Edukasiana: Jurnal Inovasi Pendidikan
ISSN 2809-6770
Volume 3, Issue 1, 2024, pp. 35-45

Effect of Class-Wide Peer Tutoring on Senior Secondary School Students' Achievement in Chemistry

Stephen Chinedu Nwafor*, Maureen Chinyere Ezeanya, Blessing Ukamaka Onuigwe
Department of Science Education, Nnamdi Azikiwe University, Awka, Anambra State, Nigeria
*Corresponding Author: sc.nwafor@unizik.edu.ng

Article History:
Received 2023-08-17
Accepted 2023-10-30

DOI:
10.56916/ejip.v3i1.490

ABSTRACT

There is an urgent need to improve students' achievement in Chemistry in Nigeria using innovative teaching methods due to the available empirical evidence. This study therefore examined the effect of CWPT (class-wide peer tutoring) on the academic achievement of chemistry students in Anambra State, Nigeria. Additionally, it looked into the moderating effect of gender on students' chemistry achievement as well as the interplay between gender and instructional tactics. Data was gathered from 78 Senior Secondary two (SS2) Chemistry students using a 30 multiple-choice items Chemistry achievement test created by researchers. The Kendall's Coefficient of Concordance (w) was used to get the reliability index for CAT, which was 0.92. Pre-test and post-test non-equivalent control group quasi-experimental design was the methodology utilized in the study. Mean and standard deviation were used to respond to the study questions, and ANCOVA was used to assess the hypotheses. The findings of the investigation showed that CWPT improves students' achievement in chemistry more than the lecture technique does. Additionally, neither gender nor the interaction between gender and instructional strategies had a statistically significant impact on students' achievement in chemistry. It was concluded that CWPT promotes gender equity in chemistry learning and Improves students' achievement in Chemistry.

Keywords: *achievement; chemistry; class-wide peer tutoring and gender*

1. INTRODUCTION

Science has emerged as one of the most significant factors influencing different fields of study which has improved human life. It has through technology, transformed drastically how human beings relate to his environments. Hence, the application of scientific knowledge has helped in disease control, better living, environmental awareness, technological innovation and breakthrough. Accordingly, science contributes to people's quality of life, strengthens a nation's economy, health, and security, and is a tool for industrialization and national progress. In order to accomplish these, it is essential that science education be given high priority in educational initiatives across the globe. The Federal Republic of Nigeria (2014) places a strong emphasis on science education at all levels. Biology, chemistry, and physics make up the bulk of the secondary science curriculum in Nigeria.

The majority of science disciplines continue to revolve around chemistry in order to achieve career goals and academic achievement in science-related fields as well as for the advancement of the country. Chemistry is the study of matter, its composition, characteristics, and reactions. Chemistry knowledge, attitudes, and abilities can be used in a variety of fields, including medicine, pharmacy, agriculture, astronomy, and geology, among others. Thus, chemistry aids man in making choices that will benefit him himself, his community, and the entire globe.

Even though Chemistry is important, empirical research indicates that Nigerian chemistry students have performed poorly in both internal and external examinations (Eze & Okorie, 2019; Ezeudu et al, 2019; Nwafor et al, 2023; Aniodoh & Eze, 2022). Additionally, the West African Examination Council 2016–2019 revealed a drop in the performance of chemistry students. According to Onyi et al. (2022), Odukwe and Nwafor (2022), and Anyanime and Abasifreke (2019), one of the key factors contributing to students' low achievement in chemistry is teachers' use of the lecture method (LM), which does not guarantee students' engagement in chemistry learning. It is crucial to understand that the pedagogy a teacher uses when teaching and learning has a significant role in accomplishing the different educational objectives. Therefore, it becomes imperative to investigate the use of teaching method such as class-wide peer tutoring (CWPT) which encourages students' participation in the learning process.

The type of peer tutoring known as "class-wide peer tutoring" involves groups of students working together to complete certain learning goals. Class-wide peer tutoring (CWPT) according to Mahoney (2023) and Peter (2016) 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). According to Maheady and Gard (2010), group reinforcement techniques such as class-wide peer tutoring allows students to actively participate in the systematic and enjoyable practice and learning of fundamental academic skills. A pre-test is used in CWPT to gauge the proficiency of each student in a given class. In groups of two to five pupils, the high ability students are partnered with the low ability students. The high ability students lead and teach the lower ability students, who are the tutees; they also record their peers' performance, give feedback, and engage in discussion. The teacher acts as a facilitator and assigns points for effective tutoring as the students work concurrently together in an organized and fun environment.

