



Effects of Acrostic-Letter -Sentence Mnemonics and Reciprocal Peer-Tutoring Strategies on Achievement of Secondary School Chemistry Students on Onitsha Education Zone

Ezeanya, M. Chinyere & Okigbo, E. Chinelo

Department of science education, Nnamdi Azikiwe University, Awka

Corresponding Author: Anamaureen94@gmail.com

Abstract

The study investigated the effects of acrostic-sentence mnemonics and reciprocal peer-tutoring on secondary school chemistry students' achievement in Onitsha Education Zone. Three research questions and four null hypotheses guided the study. The design was quasi-experimental. The population of the study was 3,296 senior secondary one chemistry students in Onitsha Education Zone. 214 students obtained using purposive and random sampling was involved in the study. Chemistry Achievement Test (CAT) consisting of multiple-choice questions validated by three experts with reliability established using Kuder Richardson formula 20 to be 0.80 was used as instrument. Mean and standard deviation was used in answering the research question and Analysis of Covariance was used analysis the hypotheses. The results showed that reciprocal peer-tutoring most significantly improved students' achievement in chemistry followed by acrostic sentence mnemonics. It was recommended that chemistry teachers should adopted the use reciprocal peer tutoring to facilitate greater interaction among students.

Keywords: Mnemonic, Peer-Tutoring, Biology, Achievement, Reciprocal

Introduction

Chemistry as a secondary school subject plays a central role in science and development. Chemistry is important for the health of humans and their survival. A clear example is in the search of effective vaccine for the novel covid-19 pandemic and the synthesis of important chemicals. Despite this importance of chemistry, the West African Examination Council's Chief Examiner's Reports from 2007-2012 shows that not up to 50% percentage of students who enrolled for the WAEC chemistry examination made credit pass (A1-C6) except in 2010. From 2013-2017, there was a continuous decline in the percentage number of students who made a credit pass from 72.34% to 52%. Students' achievement was very poor in 2018 when it is expected that given research studies, students' achievement in would improve. This persistent decline in students' achievement in chemistry has been attributed to a number of factors.

The major contributors to students' poor achievement in chemistry include absence or non-functional laboratories, lack of consumable chemical for chemistry practical and the expensive nature of laboratory apparatuses. Other factors implicated are the poor students' interest in science subjects like chemistry and the teaching methods adopted by chemistry teachers (Sakiyo & Badau, 2015; Samuel, 2017; Muhammad, Abdul, Sharifah, Dayana, Norazrena, Nurul, Zakiah & Umar, 2019). Among the factors implicated for poor achievement, the teaching method adopted by the teacher was the

most common factor. This is because, chemistry teachers like to adopt teacher centred methods that could enable them cover large content areas within the duration of time allocated for chemistry in the term. Since, teaching method is one of the most implicated factors in students' poor achievement in chemistry, there is need to further examine other innovative teaching methods that have the potentials of improving students' achievement.

Achievements in science teaching and learning have to do with attainment of set objectives of instruction. The selection of appropriate method can help them improve academic achievement unlike when they use conventional teaching method. The term conventional teaching technique as used in this study refers to the teaching using chalk and board for teachers, and pen and paper for students. Muhammad et al. (2019) are of the view that educational development nowadays needs teaching approaches that emphasize more on students' participation where the focus is on knowledge construction rather than knowledge transformation. In order to improve achievement, teachers need the adoption of learner-centred innovative strategies such as the use of acrostic letter sentence mnemonic and reciprocal peer tutorial.

Acrostic letter sentence mnemonic (ALSM) is the type of mnemonic device in the form of a sentence or phrase in which the first letter of each word represents the first letters of the information to be learned. It is the type of mnemonic in which each



first letter is converted into a cute sentence (Major, 2015). Researchers (Stalder & Olson, 2011; VanVoorhis, 2002; Egbe 2018) are of the view that introduction of mnemonic as a teaching strategy in our secondary school could yield tremendous positive results. Mnemonics could be included in the teaching science as it could help in easy learning and make learning more enjoyable (Anandhi & Raja, 2014).

