ASSESSMENT OF CLASS-WIDE PEER TUTORING STRATEGY ON THE ACHIEVEMENT OF SLOW LEARNERS IN MATHEMATICS IN PUBLIC SENIOR SECONDARY SCHOOLS IN FEDERAL CAPITAL TERRITORY, ABUJA NIGERIA

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Abstract

The study examined the assessment of Class-Wide Peer Tutoring (CWPT) strategy on the achievement of slow learners in Mathematics in public Senior Secondary Schools in Abuja, Nigeria. The research design employed was a quasi-experimental pre-test and post-test. The population of the study comprised 10,936 SS II students. A total of 46 slow learners of public Senior Secondary Schools selected by simple random sampling technique participated in the study. The instrument used for data collection was the Mathematics Achievement Test (MAT), validated by experts and subjected to reliability using Cronbach Alpha, which yielded a reliability index of 0.84. Mean and standard deviation were used to answer the research questions and Analysis of Covariance (ANCOVA) was used to test the null hypotheses at 0.05 level of significance. The findings revealed that the slow learners in the CWPT group (experimental) achieved significantly better than those in traditional method groups (control), the study also revealed no significant difference in the mean achievement scores of male and female slow learners taught Mathematics using CWPT in public Senior Secondary Schools Abuja. Based on the findings, it was recommended that the use of the CWPT method should be encouraged through workshops and seminars in schools among Mathematics teachers and CWPT method should be incorporated into the mathematics curriculum as one of the instructional strategies for teaching and learning.

Keywords: class-wide peer tutoring, slow learners, gender, mathematics

Introduction

Nigeria today is facing a large enrolment of students in public schools which makes non-uniformity and group management increasingly more difficult. Mathematics teachers at all levels of education can hardly boast that all is well with teaching and learning of Mathematics. The teacher as the custodian of the teaching and learning process is expected to use measures that would be beneficial for classroom activities, and create an enabling environment for meaningful interaction between teacher-students, students-students and learning contents in the classroom. This can only be achieved with innovative teaching methods. The reason why researchers are advocating for the adoption of student-centred teaching strategy in teaching and learning of Mathematics. Among the innovative teaching strategies that Mathematics teachers can adopt in this 21st century is known as the Peer tutoring model (Adamu & Kuse, 2018; John, 2016). It is an alternative method of teaching that supports the learner's centre. Peer tutoring makes students

active participants, giving them more responsibility and promoting their level of engagement in the task (Yusuf & Yusuf, 2015).

According to Adamu and Kuse (2018) and Michelle (2013), Peer tutoring, otherwise known as peer mentoring, is an instructional method that uses the paring of high-performing students to tutor lower-performing students in a class-wide setting or a common venue outside of school under the supervision of a teacher. In a Peer tutoring programme, one student teaches another in a school setting (Allen, 2011). Students are paired together to provide instruction and feedback to one another. Such arrangements can be uni-directional, typically when a more knowledgeable student assists another less knowledgeable student. Or, the arrangements can be bi-directional involving the whole class, often called class-wide peer tutoring (Yusuf & Yusuf, 2015). The terms "tutoring" and "mentoring" will be used synonymously, as the role of the tutor also includes maintaining a supportive and encouraging relationship with the tutee.

Peer mentoring has been used across academic subjects, and has been found to result in improvement in academic achievement for a diversity of learners within a wide range of content areas (Ahmad et al., 2021). Class-wide peering tutoring has been shown to greatly increase the level of active student responding while providing students with opportunities to receive more time on task, immediate and specific feedback, more practices in short periods, and positive social and academic supports (Maheady & Gard, 2010 cited in Yusuf & Yusuf, 2015). The strategy is effective for science education to facilitate learning without stigmatizing and alienating students (Peter, 2017). Class-wide peer tutoring involves groups of students working together to complete certain learning goals (Nwafor et al., 2024). Class-Wide Peer Tutoring (CWPT) according to Mahoney (2024) and Peter (2017) is one of the different types of structured peer tutoring, along with same-age peer tutoring (SAPT), cross-age peer tutoring (CAPT), reciprocal peer tutoring (RPT), and peer assisted learning strategies (PALS). Research indicates that peer tutoring is an economically and educationally effective intervention for slow learners and high achievers that can benefit both the tutor and tutee, socially and educationally by motivating them to learn (Yusuf & Yusuf, 2015). It means that when peer tutoring is carefully guided by a Mathematics teacher, the interaction among individuals and groups in the classroom will deepen the understanding of the concepts among the students.

