International Journal of Academic Management Science Research (IJAMSR)
ISSN: 2643-900X
Vol. 10 Issue 6 June - 2026, Pages: 262-266

Effect Of Team-Pair-Solo Strategy On Pupils' Academic Performance And Learning Retention In Numeracy In Ilorin East Local Government Area Of Kwara State

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Abstract: *The study investigated effect of Team-pair-Solo strategy on primary school pupils' academic performance and learning retention in Numeracy in Ilorin East Local Government Area of Kwara State. Research design adopted quasi-experimental research design (Pretest, posttest, control group Quasi- Experimental design). A factorial design of 2X2 was adopted for the study. The population comprised all primary school pupils in Ilorin East Local Government Area of Kwara State. Sample size for the study was 62 primary five pupils, 28 pupils' for experimental group and 34 pupils' for control group. Three hypotheses were formulated and tested at 0.05 level of significance, Instrument were given face and content validity by experts in Numeracy. Test retest method was adopted to ascertain the reliability of the instruments which was 0.82. Hypotheses were tested, using analysis of covariance (ANCOVA). Findings shown that there was significant main effect of team -pair solo on pupils' academic performance in Numeracy ($F_{(1; 62)} = 18.380$, $P < 0.05$), there was no significant effect of team-pair solo and gender on pupils' academic performance in Numeracy ($F_{(1; 62)} = 1.705$; $P > 0.05$) and there was significant effect of team -pair solo on pupils' learning retention in Numeracy ($F_{(1; 62)} = 7.820$, $P < 0.05$). It was concluded that, team pair solo strategy statistically had significant main effect on pupils' academic performance and learning retention in Numeracy in Ilorin East Local Government Area of Kwara State. It was recommended that, Schools should incorporate the Team Pair Solo approach into numeracy instruction, as it significantly enhances academic performance and educators should focus on strategies that reinforce content retention.*

Keywords; Team-Pair Solo, Academic Performance and Learning Retention

Introduction

Numeracy serves as a valuable tool for comprehending various subjects and languages. It lays the foundation for many scientific disciplines and is an essential aspect of human reasoning and logic, playing a crucial role in our endeavors to understand the world and ourselves. Despite its importance, the academic performance of learners in Mathematics at national exams has been lackluster. The Federal Government has announced the releases of the 2020/2021 National Common Entrance Examination results, which was conducted by the National Examination Council (NECO), Education minister, Adamu Adamu disclosed that a total of 70, 580 candidate sat for examination nationwide, out of which 24,416 candidates pass.

Hassan (2016) emphasizes the significant role of effective learning and academic achievement in fostering national development. The importance of these factors extends to parents, teachers, and students themselves, as well as the broader society, as the outcomes of educational institutions have the potential to shape the destiny of the entire community. However, in order for students to fulfill this role, it is crucial for them to retain and remember the knowledge imparted to them during their schooling. Learning retention is an individual's ability to remember and recall information, materials and experiences learn over time. In Numeracy this acquired materials in the mind need to be preserved in form of images for knowledge to develop. When a stimulating situation occurs, retained images are revived or reproduced to make memorization possible (Morris, 2000). Concepts therefore, need to be presented to the learners in a way or method that touches their sub consciousness, which can trigger quick recalling of the concept being taught or learnt. Okeke (2014) stated that teachers could improve leaning retention of concepts and information by explicitly creating memorable events involving visual or auditory images with projects, plays, simulations, cooperative learning and other forms of active learning, to boost pupil's retention of the concept.

Cooperative learning refers to methodology and environment in which learners engage in a common task where each individual depends on and is accountable to each other (Adolphus, Alamina, and Aderonmu 2013). There are actually various techniques to teach numeracy and other subjects. One of the potential techniques to teach pupils Numeracy is Team-pair-solo cooperative strategy. This strategy was introduced by Kagan (2009). Team-pair-solo strategy is one of the cooperative learning strategies. There are several steps that explain the general concept of team-pair solo Kagan (2009). The first step of team-pair-solo technique is forming team. The teams can be heterogeneous, homogeneous, randomized and students-selected teams Kagan (2009). This research involves the heterogeneous teams which consist of four students each groups to support teaching process on team-pair-solo. Each team is given a problem that is beyond the ability of lower achieving pupils'. The team member make sure everyone in their team knows how to solve the question that given. In teaching activities, the students can work in their team to accomplish the given task.