Studies (Fritz, Morris, Acton, Voelkel & Etkind, 2007; Stalder & Olson, 2011) show that mnemonics could be easier, faster, more enjoyable, and more useful than rote rehearsal, and that mnemonics could reduce test anxiety. Mnemonics techniques, according to Putnam (2015) are a powerful way to learn large amount of information but are not widely used in education today. Studies by Mustafa and Ali (2012) and Bakere & Orji (2018) showed that students taught using mnemonics has significantly higher achievement than those taught without it. Similarly, studies by Onur, Ali and Yunus (2013), Ezekiel (2014) and Cloca & Nerisanu (2020) on effect of mnemonics on students' achievement revealed a significant difference in favour of the students taught using mnemonics. Also the findings of Egbe (2018) and Marthila (2020) showed significant difference in the mean achievement scores of student taught using mnemonics and those taught without it in favour those taught using mnemonics. Despite mnemonics being theoretically applicable to a wide range of educational materials and popular among students, researchers are in constant search for more emerging trends in teaching and learning in the school system. One of the emerging pedagogy is reciprocal peer tutoring.

Peer tutoring is a strategy that capitalizes on the benefits students received from preparing to tutor one another (Luzale, 2012). Advancing this strategy, a step further, McMaster, Fuchs and Fuchs (2006) developed a procedure that enables all the members in a group to participate as tutors and tutee. This is known as Reciprocal Peer Tutoring (RPT). In this technique, students function equally both as tutor and tutee. Tutors are providers of instruction, while tutees are recipients of instruction. Additionally, a well-designed RPT procedure provides students with essential feedback and informs teachers about the quality of their teaching by identifying concepts that students have and have not mastered.

Many researchers (Bowman, 2013; Constantine, 2015, Alegra, Molina & Moronto, 2020) are of the view that RPT strategy could enhance teaching and learning. Bowman (2013) said that Peer tutoring is useful in encouraging educational gains in course content, and is successful

for students of elementary and secondary level classes. Studies by Obiunu (2008) and Alemu (2020) that that reciprocal peer tutoring helped in significantly improving the achievement of secondary school students. Similar studies by Agu (2018) also revealed that that peer tutoring instructional strategy had a significant effect on students' academic achievement. These potentials of reciprocal peer tutoring and mnemonic incites the need for further investigation into the use of these strategies and whether they could improve the achievement of male and female students in chemistry irrespective of gender.

Gender is one of the factors also mentioned in various research studies to have considerable effects on students' academic Achievement in science subjects (Ezeano, 2013). Gender refers to the fact of being male or female. Suleiman (2011) is of the view that the normal man has preponderance masculinity and normal female has preponderance femininity. He further stated that several researchers have been conducting studies on gender related issues. Such studies suggested that by the age of eleven, many young-stars demonstrated a sex stereotyped behaviour and attitude. Thus, the importance of examining performance in relation to gender is based primarily on the socio-cultural differences between girls and boys. Some vocations and professions are today seen as female jobs while others are also seen as male jobs.

An average Nigerian girl goes to school with these fixed stereotyped (Ogunshola & Adawale, 2012). Some researchers are of the view that more females were found in Biology and Art than in physics, chemistry and Mathematics classes. Equally Nwafor, Obodo and Okafor (2015) are of the view that males show more interest in learning science, acquire and utilize science process skills in everyday living more than females. Azoulay (2021) declared "Even today, in the 21st century, women and girls are being sidelined in science-related fields due to their gender.

Purpose of the Study

The purpose of the study was to investigate the effects of acrostic-letter-sentence mnemonics (ALSM) and reciprocal peer-tutoring (RPT) strategies on achievement of secondary school chemistry students. Specifically, the study determined the difference:

1. between the mean achievement scores of students taught chemistry using ALSM, RPT and conventional lecture method (CLM);
2. between mean achievement scores of male and female students taught chemistry.



3. interaction effect of teaching methods and gender on students' achievement in chemistry.

Research Questions

1. What are the mean achievement scores of students taught chemistry using ALSM, RPT and conventional lecture method (CLM)?

