

## Effects of Acrostic-Sentence Mnemonics and Reciprocal Peer-Tutoring on Secondary School Chemistry Students' Retention in Onitsha Education Zone

Ezeanya Maureen Chinyere & Prof. OkigboEbele Chinele

Department of Science Education,  
NnamdiAzikiwe University, Awka  
Nigeria

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### Abstract

*The study investigated the effects of acrostic-sentence mnemonics (ALSM) and reciprocal peer-tutoring (RPT) on secondary school chemistry students' retention in Onitsha Education Zone. Two research questions and three null hypotheses guided the study. A quasi-experimental research design was adopted for the study. The population of the study consisted of all the 3,296 senior secondary year one chemistry students in Onitsha Education Zone of Anambra state out of 214 students obtained using purposive and random sampling was used for the study. The instruments used for data collection was chemistry Achievement Test (CAT) and Chemistry Retention Test (CRT), validated by experts. The reliability coefficient of CAT was established using Kuder Richardson formula (KR-21) to be 0.80. The research questions were answered using mean and standard deviation while the null hypotheses were tested at 0.05 level of significance using Analysis of Covariance. The findings of the study revealed that there was significant difference between the mean retention scores of students taught chemistry using acrostic sentence mnemonics, reciprocal peer-tutoring and conventional method in favour of reciprocal peer-tutoring followed by acrostic sentence mnemonics. The study concluded that both reciprocal peer tutoring and acrostic sentence mnemonics were effective for improving retention in chemistry with reciprocal peer-tutoring being the most effective. It was recommended that when adopting RPT, effort should be made by chemistry teachers to alternate the roles of the students in a way that one student does not play the role of a tutor all through the learning period.*

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**Keywords:** *acrostic, mnemonics, reciprocal, peer, tutoring*

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### Introduction

Chemistry is the study of matter and energy and the interaction between them and is called the "central science" because it connects other sciences to each other such as Biology, Physics, Geology and Environmental Science (Jimoh,2005). Chemistry as a secondary school subject despite its importance and central role in science and development is often found difficult to understand by students. According to Ruggabar (2017), Chemistry can be one of the hardest subjects to teach, because so many different types of thinking come into play. In as much as chemistry education and Chemistry is important, Nigerian students have had a persistence low performance in Chemistry examination both in internal and external examinations such as in West African Senior School Certificate Examination (WASSCE) and National Examination Council's Senior School Certificate Examination (NECO SSCE).

One of the commonest factors often implicated for the poor retention of students is teaching method (Samuel, 2017). 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 and thus retention in chemistry, there is need to further examine other innovative teaching methods that have the potentials of improving students' retention. It is in this light that the researcher sought to investigate whether such methods as the use of acrostic letter sentence mnemonic and reciprocal peer tutorial could improve students' retention in chemistry.

Mnemonics techniques, according to Putnam (2015) are a powerful way to learn large amount of information but are not widely used in education today. Acrostic letter sentence mnemonics finds application in the teaching of chemistry concepts as well as other science subjects. Chemistry mnemonics tends to make the complex chemistry topics easier by providing different mnemonics to understand and remember difficult chemistry concepts. For instance, acrostic sentence letter mnemonics can be used in orbital electronic configuration of elements: Orbital configuration are assigned to elements using the s,p,d,f,g,h,i,k . According to Mnemonic device for chemistry (2012), this can easily be remembered accordingly using this FLSM as follows: **S**ober **P**hysicists **D**on't **F**ind **G**iraffes **H**iding **I**n **K**itchens. Acrostics letter sentence Mnemonics support recall by creating an entire sentence with the first letter of each word to be remembered. The cues provided by the first letter are, however, minimal and may not be sufficient to help some learners. Additionally, the target information must be ready, be familiar and meaningful to the learner just as in other strategies like reciprocal peer tutoring.

Peer tutoring or peer teaching is an instructional strategy that consists of student partnerships, linking high achieving students with lower achieving students or those with comparable achievement, for structured reading and math study sessions. According to Rohrbeck, Ginsburg-Block, Fantuzzo and Miller (2003), peer tutoring is a systematic, peer-mediated teaching strategy. Scruggs Mastropieri and Scruggs (2012) defined peer tutoring as an instructional strategy in which students work in pair form to learn academic tasks in the class. It is teaching to other students by students in the classroom in the form of pairs to involve them in studies (Ruggaber, 2017).

