
EFFECTS OF THINK-PAIR-SHARE STRATEGY ON PERFORMANCE IN MATHEMATICS AMONG UPPER BASIC STUDENTS IN KADUNA STATE, NIGERIA

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ABSTRACT

This study investigated the Effects of Think-Pair-Share on performance of students in Mathematics in Upper Basic Schools in Kaduna State, Nigeria. The study was guided by ten specific objectives among which are determine the differences in the pre-test and post-test scores of students taught Mathematics in Upper Basic Schools using Think-Pair-Share in Kaduna State, Nigeria; compare the difference in the post-test performance scores of students taught Mathematics in Upper Basic Schools using Think-Pair-Share and those taught Mathematics using conventional strategy in Kaduna State, Nigeria. In correspondence with the specific objectives, 2 research questions and hypotheses were raised. A quasi-experimental research design was adopted. The population of the

study comprised 2,379 students who offered Mathematics in Upper Basic Schools in Kaduna State. Three intact classes comprising 145 students were used as sample for the study. An instrument titled Mathematics Performance and Retention Test (MAPERETE) was used for data collection. Mean and standard deviation were used to answer the research questions, while t-test statistical tool was used to test hypotheses at a 0.05 level of significance. The results revealed that: Post-test performance of students taught Mathematics using the Think-Pair-Share strategy was significantly higher than their pre-test mean performance score in Upper Basic Schools in Kaduna State ($p = .000$). Students taught Mathematics using Think-Pair-Share strategy performed significantly better than those taught using the Conventional Method in Upper Basic Schools in Kaduna State ($p = .001$). The study concluded that cooperative learning strategies of Think-Pair-Share enhanced students' performance in Mathematics in Upper Basic Schools in Kaduna State. The study recommended that Upper Basic School authorities should encourage teachers to use the Think-Pair-Share strategy to teach Mathematics to improve students' performance. Teachers should adopt cooperative learning strategies over the Conventional Method to improve students' performance in Mathematics.

Keywords: Performance, Think-Pair-Share, Mathematics, Conventional, Student

Introduction

Mathematics involves a logical expression of the relationships that exist among the measurable quantities of time and space in the universe, presented in compact and simple codes. Akannu (2019), defined Mathematics as the science that deals with the logic of shape, quantity and arrangement. Akannu further expatiated that Mathematics is all around us, in everything we do; as it is the building block for everything in our daily lives, including mobile devices, architecture (ancient or modern), art, money, engineering and even sports. By implication, Mathematics is a logical way of thinking that aims at solving personal and societal problems; and it has timely improved our communication, accommodation, production and recreational activities. In the view of Fasassi and Istifanus (2022), the importance of Mathematics has never been greater than now and for the foreseeable future, as mathematical skills are crucial for a wide array of analytical, technological, scientific, security and economic applications. Paul (2015), further emphasized that there are uses of Mathematics in all the core sciences, such as Biology, Chemistry and Physics; the Social Sciences, such as Economics, Psychology, and Sociology; Engineering fields, such as Civil, Mechanical, and Industrial Engineering; Technological fields such as computers, rockets, and communications. Mathematics is even use in the arts, such as Sculpture, Drawing and Music. In addition, anything which uses a computer uses Mathematics, Paul (2015) concluded. Mathematics opens career opportunities. Without a good mathematical background, the doors to many interesting lucrative careers such as Accountancy, Medicine, Technology, Weather

Forecasting, Banking, Data Processing and the likes may be shut against one. Thus, Mathematics remains the master key to effectively unlock the secrets of other bodies of knowledge.

Think-Pair-Share (TPS) teaching strategy is a collaborative learning technique that encourages students to engage with content, develop critical thinking skills, and share ideas with peers. This strategy is simple yet powerful, fostering active participation and deep understanding in the classroom. Here's an in-depth discussion of the Think-Pair-Share strategy: Think-Pair-Share is a structured cooperative learning strategy that involves three sequential steps: Think: Students independently think about a question or problem posed by the teacher, Pair: Students pair up with a partner to discuss their thoughts and idea and Share: Pairs share their ideas with the larger group or class. This method encourages students to process information individually before discussing and refining their ideas collaboratively.

