-Pair-Share teaching method affected students' achievement in Principle of Account in Colleges of Education in the North-East part of Nigeria, Furthermore, the result showed a better achievement of the students that were exposed to the intervention (Think-Pair-Share) is in support of Mahmoud (2013) that Think-Pair-Share was a strategy that contributed to the improvement of Problem Solving and Skills resolution. The findings on the effectiveness of Think-Pair-Share by Anaduaka et al. (2018); Hastuti (2019) and Ugu

(2019) revealed that Think-Pair-Share is more effective in improving learning than the conventional method of teaching.

The findings also showed that there is no significant effect of gender on the achievement of students in Mathematics. This finding is in agreement with the findings of Asanre, et al (2021) who established that there is no significant difference in the achievement of males and females when a Mathematics game is used as Instruction in the learning of Mathematics. This finding is also in support of Abonyi and Umeh (2014) who revealed that achievement in learning is not affected by the gender of the respondent but, but by the degree of original learning, time at which achievement and retention are measured, and the individual's working memory capacity among other factors. This finding implies that what matters in teaching and learning Mathematics is the effectiveness and the efficacy of the instructional strategy and not the gender of the learners. Hence, the Think-Pair-Share method of teaching is not gender-sensitive as it increases the achievement of both genders significantly.

Conclusion

Based on the results of findings from the present study, it is concluded that the Think-Pair-Share method of teaching is a collaborative intervention that encourages sharing of ideas by members of the group and hence, enhances students' performance in Mathematics. Furthermore, the strategy does not discriminate between genders.

Recommendations

The following recommendations were made based on the findings in the present study:

- i. Mathematics teachers should be discouraged from using teacher-centered instructional strategies but student-centered instructional strategy Think-Pair-Share and other innovative strategies that will promote high-level learning achievement in Mathematics.
- ii. The think-Pair-Share strategy should be incorporated into the teaching and learning of Mathematics at the Senior Secondary School level.
- iii. Governments and stakeholders should organize workshops to train teachers on the use of new innovative teaching methods like Think-Pair-Share to teach Mathematics in Schools.

References

- Abonyi, O. S., & Umeh, V.O. (2014). Effects of heuristic method of teaching on students' achievement in algebra. *International Journal of Scientific and Engineering Research*, 5(2):1735-1740.
- Akinsolu, A.O. (2014). Teachers and Students' Academic Performance in Nigerian Secondary Schools: Implications for Planning. *Florida Journal of Educational Administration & Policy*. 3(2): 86-103.
- Anaduaka, U. S., Sunday, A. O., & Olaoye, A. E. (2018). Effect of think-pair-share cooperative strategy on mathematics achievement of attention-deficit hyperactive students. *Abacus*, 43 (1): 41-50.
- Asanre Akorede, A; Abiodun Taiwo O; Odupe Toyin, A & Ogundeji Moses A. (2021). Effects on mathematics game strategy on senior secondary school students learning outcome. *ABTU Journal of Science, Technology and Education*, 9(2): 12-17
- Bolaji, O. A. 2015. Mental ability, academic self-concept and attitude as predictors of secondary school students' achievement in Basic Science in Oyo State, Nigeria. *International Journal of Special and General Education*, 6(2): 21-30
- Esther A. A & Abubakar A.B (2019): Effects of Jigsaw and Think-Pair-Share Methods on Students' Academic Performance in Accounting in Colleges of Education in North-East Nigeria. *International Journal of Innovative Social & Science Education Research* 7(2): 119-132
- Ezeliora, B. (2014). Innovative programmes to computer .*Proceedings of the 45th Annual Conference of STAN*. 148-152. Asaba-Delta state from 15 – 21st August, 2014.
- Federal Republic of Nigeria (2014). *National Policy on Education (6th Edition)*. Lagos: NERDC PRESS.
- Forgasz, H.J., Leder, G.C., & Vale, C. (2017) Gender and mathematics: Changing perspectives. *Journal of Education and Technology*, 18(1): 161-168.
- Hastuti, T., Nuraini, F., Suyono, A. Yuliani, S., & Hartanto, D. (2019). Implementation of think-pair-share (TPS) cooperative learning model to improve the economic learning achievements. *Education Quarterly Reviews*, 2 (1), 135-143. <https://doi.org/10.31014/aior.1993.02.01.46>

- Hydea, J.S. & Mertz, J.E. (2016). *Gender, culture, and mathematics performance*. Retrieved from <http://tctvideo.madison.com/uw/gender>.
- Ifamuyiwa, A.S and Onakoya S.K (2013). Impact of Think – pair – share instructional strategy on Students' Achievement in Secondary School Mathematics. *Journal of Science Teachers Association of Nigeria*, 48(1): 44-48.
- Kitaoka, H. (2013). Teaching methods that help economics students to be effective problem solvers. *International journal of art and commerce* 2(1): 101-110.
- Kurumeh, M.S.C. (2014). Effects of Ethno-mathematics Approach on students' achievement and interest in Geometry and mensuration. Unpublished Ph.D Thesis, University of Nigeria, Nsukka.
- Mahmoud Kaddoura (2013): Think Pair Share: A teaching Learning Strategy to Enhance Students' Critical Thinking. *Educational Research Quarterly* (36)4: 1-24.
- Ogbonna, C.C. (2010). Effects of two constructivists Based Instructional Model on Students Achievement and Retention in Number and Numeration. *Journal of Educational Technology*: 15(1): 26-31.
- Scotts, S., & Palincsar, A. (2013). Sociocultural theory. Retrieved 29 August, 2019 from http://dr-hatfield.com/theorists/resources/sociocultural_theory.pdf
- Salau, M.O. (2013). Comparative effects of attending single sex and co-educational secondary schools on the female students' achievement in mathematics. *Journal of Education and Technology*, 14(2): 74-83.
- Simon, C.A (2013). Strategies guide series differentiating instruction, Urbana Illinois: NCTE publisher.
- Ugu, E. O. (2019). Effect of Student Teams Achievement in Reading Comprehension. *African Journal of Teacher Education*, 8(2): 218-237.