Schloss, Schloss and Schloss, (2007) elaborated it as an instructional strategy in which the peers play the role of teaching agent for their class fellows whereas Schunemann, Sporer, Vollinger and Brunstein (2017) stated that it is a strategy in which the students take the teachers' role in small group learning sessions. Nawaz &Rehman (2017) opined that it is a process of receiving knowledge and skill from classmates having the same social group. It is teaching strategy in which class is organized in pair of two students may be of different abilities to act as tutor and tutee in learning process and to get maximum benefits from each other. There are several models of peer tutoring which includes class-wide peer tutoring, cross age peer tutoring, peer assisted peer tutoring, same age peer tutoring and reciprocal peer tutoring (Omoroghomwen, 2017). In this work the emphasis was on reciprocal peer tutoring as it is believed to affective retention of male and female students.

Gender issues in science have been an old time problem since the academic communities are yet to completely solve the problems facing women. Researchers are of the view that women are been marginalized in societal issues and especially in the science field where there is a wider gender gap. Somerville (2020) opined that across many fields and career stages of academia, in comparison of their male counterpart, women report a lower sense of belonging. He went further to emphasize that the issue is very problematic in the sense that if a young scientist feels that she did not belong, she will be greatly discouraged from working harder. According to Somerville (2020), women equally face harassment and bullying and at the same time are less compensated than their men counterpart. The covid-19 pandemic equally had a very significant negative part on women scientists especially those at

the early stages in their career, thus contributing to widening the already existing gender gap in science and at the same time revealing the gender disparities in the scientific system (International Day of Women and Girls in Science, 2021).

Many researchers Adzaje&Akpoghol (2020); Ajayi&Ogbeba (2017); Okorie and Ezeh (2016) were of the view that gender has no significant effect is achievement and retention in chemistry. However, in the study carried out by Chikendu&Okoli (2020) on the effect of instructional computer animation on secondary school students Achievement in chemistry, it was observed that female students performed better than male students. The present study will therefore confirm or refute the above gender effects on chemistry observed by the researchers.

### **Purpose of Study**

The purpose of the study was to determine the effects of acrostic- letter sentence mnemonics (ALSM) and reciprocal- peer tutoring (RPT) strategies on retention in chemistry among secondary school students in Anambra State. Specifically, the study is designed to determine the:

1. Difference in the pretest and posttest mean retention scores of students taught chemistry using Acrostic Letter Sentence Mnemonics (ALSM), Reciprocal Peer Tutoring (RPT) and conventional lecture method (CLM).
2. Difference between the mean retention scores of male and female students taught chemistry using ALSM.
3. Difference between the mean retention scores of male and female students' taught chemistry using RPT.
4. Interaction effect of teaching strategies and gender on students' retention in chemistry.

### **Research Questions**

1. What is the difference in pretest and posttest mean retention scores of students taught chemistry using Acrostic-Letter-Sentence Mnemonics (ALSM), Reciprocal Peer Tutoring (RPT) and conventional lecture method (CLM)?
2. What is the difference between the mean retention scores of male and female students taught chemistry using ALSM?
3. What is the difference between the mean retention scores of male and female students taught chemistry using RPT?

### **Hypotheses**

1. There is no significant difference in mean retention scores of students taught chemistry using Acrostic-Letter-Sentence Mnemonics (ALSM), Reciprocal-Peer Tutoring (RPT) and conventional lecture method (CLM ).
2. There is no significant difference between the mean retention scores of male and female students.
3. There is no interaction effect of ALSM, RPT, CLM and gender on students' retention in chemistry.

### **Method**

The study adopted a quasi-experimental research design. Specifically, the pretest posttest non-randomized control group design was used. Quasi –experiment is an experiment where random assignment of subjects to experimental and control groups is not possible. The area of the study is Onitsha Education Zone of Anambra state. Onitsha Education Zone consists of three local government areas namely: Onitsha north, Onitsha south and Ogbaru. There are 32 secondary schools in the area out of which 20 are co-educational secondary schools while 12 are single-sex secondary schools. population of the study comprised 6,225 (3,492 males, 2733 females) Senior Secondary School year one (SS 1) students offering

Chemistry . The sample for the study consisted of 214 (130 males and 84 females) SS 1 chemistry students from three co-educational public secondary school in Onitsha Education Zone of Anambra State. The sampling involved a multistage procedure.