Academic performance as opined by Mayer (2021) is the extent of accomplishment and success achieved by a student in their educational endeavors within an academic environment. This concept commonly includes diverse elements such as grades, examination scores, class standings, and overall academic accomplishments. Academic performance is frequently measured using quantitative indicators, such as grade point averages (GPAs), standardized test scores, or percentiles. These metrics objectively assess a learner's academic abilities and progress compared to their peers. However, academic performance should not be limited solely to numerical measures. It can also include qualitative aspects such as critical thinking skills, problem-solving abilities, creativity, research aptitude, and effective communication. Academic performance is the outcome of education. It refers to what students achieve in their studies and how they cope with or accomplish different learning experience given to them by their teachers.

The constructivism theory served as the foundation for this study's theoretical framework. The guiding framework or blueprint for interpreting and putting into practice effective teaching is educational theory, which is crucial. The constructive controversy and constructivism are the underlying theories of this study. John Dewey, Jean Piaget, Jerome Brunner, and Vygotsky, who are frequently regarded as philosophical pioneers in this approach, were key proponents of these theories and their models. Particularly noteworthy are the contributions made by John Dewey between the years 1973 and 1978. In the field of cognitive constructivism, prominent theorists include Brunner (1990) and Piaget (1954), while Vygotsky (1978) is a significant figure in the field of social constructivism. This study therefore utilized Brunner and Piaget's cognitive constructivism theory

Essentially, constructivism is a theory that explains how people learn based on scientific research and empirical observation. It proposes that people actively engage in experiences and reflect on them in order to construct their knowledge and understanding of the world. People use their experiences and cognitive abilities to study problems and acquire skills or concepts, according to

the theory. Using what they already know and know how to do, students actively construct new ideas using their senses. One of the most important theories of learning, constructivism can be used to teach mathematics. It is a theory that is based on real-world experience, observation and application.

Mathematics remains one of the most essential subjects in education, serving as a foundation for science, technology, and innovation. Despite its importance, students' performance and retention in Mathematics at the Upper Basic level in Kaduna State, Nigeria, have been persistently low, as evidenced by poor results in standardized assessments and classroom evaluations. Factors contributing to this trend include the use of traditional teacher-centered instructional methods, lack of engagement, and inadequate opportunities for collaboration and critical thinking during lessons.

A feasibility study revealed that Secondary School strategy of teaching subject including Mathematics has been under criticism in a short while. The conventional strategy of teaching, solving and learning Mathematics is designed towards making the students inactive in the classroom, which might have resulted in poor academic performance of Upper Basic School students in Mathematics in Kaduna State. This view is in line with Yusuf (2018), who revealed that most teachers at secondary schools' level in Kaduna State do not use student-centered approach or strategy to teach Mathematics for effective curriculum implementation. An effective system in the contemporary educational landscape should facilitate extensive social interaction and engagement between teachers and students to yield positive outcome creating a supporting, open, and interactive environment for student is essential.

Therefore, this study sought to address the problem of poor performance in Mathematics among Upper Basic students, by investigating the effects of the Think-Pair-Share strategy. The findings will provide insights into whether these cooperative learning approaches can enhance students' understanding of mathematical concepts, compared to traditional methods, and ultimately contribute to improving overall academic outcomes.

To guide the study, two specific objectives set which are to:

4. determine the differences in the pre-test and post-test scores of students taught Mathematics in Upper Basic School using Think-Pair-Share in Kaduna State, Nigeria.
5. compare the difference in the post-test performance scores of students taught Mathematics in Upper Basic School using Think-Pair-Share and those taught using conventional strategy in Kaduna State, Nigeria.

The following research questions were used to investigate this study:

- What is the difference in the pre-test and post-test scores of Students taught Mathematics in Upper Basic School using Think-Pair-Share in Kaduna State, Nigeria?
- To what extent is the difference between the post-test performance scores of students taught Mathematics using Think-Pair-Share and those taught using conventional strategy in Upper Basic Language School in Kaduna State?

Based on the research questions, the following null hypotheses were formulated to and were tested in the study:

HO₁: There is no significant difference between the pre-test and post- test scores of students taught Mathematics in Upper Basic School using Think-Pair-Share in Kaduna State, Nigeria.

HO₃: There is no significant difference between the post-test performance scores of students taught Mathematics using Think-Pair-Share and those taught using conventional strategy in Upper Basic School, Kaduna State, Nigeria.