Hypotheses

1. There is no significant difference in mean achievement scores of students taught chemistry using ALSM, RPT and conventional lecture method (CLM).
2. There is no significant difference between the mean achievement scores of male and female students taught chemistry
3. There is no Interaction effect of teaching methods and gender on students' achievement in chemistry.

Method

The study adopted a quasi-experimental research design, specifically the pretest posts non-equivalent control group design. The study was carried out in Onitsha Education Zone in Anambra state. The population of the study comprised of 3, 296 (2,104 males, 1192 females) Senior Secondary School year one (SS 1) chemistry students in 20 public coeducation secondary schools. The sample for the study was 214 SS 1 chemistry students. Purposive sampling technique was used to select the three coeducational schools out of the twenty coeducational secondary schools in Onitsha education zone. This was to ensure that the schools are situated mile apart to avoid class interaction or subject contamination. Simple random sampling by lucky dip was used in assigning the three schools to ALSM, RPT and CLM.

The instrument for data collection was Chemistry Achievement Test (CAT). The 50-item multiple choice tests were validated by two experts from Nnamdi Azikiwe University and one experienced secondary school teacher. The reliability of CAT was established using Kuder Richardson Formula 20 (KR-20) to be 0.80.

The treatment was done by research assistant that were the regular chemistry teachers in the schools involved in the study. They were trained using a guide produced by the research on how to administer the treatment using the plan and to collect data. The treatment for ALSM involved teaching students with a sentence or phrase in which the first letter of each word represents the first letters of the information to be learned. The teacher introduced the topic as writing of chemical formulae of

compounds and explained the term oxidation number of elements and radicals. The teacher used the ALSM to teach them on how to memorize the oxidation number of common elements and radical, as shown below:

Oxidation numbers (+2): Divalent

Calcium ion (Ca^{2+}) = Calabar, Cobalt ion (Co^{2+}) = Cultural, Copper (II) ion (Cu^{2+}) = Carnival, Iron (II) ion (Fe^{2+}) = In, Nickel ion (Ni^{2+}) = Nigeria, Tin (II) ion (Sn^{2+}) = Takes, Lead (II) ion (Pb^{2+}) = Lead, Barium ion (Ba^{2+}) = Because, Magnesium (Mg^{2+}) = Most, Mercury II ion (Hg^{2+}) = Men, Manganese (II) ion (Mn^{2+}) = Match, Zinc ion (Zn^{2+}) = Zealously

(Calabar Cultural Carnival In Nigeria Takes Lead Because Most Men Match Zealously).

The above is illustration of ALSM on divalent elements. The teacher then then taught them how the oxidation numbers helped them in writing the chemical formula which is done by interchanging the oxidation number of elements and radicals present in a particular compound. For instance, the oxidation number of calcium (Ca) is + 2 while that of chlorine is -1, then calcium chloride becomes CaCl_2 and not CaCl , oxidation number of sodium is +1 while that of chlorine is -1, therefore sodium chloride becomes NaCl and not NaCl_2 .

For RPT the teacher introduced the lesson topic as chemical formulae of compounds. The teacher explains the rationale in writing the formulae by introducing to the students the meaning of oxidation number and gave them the rules for assigning oxidation number to atoms and radical and wrote the various oxidation numbers of common elements and radicals on the board. The teacher taught them how to write the chemical formulae of compounds by interchanging the oxidation number of elements and radicals present in the compound. The teacher called them out one after the other to write the chemical formulae on the board using the knowledge of oxidation number.

From the exercise, the teacher identified the students who understood the topics and the slow learner who are yet to understand. The students were then grouped according to the number they are in the class considering the fast and slow learners among them. They were also allowed to teach themselves in turns within the group while the researcher monitored their teaching. Each group worked independently within a timeframe and corrections were given to various groups. The researcher regrouped the students at the end of the lesson and assessed them in order to know the extent they have



understood the lesson. Take home assignments were also given to the students as a follow up of what they have learnt.