The task is to construct the help for students to recognize the use of literary devices Kagan cited in Virginia (2012) The second step is that the students break into two pairs and in turn the each partner do a problem like the one that was solved as a team. There are two people working together to discuss the given problem. In team-pair-solo, after working as a team, the team is divided into pairs. In teaching activity, the students must be able to understand the content. According to Kagan cited in Virginia (2012) the tasks have

to guide the students to interpret, inferred or conclude the given content with their partner. Therefore, the teacher has to prepare a task to lead the students to get a deeper understanding about the teaching topic shared with their partner. After the students work in a team, they work in a pair. They go on to the last step, *solo,* in which one works individually. The basic principle of this last step under Vygotsky's theory (1978) can be inferred that every person's development includes the development inside the person as an individual. Because when people work on their own, they can use their own knowledge and understanding that they have already got as the result of the earlier discussions as groups of four and pairs. In this step, the students can solve similar questions alone, applying what they learned first as a team and then during the pair work.

Team Pair Solo (TPS) is one of cooperative learning techniques that proposed by Spencer Kagan. According to Kagan (2001), Team Pair Solo is simple. At the beginning, students solve the problems with a team, then with a partner and finally on their own. It means that, in this technique, the students have to do three phases to solve the problem. Spring (2007) states TPS technique builds confidence when attempting more difficult content material. It means that Team Pair Solo Technique can make students to be confident in learning because they have tried to solve the problem in team and pairs before finally on their own. The variable of the interest to the study is gender.

The concept of gender pertains to the distinct characteristics of males and females. It encompasses the social, economic, cultural, and political attributes and opportunities associated with being a man or a woman. The societal definitions of what constitutes masculinity and femininity differ across cultures and evolve over time. Gender, as defined by Ghosh (2020), is a socio-cultural manifestation of certain qualities and roles linked to particular groups of people based on their sex and sexuality. It also encompasses the range of traits that differentiate femininity from masculinity. These may include biological sex, sex-related social constructs, and other related factors, depending on the context. The attributes associated with being male or female are collectively referred to as gender (Kevin, 2017). Therefore, gender is a representation of the distinctive features and roles specific to particular groups of individuals with regards to their sexuality and sex (Ghosh, 2020), which defines femininity and masculinity and sets them apart from each other based on a range of characteristics (Kevin, 2017).

However, a contrasting perspective emerges from Wangu's (2014) examination of secondary school students in Kenya, where boys were observed to outperform girls. In a separate study focusing on college students. It has been observed from the literature reviewed that study of this type has never been carried out in Ilorin East Local Government Area of Kwara State. Therefore, this is meant to fill the gap requiring empirical evidence regarding the relative effectiveness of team-pair solo strategy on pupils' academic performance and learning retention in Numeracy.

Statement of the Problem

The Federal Government has announced the releases of the 2020/2021 National Common Entrance Examination results, which was conducted by the National Examination Council (NECO), Education minister, Adamu Adamu disclosed that a total of 70, 580 candidate sat for examination nationwide, out of which 24,416 candidates pass. Poor performance in Numeracy at this level of education might be as a result of inadequacies and inappropriate use of classroom practices by the teachers.