Slow learning is not a learning disability that can be classified as a diagnostic category. It is simply a term used to describe a student with the ability to acquire all necessary academic skills, but at a rate and depth below that of the average student (Yusuf & Yusuf, 2015). The rate at which students learn differs, some learn slowly while others learn very fast as noted by (Atadoga & Lakpini, 2013). Slow learners are students that performed below average and their intelligence test scores are too high for consideration as students with mental retardation (Sabitu & Francis, 2016). In addition, Maheady and Gard, (2010) opined that a slow learner in the diagnostic category is a term used to describe students who can learn necessary academic skills, but at a rate and depth below the average of same-age peers. To grasp new concepts, a slow learner needs more time, more repetition, and often, more resources, external stimulation and encouragement

from teachers to be successful. Reasoning skills are typically delayed, which makes new concepts difficult to grasp (Muppudathi, 2014).

Recent studies have found that Class-Wide peer tutoring has some positive effects on students' achievement. For instance, Ahmad et al. (2021) found that Class-Wide Peer Tutoring (CWPT) was more effective in improving student's academic achievement than the conventional teaching method. CWPT improves students' achievement in chemistry more than the lecture technique does according to Nwafor et al. (2024). The findings by Akanbi (2022) revealed significant differences between students taught Projectile Motion using CWPT and those taught with traditional method. According to Sabitu and Francis's (2016) study, slow learners taught by peer tutors using CWPT performed significantly better than those taught by the teachers using the lecture method. Also, research conducted by Yusuf and Yusuf (2015) showed that there was a statistically significant difference between the pre-test and posttest mean scores of students taught economics using class-wide peer tutoring. The study by Olawoyin (2016) showed that the slow learners who were taught Financial Accounting using CWPT performed higher than the slow learners taught using the conventional method at posttest. Similarly, Kalu-Uche and Ogbonna (2021) conducted a study in Aba Educational Zone and found that the class-wide peer tutoring strategy promotes a better conceptual understanding of flowering plants, as there were significant differences between the mean academic achievement of students taught using the class-wide peer tutoring strategy and those taught using the conventional teacher-led discussion strategy.

Gender issues cannot be overlooked since it is one of the variables of this study. Onyi et al. (2022) opined that gender is one of the key factors influencing the advancement of science and technology in Nigeria. Several studies such as those of Peter (2017) and Etsu and Manko (2019) have shown differential performance in science subjects in secondary schools as a result of gender. Also, Onyi et al. (2022) discovered that gender significantly influences student achievement in favour of male students, but Eze et al. (2018) demonstrated a significantly different result in favour of female chemistry students. Contrarily, some other researchers found no gender influences on achievement at the secondary school level (Wahab & Oduola, 2024; Ahmad et al., 2021; Yusuf & Yusuf, 2015). Consequently, gender differentiations that exist in Mathematics, which lead to variation in academic achievement of male and female students remain an issue of concern to researchers.

The slow learners in Mathematics should be identified and necessary remedial measures have to be taken for improvement in their achievement. Hence, an alternative strategy for improving learning among slow learners seems to be most appropriate and the present study confirmed its effectiveness in improving the rate of learning Mathematics among slow learners. Previous studies have shown that CWPT afforded the tutee more time to practice, ask questions, and learn the subject matter. These results, however, were obtained in regular and special education settings. Little is known about whether these effects are similar for instruction in Mathematics education settings. It is on this premise that this study explored the assessment of class-wide peer

tutoring strategy on the achievement of slow learners in Mathematics in public Senior Secondary Schools in Abuja Municipal Area Council Abuja, Nigeria.

Research Questions

The following research questions were raised to guide the study.

1. Is there any significant difference in the mean achievement scores of the slow learners taught Mathematics using CWPT and those taught using the traditional method?
2. Is there any significant difference in the mean achievement scores of male and female slow learners taught Mathematics using CWPT in public Senior Secondary Schools Abuja?

