IMPACT OF PEER-LED MASTERY LEARNING APPROACH ON PERFORMANCE AND ATTITUDE OF SENIOR SECONDARY SCHOOL SCIENCE STUDENTS

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Abstract

Science as an academic discipline in secondary schools is plagued with problems such as poor performance and poor attitude of students to learning. These problems could be traced to the abstract nature of science subjects and teaching approaches employed by science teachers. This study investigated the impact of Peer Led Mastery Learning (PLML) approach on science students' attitude and academic performance. A survey research design was adopted. The population of the study comprised of all the 1,900 senior secondary II science students in Gwagwalada Area council of the FCT, Abuja. Simple random technique was used to select 378 science students in physics, chemistry and biology with 126 male and female students each in physics, chemistry and biology. Three research questions and three hypotheses guide the study. Two instruments: Students' Attitude Evaluation Questionnaire (SAEQ) and Science Students Performances Test (SSAT) where used to gather data from the respondents. Data collected were analysed using mean and standard deviation to answer the research questions and ANOVA to test the hypotheses at 0.05 level of significant. The result of the study revealed that when science is taught with PLML it promotes positive attitude towards science for both male and female and science students' performance do not differ significantly by gender. It was also revealed that PLML approach impacted positively on students' performance in science. The study concluded that PLML approach is gender friendly. The study recommended that Physics, chemistry and biology teachers should adopt the use of Peer Led Mastering learning strategy because it enhances students' performance and it is not gender-biased.

Keywords: Peer led mastering learning strategy, performance, attitude and gender.

Introduction

The importance of science for technological and economic development of a nation is internationally recognized. All over the world, nations are classified as developed, developing or underdeveloped based majorly on their scientific and technological strength. The development of any nation depends on the quality of scientific knowledge at the disposal of such nation. The knowledge of science is therefore, a requirement in all countries and among all people globally in order to confront its challenges. Developed nations of the world are rated world powers because of their scientific knowledge which is applied in technological inventions. This can only be achieved by empowering the citizens with the knowledge of science and technology and engaging them in scientific and technological oriented careers such as space science, bio – engineering Medicine and so on.

Science has been regarded as the bedrock which modern day technological breakthrough is built. According to Ogunleye (2012) Science comprises the basic disciplines such a Physics, Chemistry, Mathematics and Biology. Investigations have shown that secondary school students are exhibiting dwindling interest in Science (Esiobu, 2019).

Science focuses on the general nature of the natural world. It has played a crucial role in the services of mankind and its principles are daily applied in our homes, lives and the discoveries made from these principles have been of great importance to human existence. The reliance on technology reveals the importance of science to mankind. Other disciplines such as agriculture, environmental, biological sciences as well as engineering courses used the laws of Physics and chemistry to better understand their studies. Physics, chemistry and mathematics have many applications in medicine, transportation and communication technology. The fundamental discoveries in these areas of science are being used by medical communities to devise new techniques for diagnosing and treatment of a variety of illness such as typhoid, malaria among others. Modern means of transportation such as auto-mobiles, aircraft and other forms of technological innovations and advancement are all made possible through the application of some basic laws in sciences. Also in the entertainment industry, scientific principles are employed in the refinement of sound and colour mixing to create special effects in stage presentation. Its principles formed the basis in information technology which has helped to reduce the world into a global village. Its importance in making the world worth living are too numerous to mention. All these lead to the development of social standard in both personal and professional life.

However, it is disheartening to know that despite the importance of science and its applications in various fields, the subject has been plagued by low enrolment, poor teaching methods, limited number of professionally trained science teachers and poor performance of students in the subjects which led to reduction in the number of students wishing to continue with science subjects at all level of education in Nigeria. According to West Africa Examination Council (WAEC) Chief Examiners' report for 2018, many candidates were not adequately prepared for the examination. This feature was reported for Chemistry, Biology, Physics, General Agriculture and Animal Husbandry. Average performance in was recorded physics and chemistry but candidates have difficulty with calculations in thermodynamics, chemical kinetics and many candidates failed to explain the mole concept and heat concept. This difficulty could be more pronounce at the secondary school level probably because of the abstract nature of presentation by science teachers.

With such discourse in the science education in Nigeria, students find it difficult to have a positive attitude toward learning science because of its computational exigency in every problem set, moreover, if they do not like the subject more often, they do not like the teacher. Cracker (2016) observed that the students who have negative attitude towards sciences lack motivation for class engagement but those with positive attitudes towards sciences have motivation for class engagement (Cracker, 2016).