The instruments used for data collection were Chemistry Achievement Test (CAT) and Chemistry Retention Test (CRT). The CRT (delay test) was a reshuffled CAT. It was reshuffled to minimize test knowledge. CAT is a 50- item multiple choice test that was adopted by the researcher from standardized Senior Secondary School Certificate Examination (SSCE) past questions to measure students' academic achievement in the selected chemistry concepts. Lesson plans were equally developed for the experimental groups and control group in the content areas that were taught.

Both the instrument and lesson plans were validated by three experts for validation; two lecturers in the Department of Science Education and one from the Department of Educational Foundations for face and construct validity. The reliability of CAT was established using Kuder Richardson Formula 20 (KR-20) to be 0.80. The experiment commenced with training of research assistants.

*Treatment to experimental group one ( $E_1$ ) using ALSM:*

ALSM involves 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. She explained the term oxidation number of elements and radicals and wrote them on the board. She 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 ( $\text{Ca}^{2+}$ )	<u>C</u> alabar
Cobalt ion ( $\text{Co}^{2+}$ )	<u>C</u> ultural
Copper (II) ion ( $\text{Cu}^{2+}$ )	<u>C</u> arnival
Iron (II) ion ( $\text{Fe}^{2+}$ )	<u>I</u> n
Nickel ion ( $\text{Ni}^{2+}$ )	<u>N</u> igeria
Tin (II) ion ( $\text{Sn}^{2+}$ )	<u>T</u> akes
Lead (II) ion ( $\text{Pb}^{2+}$ )	<u>L</u> ead
Barium ion ( $\text{Ba}^{2+}$ )	<u>B</u> ecause
Magnesium ( $\text{Mg}^{2+}$ )	<u>M</u> ost
Mercury II ion ( $\text{Hg}^{2+}$ )	<u>M</u> en
Manganese (II) ion ( $\text{Mn}^{2+}$ )	<u>M</u> atch
Zinc ion ( $\text{Zn}^{2+}$ )	<u>Z</u> ealously

Calabar cultural carnival in Nigeria takes lead because most men match zealously.

The above is illustration of ALSM on divalent elements. Other examples are written in the lesson plan.

The research assistant then taught them how the oxidation numbers will help 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  $\text{CaCl}_2$  and not  $\text{CaCl}$ , oxidation number of sodium is +1 while that of chlorine is -1, therefore sodium chloride becomes  $\text{NaCl}$  and not  $\text{NaCl}_2$ . The teacher equally gave various examples on how to write the chemical formulae of compounds on the board with the aid of the FLSM as a memory guide. She allowed the students to come to the board one after the other to write the chemical formulae of compound using the knowledge they have about the oxidation numbers of elements and radicals. She finally gave them assignment to do at home as a follow up of what they have learnt in the school.

### *Treatment to experimental group 2 (E<sub>2</sub>) using RPT*

RPT is a form of collaborative learning that involves students of similar academic backgrounds experiencing interchanging roles of tutor and learner. The teacher introduced the lesson topic as chemical formulae of compounds. She explained the rationale in writing the formulae by introducing to the students the meaning of oxidation number. She gave them the rules for assigning oxidation number to atoms and radical. She showed the chart of various oxidation numbers of common elements and radicals on the board. She taught them how to write the chemical formulae of compounds by interchanging the oxidation number of elements and radicals present in the compound. She called them out one after the other to write the chemical formulae on the board using the knowledge of oxidation number. From this exercise, she identified the students who understood the topics and the slow learner who are yet to understand. She then puts them into group of three students per group considering the fast and slow learners among them. She allowed them to teach themselves given in turns in a group while she (the research assistant) monitored their teaching. She gave them corrections in their various groups. She equally timed their teaching. When the time lapsed, she called them together and tested them especially the slow learners through class work to know the extent they understood the lesson. She finally gave them a home assignment as a follow up of what they have learnt.

Week 3:

E<sub>1</sub> (ALSM)

The teacher introduced the topic which was writing and balancing of chemical equations. She taught them that chemical equation is a shorthand method of using chemical formulae to present chemical changes. In presenting such change substance combining or disappearing are called reactants, while those that are newly formed or appearing are called products. She used ALSM “read and pass” to inform them that in writing chemical equations reactant (read) is written first at the left hand side, followed by an arrow (and) pointing the product (pass) written at the right hand side. Teacher equally informed them that the diatomic elements which are seven in number do not exist separately when they are involve in a chemical reaction. She used the ALSM to aid them in memorizing the elements thus: hello, buy food items not cashew & orange.