Hypotheses

The following hypotheses were formulated and tested at 0.05 level of significance:

Ho_1: There is no significant difference in the mean achievement scores of the slow learners taught Mathematics using CWPT and those taught using the traditional method.

Ho_2: There is no significant difference in the mean achievement scores of male and female slow learners taught Mathematics using CWPT in Abuja Municipal Area Council Public Senior Secondary Schools.

Methodology

The study adopted a quasi-experimental non-equivalent pre-test and posttest control group research design. The target population consisted of all SS II students in public senior secondary schools in the Federal Capital Territory, Abuja. A purposive sampling technique was used to select Abuja Municipal Area Council (AMAC) from the six Area Councils in FCT Abuja due to its similarity in schools' characteristics. A simple random sampling technique was employed to select forty-six (46) public senior secondary school students (SS II mathematics slow learners), from two public senior secondary schools within AMAC. The experimental and control groups were determined through random sampling by balloting. In each school, slow learners were identified by their mathematics teachers based on factors such as their ability to acquire necessary problem-solving skills at a rate and depth below that of their peers, consistently low scores on achievement tests and slow problem-solving skills. The lesson was taught in both experimental and control groups after school hours. The peer tutors taught the slow learners in the experimental, while the control group was taught using the conventional teaching method. The Mathematics Achievement Test (MAT) was developed by the researcher to collect data for the study, based on the first-term curriculum. The instrument underwent face validity by three experts while content validation was established using the table of specifications. The experts' suggestions were incorporated into the final instrument used for the study. A pilot study was conducted in a secondary school different from the study schools, and the results were subjected to reliability testing using the Cronbach Alpha technique, which yielded a reliability index of 0.84. The instrument consisted of 25 multiple-choice objective test items with four answer options. The multiple-choice objective test items were used for both the pre-test and post-test, but they were shuffled before being administered as the post-test. The pre-test established the baseline for slow learners before the treatment, while the post-test determined the effects of Class-Wide Peer Tutoring (CWPT) on the achievement of slow learners in Mathematics in

public Senior Secondary Schools in FCT Abuja. Mean and standard deviation were used to answer the research questions, and Analysis of Covariance (ANCOVA) was used to test the null hypotheses at the 0.05 level of significance.

Results

Research Question 1: Is there any significant difference in the mean achievement scores of the slow learners taught Mathematics using CWPT and those taught using the traditional method?

Table 1: *Mean and Standard Deviation of the Slow Learners Taught Mathematics using CWPT and those Taught with conventional teaching Method*

Groups	N	Pre-test		Posttest		Mean Gain	Mean Diff.
		Mean	Std. Dev	Mean	Std. Dev		
Experimental	22	25.01	6.13	66.94	9.34	**41.93**	**14.21**
Control	24	24.89	6.04	52.61	8.11	**27.72**	

The results in Table 1 show that students who were taught Mathematics using the CWPT method had a pretest mean achievement score of 25.01 and a posttest mean achievement score of 66.94. On the other hand, students taught with the conventional teaching method had a pretest mean achievement score of 24.89 and a posttest mean achievement score of 52.61. A comparison of the two groups shows that the mean gain for the experimental group was 41.93, while the mean gain for the control group was 27.72. This resulted in a difference of 14.21 in favour of the students in the experimental group. These findings suggest that students taught Mathematics using CWPT outperformed those taught with the conventional teaching method.

Research Question 2: Is there any significant difference in the mean achievement scores of male and female slow learners taught Mathematics using CWPT in Abuja Municipal Area Council in public Senior Secondary Schools?

Table 2: *Means and Standard Deviations of Male and Female Slow Learners Taught Mathematics using CWPT*

Gender	N	Pre-test		Posttest		Mean Gain	Mean Diff.
		Mean	Std. Dev	Mean	Std. Dev		
Male	19	25.48	5.79	64.51	7.56	**39.03**	**3.22**
Female	27	26.11	4.83	61.92	7.17	**35.81**	

The results in Table 2 indicate that male students taught Mathematics using CWPT had a pretest mean achievement score of 25.48 and a posttest mean achievement score of 64.51. Female students taught Mathematics using CWPT had a pretest mean achievement score of 26.11 and a posttest mean achievement score of 61.92. A comparison of the results shows a mean gain of 39.01 for males and 35.81 for females, with a difference of 3.22 in favour of male students in the experimental group. This suggests that male students performed better than female students when taught Mathematics using CWPT.