Efforts have been made in various science educator forums and different educational boards aimed at making science simple and less difficult for students. Different strategies and approaches have been suggested and empirical studies have been carried out on the effect of these strategies and approaches on the academic performance of students in sciences, yet the attitude and performance remain poor. One important factor that determined students' learning outcomes is the instructional technique adopted by the teachers. Sciences teachers still frequently apply the old and conservative method of teaching science subjects, knowing fully that science is an activity-oriented subject. The way science is taught is important in helping the students acquire basic scientific

knowledge, better retention ability and skills to solve different problems in life. It is therefore, important that the teacher employ teaching approaches that will give students the opportunity to be actively involved in learning the subject. The different instructional strategies employed in teaching sciences such as cooperative teaching method, concept mapping among others, have not improved students' performance in the subjects to an appreciable extent (Kibett & Kathuri, 2015). Could the used of other teaching approach such as Peer-Led Mastery Learning Approach (PLMLA) be part of solution to improve performance in other science subjects? Research is yet to ascertain how this approach can impact on the learning of students in physics, chemistry and biology, hence thenneed for this research.

Peer-Led Mastery learning is an instructional strategy that is based on the principle that all students can learn a set of reasonable objectives when provided with appropriate instruction and sufficient time. Peer-led approach is a structured form of group learning where a small group of six to eight students meet to discuss and solve problems related to topics covered in class. These groups are led by a trained peer who earned at least a credit in precious topic. The role of the peer leader is to engage the group in problem-solving activities, assist students in developing conceptual understanding, and to facilitate discussion of scientific concepts and ideas (Gafney &Varma-Nelson, 2018; Gosser, 2018). It is a method in which students are given unlimited opportunities to demonstrate mastery of content taught. It involves breaking down the subject matter to be learned into units of learning each with its own objectives. It gives students the opportunity to study a material, unit after unit until they master it. Mastery learning uses differentiated and individualized instruction, progress monitoring, formative assessment, feedback, corrective procedures, and instructional alignment to minimize performance gaps and focuses on how to improve the process of mastering content rather than changing it (Bloom, 1971). Following a previous instruction, the teacher administers a brief formative assessment based on unit learning goals. The assessment as a feedback informs the teacher about the student, which helps to identify what have been learnt and what needs to be learnt better. Students who have learnt the specified concepts continue their learning experiences while others who have not properly learnt the concept receive feedback paired with corrective activities different from the initial instruction and offer guidance and direction on how to remedy their learning challenges. These corrective activities can include varying activities, individualized instruction, and additional time to complete assignments. Obih and Ekomaru (2011) stated that mastery learning is the mastery of a task, topic, or subject by every learner whereby the instruction is well related with the learner's characteristics and the learner is given the time required to learn the task, topic or subject and at the same time given the optimum quality of instruction for improved academic performance.

According to Akinyele (2018), the academic performance of students in secondary schools has been a subject of concern to many people including parents, administrators, educators, psychologists and counsellors. The poor performance of students in science has continued to be a major concern to all and particularly those in the main stream of science education (Ariyo, 2016). Eryilmaz (2017) observes that gender contributes to poor performance of students in sciences. Gender according to Yang (2010) refers to the social attributes and opportunities associated with being male and female and the relationships between women and men; girls and boys, as well as the relations between

women and those between men. These attributes, opportunities and relationships are socially constructed and are learned through socialization processes.

According to Mbajiorgu (2003), female enrolment in science subjects in general is very poor. This is in line with the study by Gonzuk and Chargok (2012) which revealed that the number of females who study sciences in secondary and tertiary institutions is small compared to the number of boys. This difference in the number of females and males in the study of sciences has created gender disparity in the academic performance of students in science subjects as a whole.
Gender difference was first investigated by sociologist of education. The focus was largely on female under performance at every level of the educational system. Therefore, there is need to promote the teaching and learning of physics, chemistry and biology in schools especially among female students. Ajeyalami and Busari (2019) identified Lack of functional guidance and counselling services, Relationship of sex to occupational prestige, Influence of schooling, Family background, Interest among other factors, Lack of adequate orientation program, Societal discrimination against females in education, Occupational choice and adaptation of science and technology are some of the factors contributing to under representation of females in science and technology education in Africa.

The critical belief of biological theorists is that gender differences are natural and therefore, unalterable (Olubunmi, 2011). It would be right and proper to treat boys and girls in schools differently because their natural inclinations are different roles. Thus, theories were advanced that females excelled in language-based subject because of their greater and reasoning abilities yet under performed in sciences because of their lower level of innate ability of shape and form factors.

This study therefore attempted to find out whether these factors could be address when biology, chemistry and physics are taught using the PLML approach.