While theoretical and empirical evidences on the learner-centered teaching instruction have been documented in Numeracy across the globe, empirical evidence on some of these innovative strategies (Team-Pair Solo) in the study is not many. To the best of researcher's knowledge, there seems to be no documented evidence on the effect of Team-Pair Solo on pupils' academic performance and learning retention in Numeracy. Although some researchers have worked on other strategies such as Numbered-Heads Together and jigsaw relationship between children's constructive play activities and problem-solving performance. In spite of these efforts, the problem of pupils' poor academic performance in Numeracy persists. This creates a researchable gap in knowledge, the gap which research intends to fill by examining the effect of Team-Pair Solo on pupils' academic performance and Learning retention in Numeracy in Ilorin East Local Government Area of Kwara State.

Research Hypotheses

The following research hypotheses were formulated and tested

$H_0$1: There is no significant main effect of treatment on pupils' academic performance in Numeracy in Ilorin East Local Government Area of Kwara State

$H_0$2: There is no significant interaction effect of treatment and gender on pupils' academic performance in Numeracy in Ilorin East Local Government Area of Kwara State

$H_0$3: There is no significant main effect of treatment on pupils' learning retention in Numeracy in Ilorin East Local Government Area of Kwara State

Methodology

This research adopted the quasi-experimental research design. The design is suitable in establishing the possible cause and effect relationship. A factorial design of 2X2 was adopted to test the null hypotheses. The population comprised all primary school pupils in Ilorin East Local Government Area of Kwara State. Sample size was 62 primary five pupils which include; two primary schools. The simple sampling technique was used to select 2 primary schools.

The researcher developed three instruments: Numeracy Performance Test (NPT), Instructional Guide for Team-Pair Solo strategy (IGTS) and Instructional Guide for Conventional Method (IGCM). The Numeracy Performance Test (NPT) was used to obtain data for learning retention. Instruments were given face and content validity by some selected numeracy experts, 25 copies of the test were administered two times for primary 5 pupils in another school outside sample. The final drafts were tested two times, giving two weeks interval. Thereafter, Pearson Product-Moment Correlation (PPMC) coefficient was used to determine the reliability coefficient, the reliability index was 0.82. The data were analyzed using both descriptive and inferential statistics ANCOVA, Analysis of covariate, with the help of 29 version SPSS Package.

Results

Research Hypothesis One: There is no significant main effect of treatment on pupils' academic performance in Numeracy in Ilorin East Local Government

Table 1: Showing summary of Analysis of Co-variance (ANCOVA) on effect of treatment on pupils' academic performance in Numeracy in Ilorin East Local Government

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	8620.627[a]	4	2155.157	62.135	.000
Intercept	1517.669	1	1517.669	43.756	.000
Pretest	728.072	1	728.072	20.991	.345
Treatment	637.495	1	637.495	18.380	**.002**
Gender	7.227	1	7.227	.208	.650
Treatment * Gender	59.140	1	59.140	1.705	.197
Error	1977.050	57	34.685		
Total	217776.000	62			
Corrected Total	10597.677	61			

Table 1, ($F_{(1; 62)} = 18.380$, $P < 0.05$). The hypothesis was rejected in the light of the result since the significant value (.002) is less than 0.05. This shown that treatment had significant main effect on pupils' academic performance in Numeracy

Table 2: Summary of Bonferroni's Post Hoc pairwise Comparison of the scores within the two Groups

Treatment	Mean Score	Experimental	Control Group
Team-Pair Solo Strategy	64.704		*
Conventional Method	52.078	*	

Table 2 reveals that the significant main effect exposed by table 1 is as a result of the significant difference between: Team–Pair Solo Strategy and Conventional Method. Team–Pair Solo refers to experimental group and Conventional Method known as control group. This implies that those taught with Team–Pair Solo performed better than those taught conventional method.

Research Hypothesis Two: There is no significant interaction effect of treatment and gender on pupils' academic performance in Numeracy in Ilorin East Local Government Area of Kwara State. Table 1 also reveals the effect of treatment and gender on pupils' academic performance in Numeracy. There was no significant effect of treatment and gender on pupils' academic performance in numeracy ($F_{(1; 62)} = 1.705$; $P > 0.05$). The hypothesis is therefore not rejected in the light of the result since the significant value (.197) is greater than 0.05. This implies that treatment and gender had no significant effect on pupils' academic performance in Numeracy.