The control group was equally being taught by their class teacher using conventional method of instruction. At the end of the treatment, the CAT was reshuffled and administered again to both the experimental and control groups as post-test by the class teacher. The research questions were answered

using mean and standard deviation scores. The hypotheses were tested using analysis of covariance (ANCOVA). ANCOVA was used because it helped to take care of the initial differences among groups. In taking decision; when the p-value was greater than 0.05, the null hypothesis was not rejected. Conversely, when the p-value was less than or equals 0.05, the null hypothesis was rejected.

Results

Table 1: Mean Achievement Scores of Students taught Chemistry using ASLM, RPT and CLM

Source of Variation	N	Pretest Mean	SD	Posttest Mean	Posttest SD	Gain in Mean
ASLM	73	28.48	5.16	60.77	7.91	32.29
RPT	69	28.86	7.81	66.99	7.05	38.13
CLM	72	25.79	5.02	57.06	6.40	31.27

Table 1 shows that the students taught chemistry using ASLM has pretest mean achievement score of 28.48 and posttest mean achievement score of 60.77 with gained mean achievement score of 32.29, while those taught using RPT has pretest mean achievement score of 28.86, posttest mean

achievement score of 66.99 with gained mean achievement score of 38.13, where those in the control group taught using CLM had pretest mean achievement score of 25.79 and posttest mean achievement score of 57.06 with gained mean achievement of 31.27.

Table 2: ANCOVA on Significance of Interaction Effect of Teaching Methods and Gender on Students' Achievement in Chemistry

Source of variation	SS	Df	MS	F	P-value	Decision
Corrected Model	4240.932 ^a	6	706.822	14.497	.000	
Intercept	40869.726	1	40869.726	838.254	.000	
Pretest	262.441	1	262.441	5.383	.021	
Method	2897.843	2	1448.922	29.718	.000	S
Gender	.786	1	.786	.016	.899	NS
Method * Gender	289.610	2	144.805	2.970	.053	NS
Error	10092.451	207	48.756			
Total	824350.000	214				
Corrected Total	14333.383	213				

Table 2 shows that at 0.05 level of significance, there was a significant main effect of the teaching methods on students' achievement in chemistry, $F(2, 213) = 29.718$, $P(0.000) < 0.05$. Therefore, the

null hypothesis was rejected. Thus, there is a significant difference in mean achievement scores of students taught chemistry using ALSM, RPT and conventional lecture method (CLM).

Table 3: Scheffe PostHoc

(I) Method	(J) Method	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
					Lower Bound	Upper Bound
ASLM	RPT	-6.305*	1.181	.000	-8.633	-3.977
	CLM	4.328*	1.187	.000	1.988	6.669
RPT	ASLM	6.305*	1.181	.000	3.977	8.633
	CLM	10.633*	1.209	.000	8.249	13.017
CLM	ASLM	-4.328*	1.187	.000	-6.669	-1.988
	RPT	-10.633*	1.209	.000	-13.017	-8.249

Table 3 reveals that significant difference exists between the mean achievement scores of students taught chemistry using ALSM and RPT in favour of

RPT. Table 5 also reveals that a significant difference exists between the mean achievement scores of students taught chemistry using ALSM and



CLM in favour of ALSM. Table 5 further shows that there is significant difference between the mean achievement scores of students taught using RPT and CLM in favour of RPT. This shows that the direction of significance moves from RPT, ALSM and CLM.

Table 4 shows that at 0.05 level of significance, there was no significant main influence of gender on students' achievement in chemistry, $F(1, 213) = 0.016$, $P(0.899) > 0.05$. Therefore, the null hypothesis was rejected. Thus, there is no significant difference in mean achievement scores of male and female students taught chemistry.

Table 4 further shows that at 0.05 level of significance, there was a significant interaction effect of teaching methods and gender on students' achievement in chemistry, $F(1, 213) = 2.970$, $P(0.053) = 0.05$. Therefore, the null hypothesis was rejected. Thus, there is significant interaction effect of ALSM, RPT, CLM (teaching methods) and gender on students' achievement in chemistry.

