

# Effect of think-pair-share instructional strategy on senior secondary school students' academic achievement in mathematics in Ogun State

Ademola Kehinde Badru

Olabisi Onabanjo University, Ogun State, Nigeria

Email: badru.ademola@oouagoiwoye.edu.ng

## Abstract

This study investigated the effect of the Think-Pair-Share instructional strategy on senior secondary school students' achievement in mathematics in Ogun state, Nigeria. The study adopted a pre-test, post-test, and control group quasi-experimental research design with a 2X3X2 factorial matrix. The sample comprised 104 students from two classes of the SS2 students. Two instruments used were the Mathematics Achievement Test (MAT) and Instructional treatment packages (experimental and control). Data was analysed with descriptive and inferential statistics (Analysis of Covariance) to test hypotheses 0.05 significance level. The result showed a significant main effect of treatment and parental educational background on students' academic achievement in Mathematics ( $F_{(1,103)} = 13.092$ ;  $F_{(2,103)} = 15.327$  respectively,  $P < 0.05$ ). It showed that students taught with the Think-Pair-Share instructional strategy recorded a higher adjusted post-test mean score in MAT (21.91). However, the outcomes of treatment and Parental education background levels contributed 35.4% and 39.5%, respectively, to the variance in students' achievement in mathematics. It is concluded that this strategy encourages students to participate actively and interact, thereby making them take responsibility for their learning. As part of the recommendations, mathematics teachers should be encouraged to use the think-pair-share instructional strategy as a variety tool in mathematics classrooms.

Penelitian ini menyelidiki pengaruh strategi pembelajaran Think-Pair-Share terhadap prestasi siswa sekolah menengah atas dalam bidang matematika di negara bagian Ogun, Nigeria. Penelitian ini menggunakan desain penelitian kuasi-eksperimental pre-test, post-test, dan kelompok kontrol dengan matriks faktorial 2X3X2. Sampel terdiri dari 104 siswa dari dua kelas siswa SS2. Dua instrumen yang digunakan adalah Tes Prestasi Matematika (MAT) dan paket perlakuan instruksional (eksperimen dan kontrol). Data dianalisis dengan statistik deskriptif dan inferensial (Analisis Kovarians) untuk menguji hipotesis pada tingkat signifikansi 0,05. Hasil penelitian menunjukkan adanya efek utama yang signifikan dari perlakuan dan latar belakang pendidikan orang tua terhadap prestasi akademik siswa di bidang Matematika ( $F(1,103) = 13.092$ ;  $F(2,103) = 15.327$ ,  $P < 0.05$ ). Hasil penelitian menunjukkan bahwa siswa yang diajar dengan strategi pembelajaran Think-Pair-Share mencatat nilai rata-rata post-test yang lebih tinggi dalam MAT (21,91). Namun, hasil dari perlakuan dan tingkat latar belakang pendidikan orang tua masing-masing berkontribusi sebesar 35,4% dan 39,5% terhadap varians pencapaian siswa dalam matematika. Dapat disimpulkan bahwa strategi ini mendorong siswa untuk berpartisipasi aktif dan berinteraksi, sehingga membuat mereka bertanggung jawab atas pembelajaran mereka. Sebagai bagian dari rekomendasi, guru matematika harus didorong untuk menggunakan strategi pembelajaran think-pair-share sebagai alat variasi di kelas matematika.

**Keywords:** Think-Pair-Share Instructional Strategy, Parental Educational Background levels, gender and Academic Achievement

## Introduction

Mathematics education plays a dominant role and is one of the basic educational materials that can be useful and effectively contribute to the development and growth of the student's mathematical aspects. For example, mathematics is the science of instruction using mathematical language, symbols, words, forms and relationships to express and understand mathematical ideas (AbdAlgani, 2022). It also occupies a conspicuous position among the branches of knowledge in any educational institution (Alabi, 2020).

In spite of the importance of mathematics at the Senior Secondary educational level, students are still having low performance in the public examinations such as West African Senior Secondary Certificate Examinations (WASSCE) and National Examinations Council (NECO). The studies of Rasheed et al (2023), and Falebita and Olofin (2020) established students' low achievement in mathematics. The low achievement in mathematics prompted researchers to proffer different solutions to this predicament and also introduce various interventions. Many past works have been conducted to improve mathematics Achievement among students. For instance, a study conducted by Hammond (2021) reported that the social interaction approach significantly affected senior secondary school students' achievement in mathematics. Similarly, Asanre et al. (2022) revealed that the teacher's instructional techniques had contributed positively or negatively to the student's achievement in mathematics. Abiodun et al, (2022) and Alabi, and Sanni (2021) also reported that students' persistent poor achievement, partly, to instructional strategies adopted by the teachers. Ndanwu et (2022) identified that many factors, which range from students' perception that mathematics is difficult, shortage of qualified mathematics teachers and lack of mathematics laboratories, influenced low achievement in mathematics. (Rasheed et al, (2023) established that students of secondary schools in Ogun State had low achievement in mathematics.