As will be explained below, recent researches have found that CWPT has some positive effects on students' achievement. In their study on using peer tutoring to raise students' biology test scores, Ihekwoaba et al. (2020) discovered that students who were taught biology using CWPT performed better than those who were taught using RPT. Students' "academic performance in both curriculum-specific based and standardized measures of achievement" are greatly improved, according to Maheady and Gard (2010). The findings by Bowman-Perrott et al (2023) demonstrated that peer tutoring has a positive impact on academic and behavioral outcomes for adolescents who have Emotional and Behavioral Disorders (EBD) or are at risk for developing it. According to Adekoya and Olatoye's (2011) study, agricultural science students who received instruction on pasture and fodder crops utilizing CWPT outperformed those who received traditional lecture instruction. Mkpanang (2016) discovered using SSII students in Akwa Ibom State of Nigeria that physics students exposed to CWPT outperformed their peers in RPT and the control group. There are noticeable differences between slow learners taught using the class-wide peer tutoring strategy and those taught using the conventional teacher-led discussion strategy, according to a study by Kalu-Uche and Ogbonna (2021) on the effect of peer tutoring instructional strategy on secondary school slow learners' academic achievement and retention in biology. The mean achievement scores of students who were taught biology via peer tutoring and traditional teaching techniques, according to Ndirika and Ubani's (2017) hypothesis, did not significantly differ from one another. The adjusted mean of the students' ability level and the two strategies, however, showed a statistically significant difference, demonstrating that there is an interaction effect between instructional techniques and ability level on students' academic progress. Peer tutoring, according to Essien (2016), is more effective at raising students' academic performance and retention in basic science among junior secondary school students. Majdoleen and Suhail (2017) conducted a study in Saudi Arabia and found that CWPT promoted healthy competition and collaboration among students, which may have

contributed to the improvement in word attack abilities observed among students with learning difficulties.

Furthermore, CWPT created a learning environment that encouraged experimentation and discovery and supported the successful use of this technique. According to Eldessouki (2016) and Madou & Iserbyt (2018), peer tutoring increases student involvement and motivation, which aids in the achievement of their goals. Similar to this, Agu and Azih (2019) claimed that peer tutoring significantly improves students' academic performance compared to those who are exposed to traditional methods and helps all students feel like they are a part of the learning process. The effectiveness of the CWPT technique was investigated by Ntoliou et al. (2016) in a Greek primary school classroom with a range of learning (dis)abilities. The findings showed that all students' performance improved, even those who might have learning impairments. Although, studies as mentioned above have showed some empirical evidence to how CWPT has improved students' achievement in some European and African countries and in different school subjects, based on the researchers knowledge, none has been conducted in Anambra State, Nigeria on the effect of CWPT on students' achievement in Chemistry. This is why the current investigation is necessary. In addition to instructional strategies, gender can also have an impact on students' academic performance.

A male or female is assigned a gender, which is a socially and culturally defined role, in a society. According to Nwaubani et al. (2018), gender is a socially established classification of women and men in society. It is a significant variable among students, particularly in multicultural countries like Nigeria, and refers to the societal roles or responsibilities that are allocated to males or females. As a result, gender is one of the key factors influencing the advancement of science and technology in Nigeria, according to Onyi et al. (2022). There are differences between male and female students' chemistry achievement, according to several empirical investigations. For instance, Onyi et al. (2022) discovered that gender significantly influences student achievement in favor of male students, but Eze et al. (2018) demonstrated a significantly different result in favor of female chemistry students. However, other researchers, such Odukwe and Nwafor (2022) and Ezeudu et al (2019), found no evidence of a gender effect on students' achievement in chemistry in their separate investigations. All these revealed that there is no agreement on how gender affects students' achievement in chemistry, which is why the current study is necessary.