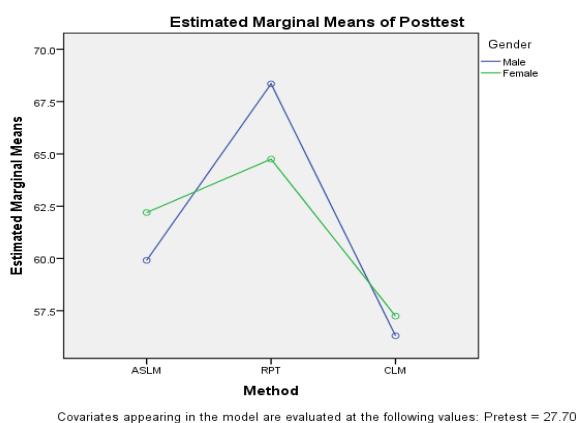


Figure 1: Plot of interaction effect of teaching methods and gender on students' achievement in chemistry

Discussion

The findings of the study showed that there existed a significant difference between the mean achievement scores of students taught chemistry using ALSM, RPT and conventional lecture method in favour of RPT followed by ALSM. The observed result was because students in the reciprocal peer tutoring group had several encounter with the learning materials given that they discussed the content with the peer after teaching until they understood the concepts. The use of reciprocal peer tutoring created a friendlier learning atmosphere where students are comfortable to ask questions and seek clarifications until their properly conceptualize what was being studied. By seeking help and

learning and also teaching others from what was learnt, students developed mastery of learning contents. The alternating of roles between the tutee and tutor among peers developed in them self-confidence about what was learnt and with the same confidence they taught their peers. The whole process of learning therefore led to improved achievement in chemistry.

The findings of the study are in line with the findings of Obiunu (2008) that that reciprocal peer tutoring is an effective intervention strategy for enhancing the career decision making process of secondary school adolescents. The finding of the study also supports the finding of Alemu (2020) that that reciprocal peer tutoring helped in improving Physics achievement of secondary school students. The finding Agu (2018) also supports the findings of the study when they reported that that peer tutoring instructional strategy has a significant effect on students' academic achievement in Basic Science and Technology.

The finding of the study also showed that significant difference exists between the mean achievement of students taught chemistry using ALSM and conventional method in favour of ALSM. The observed results could be attributed to the fact that the use of mnemonics helps students to remember what is taught in a way personal to them. Students taught using mnemonics transform the new knowledge into concrete and memorable information. To do this however, students must use acronyms that meaningfully summarize the new material they are learning. The whole process of trying to encode learning into mnemonics facilitates deeper understanding of the concepts.

The use of mnemonics helped students to make concrete connections between familiar or previous knowledge and new information. Acrostics mnemonics exposed the students to a way of learning that involved organizing learning material into a meaningful whole for easy recall. The organized material also enabled students to learn in their own way being able to learn the material in a sequence suitable for their own understanding. Also the use of mnemonics made the students active participants in the learning process.

The finding of the study is in line with the findings of Mustafa and Ali (2012) and Bakere & Orji (2018) revealed that there was significant difference between the mean achievement scores of the experimental and control group in favour of the experimental group taught using mnemonics. The finding of the study supports the finding of Onur, Ali and Yunus (2013) that there was a significant difference between the groups in favour of the



treatment group taught using mnemonic device in terms of recalling what was learnt. The finding of the study supports the findings of Ezekiel (2014) and Cloca & Nerisanu (2020) that students taught using mnemonics based instructional strategy had higher achievement scores than those taught using prior knowledge based instructional strategy. Also the findings of Egbe (2018) and Marthila (2020) supports the findings of the present study when he reported revealed that mnemonic technique has a significant effect on students' achievement in English stress patterns.

The finding of the study revealed that there was no significant difference between the mean achievement scores of male and female students both in the ASLM and RPT groups. This is because both ASLM and RPT gave students the opportunity to be actively engaged in the learning process. Students whether male or female learnt at their own pace and interacted with the learning materials enough to facilitate improved achievement. There was significant disordinal interaction of teaching methods and gender on students' achievement in chemistry. This indicated that both ALSM and RPT are gender sensitive.