This could be a result of the fact that it is only very studies that have used active learning instructional strategies with students to improve their mathematics achievement. The low achievement of students in mathematics may be a result of the conventional method teachers are using to teach students, which is teacher-centered. The conventional method of teaching is an instructional approach that emphasizes on the teacher as a propagator of information or knowledge and it is characterized by questioning and lecture methods (Alabi, & Sanni, 2021). As a result of the inadequacies detected in the methods used by teachers in the teaching and learning process which translates to low achievement in mathematics at secondary school level, this study employed the use of Think-Pair-Share instructional strategy.

Think-Pair-Share instructional strategy is a collaborative learning technique which is aimed to provide students the achievement and to stimulate their energies and develop their abilities suitable for students of all ages and those engaging in cooperative learning for the first time (Ahmed, 2016). Think-pair-share is a cooperative learning strategy which has three major steps: Time for thinking; time for sharing with a partner; and time to share among pairs to a larger group. This strategy provides an opportunity to students work together to solve a problem or answer a question. It is strategy which requires students to think individually about a topic or an answer to a question and share ideas with classmates. Using think-pair-share allows the teacher to gain insight into the quality of student understanding. When teachers are able to measure their students' understanding and they can be more beneficial to learners (Alabi, 2020).

According to Falebita et al (2022), Think-pair-share instructional strategy promotes active participation, critical thinking, and effective communication skills among students. It is kind of collaboration which express that learning is a communal process and not a distinct one, and it occurs when students interrelate with their teachers and with one another in the classroom and also beneficial for students with lower self-esteem, the lesser competent student, or those who are highly dependent). The think-pair-share strategy promotes the importance of social interaction and observation and encourages pair and group discussions, students have the opportunity to observe and learn from their peers, expanding their knowledge and skills through social interaction. This strategy deals with the modeling and imitation of behaviors, as students can observe and learn from each other's ideas and perspectives. Additionally, the think-pair-share strategy encourages students to collaborate, share their thoughts, and receive feedback, fostering a supportive and interactive learning environment (Egbai, et al, 2022).

In the literature review, many studies carried out reported that think-pair-share can positively impact students' achievement, active engagement, and social interactive classroom environment. Studies have found that think-pair-share enhances students' understanding of mathematical concepts, problem-solving skills, and critical thinking abilities (Ahmed, 2016). By engaging in discussions with their peers, students can clarify their own thinking, learn from different perspectives, and develop more robust mathematical reasoning (Al-Zahrani, 2022). Furthermore, think-pair-share encourages students to express their ideas and reasoning, fostering effective communication skills. The opportunity to share their thoughts with the whole class increases students' confidence and engagement in mathematics and also active involvement that leads to improved academic achievement and student performance in mathematics (Alabi, & Sanni, 2021).

Studies like Omeje (2024), Usang and Okoli (2021) reported the importance of think-pair-share in promoting active student engagement, collaboration, critical thinking, and problem-solving and effective communication skills. This strategy encourages students to think deeply about the math concepts and actively participate in discussions, leading to a deeper understanding of the material. These studies highlight the potential benefits of the think-pair-share strategy in enhancing students' mathematics learning experience.

In the same vein, research reported that the think-pair-share strategy is an adequately effective technique in classroom conversation (Al-Zahrani, 2022; Alabi, & Sanni, 2021; Akanmu, 2019). This effectiveness of the think-pair-share strategy had been supported with similar or different subject contents research studies. In similar subject content, the study of Abiodun et-al, (2022) aimed at knowing the impact of the think-pair-share strategy on the achievement of the second-grade intermediate female students in Mathematics and their reasoning thinking while in different subject content, the study of Khaji (2010) aimed to investigate the effectiveness of the think-pair-share strategy to acquire Physics concepts and the development trend towards solving Physics issues among the students in the first grade. Hence, it is against this background that the study examined the effect of Think-Pair-Share instructional strategy on senior secondary school students' academic achievement in mathematics.

Moreover, different studies have also looked at various factors that could be responsible for low achievement in mathematics. These factors include demographics, academic backgrounds, family characteristics, parents' socio-economic status, parents' role, social environmental level, students' attitude toward learning, age factor, and parental involvement among others (Haider et-al, 2024; Sabrina, & Adam, 2023; Onyedikachim, & Ezekiel-Hart, 2021). However, parental educational background is of great interest to this study because there have been several conflicting reports about its influence on achievement in mathematics especially at the secondary school level.