The ALMS represents H<sub>2</sub>, Br<sub>2</sub>, F<sub>2</sub>, I<sub>2</sub>, N<sub>2</sub>, Cl<sub>2</sub>, & O<sub>2</sub> respectively.

Reactant     $\rightarrow$  product

(left hand side)    arrow    (right hand side)

Teacher gave them the ALSM on how to obtain a balanced chemical equation which is “experiment without formula equation” where e denotes experimental fact should be written, w, denotes word equation should be written, f, denotes formula equation should be written while e denotes equal number of atoms in both reactants and products side. She illustrated this with many examples. For instance hydrogen gas burns in oxygen gas to produce water-experimental fact

Hydrogen + oxygen     $\rightarrow$  water – word equation

H<sub>2(g)</sub> + O<sub>2(g)</sub>  $\rightarrow$  H<sub>2</sub>O<sub>(l)</sub> - formula equation (not balanced )

2H<sub>2(g)</sub> + O<sub>2(g)</sub>  $\rightarrow$  2H<sub>2</sub>O – equal number of atoms in both reactants and products ( balanced equation). Many more illustration was given to the students. Home assignment was finally given to them as a follow up teaching exercise.

E<sub>2</sub> (RPT)

The teacher introduced the topic which was writing and balancing of chemical equations. She taught them that chemical equation is a shorthand method of using chemical formulae to present chemical changes. In presenting such change substance combining or disappearing are called reactants, while those that are newly formed or appearing are called productions. She explained to the students the rudiment in balancing of chemical reactions.

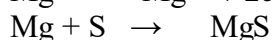


Teacher equally informed them that the diatomic elements which are seven in number do not exist separately when they are involve in a chemical reaction. She wrote the names and formulae of the diatomic elements on the board. She illustrated writing of chemical equation using several examples. She invited the students to write and balance the chemical reactions. Considering the already learnt material among the students, she shared them into groups assigning roles to them. They were allowed to work on the different segments of the topic while the teacher was there as a moderator. After the discussion in groups, questions were asked immediately especially to the slow learners. Assignment was equally given to ensure mastery.

Week 4:

E<sub>1</sub> (ALSM)

The teacher introduced the topic: types of chemical reaction. She wrote down different types of chemical reaction which are: Combination (addition) reaction, thermal decomposition reaction, displacement (replacement) reaction, double decomposition reaction, thermal dissociation, reversible reaction, catalyzed reaction, exothermic and endothermic reaction and oxidation-reduction (redox) reaction. The teacher taught the group using the ALSM: **C**an **T**eacher **D**ennis **D**o **T**he **R**ight **C**onstantly **E**very **O**ctober for the different types of reaction respectively. In the course of the explanation under the displacement reaction she used the following ALSM to teach them on how the metal are arranged in the reactivity series according to Ojokuku (2012): **P**opular **S**cientist **C**an **M**ake **Z**oo **I**n **T**he **L**ow **H**umid **C**ountry **M**ore **S**atisfactorily **G**ood. The mnemonic represents Potassium, Calcium, Aluminum, Zinc, Iron, Tin, Lead, Hydrogen, Copper, Mercury, Silver, Gold. He explained thoroughly with examples the different types of chemical reactions using the ALSM as a guide and reminder. For instance in the teaching of Redox reaction she used the following to guide definition of the term for easier retention. Oxidation is the process of electron loss e.g.



Magnesium atom with zero ON oxidized to magnesium ion by loss of its two valence electrons



Oxidation is equally defined as an increase in oxidation number as in the above reactions. The teacher used the FLSM to aid the memory of the definition as follows: **O**dd **p**eople **l**oose  
Odd :Oxidation; People : process of; Loose : loss of electron

The oxidation number of Mg, Na and Al has increase from 0 to +2, +1 and + 3 respectively.

Reduction is the process of electron gain.

FLSM for remembering the definition is **R**eal **p**eople **g**ain

Real: reduction; People: Process of electron

Here sulphur is reduced by gaining of two electrons.

She finally gave them assignment as a follow up.