Methodology

This study adopted the Quasi-experimental research design, which employed two groups: one experimental group and one control group with intact classes. All groups underwent a pre-test to assess the students 'entry behavior. The experimental group (EG) received instruction in Mathematics using the Think-Pair-Share strategy. In contrast, the control group (CG) received conventional instruction in Mathematics. Following an eight-week treatment period, a post-test was administered to evaluate the effectiveness of Think-Pair-Share strategy on students ' performance in Mathematics among upper basic students in Kaduna State, Nigeria. This approach aligns with Aliyu (2016), as quasi-experimental design allows for investigating cause-effect relationships between independent and dependent variables.

The population comprised seven thousand and sixty three (7,063) upper Basic two Mathematics students from all Upper Basic Schools in Kaduna State, Nigeria. A sample size of one hundred and forty five (145) Upper Basic two Mathematics Student was selected using purposive sampling technique. With intact classes of the sampled Upper Basic Schools which were assigned. This is in line with Aliyu (2016), who recommended that, the sample size be at least 30 and less than 500 for experimental research. A purposive sampling technique was adopted to select the two Upper Basic Schools in Plateau State, Nigeria, based on a similar Curriculum as the Federal Ministry of Education prescribed.

A simple random sampling technique was however, used to assign experimental group (EG), which was taught Mathematics using Think-Pair-Share strategy, then control group (CG) which was taught using Conventional Strategy.

The instrument "Mathematics Performance Test (MPT)" developed by the researcher was based on the content of Upper basic two, which included the following topics: square roots, division, quadrilaterals, Addition of whole numbers, subtraction, division, multiplication, and Introduction to fractions. MPT comprises thirty (30) objective questions with four multiple-choice item options A-D each, which carried equal marks of two (2) marks and was rewarded for each correct answer and zero (0) effects for a wrong answer, making sixty (60) marks).

The treatment was administered by the researcher (self) and the whole exercise lasted for eight weeks (8). In the experiment, Experimental Group (EG) received instruction through the Think-Pair-Share strategy and the Control Group (CG) was instructed using the Conventional Strategy. Subsequently, a post-test was immediately conducted for all the groups using the data collection instrument (NPT). The scores obtained from this administration were used as post-test performance scores for the study.

t-test statistics at 0.05 level of significance were used to test the two null hypotheses. The null hypotheses were rejected when t-calculated values were greater than the t-critical values, while the null hypotheses were accepted when t-calculated values were equal to or less than t-critical values

Results

To address the two research questions posed in this study, the collected data were subjected to analysis using mean and standard deviation, as outlined below:

Research Question One:

What is the difference in the pre-test and post-test scores of Students taught

Mathematics in Upper Basic Schools using Think-Pair-Share in Kaduna State, Nigeria?

To answer this research question, a test result was used and the summary of the scores is presented in Table 1

Table 1 Mean and standard deviation on difference in the pre-test and post-test scores of Students taught Mathematics in Upper Basic Schools using Think-Pair-Share in Kaduna State, Nigeria

Variable	N	Mean	SD	Mean Diff.
Pre-test Think-Pair-Share	60	37.46	15.74	23.57
Post-test Think-Pair-Share	60	61.03	13.63	

Source: (Field survey, 2025)

The analysis of results in Table 1 showed the difference in the pre-test and post-test performance of students taught Mathematics using the Think-Pair-Share strategy in Upper Basic Schools in Kaduna State, Nigeria. The results revealed that pre-test and post-test mean scores of 37.46 and 61.03 respectively, with a mean difference of 23.6. This indicated that the Think-Pair-Share instructional strategy significantly improved students' performance in Mathematics in Upper Basic Schools in Kaduna State.

Research Question Three: To what extent is the difference between the post-test performance scores of students taught Mathematics using Think-Pair-Share and those taught Mathematics using conventional strategy in Upper Basic Language Schools in Kaduna State?