Parental educational background refers to the academic attainment of the father and mother or guardian in schools which might play a crucial role in shaping a learner's mathematics academic achievement (Rasheed et-al, 2023; Cui et-al, 2021). Parental educational experience is related to the number of schools attended and the qualifications acquired from the different tiers of education (Rasheed et-al, 2023; Onyedikachim, & Ezekiel-Hart, 2021). Studies have indicated that Parental educational background to be a superior predictor of a learner's repeating grades than poverty status, family structure, or family income (Purnomo et-al, 2022). Some findings have reported that parents with advanced educational levels might stimulate the intellectual abilities of children which may bring about better performance in school (Hou et-al, 2020; Sabrina, & Adam, 2023). Claudine, (2023) affirmed that educational accomplishment of parents is a reliable predictor of academic accomplishment of learners. In contradictory, Haider, (2024); Shoaga et-al, (2023) reported that parents' education level did not influence students' academic achievement in mathematics. The results of the findings of Biitokoro et-al, (2023) established that there is no strong association between parents' education and students' achievement in mathematics.

However, students' gender plays a very remarkable role in their academic achievement in mathematics (Asanre et-al, 2022). There is a significant difference of students' gender on achievement in mathematics (Hlalele, 2022; Hammond, 2021). But some researchers (Alabi, (2020); Ahmed, (2016) reported that gender has no significant determinant of participants' achievement in mathematics. This is line with finding of (Rasheed et-al, 2023) who did not find any significant difference in the academic achievement of male and female participants in his study.

In view of the discussions above, this paper examined the effect of think-pair-share instructional strategy on students' academic achievement in senior secondary school Mathematics. The paper used students' parental educational background levels and students' gender on students' academic achievement in senior secondary school Mathematics.

## Statement of problem

The difficulties in teaching mathematics in senior secondary school are making it engaging and relatable for students. Many students find mathematics fear, abstract and anxiety that some students may have towards the subject. It is very necessary for teachers to create a safe and supportive learning environment where students feel comfortable asking questions and making mistakes. By fostering a positive mindset and providing opportunities for collaborative problem-solving, mathematics teachers can help lessen anxiety and promote a growth mindset among students. Hence, against this backdrop, this study examined the effect of think-pair-share instructional strategy on students' academic achievement in senior secondary school Mathematics. It further examined the moderating impacts of parental educational background and students' gender on students' academic achievement in senior secondary school Mathematics.

## Research questions

1. What are the mean academic achievement scores of students taught Mathematics using the think-pair-share instructional strategy and those taught using the Conventional method?
2. What are the mean academic achievement scores of male and female students taught Mathematics using the think-pair-share instructional strategy and those taught using the Conventional method?
3. What are the mean academic achievement scores of students with parental educational background (primary; secondary and tertiary) levels taught Mathematics using the think-pair-share instructional strategy and those taught using the Conventional method?

## Statement of Hypotheses

The following hypotheses were generated for this study. The hypotheses were tested at a 0.5 level of significance.

1. There is no significant main effect of treatment, parental educational background and students' gender on students' academic achievement in senior secondary school Mathematics.
2. There is no significant two-way interaction effect of treatment, parental educational background and students' gender on students' academic achievement in senior secondary school Mathematics.
3. There is no significant three-way interaction effect of treatment, parental educational background and students' gender on students' academic achievement in senior secondary school Mathematics.

## Theoretical Frame work

This paper adopted a Bruner's theory of discovery learning. It is an instructional model designed to improve students' critical thinking skills and develop active learning methods (Yerimadesi et al, 2019). Bruner used discovery learning as an active invention knowledge and automatically gives the best results. It was reported that learning would be more meaningful for students if they were focused on understanding the structure of information. Students should active to obtained information structure and had to identify the key principles rather than merely accepted the teacher's explanation (Jannah & Kiram, 2018). Bruner believes that every child/ learner has the desire to learn and this desire should be employed in activities that pique students' interest and encouragement them to read and gain information. He further added that learning occurs through discovery,

reasoning, testing and investigation, using new facts and information that students have gathered in an exploratory learning environment (Balim, 2009). However, this theory is relevant to learning of Mathematics using think-pair-share instructional strategy which activates discovery learning. The theory encourages the students' centred instructional environment for discovery, inquiry and active engagement in solving problems in mathematics.

## **Methodology**

### **Research design**

The researcher employed a quantitative approach in the conduct of the study which was a pre-test, post-test, control group quasi-experimental research design with a 2x3x2 factorial matrix to determine the effectiveness of think-pair-share strategy in improving mathematics achievement of senior secondary school students in Ijebu-Ode local government areas, Ogun state. This design made it possible to establish the effectiveness of the independent variable (think-pair-share strategy) on the dependent variable (mathematics achievement). It also provided the opportunity to study the interaction effects of the moderating variables (parental educational background levels: primary; secondary and tertiary and students' gender levels: male and female).