The study's theoretical foundation is the social learning theory of Vygotsky. According to Vygotsky's (1978) theory, social interaction can help people learn the necessary knowledge, attitude, and abilities. Peer engagement helps students internalize material and grow into autonomous thinkers. With the aid of their peers within the zone of proximal development (ZPD), the pupils' shared experiences enable them to successfully foster mutual understanding and awaken a range of internal development. Vygotsky defined the ZPD as the stage where learners rely on their teacher, elders, or more experienced peers for direction and support. Vygotsky's emphasis on ZPD highlights his belief in the significance of social influence in learning because giving a student the right helps while they are in their ZPD for a particular activity will help them complete it. According to the hypothesis, CWPT conducted by a more experienced or informed student and aided by the teacher will offer the necessary transition through the ZPD. This is so that the students can take charge of their education with support from their peers courtesy of CWPT.

2. METHODS

Research Design

The study employed a quasi-experimental research design. It was specifically the non-equivalent control group that was used before and after the test. A 2 x 2 factorial matrix served as the design, representing the two teaching approaches (CWPT and LM), as well as the moderating variable that

included the two levels of gender (male and female). Because intact classes (non-randomized groups) were employed for the investigation, the design was deemed appropriate. Because the experimental and control groups are typically arranged in intact classes, per Nworgu (2018), the quasi experimental design is frequently employed in classroom experiments in order to avoid interfering with the academic program of the participating schools.

Research Setting and Participants

The study was conducted in Nigeria's Anambra State's Awka South Local Government Area. Nigeria has 36 states, with Anambra State being one of them. All 1,482 pupils in senior secondary two (SS2) Chemistry in the Awka South Local Government Area of Anambra State were the population that was targeted. There are a total of 19 public secondary schools in the Local Government Area. Through a multi-stage sampling process, 78 SS2 Chemistry students were chosen as the sample size. First, using a purposive sampling strategy, two co-educational schools were chosen. Each of the two schools formed an intact class used for the study. Additionally, the experimental and control groups were chosen at random from the two intact classes. The control group had 36 students (15 males & 21 females), whereas the experimental group had 42 students (17 males & 25 females).

Research Instrument

For the purpose of gathering data, researchers created the Chemistry Achievement Test (CAT), which consists of 30 multiple-choice objective items. Three experts from the Department of Science Education (Measurement & Evaluation Unit), University of Nigeria, Nsukka, Enugu State, and the Department of Science Education (Chemistry Unit), Nnamdi Azikiwe University, Awka, Anambra State, received the lesson plan and the CAT for validation. The test blueprint created by the researchers based on the cognitive skills examination of knowledge, comprehension, analysis, synthesis, and evaluation was used to establish the content validity of the CAT. For the pre-test and post-test, the CAT was given to the chemistry students in the experimental and control groups, respectively. With the use of Kendall's Coefficient of Concordance (w), a reliability index of 0.92 for CAT was calculated.

Experimental Procedure

The two sampling schools' regular chemistry teachers worked as the study's research assistants, and the trial lasted for seven weeks. Regular chemistry teachers were instructed by the researchers throughout the first week. Therefore, the chemistry instructor in the experimental group received training utilizing CWPT lesson plans while the other was exposed to the still-used lecture form of instruction. The experimental group was also divided based on the students' pre-test results during the second week, right before the start of the treatment, in the intact classes of the two groups. The treatment was provided from the third to the sixth week, and the post-test was given on the seventh week.

Data Analysis

Using SPSS Version 25, the data gathered from the pre-test and post-test of the groups were analyzed. The research question was answered using the mean and standard deviation, and the hypotheses were tested using Analysis of Covariance (ANCOVA) at the .05 level of significance.

4. RESULTS AND DISCUSSION

Results

The results of the study are presented in the order of the research questions and hypotheses.

Research Question One: What are the mean achievement scores of students taught chemistry using CWPT and those taught with lecture method?