Statement of Problem

Today, the world is referreed to as a global village due to scientific and technological effort. If there should be continuous progress in science, then there is need to adopt a new approach to its teaching. Several approaches have been suggested over the years by different science organizations such as Science Teachers' Association of Nigeria (STAN) aimed at improving the quality and learning output. Approaches such as activity base leaning, co-operative learning, experimental approach have been suggested and many others. Yet the learning outcome of students in the sciences continued to remain low possibly due to teachers/students' attitude towards the teaching /learning of the sciences. Researchers at different gathering have observed that over the years, there has been consistent poor performance and high failure rate in Senior School Certificate Examinations in almost all the subjects in Nigeria, FCT inclusive. Science subjects are the worst hit. Many students perform poorly in these subjects probably due to poor teaching approach, lack of laboratories, and dearth of instructional materials and teachers' use of instructional materials, students' attitude to science among others. Could the use of PLML approach be part of solution to this problem? This study used the PLML approach in the teaching of science and to ascertain its impact on students' academic performance in the sciences on one hand and to determine its impact on students' attitude to science on the other hand. It also compared the efficacy of the PLML approach on the different science subjects (biology, chemistry and physics) and

as well find out whether differences exist in the performance of students base on the approach used.

Purpose of Study

The study investigated the impact of Peer- Led Mastering Learning approach on science (biology, chemistry and physics) students performance and attitude to science in Senior Secondary Schools in FCT Abuja, Nigeria. Specifically, the objectives of the study were to:

1. Determine the impact of Peer Led Mastery Learning Approach (PLML) on Physics, chemistry and biology students 'performance.
2. Determine the impact of PLML on attitudes of Physics, chemistry and biology students.
3. Find out the impact of PLML on the performance of science students based on gender

Research Questions

The study sought answer to the following research questions

1.What is the mean impact of PLML on senior secondary school students' performance score in physics, chemistry and biology?

2.What is the mean impact of PLML on the performance of physics, chemistry and biology students based on gender?

3. What is the mean impact of PLML on the attitudes of Physics, chemistry and biology students in secondary schools?

Research Hypotheses

H_1. There is no significant difference among the mean academic performance score of physics, chemistry and biology students taught using the PLML approach.

H_2. There is no significant difference among the attitude of physics, chemistry and biology students when expose to PLML approach.

H3. There is no significant difference among physics, chemistry and biology students in their academic performance based on gender.

Methodology

This study employed quasi-experimental research design. The sample of the study consists of 378 male and female students drawn from a population of 1900 Government Senior Secondary two (SS II) science students in Gwagwalada Area council of the Federal Capital Territory (FCT), Abuja using random sampling techniques. Thus, the sample for the study comprised of 126 physics, chemistry and biology students each from the senior secondary schools in FCT, Abuja.

The two instruments of Science Students' Performance Test (SSAT) and Science Students' Attitude Evaluation Questionnaire (SAEQ) were used to gather data from the respondents. The Science Students' Performance Test (SSAT) which was divided into three parts namely; part A: Physics Performance Test (PAT), part B: Chemistry Performance Test (CAT) part C: Biology Performance Test (BAT), in each case part A, B & C consists of 20 objective items with four options. Thus, for right answer (option) tick, attracted 1mark and for wrong answer (option) tick attracted 0 mark in each case. On the hand, the SAQ which consists of twenty items was administered to the respondents on obtain information about their attitude towards studying sciences. The SAEQ consisted of structure question with for options of Strongly Agree (SA), Agree (A) Disagree (D) and Strongly Disagree (SD). Thus, for a SA, A, D or SD tick attracted 4,3,2,1 respectively for a positive item, while the reverse was the case for a negative items. In each case, the results were separated by gender to answer the research question 3 and to test research hypothesis 3.

The SSAT and SAEQ were subjected to expert validation in the field of science education (physics, chemistry and biology) to determine the face and content validity. The experts were drawn from university and colleges of education. Their suggestions and constructive criticism was used in the final development of the SSAT and SEAQ. However, SSAT and SEAQ were pilot tested in schools in FTC that are part of the population but do not form part of the study sample. Scores obtained were used to determine the internal consistency of the SSAT and SEAQ using Kuder-Richarson formula 20 and Cronbach alpha reliability test formula in each case. A reliability coefficient of between 0.78, 0.87 and 0.76 were obtained respectively and was considered reliable and appropriate.