### **Target population**

The target population for the study consisted of Senior Secondary Two (SS2) students offering mathematics in two public secondary schools in Ijebu-Ode Local Government Areas, Ogun state.

### **Sample and sampling technique**

The sample for this study was 104 students drawn from two classes of the Senior Secondary 2 (SS2) students designated as the treatment and control groups of public schools in the Ijebu-Ode Local Government Areas, Ogun State. SS2 schools were purposively selected for the study based on the following criteria:

- i. They must be coeducational.
- ii. The school must not be located close to each other to prevent interaction effect of the participating students.
- iii. There should be willingness on the part of the students to participate in the study.
- iv. The respective school management should be willing to approve the conduct of the experiment in their schools.

Lastly, in each of the schools selected, one arm (science) of the intact class of SS2 students participated in the study.

### **Instrumentation**

The instruments used for this study were Mathematics Achievement Test (MAT) and Instructional treatment packages (experimental and control).

#### **a. Mathematics Achievement Test (MAT)**

Mathematics achievement test was used to measure the mathematical achievement of the student. Mathematics was sectioned into two segments, section A was obtained to obtain demographic data of the respondents such as Identification number, age range and gender and parental educational background (Primary, Secondary or Tertiary level) were obtained. Section B contained twenty nine (29) items of multiple choice objective test items each with four alternatives (A-D). Each of the test items carries one mark, that is, the totality of the test was 20 marks. The test questions covered the following topics from the SS2 scheme of work (Circle theorems and their applications, Arithmetical and Geometrical Progressions). To ascertain the reliability of the instrument, the researcher adopted Kuder-Richardson - 20 formula. Reliability co-efficient value was computed to be 0.89.

#### **b. Instructional treatment packages (experimental and control)**

**1. Instructional guide for experimental groups**

The procedure for experimental group are as follows:

**Step I:** Teacher wrote the questions on the board for students to discuss individually. The students were allowed to think on their own within five minutes.

Step II: Teacher peered the students to solve the problems together within ten minutes

Step III: Teacher called one of the groups to solve earlier questions on the board to the whole class members and later allow criticism to the solution from each member.

**2. Instructional guide for control group**

Teacher in the control group used his or her lesson guide to teach the same topics for the study using usual method of teaching regarded as conventional method of teaching.

**Method of data collection**

**First week:** With permission of the principals, the researcher contacted the subject teachers and students to solicit for their supports, cooperation and commitment toward the success of the study. Orientation for the research assistants and participants. The study was took seven weeks base on the time table.

**Second week:** Pre-test of MAT was administered.

**Third – Sixth weeks:** 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 two research assistants. The treatment lasted for four weeks in each of the groups using four topics (Circle theorems and their applications, Arithmetical and Geometrical Progressions).

**Seventh week:** The Post-test of MAT as administered with the assistance of the trained teachers.

**Method for data analysis**

Data collected subjected to descriptive and inferential statistics. While the descriptive statistics involved the use of mean values and standard deviation values to answer research questions raised, the inferential statistics involved the use of Analysis of Covariance (ANCOVA) with Pre-test scores as covariates and Multiple Classification Analysis (MCA) to test for three hypotheses formulated 0.05 level of significance.

**Findings and Discussion**

**a. To answer Research Questions**

**Research question 1:** What are the mean academic achievement scores of students taught Mathematics using the think-pair-share instructional strategy and those taught using the Conventional method?

**Table 1: Mean Academic Achievement Scores of students in Mathematics using Treatments**

	Think-Pair-Share	Conventional	Mean difference
Mean	21.38	18.37	3.01
SD	3.76	3.34	
N	50	54	

Table 1 indicated that the analysis of students’ post mean scores in Mathematics Achievement in the treatment (Think-Pair-Share group and Conventional group). The result revealed that students in the Think-Pair-Share group obtained Post-test mean scores of 21.38, Standard Deviation (SD) scores = 3.76 and N = 50 while students in the Conventional group obtained Post-test mean scores of 18.37, SD = 3.34 and N = 54. In conclusion, the Table showed that students in Think-Pair-Share group displayed higher Post-test mean scores than students in the conventional group.

**Research question 2:** What are the mean academic achievement scores of male and female students taught Mathematics using the think-pair-share instructional strategy?