Table 1: Pre-test and post-test mean and standard deviation achievement scores of students' taught chemistry with class-wide peer tutoring (CWPT) and those taught using lecture method (LM)

Methods	Pre-test			Post-test		
	N	Mean	SD	Mean	SD	Mean Gain
CWPT	42	14.07	4.35	24.17	2.66	10.10
LM	36	13.00	4.60	17.58	3.57	4.58

The results as shown in Table 1 reveals that the students who were taught chemistry via CWPT had mean achievement scores of 14.07 before the test, with a standard deviation (SD) score of 4.35, and mean achievement scores of 24.17 after the test, with an SD value of 2.66. When using CWPT to instruct students, the average gain was 10.10. On the other hand, the students who were taught chemistry using LM had mean achievement scores of 13.0 with an SD of 4.60 before the exam, and mean achievement scores of 17.58 with an SD of 3.57 after the test. When students are taught with LM, the average gain was 4.58. The results stated above implies that students who were taught chemistry using CWPT achieved better than their counterpart taught using LM. Hence, class-wide peer tutoring is more effective in teaching chemistry than lecture method.

Hypothesis One: There is no significant difference in the mean achievement scores of students taught chemistry using CWPT and those taught exposed to LM.

Table 2: Analysis of covariance (ANCOVA) of the significant difference in the mean achievement scores of students taught chemistry by methods and gender

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	1128.783[a]	4	282.196	45.989	.000
Intercept	1698.071	1	1698.071	276.735	.000
Pretest	283.223	1	283.223	46.157	.000
Methods	708.034	1	708.034	115.388	.000
Gender	3.787	1	3.787	.617	.435
Methods*Gender	2.339	1	2.339	.381	.539
Error	447.935	73	6.136		
Total	36396.000	78			
Corrected Total	1576.718	77			

Table 2 results reveal that for the effect of CWPT and LM on students' mean achievement scores in chemistry, an F-ratio value of 115.388 was obtained with the corresponding probability value of .00. The null hypothesis, which indicated that there is no significant difference in the mean achievement scores of students taught chemistry using CWPT and those taught exposed to LM, is rejected since the probability value of .00 was less than the .05 threshold of significance ($p < .05$) assigned as the bench mark.

Research Question Two: What are the mean achievement scores of male and female students taught chemistry using CWPT?

Table 3: Mean and standard deviation of pre-test and post-test achievement scores of male and female students taught chemistry using CWPT

CWPT	Pre-test			Post-test		
	N	Mean	SD	Mean	SD	Mean Gain
Male	17	13.94	4.28	24.59	2.60	10.65
Female	25	14.16	4.49	23.88	2.71	9.72

According to the results shown in Table 3, male students who were taught chemistry using CWPT had a mean achievement score on the pre-test of 13.94 with an SD score of 4.28 and a mean achievement score on the post-test of 24.59 with an SD score of 2.60, while female students who were taught chemistry using CWPT had a mean achievement score on the pre-test of 14.16 with an SD score of 4.49 and a mean achievement score on the post-test of 23. When teaching chemistry to male and female students using CWPT, the mean gains were 10.65 and 9.72, respectively. This suggests that when chemistry was taught via CWPT, male students slightly outperformed their female counterparts in terms of achievement.

Hypothesis Two: There is no significant difference in the mean achievement scores of male and female students taught chemistry using CWPT.

Table 4: Analysis of covariance (ANCOVA) of the significant difference in the mean achievement scores of male and female students taught chemistry using CWPT

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	74.389[a]	2	37.194	2.065	.140
Intercept	1.392	1	1.392	.077	.782
Pretest	73.904	1	73.904	4.103	.050
Gender	3.340	1	3.340	.185	.669
Error	702.397	39	18.010		
Total	9093.000	42			
Corrected Total	776.786	41			

The outcome, as given in Table 4, demonstrates that the F-ratio value for the effect of CWPT on the mean achievement scores in chemistry for male and female students was obtained with the associated probability value of .669. The null hypothesis, which claimed that there is no significant difference in the mean achievement scores of male and female students taught chemistry using CWPT, is not rejected because the probability value of .669 was greater than the .05 level of significance ($p > .05$) set as the benchmark. Therefore, when teaching utilizing CWPT, gender has no discernible impact on the mean achievement scores of students in chemistry.

Hypothesis Three: There is no significant interaction effect of instructional methods and gender on students' achievement in chemistry.