Test of Hypotheses

Hypothesis One: There is no significant difference in the mean achievement scores of the slow learners taught Mathematics using CWPT and those taught using the conventional teaching method.

Table 3: *ANCOVA Result of Slow Learners Scores in Mathematics by Treatment and Gender*

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	2175.317a	4	1027.073	5479.181	.000	.218
Intercept	14082.529	1	14082.529	2816.029	.000	.323
Pretest	2.934	1	2.934	.087	.316	.003
Treatments	2423.527	1	2423.527	20318.953	.000	.226
Gender	.029	1	.029	.724	.431	.000
Treatments * Gender	23.153	1	23.153	.042	.206	.010
Error	2710.562	41	23.417			
Total	258233.000	46				
Corrected Total	5391.824	45				

a. R Squared = .327 (Adjusted R Squared = .316)

Results in Table 3 show there is a significant difference in treatments (CWPT and Traditional Teaching methods) on slow learners' achievement in mathematics ($F_{(1,41)}$ = 20318.953; $p<0.05$). Hence, hypothesis 1 is rejected. To determine the mean difference between the two groups, table 1 shows a difference of $\bar{x}$=14.21 in favour of the experimental group (students exposed to CWPT).

Hypothesis Two: There is no significant difference in the mean achievement scores of male and female slow learners taught Mathematics using CWPT in public Senior Secondary Schools in Abuja.

Results in Table 3 show there is no significant difference in the mean achievement scores of male and female slow learners taught Mathematics using CWPT ($F_{(1,41)}$ = .042; p=.206). Hence, hypothesis 2 is accepted.

Discussion

This study reveals that the Class-Wide Peer Tutoring (CWPT) strategy is more effective than the traditional method in improving the academic achievement of slow learners in Mathematics in public Senior Secondary Schools Abuja, Nigeria. The null hypothesis which stated that there was no significant difference in the mean achievement scores of the slow learners taught Mathematics using CWPT and those taught using the conventional method was not accepted. This implies that there was a statistically significant difference in the mean achievement scores of the slow learners taught Mathematics using CWPT and those taught using conventional teaching methods, with the experimental group outperforming the control group. The implication is that the Class-Wide Peer Tutoring (CWPT) strategy is effective in teaching and learning Mathematics compared to the traditional method of teaching. These findings support previous

research by Olawoyin (2016), Sabitu and Francis (2016), Ahmad et al. (2021), and Nwafor et al. (2024) which all concluded that CWPT was more effective in improving academic achievement compared to conventional teaching methods.

Furthermore, the study upheld hypothesis two which states that there is no significant difference in the achievement scores of male and female slow learners taught Mathematics using the Class Wide Peer-Tutoring (CWPT) strategy. CWPT strategy showed no gender bias in improving slow learners' achievement in Mathematics, indicating that it did not favour females over males or vice versa. This finding is in agreement with the studies of Yusuf and Yusuf (2015), Ahmad et al. (2021) and Wahab and Oduola (2024) who found no gender influences on the achievement of students at the secondary school level. On the contrary, the findings of Onyi et al. (2022) discovered that gender significantly influences student achievement in favour of male students, while Eze et al. (2018) demonstrated a significantly different result in favour of female chemistry students.

Conclusion

The findings of the study confirmed the effectiveness of Class-Wide Peer Tutoring (CWPT) in enhancing the academic achievement of slow learners. The study also confirmed that both male and female slow learners could benefit maximally from CWPT. Researchers found a positive relationship between social and self-concept outcomes and academic achievement among slow learners. This indicates an improvement in slow learners' academic achievement, on-task behaviours, and social skills as a result of utilizing the CWPT strategy. Students enjoy both the role of tutor and tutee, giving them immediate feedback, which increases their positive social interactions while reducing disruptive behaviours.

Recommendations

Based on the findings of the study it was recommended that:

1. The use of the CWPT method should be encouraged through workshops and seminars in schools among Mathematics teachers.
2. The CWPT method should be incorporated into the mathematics curriculum as one of the instructional strategies for teaching and learning.

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