To answer this research question, a test result was used and the summary of the scores is presented in Table

Table 2 Mean and standard deviation on the difference between the post-test performance scores of students taught Mathematics using Think-Pair-Share and those taught Mathematics using conventional strategy in Upper Basic Language Schools in Kaduna State

Variable	N	Mean	SD	Mean Diff.
Post-test Think-Pair-Share	60	61.03	13.63	11.42
Post-test Conventional Method	85	49.61	14.43	

Source: (Field survey, 2025)

The analysis of results in Table 2 showed the difference between the post-test performance scores of students taught Mathematics using the Think-Pair-Share strategy and those taught using the conventional method in Upper Basic Schools in Kaduna State. The results revealed mean scores

of 61.03 for students taught with the Think-Pair-Share strategy and 49.61 for those taught with the conventional method, with a mean difference of 11.42. This indicated that the Think-Pair-Share instructional strategy proved more effective in enhancing students' performance than the conventional teaching method in Upper Basic Schools in Kaduna State.

Two null hypotheses were tested using t-test as the statistical tool at 0.05 level of significant as follows:

Null Hypothesis One: There is no significant difference between the pre-test and post- test scores of students taught Mathematics in Upper Basic Schools using Think-Pair-Share in Kaduna State, Nigeria.

Data collected to address this hypothesis were summarised and presented in Table 3.

Table 3: Paired sample test analysis on difference between the pre-test and post- test scores of students taught Mathematics in Upper Basic Schools using Think-Pair-Share in Kaduna State, Nigeria

Variable	N	Mean	SD	Df	t-cal.	P-value	Decision
Pre-test Think-Pair-Share	60	37.46	15.74				
				59	18.78	.000	Rejected
Post-test Think-Pair-Share	60	61.03	13.63				

Source: (Field survey, 2025)

The analysis of results in Table 3 showed the difference between the pre-test and post-test performance of students taught Mathematics using the Think-Pair-Share strategy in Upper Basic Schools in Kaduna State, Nigeria. The result revealed t-Cal of 18.78 with a p-value of .000. The Hypothesis was rejected because the significance value of .000 was less than the 0.05 level of significance. By implication, the difference of 59 between the pretest and posttest of students taught mathematics using Think-Pair-Share Strategy was significantly in favor of the post test. This therefore means that the Think-Pair-Share instructional strategy effectively enhanced performance in Mathematics in Upper Basic Schools in Kaduna State.

Null Hypothesis Three: There is no significant difference between the post-test performance scores of students taught Mathematics using Think-Pair-Share and those taught Mathematics using conventional strategy in Upper Basic Schools Kaduna State, Nigeria.

Data collected to address this hypothesis were summarised and presented in Table 4.

Table 4: Independent Sample t-test analysis on difference between the post-test performance scores of students taught Mathematics using Think-Pair-Share and those taught Mathematics using conventional strategy in Upper Basic Schools Kaduna State, Nigeria

Variable	N	Mean	SD	Df	t-cal.	P-value	Decision
Post-test Think-Pair-Share	60	61.03	13.63				
				143	11.49	.001	Rejected
Post-test Conventional Method	85	49.61	14.43				

Source: (Field survey, 2025)

The analysis of results in Table 4 showed the difference between the post-test performance scores of students taught Mathematics using the Think-Pair-Share strategy and those taught using the Conventional Method in Upper Basic Schools in Kaduna State, Nigeria. The result revealed t-cal of 11.49 and p-value of .001. The Hypothesis was rejected because the significance value of .001 was less than the 0.05 level of significance. .Which means that the difference in performance was as a result of Think-Pair-Share strategy intervention. These therefore meant that the Think-Pair-Share instructional strategy was more effective in teaching and learning, mathematics than the Conventional Method in Upper Basic Schools in Kaduna State.

Summary of Findings

Based on the data analysis, the following findings were obtained:

4. Post-test performance of student taught Mathematics using the Think-Pair-Share strategy significantly higher than their pre-test performance in Upper Basic Schools in Kaduna State ($p = .000$).
5. Student taught Mathematics using the Think-Pair-Share strategy performed significantly better than those taught using the Conventional Method in Upper Basic Schools in Kaduna State ($p = .001$).

Conclusion

Based on the findings, the study concluded that cooperative learning strategies, specifically Think-Pair-Share significantly enhanced students' performance in Mathematics compared to the Conventional Method. As it was effective, this implied that students' understanding of

Mathematics concepts are improved when cooperative learning strategies are used in Upper Basic Schools in Kaduna State.

Recommendations

1. Upper Basic School authorities should encourage teachers to use the Think-Pair-Share strategy to teach Mathematics to improve students' performance.
2. Teachers should adopt cooperative learning strategies over the Conventional Method to improve students' performance in Mathematics.

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