Additionally, the outcome in Table 2 shows that an F-ratio of .381 was obtained with an associated probability value of .539, which is greater than the threshold value of .05, for the interaction

effect of instructional approaches and gender on students' achievement in chemistry. This suggests that the null hypothesis, according to which instructional strategies and gender have no significant interaction effect on students' achievement in chemistry, is not rejected. Furthermore, Figure 2 demonstrated that the lines drawn between the genders of the students (male and female) did not intercept at any point. As a result, neither methods nor gender affect how well chemistry students perform in the subject. See the illustration in Figure 2 below.

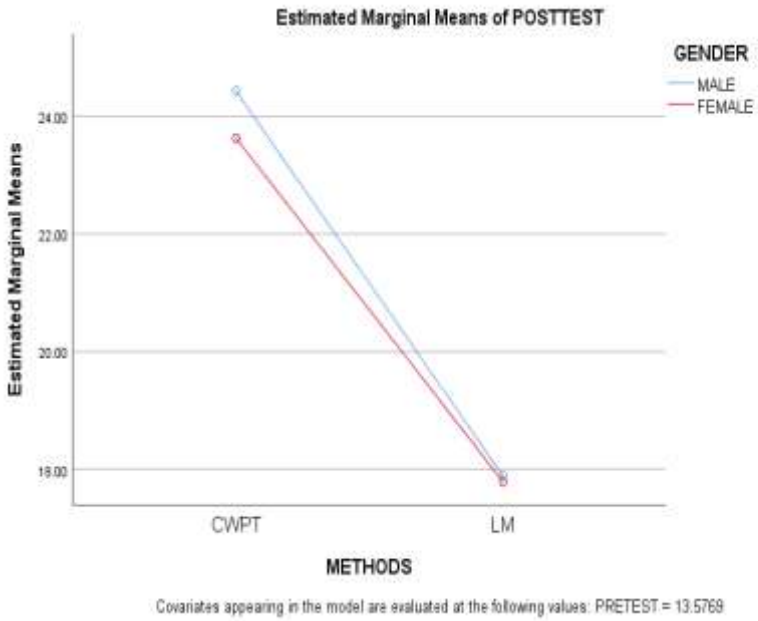

Figure 2: Graph of the interaction effect of instructional methods and gender on students' achievement in chemistry.

Discussions

According to the findings of the study, which are presented in Tables 1 and 2, students who were taught chemistry using CWPT greatly outperformed their counterparts who were taught using LM. CWPT is hence noticeably more successful than LM in teaching chemistry. The opportunity for students to express themselves and engage with teachers and other students through CWPT may be the cause. So removing their misunderstandings, uncertainties, and academic limitations in the study of chemistry. The results are consistent with those of Ihekwoaba et al. (2020), Mkpanang (2016), and Ntoliou et al. (2016) who claimed that CWPT increases students' achievement in academic areas other than English more than the traditional approach. The results correspond with those of Kalu-Uche and Ogbonna (2021), who claimed that peer tutoring is an effective instructional technique for increasing slow learners' academic progress and retention. The study's findings also supported Vygotsky's social learning theory, which held that interactions between students and their peers help them develop the necessary information, attitudes, and abilities. Additionally, the results are consistent with those of Liu et al. (2018), who found that group learning by students enhances their performance, confidence, and attitude while Draper (2023) recommended the need for teachers to provide the necessary social and academic supports and ensure that students work together for their benefits.

The results, as shown in Tables 3 and 4, showed that when using CWPT, male students somewhat outperformed their female counterparts in terms of achievement. Further investigation, however, showed that there was not a significant difference between male and female students who were taught chemistry

using CWPT in terms of mean achievement scores. Therefore, CWPT is gender inclusive and includes all genders in learning chemistry. The gender-friendly feature of the CWPT approach, which allowed both male and female students to actively participate in the learning process in contrast to some past cultural limitations, may be the explanation, as witnessed during the trial. The results of Ndirika and Ubani (2017) and AbdulRaheem et al. (2017), who reported no significant differences between male and female students who received peer tutoring versus those who received traditional instruction, are consistent with this. The outcomes also align with those of Olatunji and Mbanefo (2019), who discovered no statistically significant differences in the academic achievement of male and female students who underwent peer tutoring. Additionally, the results are consistent with Olulowo et al. (2020), who asserted that peer tutoring was sensitive to socioeconomic position rather than gender. This result contradicts with that of Agommuoh (2019), who found that exposure to the peer tutoring learning approach resulted in a significant gender difference favoring females. The outcomes also contradict those of Ezenwosu and Nworgu (2013), who claimed that when exposed to a peer tutoring technique, male students performed marginally better than female students.