**Table 2: Mean Academic Achievement Scores of male and female students in Mathematics using taught Mathematics using the think-pair-share instructional strategy**

	Male students	Female students	Mean difference
Mean	21.63	21.23	0.40
SD	3.92	3.71	
N	19	31	

Table 2 indicated that the analysis of male and female students' post mean scores in Mathematics Achievement in the Think-Pair-Share group. The result revealed that male students obtained Post-test mean scores of 21.63, Standard Deviation (SD) scores = 3.92 and N = 19 while female students in the Think-Pair-Share group obtained Post-test mean scores of 21.23, SD = 3.71 and N = 31. Hence, the Table showed that there is no difference between the Post-test mean scores of male and female students in the Mathematics Achievement Test using Think-Pair-Share instructional strategy.

**Research question 3:** What are the mean academic achievement scores with parental educational background (primary; secondary and tertiary) levels of students taught Mathematics using the think-pair-share instructional strategy?

**Table 3: Mean Academic Achievement Scores with parental educational background (primary; secondary and tertiary) levels of students in Mathematics using the think-pair-share instructional strategy**

	Primary educational	Secondary educational	Tertiary educational
Mean	19.75	20.90	23.67
SD	3.88	3.84	2.50
N	8	30	12

Table 3 indicated that the analysis of parental educational background of students' post mean scores in Mathematics Achievement in the Think-Pair-Share group. The result revealed that students of Parental primary educational background level obtained Post-test mean scores of 19.75, Standard Deviation (SD) scores = 3.88 and N = 8, students of Parental secondary educational background level obtained Post-test mean scores of 20.90, SD = 3.84 and N = 30 and students of Parental tertiary educational background level obtained Post-test mean scores of 23,67, SD = 2.50 and N = 12 Hence, the Table showed that students of Parental tertiary educational background level had highest score in the MAT, follows by students of Parental secondary educational level and students of Parental primary educational level came last in the think-pair-share instructional strategy.

## b. To test for Hypotheses

**Hypothesis 1:** There is no significant main effect of treatment, parental educational background and students' gender on students' academic achievement in senior secondary school Mathematics.

**Table 4: Summary of Analysis of Covariance of Students in MAT on Treatment, Parental educational background and Gender**

Dependent Variable: post test						
Source	Type II Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	644.558 <sup>a</sup>	12	53.713	5.586	.000	.424

Intercept	3719.781	1	3719.781	386.870	.000	.810
Pre-test	131.401	1	131.401	13.666	.000	.131
Parental	294.746	2	147.373	15.327	.000	.252
Treatment	125.880	1	125.880	13.092	.000	.126
Gender	.950	2	.475	.049	.952	.001
Parental * Treatment	37.516	2	18.758	1.951	.148	.041
Parental * Gender	4.390	2	2.195	.228	.796	.005
Treatment * Gender	.693	1	.693	.072	.789	.001
Parental * Treatment * gender	2.482	1	2.482	.258	.613	.003
Error	874.971	91	9.615			
Total	42363.000	104				
Corrected Total	1519.529	103				
a. R Squared = .424 (Adjusted R Squared = .348)						

Table 4 revealed the analysis of the test on the effect of treatment, parental educational background and students' gender on students' academic achievement in senior secondary school Mathematics. The result showed significant main effect of treatment and parental educational background on students' academic achievement in senior secondary school Mathematics ( $F_{(1,103)} = 13.092$ ;  $F_{(2,103)} = 15.327$  respectively,  $P < 0.05$ ). This indicated that students in Think-pair-share instructional strategy and control groups and their Parental educational background differ significantly in Post-test mean scores obtained in MAT after treatment. Hence, there is a significant main effect of treatment and parental educational background on students' academic achievement in senior secondary school Mathematics. However, Table 5 revealed further analysis of the students' Post-test mean scores in MAT in terms of magnitude. This was done through Multiple Classification Analysis (MCA).

**Table 5: Multiple Classification Analysis (MCA) of Students Post-Test mean score in MAT according to Treatment, Parental educational background and Students' gender**

Grand mean = 20.51

Unadjusted		N Adjusted for Factors	Predicted Mean	Deviation Adjusted for Factors	Eta	Beta
Treatment	Think Share and	50	21.38	1.397	.389	.354
	Control	53	18.40	-1.317		
Parental educational background	Primary	12	18.25	-2.040	.440	.395
	Secondary	73	19.22	-.428		
	Tertiary	18	23.44	3.094		
Gender	male	50	19.84	.101	.001	.026
	female	53	19.85	-.096		