The findings of the study also support that finding of Ekwale (2019) The findings of the study showed that there is no significant difference in the academic achievement of biology between male and female students. The finding of the study supports the finding of Godpower-Echie and Ihenko (2017), Okorie and Ezech (2016) and Ezeugwu, Nji, Anyaegbunam, Enyi and Eneja (2016) that gender has no significant influence on achievement of students. The findings of the study contravene the finding of Babayemi and Ahmed (2019) that gender had significant main influence on achievement and that there was no significant two-way interaction effect of treatment and gender on achievement.

Conclusion

The conclusion drawn from the findings of the study is that reciprocal peer tutoring is an effective instructional strategy form improving students' achievement in chemistry. The study concludes that adoption of reciprocal peer tutoring enables students to interact very well among themselves, sharing knowledge and improving achievement.

Recommendations

It is recommended based on the findings that

1. Chemistry teachers should adopt the use reciprocal peer tutoring to facilitate greater interaction among students as they learn new

chemistry concepts and to provide conducive classroom environment.

2. Seminars and workshops should be organized by professional educational organization like STAN, educational stakeholders and heads of schools for chemistry teachers on how to use RPT and ALSM.

References

- Adepeju O.A (2014). *Mnemonic as an innovative approach to creative teaching of secondary school chemistry*. Unpublished Thesis, Department of Education Gombe State University Gombe.
- Agu, P.A. (2018). Effect of peer tutoring instructional strategy on achievement of basic science and technology students with learning disabilities in Nasarawa state, Nigeria. *East African Scholars Journal of Education, Humanities and Literature*, 1(2), 47-54.
- Alegra, F., Mohner, L. & Maroto, A. (2020). Academic achievement and peer tutoring in mathematics. A comparison between primary and secondary education. Retrieved from <https://doi.org/10.1177/2158244020929295>
- Alemu M. (2020). Improving secondary school students' physics achievement using reciprocal peer tutoring: A multi-level quasi-experimental study. *Eurasia Journal of Mathematics, Science and Technology Education*, 16(4), 18-32.
- Anandhi, S. & Raja, B.W. (2014). Acronym- A retrieval strategy for science learning. *Indian Journal of Applied Research*, 4(1), 180-1833.
- Babayemi, J.O. & Ahmed, A.A. (2019). Effects of enhanced conventional lecture method and gender on students' achievement in basic science. *Journal of Contemporary Education Research (JCER)*, 13(6), 242-256.
- Bakere J. & Orji C.T. (2018). Effects of reciprocal peer tutoring and direct learning environment on sophomores' academic achievement in electronic and computer fundamentals. *Education and information Technologies*, 3(2), 12-19.