Furthermore, according to the study's findings, there was no significant interaction between gender and instructional methods and students' achievement in chemistry, as seen in Table 4 and Figure 2. As a result, there is no interaction between method and gender that affects students' performance in chemistry. The results of Longjohn and Osila (2022) and Oviawe et al. (2015), who found no statistically significant interaction between gender and teaching techniques on student achievement in mathematics and building technology, respectively, support this conclusion. The results are also similar to those of Ogundola (2017), who discovered that there was no significant interaction between treatment and gender that affected students' learning outcomes.

The researchers are of the opinion that the study has empirically proven that Chemistry instruction through the use of Class-wide peer tutoring helps to enhance learning outcome in the subject. The finding of this study therefore has contributed to knowledge especially as it concern improving students' achievement in Chemistry education in Anambra State, Nigeria and other parts of the country towards enhancing national development.

5. CONCLUSION

The researchers came to the conclusion that CWPT could function as a cutting-edge instructional strategy that significantly enhances students' achievement in chemistry and fosters a gender-neutral learning environment. As a result, CWPT substantially closes the gender gap in chemistry learning in Nigeria. Based on their findings, the researchers suggested that Nigeria's government, ministries of education, and other educational stakeholders train chemistry teachers and other teachers to effectively use CWPT through conferences and seminars. They also suggested that curriculum planners incorporate the strategy into various curriculum materials. Additionally, as the CWPT improves gender equity in chemistry learning, chemistry and other academic topics in Nigeria should employ the strategy to close the gender achievement gap. Finally, training for this new teaching strategy should be provided for both pre-service and in-service teachers.

The limited sample size employed for the study, which may restrict the generalizability of the findings for the entire population, is one of the constraints faced by the researchers. Other instructor characteristics, including their personality, experience, and academic qualifications, among others, may also have had an impact on the results of the study. Further research could be carried out by examining the effect of the strategy on students' psychological variables such as their attitude, self-esteem, self-

efficacy in different school subjects. Moreover, further research could be done using larger sample size and among students in different school level such as the University students.

6. REFERENCES

AbdulRaheem, Y., Yusuf, H. T. & Odutayo, A. O. (2017). Effect of Peer Tutoring on Students' Academic Performance in Economics in Ilorin South, Nigeria. *Journal of Peer Learning, 10,* 95-102. http://ro.uow.edu.au/ajpl/vol10/iss1/7

Adekoya, Y. M. & Olatoye, R. A. (2011). Effect of demonstration, peer- tutoring and lecture teaching strategies on senior secondary school students' achievement in an aspect of agricultural science. *The Pacific Journal of Science and Technology, 12*(1), 320–332. https://www.semanticscholar.org/paper/Effect-of-Demonstration%2C-Peer-Tutoring %2C-and-Lecture-Adekoya-Olatoye/bcd20d72f44efc06d329d4059064458b6830d959

Agommuoh, P.C. (2019). Effect of peer tutoring instructional strategy on academic performance in physics among senior secondary school students in Umuahia North Local Government Area. *MJWS,1*(1),133-138.

Agu, O. O. U, & Azih, N. (2019). Effect of peer tutoring on achievement of students in business studies in public junior secondary schools in Gassol Education Zone of Taraba State. *Middle-East Journal of Scientific Research, 27*(3), 188-196. Doi: 10.5829/idosi.mejsr.2019.188.196

Aniodoh, H.C.O. & Eze, G. N. (2022). Effects of tutorial, drill and practice modes of computer-assisted instruction on students' attitude and achievement in secondary school chemistry. *Journal of Evaluation, 7*(1), 33-44.

Anyanime, O. A. & Abasifreke, N. E. (2019). *Effect of constructivist and jigsaw models instructional strategies on the academic achievement of students in chemistry.* 60th Annual conference proceedings of STAN, 409-415.