Research Hypothesis Four: There is no significant main effect of treatment on pupils' Learning Retention in Numeracy in Ilorin East Local Government

Table 3: Showing summary of Analysis of Co-variance (ANCOVA) on effect of treatment on pupils' Learning Retention in Numeracy in Ilorin East Local Government

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	7683.158[a]	2	3841.579	90.358	.000
Intercept	710.537	1	710.537	16.713	.000

Pretest	1623.525	1	1623.525	38.187	.345
Treatment	332.468	1	332.468	7.820	**.007**
Error	2508.391	59	42.515		
Total	213916.000	62			
Corrected Total	10191.548	61			

Table 3, ($F_{(1; 62)} = 7.820$, $P < 0.05$). The hypothesis was rejected in the light of the result since the significant value (.007) is less than 0.05. This shown that treatment had significant main effect on pupils' Learning Retention in Numeracy

Table 4: Summary of Bonferroni's Post Hoc pairwise Comparison of the scores within the two Groups

Treatment	Mean Score	Experimental	Control Group
Team-Pair Solo	60.635		*
Conventional Method	53.300	*	

Table 4 reveals that the significant main effect exposed by table 3 is as a result of the significant difference between: Team-Pair Solo Strategy and Conventional Method. Team-Pair Solo refers to experimental group and Conventional Method known as control group. This implies that those taught with Team-Pair Solo performed better than those taught conventional method.

Discussion

The aim of the research was to examine the effect of Team-Pair Solo strategy on the academic performance and learning retention in Numeracy in Ilorin, Kwara State. Results revealed that the Team-Pair Solo strategy was relatively more effective than the conventional method. The outcome of the study corroborated the findings of Faiz (2016) entitled: Boosting Students' Reading Comprehension through Team Pair Solo. The results showed that TPS improved the students' ability in comprehending reading text. She added that, this technique also make teaching learning process enjoyable and decreased students' boredom in studying English. The result was consistent with Obafemi (2023), the implementation of the Think-Pair-Share strategy had a significant positive effect on the academic performance of final year primary school pupils in Mathematics. The study was in tandem with Macmillan and Alhamdu (2020) their finding revealed that students taught using TPS achieved higher in physics than those taught using conventional lecture method of instruction (CLM). It was also revealed that the TPS is gender-friendly

In the study, it was revealed that treatment and gender had no significant effect on their academic performance in Numeracy in Ilorin East Local Government Area of Kwara State. This result was consistent with previous findings from Obafemi (2023), it was discovered that treatment and gender of final year primary school pupils in Ilorin, Kwara State had no significant impact on their academic achievement in Mathematics, regardless of the treatment they were exposed to. On the contrary, Jones, Davis and Wilson (2006) conducted a study where they observed a significant interaction effect of treatment and gender on mathematics achievement. The treatment intervention was found to be more effective for female learners compared to male learners. The study was also revealed that there was significant effect of treatment on pupils learning retention.

Conclusion

The Team-Pair-Solo strategy (TPS) is suitable for teaching Numeracy in Ilorin East Local Government Area of Kwara State. This is because the strategy has been found to have a positive effect on pupils' academic performance and learning retention. The strategy has also been found not to be gender biased; it does not discriminate against gender.

Recommendations

Based on the findings of the study, the researchers recommended the following:

1. Schools should incorporate the Team Pair Solo approach into numeracy instruction, as it significantly enhances academic performance. This method promotes collaboration and independent learning, fostering a deeper understanding of numeracy concepts.
2. Given the positive impact of Team Pair Solo on learning retention, educators should focus on strategies that reinforce content retention. Regular reviews and collaborative assessments can help solidify students' understanding and memory of numeracy skills.
3. Educators should regularly assess both individual and group contributions within the Team Pair Solo framework. This ensures that all students remain engaged and accountable, further enhancing their overall performance and retention in numeracy.

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