- Cloca, L. & Nerisanu, R.A. (2020). Enhancing Creativity: Using visual mnemonic devices in teaching process in order to develop creativity in students. *Sustainability MDPI*
- Constantine C. (2015). Pairing Learners by Companionship. Effects on Motor Skills Performance and comfort levels in Reciprocal Style of Teaching DOI:<https://doi.org/10.18666/JPE-2015-V72-15-6213>.
- Ekwale, E.A. (2019). The effect of gender, self-concept. Socio-economic status of parents and type of school on students' general academic achievement and students' achievement in biology: a case study of senior secondary school students in the Calabar municipality, Nigeria. *International Journal of Trend in Scientific Research and Development (IJTSRD)*, 3(2), 194-201.
- Egbe, C. I. (2018). Effect of mnemonics on Nigerian senior secondary school students' achievement in English stress patterns. *Review of Education Institute of Education Journal*, 23(1), 65-76.
- Ezeano, C.A. (2013). Extent of lab-works taught/exposed to senior secondary school 3 chemistry students before external examinations in Enugu state. *Journal of Education and practice*, 4(27), 23-31.
- Ezekiel, O.O. (2014). *Effects of mnemonic and prior knowledge-based instructional strategies on senior secondary school students' learning outcomes in mathematics in Ibadan*. Unpublished PhD dissertation, University of Ibadan, Ibadan.
- Ezeugwu, J.O., Nji, G.C., Anyaegbunam, N.J., Enyi, C. & Eneja, R.U. (2016). Influence of cognitive ability, gender and school location on students' achievement in senior secondary school financial accounting. *European Journal of Economics, Finance and Administrative Sciences*, 1(89), 98-113.
- Fritz C.O., Morris P.E., Acton M. Voelkel A.R. & Etkind R., (2007). Comparing and combining retrieval Practice and the Keyword Mnemonic for Foreign Vocabulary Learning. Wiley online Library.
- Godpower-Echie, G. & Ihenko, S. (2017). Influence of gender on interest and academic achievement of students in integrated science in Obio Akpor local government area of River state. *European Scientific Journal*, 13(10), 272-279.
- Luzale, D. (2012). *The effect of reciprocal peer tutoring and non-reciprocal on the performance of students in college physics*. Retrieved from <https://doi.org/107227/R1E8713>.
- Major, C. (2015). *21 best, easy memorization techniques for students* Retrieved from <https://www.developinghumanbrain.org>.
- Marthila L. (2020). The Effectiveness of using Mnemonic Technique in Teaching Vocabulary Mastery at the First Semester of the Seventh Grade of SMP N 2 Baradatu in the Academic Year of 2019/2020
- McMaster K.L., Fuchs D., & Fuchs L.S. (2006). Research on Peer-Assisted Learning Strategies: The Promise and Limitations of Peer-mediated Instruction. *Reading and Writing Quarterly* 22(2), 5-25. Taylor Francis online.
- Muhammad S.A., Abdul, H.A, Sharifah O, Dayang F.A., Norazrene A.S., Nurus, F. J., Zakiah M.A. & Umar H. A. (2019). A systematic Review on the Impact of Peer Tutoring Strategy in Linear Algebra Among Polytechnic Students. University of Education, University Teknologi Malaysia, Malaysia. Azman Hashin International, Business School, University Teknologi Malaysia.
- Mustafa, A. & Ali, M.S. (2012). Effect of the verbal mnemonics on students' achievement and their attitudes. *Procedia-Social and Behavioural Sciences*, 47, 1506-1510.
- Nwafor, C.E., Obodo, A.C. & Okafor, G. (2015). Effect of self-Regulated Learning Approach on Junior secondary school students Achievement in basic science. *Journal of Education and Practice*, 6(5), 22-28.
- Obiunu, J.J. (2008). The effect of reciprocal peer tutoring on the enhancement of career decision making process among secondary



- school adolescents. *Educational Research and Review*, 3(7), 236-241.
- Obiunu, J.J. (2008). The effect of reciprocal peer tutoring on the enhancement of career decision making process among secondary school adolescents. *Educational Research and Review*, 3(7), 236-241.
- Ogunshola F. & Adewale A.M. (2012). The Effects of Parental Socio-Economic status on Academic Performance of Students in Selected Schools in Edu Lga of Kwara State, Nigeria.
- Okorie, E.U. & Ezech, D.N. (2016). Influence of gender and location on students' achievement in chemical bonding. *Mediterranean Journal of Social Sciences*, 7(3), 309-318.
- Onur, K., Ali, M.S., & Yunus, E.O. (2013). The impact of mnemonic devices on attainment and recall in basic knowledge acquisition in nursing education. *psychology*, 29, 2179-250.
- Putnam A.L. (2015). Mnemonics in Education. Current Research and Applications. Translation issues in Psychological Science 1(2), 130. American Psychological Association.
- Sakiyo, J. & Badau, K. M. (2015). Assessment of the trend of secondary school students' academic performance in sciences, mathematics and English. Implication for attainment of the millennium development goals in Nigeria, *Advances in Social Sciences research*, 2(2), 31-38.
- Samuel K.R. (2017). A Comparison of Academic Performance between Public and Private Secondary Schools in Wareng District Kenya. *British Journal of Education*, 5(11), 58-67.
- Stalder, D.R. & Olson N. (2011). T for two. Using mnemonics to teach statistics. *Teaching of Psychology*, 38, 247-250.
- Suleiman, A.M. (2011). *Effect of inquiry teaching method on Academic Achievement, Retention and attitudes towards chemistry among Diploma students of Kano State Polytechnique*. Unpublished M.ED. Dissertation.
- VanVoorhis, C.R. (2002). Stat jingles: To sing or not to sing. *Teaching psychology*, 29, 2179-250.