Bowman-Perrott, L., Ragan, K., Boon, R. T., & Burke, M. D. (2023). Peer tutoring interventions for students with or at-risk for emotional and behavioral disorders: A systematic review of reviews. *Behavior Modification, 47*(3), 777-815. https://doi.org/10.1177/01454455221118359

Draper, E. A. (2023). Working together: Peer interactions to support students with disabilities in the music classroom. *Journal of General Music Education, 36*(2) 38–41, Doi: 10.1177/27527646221134042

Essien, E.U. (2016.) Effects of peer tutoring on students academic performance and retention in junior secondary school basic science. *International Journal of Education Bench Mark (IJEB), 3*(1), 91-100. https://benchmarkjournals.com/wp-content/uploads/2019/07/Effect-of-Peer-Tutoring-On-Students%E2%80%99-Acade mic-Performance-and-Retention-In-Junior-Secondary-School-Basic - Science.pdf

Eze, C.U., Egbo, J.J. & Omeje, C. O. (2018). *Improving senior secondary school students' achievement in chemistry through programmed instruction strategy*. 59th Annual conference proceedings of STAN, 186-192.

Ezenwosu, S. U. and Nworgu, L. N. (2013). Efficacy of peer tutoring and gender on students' achievement in biology. *International Journal of Scientific and Engineering Research, 4*(12), 944-950. https://www.ijser.org/researchpaper/efficacy-of-peer-tutoring-and-gender-on-students-achievement-in-biology.pdf

Ezenwosu, S. U., & Nworgu, L. N. (2013). Efficacy of peer tutoring and gender on students' achievement in Biology. *International Journal of Scientific and Engineering Research, 4*(12), 946-950.

Ezeudu, F. O., Chukwudi, S. U., Nwafor, S. C. & Agugu, V. C. (2019a). Effects of microscale experiments on senior secondary school students' achievement and science process skills acquisition in practical Chemistry. *Research Journal of Applied Sciences, 14*(2SI), 5322-5332. Doi:10.36478/ jeasci.2019.5322.5332

Ezeudu, F. O., Nwafor, S. C., Abaeme, O. D., Alabi, A. O., Chukwuka, C. U., Ikuelogbon, E. O. (2019b). Effect of scaffolding and hand-on instructional approaches on senior secondary school students' achievement and interest in Chemistry. *Research Journal of Applied Sciences, 14*(5), 170-178. Doi: 10.36478/rjasci.2019.170.178

Kalu-Uche, N. & Ogbonna, N. G. (2021). Effect of peer tutoring instructional strategy on secondary school slow learners' academic achievement and retention in biology. *Rivers State University Journal of Education, 24*(1), 13-24. https://rsujoe.com.ng/index.php/joe/article/view/37/45

Longjohn, I. T & Osila, K. (2022). Effect of peer tutoring on senior secondary school students' academic performance in mathematics in ahoada east local government area of Rivers State. *Saudi Journal of Humanities and Social Science,7*(4), 164-169. Doi: 10.36348/sjhss.2022.v07i04.008

Madou, T., & Iserbyt, P. (2018). Effect of pairing by ability on performance, physical activity, and time-on-task during reciprocal peer teaching in swimming. *The Physical Educator, 75*(5), 756-773. Doi: 10.18666/TPE-2018-V75-I5-8326

Maheady, L. & Gard, J. (2010). Classwide peer tutoring: Practice, theory, research and personal narrative. *Intervention in School and Clinic, 46* (2) 71 – 78. Doi: 10.1177/1053451210376359

Mahoney, M. W. M. (2023). Peer-mediated instruction and intervention to support the academic achievement of secondary students with autism spectrum disorder: A systematic review of the literature. *Journal of Special Education Apprenticeship, 12*(1), 1-26. https://files.eric.ed.gov/fulltext/EJ1375291.pdf

Majdoleen. S. B. A. R. & Suhail, M. A–Z. (2017). Effects of classwide peer tutoring on word attack skills among students with learning disabilities. *European Journal of Special Education Research, 2*(5), 88-101. Doi: 10.5281/zenodo.838262