Table 5 indicated the magnitude of students' post-test mean cores in MAT in the 2 x 3x2 levels of treatment,

parental educational backgrounds and students' gender respectively. The MCA showed a grand mean of 20.51, the students taught with Think-Pair-Share instructional strategy recorded adjusted post-test mean score of 21.91 (20.51 + 1.40), while the control group recorded adjusted post-test mean score of 19.19 (20.51 - 1.32). This outcome thus showed that students taught with Think-Pair-Share instructional strategy recorded higher adjusted post-test mean score in MAT than those taught with the control group. However, the outcome of treatment had contributed of 35.4% to the variance in students' achievement in mathematics and significant. The table also revealed the result of MCA on parental educational background of students (primary, Secondary, and tertiary levels) recorded adjusted post-test scores in MAT of 18.47 (20.51 - 2.04); 20.08 (20.51 - 0.43) and 23.60 (20.51 + 3.09) respectively. This implied that students from parental educational background level recorded highest adjusted post-test mean score, followed by students from parental educational background level. However, the result showed parental educational background levels had contributed 39.5% to the variance in students' achievement in mathematics and significant. The table 5 indicated the result of MCA on gender of students (male and female) recorded adjusted post-test scores in MAT of 20.61 (20.51 + 0.10) and 20.41 (20.51 - 0.10) respectively. This implied that male students recorded higher adjusted post-test mean score than their female counter part. However, the result showed gender of students had contributed 2.6% to the variance in students' achievement in mathematics but not significant.

**Hypothesis 2:** There is no significant two-way interaction effect of treatment, parental educational background and students' gender on students' academic achievement in senior secondary school Mathematics.

The results of the 2-way interaction effect in Table 4 revealed non-significant interaction effect of treatment, parental educational background and students' gender on students' academic achievement in senior secondary school Mathematics {  $F_{(2,103)} = 0.148$ ;  $F_{(2,103)} = 0.796$  and  $F_{(2,103)} = 0.789$  respectively,  $P > 0.05$ ). This implied that there is no significant two-way interaction effect of treatment, parental educational background and students' gender on students' academic achievement in senior secondary school Mathematics.

**Hypothesis 3:** There is no significant three-way interaction effect of treatment, parental educational background and students' gender on students' academic achievement in senior secondary school Mathematics.

The results of the 3-way interaction effect in Table 4 revealed non-significant interaction effect of treatment, parental educational background and students' gender on students' academic achievement in senior secondary school Mathematics ( $F_{(1,103)} = 0.613$ ;  $P > 0.05$ ). This outcome implied that there is no significant 3-way interaction effect of treatment, parental educational background and students' gender on students' academic achievement in senior secondary school Mathematics.

## Discussion of findings

From the analysis of outcomes of the findings from the first hypothesis indicated that students taught with Think-Pair-Share instructional strategy recorded higher adjusted post-test mean score in MAT than those taught with the control group. This implies that Think-Pair-Share instructional strategy is better than control treatment in improving the students' achievement in mathematics. This could be explained to the fact that students exposed to Think-Pair-Share instructional strategy received cues and prompts from their colleagues when needed, they were able to pair up and interact with their peers that were more knowledgeable to guide themselves in problem solving. They were also able to explore various instructional materials and actively participated in the classroom activities than the control method taught mathematics in abstract. The outcome is in support of research relate to the discoveries of Omeje (2024), Hernando (2023), Freeman et-al, (2022), Abiodun et-al, (2022), Al-Zahrani (2022), Okolocha, and Nwaukwa (2020) that reported the effectiveness of Think-Pair-Share instructional strategy in improving the academic achievement of students in mathematics knowledge and skills, acid base reaction, lit in English, introductory sciences, mathematics, English language and financial accounting among others.

Further analysis from the first hypothesis indicated that there is significant main effect of Parental Educational background levels on students' academic achievement in senior secondary school Mathematics. This implied that the Parental Educational background levels had influence on students' academic achievement

in senior secondary school Mathematics. This might be because of the Think-Pair-Share instructional strategy allowed the students to be actively engaged as they interacted with each other. This finding is corroborated the findings of studies conducted by Haider et-al, (2024), Claudine, (2023), Purnomo et-al, (2022), Alabi, and Sanni, (2021) reported that parental educational background levels significantly determine the academic achievement of students and Parental education levels are important and also motive the students to study more effectively. But in the contradiction to the outcome of this study, the finding of the study conducted by Rasheed et-al, (2023) reported that there is no significant main effect of parents' educational levels on Pre-primary school children's mental development achievement. They also reported that Pre-primary school children with parents that had primary education level had highest mean score of mathematics achievement (19.60), followed by those with parents that had secondary education (19.46) and then by those that had parents with tertiary education (15.75). In the same vein, Biitokoro et-al, (2023), Hou et-al, (2020) affirmed that students' academic achievement may not always be influenced by their parent's educational levels.