E<sub>2</sub> (RPT)

The same topic as the one above was treated but without mnemonics. The teacher wrote and explained the different types of chemical reactions with lots of illustration. She finally shared the students into groups and assigned to each group a particular type of chemical reaction for them to do further teaching and studies by teaching themselves in turn for proper understanding. After the group tutoring, she gathered them together for further emphasis on the lesson topic by allowing one out of each group member to act as a tutor to the rest of the class. At the end, opportunity was given for reactions from each group. Assignment was given as a follow up of the class work.

The control group was equally taught by their class teacher using conventional instructional strategy. The lesson as in the case of the experimental groups lasted for

90minutes (double period). The experiment lasted for four weeks using the normal school time table.

At the end of the experiment, the CAT was reshuffled and administered again to both the experimental and control groups as post-test by the class teacher (research assistant). After three weeks, the same test was reshuffled as chemistry retention test (CRT) and administered for both experimental and control groups to obtain retention scores.

The research questions were answered using mean and standard deviation scores. The hypotheses were tested using analysis of covariance (ANCOVA). In taking decision; when the p-value is greater than or equal to 0.05, the null hypothesis is accepted. Conversely, when the p-value is less than 0.05, the null hypothesis is rejected.

## Results

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

Source Variation	of N	Posttest Mean	Posttest SD	Retention Mean	Retention SD	Loss in Mean
ASLM	73	60.77	7.91	56.22	7.09	4.55
RPT	69	66.99	7.05	62.91	5.96	4.08
CLM	72	57.06	6.40	54.79	6.42	2.27

Table 1 shows that the students taught chemistry using ASLM has retention mean score of 56.22 with loss in mean score of 4.55, while those taught using RPT has mean retention score of 62.91 with loss in mean score of 4.08, where those in the control group taught using CLM had mean retention score of 54.79 with loss in mean score of 2.27. This shows that after the decay in knowledge, students taught using RPT has higher knowledge retention, followed by those taught using ASLM and CLM. There was higher spread of retention scores in students taught chemistry using ASLM, followed by those taught using CLM. Students in the RPT group had the most homogeneous retention score than those in the ASLM and CLM groups.

**Table 2: Mean Retention Scores of Male and Female Students taught Chemistry using ALSM**

Gender	N	Posttest Mean	Posttest SD	Retention Mean	Retention SD	Loss in Mean
Male	41	59.59	8.56	56.61	8.87	2.98
Female	32	62.28	6.81	55.72	3.83	6.56

Table 2 shows that the male students taught chemistry using ALSM has mean retention score of 56.61 with loss in mean score of 2.98, while the females has mean retention score of 55.72 with loss in mean score of 6.56. Male students in the ALSM group had higher mean retention scores than the female. The male students also had a more homogeneous retention score than the females.

**Table 3: Mean Retention Scores of Male and Female Students taught Chemistry using RPT**

Gender	N	Posttest Mean	Posttest SD	Retention Mean	Retention SD	Loss in Mean
Male	47	68.36	7.23	63.79	5.99	4.57
Female	22	64.05	5.78	61.05	5.59	3.00

Table 3 shows that the male students taught chemistry using RPT has pretest mean retention score of 63.79 with a loss in mean score of 4.57, while the females had mean retention score of 61.05 and loss in mean score of 3.00. Male students in the RPT group had higher mean retention scores than the female. The female students also had a more homogeneous retention score than the males.

**Hypothesis 1:** There is no significant difference in mean retention scores of students taught chemistry using ALSM, RPT and conventional lecture method (CLM).

**Table 4: ANCOVA on Significance of Difference between the Mean Retention Scores of Students taught Chemistry using ALSM, RPT and CLM**

Source of variation	SS	Df	MS	F	P-value	Decision
Corrected Model	-8361.234 <sup>a</sup>	6	1393.539	89.183	.000	
Intercept	437.537	1	437.537	28.001	.000	
Pretest	5581.419	1	5581.419	357.197	.000	
Method	185.666	2	92.833	5.941	.003	Sig.
Gender	33.064	1	33.064	2.116	.147	NS
Method * Gender	108.171	2	54.086	3.461	.033	Sig.
Error	3234.504	207	15.626			
Total	728942.000	214				
Corrected Total	11595.738	213				

Table 4 shows that at 0.05 level of significance, there was a significant main effect of the teaching methods on students' retention,  $F(1, 207) = 5.941$ ,  $P(0.003) < 0.05$ , therefore, the null hypothesis was rejected. Thus, there is a significant difference between the mean retention scores of students taught chemistry using ALSM, RPT and CLM.