Mkpanang, J. T. (2016). Effects of classwide and reciprocal peer tutoring strategies on students' mathematical problem-solving achievement in electricity concepts in physics. *International Journal of Education, Learning and Development, 4*(3), 37-44. http://eajournals.org/wp-content/uploads/Effects-of-Classwide-and-Reciprocal-Peer-Tutoring-Strategies-on-Students---- Mathematical-Problem-Solving-Achievement-in-Electricity-Concepts-in-Physics.pdf

Ndirika, M. C. & Ubani, C. C. (2017). Peer tutoring teaching strategy and academic achievement of secondary school biology students in Umuahia Education Zone, Nigeria. *IOSR Journal of Research & Method in Education, 7*(3), 72-78. Doi:10.9790/7388-0703027278

Ndirika, M. C. & Ubani, C. C. (2017). Peer tutoring teaching strategy and academic achievement of secondary school biology students in Umuahia education zone Nigeria. *Journal of Research and method in education (JOSR-JRME), 7*(3), 72-78.

Ndirika, M. C. & Ubani, C. C. (2017). Peer tutoring teaching strategy and academic achievement of secondary school biology students in Umuahia Education Zone, Nigeria. *IOSR Journal of Research & Method in Education, 7*(3), 72-78. Doi:10.9790/7388-0703027278

Ntoliou, C., Papatzikis, E., & Pligou, V. (2016). Investigating the effectiveness of "classwide peer tutoring" (CWPT) strategy in a mixed learning (dis)abilities primary school classroom: A case study. *Ankara Üniversitesi Eğitim Bilimleri Fakültesi Özel Eğitim Dergisi, 17*(1), 23-41. Doi: 10.1501/Ozlegt_0000000237

Nworgu, B. G. (2018). *Educational research: Basic issues and methodology (Reprinted).* University Trust Publishers.

Nwaubani, O. V., Okechukwu, A. E. & Ogbonnaya, K. A. (2018). Utilization of media resources for instructions in adult literacy centres in Abia State, Nigeria. *Review of Education, 30*(1), 168-184.

Odukwe, O. C. & Nwafor, S. C. (2022). Effect of guided-inquiry method on senior secondary school chemistry students' academic achievement in Anambra State, Nigeria. *Unizik Journal of Educational Research and Policy Studies, 11*(1), 151-161. https://unijerps.org/index.php/unijerps/article/view/228/198

Ogundola, P. (2017). Effects of peer tutoring strategy on academic achievement of senior secondary school students in technical drawing in Nigeria," *British Journal of Education, Society & Behavioural Science, 19*(1), 1–10. Doi: 10.9734/BJESBS/2017/30419

Olatunji, F. O. & Mbanefo, M. C. (2019). *Effect of peer instruction strategy on students' academic performance and retention in Basic science.* 60th Annual conference proceedings of STAN, 238-244.

Olulowo, T. G., Ige , O. A. & Ugwoke, E. O. (2020). Using peer tutoring to improve students' academic achievement in financial accounting concepts. *Hindawi Education Research International, 20,* 1-10. https://doi.org/10.1155/2020/8871235

Onyi, I. E., Njoku, Z. C. & Nwafor, S. C. (2022). Efficacy of problem based learning in promoting high achievement of students in chemistry. *Journal of Critical Reviews, 09*(01), 49-57. https://www.jcreview.com/ad min/Uploads/Files/61d694d54bc2d1.24608275.pdf

Oviawe, J. I., Ezeji, S. C. O. A. and Uwameiye, R. (2015). Comparative effects of three instructional methods on students' performance in building technology in Nigerian polytechnics. *European Scientific Journal, 11*(12), 274-285. https://eujournal.org/index.php/esj/article/view/5481

Sarabjeet & Nagra, V. (2022). Effect of peer tutoring on achievement in mathematics among secondary school students. *Journal of Emerging Technologies and Innovative Research, 9*(6), 777-780. https://www.jetir.org/papers/JETIR2206997.pdf

Susanti, Y., Astuti, D. S. & Ramadhiyanti, Y. (2020). Improving students' reading comprehension by using classwide peer tutoring (cwpt) method. *Journal of English Language Teaching and Education, 1*(1), 1-20. Doi: https://doi.org/10.31571/jelte.v1i1.21

Vygotsky, L. (1978). *Mind in society: The development of higher psychological processes*. Cambridge, M.A: Harvard University Press.