## Conclusion and Recommendations

The outcomes of the study indicated that the think-pair-share instructional strategy significantly improved the achievement of students in Mathematics, and it is a strategy which is effective in enhancing the achievement of students in Mathematics. It can also be concluded that when Mathematics teachers adopt the strategy, student-to-student active participation and interaction increase, thereby making students take responsibility for their learning compared to the control methods. The study revealed that parental educational background levels are an important factor that influences students' academic achievement in mathematics when they are exposed to the think-pair-share instructional strategy.

In light of the findings, since the Think-Pair-Share instructional strategy proved more effective than control methods, mathematics teachers should be encouraged to use the think-pair-share instructional strategy as a variety tool in mathematics classrooms; curriculum planners should incorporate the think-pair-share instructional strategy into the curriculum of pre-service-teachers. This will enable any prospective teachers who pass through College or Faculty of Education to be exposed to the use of the instructional strategy. Professional organisations and ministries of education should encourage mathematics to attend workshops and seminars on think-pair-share instructional strategies for in-service teachers.

## References

- AbdAlgani, Y. M. (2022). Role, Need and Benefits of Mathematics in the Development of Society. *Journal for the Mathematics Education and Teaching Practices*, 3(1), 23-29.
- Abiodun, T., O., Asanre, A., A., Ogundeji, M., A., Odupe, T., A., & Rasaki, M. G., (2022). Effect of Think-Pair-Share Strategy on Student Achievement in Senior Secondary School Mathematics. *Journal of Mathematics and Science Education*. 3, (2). 20-36. ISSN: 2814-0885 e-ISSN: 2814-0931.
- Ahmed, M.A. (2016). The effect of (think pair share) and (sequenced questions) strategies on fifth primary students' achievement and retention at sciences. *Journal of College of Basic Education*, 22(94), 403-442.
- Akanmu, M., A. (2019). Effects of think-pair-share on senior school students' performance in mathematics in Ilorin, Nigeria. *African Journal of Educational Studies in Mathematics and Sciences*. 15 (2). 109-114. DOI: <https://dx.doi.org/10.4314/ajesms.v15i2.9> 109.
- Alabi, I. A., (2020). Effect of Personalised Instruction on Students' Learning Outcomes and Attitude in Mathematics Education at Senior Secondary School, Lagos State, Nigeria. *International Journal of Innovative Research & Development*, 86-90. DOI: 10.24940/ijird/2020/v9/i1/ JAN20060.
- Alabi, I., & Sanni, R. (2021). Effects of the Think-Pair-Share Instructional Strategy on Students' Learning Achievements in Secondary School Mathematics. *Abacus Mathematics Education Series*. 46, (1). 119.
- Al-Zahrani, A. S. (2022). The impact of the Think-Pair-Share strategy on the critical thinking skills of intermediate