**Table 5: ScheffePostHoc**

(I)	(J)	Mean Difference (I-J)	Std. Error	Sig *	95% Confidence Interval for Difference <sup>b</sup>	Lower Bound	Upper Bound
ASLM	RPT	-2.224*	.715	.002	-3.635		-.814
	CLM	-1.240	.682	.070	-2.584		.104
RPT	ASLM	2.224*	.715	.002	.814		3.635
	CLM	.984*	.777	.207	-.548		2.517
CLM	ASLM	1.240*	.682	.070	-.104		2.584
	RPT	-.984*	.777	.207	-2.517		.548

Based on estimated marginal means

\*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Least Significant Difference ( equivalent to no adjustments ).

Table 5 reveals that significant difference exists between the mean retention scores of students taught chemistry using ALSM and RPT in favour of RPT. Table 5 also reveals that non-significant difference exists between the mean retention scores of students taught chemistry using ALSM and CLM ( $P = 0.07 > 0.05$ ). Table 5 further shows that there is no significant difference between the mean retention scores of students taught chemistry using RPT and CLM, ( $P = 0.207 > 0.05$ ). This shows that only RPT is most effective in improving students' retention score in chemistry.

Table 4 also shows that at 0.05 level of significance, there was a significant influence of gender on the mean retention scores of students in chemistry  $F(1, 207) = 2.116$ ,  $P(0.147) > 0.05$ . Therefore, the null hypothesis is rejected. Thus, there is no significant different between



the mean retention scores of male and female students.

Table 4 further shows that at 0.05 level of significance, there was a significant interaction effect of teaching methods and gender on students' retention in chemistry,  $F(2, 207) = 3.461$ ,  $P(0.033) < 0.05$ . Therefore, the null hypothesis is rejected. Thus, there is an interaction effect of teaching methods and gender on students' retention in chemistry.

### **Discussion**

The findings of the study showed that there was significant difference between mean retention scores of students taught chemistry using ASLM, RPT and conventional method in favour of RPT. The observed result was due to the collaborative learning involving the sharing of knowledge among peers. Students who took turn with the role of teaching other students are exposed to other students' difficulty in understanding the concepts. Having helped others as tutors overcome the difficulties encountered in learning the concepts, the student tutor becomes exposed to different learning experiences that facilitated easy recall.

The findings of the study further showed that a significant difference exists between the mean retention scores of students taught using ALSM and those taught using conventional lecture method in favour of ALSM. 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 findings of the study are also in line with the findings of Auwal (2013) that demonstration method was found to be more effective in making the students to remember agricultural science knowledge than discussion method.

The findings of the study on effectiveness of the ALSM on retention contradicted the findings of Donell (2019) who observed in his studies that while one group of students performed better after teaching them with mnemonics for four-to five weeks, they did not show better significant retention after one week. Comparatively, the second group showed overall knowledge retention regardless of use of mnemonic technique or not. It was equally observed that they retain information better without the use of mnemonic device in some of the questions they answered.

The finding of the study showed that there was significant difference between the mean retention scores of male and female students taught chemistry using ALSM but no significant difference was observed for male and female students taught using RPT. Also a significant disordinal interaction effect between teaching methods and gender was observed on students' retention in chemistry. The findings of the study support the finding of Chibabi, Unoru, Onah and Itodo (2018) that there was significant difference in retention of male and female school students.

### **Conclusion**

The conclusion drawn from the findings of the study is that reciprocal peer tutoring is more effective instructional strategy than ALSM in improving students' retention in chemistry. The study concluded that adoption of reciprocal peer tutoring enables students to interact very well among themselves, sharing knowledge and longer retention of learning. The study also established that students taught chemistry using acrostic sentence mnemonics tend to make concrete connections between previous knowledge and new materials. These connections help facilitate the understanding of the materials leading to improved retention.

### **Recommendations**

The following recommendations were made based on the findings and conclusions of the study.

1. When adopting RPT, effort should be made by chemistry teachers to alternate the roles of the students in a way that one student does not play the role of a tutor all through the learning period.
2. Pre-service chemistry teachers should be taught on how to adopt RTP for effective

- chemistry learning and how to use it in instructional delivery.
3. Textbook writers should adopt the RPT approach in present subject matter content of chemistry when reviewing their textbooks.

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