- school students in English language learning. *Journal of Language Teaching and Research*, 13(1), 257-271.
- Asanre, A., A., Abiodun, T., O., Odupe, T., A., Olusola, G., S, & Ojabaro, D., I. (2022). Effects of Guided Inquiry Strategy on the Mathematics Achievement of Senior Secondary School Students. *Journal of Science and Information Technology*. 17, (1). 12-23.
- Biitokoro, N., M., Tukur, M. & Abdul-Rahim (2023). Influence of Parental educational level and students' academic performance among secondary school students of Kitsuamba and Rugendabara-Kukongo town connects, Kasese district, Uganda. *IAA Journal of Education*, (2). 129-141.
- Claudine, T., M. (2023). Parental Level of Education and its Implications on their Expectations towards their Children Academic Performance. *International Journal of Psychology and Cognitive Education*. 2, (2). 1-20. ISSN 2958 - 4167 (Online) DOI: <https://doi.org/10.58425/ijpce.v2i1.1091>.
- Cui, Y.R., Zhang, D.H. & Leung, F.K.S. (2021). The Influence of Parental Educational Involvement in Early Childhood on 4th Grade Students' Mathematics Achievement. *Early Education and Development*, 3, 113-133. <https://doi.org/10.1080/10409289.2019.1677131>.
- Egbai, J., M., Otu, B., D., Ita, C., I., Ojini, R., A., & Eke, O., E., (2022). Effect of Think-pair-share Instructional Strategy on Senior Secondary II Students' Academic Achievement. *Prestige Journal of Education*, 5 (2). 30-36. ISSN: 2645-324X.
- Eke, C. (2021). *Effect of think-pair-share and scaffolding instructional strategies on senior secondary II students' achievement in English language comprehension in Abia State*. Unpublished Ph.D thesis, College of Education, Michael Okpara University of Agriculture, Umudike.
- Falebita O. S., Ayanwoye O. K. & Salami, O. O. (2022) Effects of lesson study and Think-Pair-Share Instructional Strategies on Students' Academic Performance in Circle Geometry. *Abacus Mathematics Education Series*. 47, (2), 140.
- Falebita, O. S., & Olofin, S. O. (2020). Effects of Think-Pair-Share (TPS) Learning Strategy on Senior Secondary School Students' Performance and Self-Efficacy in Circle Geometry. *AAUA Journal of Science and Technology Education*, 3(1), 12 - 24.
- Freeman, S., Haak, J., & Wenderoth, M. P. (2022). Active learning nearly doubles learning in the sciences: Evidence for the impact of active learning on college student learning in introductory science courses. *Science Education*, 106(3), 432-458.
- Haider, S. L., Hussain, A., Haider M., H., Zakir, A & Shahdi, R. (2024). Impact of Parents Education Level on the Academic Performance of their Children. *International Journal of Contemporary Issues in Social Sciences*. 3 (1). 1202-1207.
- Hammond, J. (2021). Scaffolding instructional strategy for teaching mathematical concepts. *Mathematics Education*, 4(2), 85-92.
- Hernando, M., J., C., Reponte-Sereño, R., R., Gloria Con-ui Cuevas, G., C., & Pacaldo, J., M., (2023). Think-Pair-Share: A Strategy for Effective Student-Engaged Literature Classes. *International Journal of English Language Studies* 4 (1). 32-40.
- Hlalele, D. (2022). Gender differences in attitudes toward mathematics. *Gender and Education*, 45(2), 221-23.
- Hou, S., Wang, R. & Liu, Y. (2020). *How Parental Instructions Scaffold Young Children's learning Performance: A Cross-Cultural Comparison between America and China*. *Cognitive Development*, 56, Article ID: 100953. <https://doi.org/10.1016/j.cogdev.2020.100953>
- Khaji, T. H. (2010). The effectiveness of (Think-pair-share) strategy to acquire physics concepts and the development trend towards solving physics issues among students in first grade, *Al Fath Journal*, 6 (44), 139-156.
- Mohammad, A. D., (2020). Effect of employing the strategy of (Think-Pair-Share) on the academic achievement and motivation for learning at students of diploma in statistics course at (Zarqa University College), *British Journal of Humanities and Social Sciences*. 23 (2). 56-59. ISSN 2048-1268.
- Ndanwu, A. I., Ezejiofor, V. O. Esimone, R. O., & Nwako, F. A. (2022). Think-Pair-Share instructional method:

- A pedagogical tool for enhancing students' academic achievement in cataloguing and classification. *Tropical Journal of Education*, 4(1/2), 1 – 9, 2022 ISSN: 2645-2529.
- Ogbaga, O., A. & Osuafor, A., M. (2022). Effects of Brainstorming and Think-Pair-Share Instructional Strategies on Secondary School Students Achievement in Biology in Awka Education Zone. *UNIZIK Journal of STM Education*. 5, (1). 50-64.
- Okolocha, C. C. & Nwaukwa, F. C. (2020). Effect of think-pair-share instructional strategy on secondary school students' academic achievement and Retention Financial Accounting in Abia State. *International Scholars Journal of Arts and Social Science. COOU Journal of Science Education and Allied Discipline*; 3(1), 146-156. ISSN (Print): 2635-3083.
- Omeje, C. O., (2024). Effect of Think-Pair Share Instructional Strategy on Senior Secondary Students' Academic Achievement in Acid-Base Reactions in Enugu Education Zone. *Sapientia Foundation Journal of Education, Sciences and Gender Studies*. 6, (1). 171 – 180.
- Onyedikachim, E., N., & Ezekiel-Hart, J. (2021). Educational Level of Parents on Students' Academic Achievement in Secondary Schools in Abia State. *Journal of Contemporary Education Research*. 21, (8). 55-66. ISSN: 2359-1991.
- Purnomo, Y.W., Apriyanti, N., Mubarokah, S.A., Susilowati & Anggraheni, W.A. (2022). The Role of Parental Involvement and Mathematics Self-Concept of Elementary School Students in Online Mathematics Learning. *The Education and Science Journal*, 24, 110-125. <https://doi.org/10.17853/1994-5639-2022-7-110-125>.
- Rasheed, S., T., Shoaga, O., & Oni, A. (2023). The effect of Scaffolding strategy on mathematics achievement of Preschool children. *Journal of Early Childhood Association of Nigeria*. 12, 232-251.
- Sabrina, S.A. & Adam, K. D. (2023) Measuring Digital Home Numeracy Practice: A Scale Development and Validation Study. *Journal of Research in Childhood Education*, 37, 310-340. <https://doi.org/10.1080/02568543.2022.2100021>.
- Usang, F., P., & Okoli, J., N. (2021). Effect of think-pair-share teaching strategy on secondary school students' achievement in Chemistry in Cross River State. *Journal of Research & Method in Education*, 2(2), 42-48.