Data were collected from the respondents through the administration of the two instruments of Science Students' Performance Test (SSAT) and Science Students' Attitude Evaluation Questionnaire (SAEQ). The SSAT which was divided into three sections of A, B and C. With 20 multiple choice questions each with three options of A, B and C. section A consisted of physics Performance Test,(PAT) section B consisted of Chemistry Performance Test (CAT) while section C was Biology Performance Test(BAT) and SAEQ which consisted of ten(10) items with four options of strongly agreed, agreed, disagreed and strongly disagreed, which was scored as 4,3,2 1 for a positive question and 1,2,3 4 a negative question was administered to the students as pretest to determine their level of performance and attitude towards sciences. The students in each science subject were divided into experimental and control group in which the experimental group were exposed to the PLML approach while the control group were taught using the lecture method for three weeks thereafter the students were administered the same instruments as posttest to determine their performance in the experimental and control group. In this case the researcher employed the use of research assistants in biology, chemistry and physics. Thus, three teachers each who are teaching chemistry, biology and physics in the FCT schools were trained on the use of the PLML approach in the teaching of sciences. The trained research assistants were to help teach their various courses using the new approach of PLML and the students were then tested at the end of the term and at the same time administer the SAEQ to find out whether the PLML has impacted favourably on their attitude towards science. This was done by finding the mean attitude ratings of the students on the Likert scale. Thus, a mean score of 4.0-5.0 was regarded to be favourable, a mean score of 3.0-3.9 was regarded as moderately favourably, while a mean score of between 1.0- 2.9 was regarded as not favourable.

Data collected were used to answer the research questions stated and to test the null hypotheses at 0.05 level of significance. Thus, research question one and three were answered using mean. In this case. Hypotheses one to three were tested using mean and ANOVA.

Results

Research Question 1: What is the impact of PLML on senior secondary school students' performance score in physics, chemistry and biology?

Table 1: Mean of the Impact of Impact of PLML on Senior Secondary School Students' Performance Score in Physics, Chemistry and Biology.

Group		Experimental			Control	
Subjects	Physics	Chemistry	Biology	Physics	Chemistry	Biology
N	63	63	63	63	63	63
Pre-test mean score	23.45	31.53	40.32	22.78	32.02	39.90
Posttest mean score	37.89	42.58	45.43	30.05	33.67	42.76
Mean	14.44	11.05	5.11	7.27	1.65	2.86

Table 1 shows the mean gain in pre-test and post-test mean scores of physics, chemistry and biology students in the experimental and control groups. From the table, it is revealed that the students have a mean score of 22.78, 32.02 and 39.90 in the control group pretest in physics, chemistry and biology respectively with a posttest mean score of 30.05, 33.67 and 42.76 respectively. The mean gain in the control group was 7.27, 1.65 and 2.86 in physics, chemistry and biology respectively. However, the students have mean score of 23.45 in physics, 31.53 in chemistry and 40.32 in biology in the pre-test while the post-test mean scores were 37.89, 42.58 and 45.43 respectively in the experimental group with a mean gain of 14.44, 11.05 and 5.11 in the three science subjects of physics, chemistry and biology respectively. Which shows that the PLML have effectively improved the performance of science students in the experimental group and less effective in the control group.

Research Question 2

What is the impact of PLML on the performance of physics, chemistry and biology students based on gender?

Table 2: Mean Gain of Male and Female Physics, Chemistry and Biology Students in the Pretest and Posttest Experimental and Control Groups

Group				Exp				Cont.				
Subj		Phy		Che		Bio		Phy		Che		Bio
Sex	M	F	M	F	M	F	M	F	M	F	M	F
n	63	63	63	63	63	63	63	63	63	63	63	63
Pretest Mean	22.6	21.4	21.6	21.7	24.6	23.8	21.9	22.2	20.9	20.6	23.9	23.2
Posttest Mean	28.8	29.4	30.7	31.2	27.5	28.3	22.6	23.8	23.4	21.1	23.4	24.2
Mean Gain	6.2	8.0	9.1	9.5	2.9	4.5	0.7	1.6	2.5	0.5	0.5	1.0

Table 2 reveals the mean again of male and female science students in the pre-test post-test experimental and control groups. The table shows that the pre-test mean score of the male and female physics, chemistry and biology students in the control group is 22.2, 20.6 and 23.2 respectively and with post-test mean score of 22.6, 23.4 and 23.4 for the males in physics, chemistry and biology. The post-test score for the female were23.8,21.1 and 24.2 with am mean gain of 0.7,2.5 and -0.5 for the male while the female has a mean gain of 1.6, 0.5 and 1.0 in physics chemistry and biology respectively. However, in the experimental group, the male has a mean score of 22.6, 21.6 and 24.6 in physics, chemistry and biology respectively while the post-test mean score is 28.8,30.7 and 27.7 with a mean gain of 6.2,9.1 and 2.9 respectively. Furthermore, the table reveals that the female post-test mean score is 29.4, 31.2 and 28.3 in physics, chemistry and biology with a pre-test score of 21.4,21.7 and 23.8 respectively. The mean gain for the female in the post-test is 8.0, 9.5 and 4.5 in physics, chemistry and biology respectively.

Research question 3: What is the impact of PLML on the attitudes of Physics, chemistry and biology students in secondary schools?

Table 3: Summary of Mean Attitude Score of Physics, Chemistry and Biology Students in the Experimental Group

Group	**Physics**	**Chemistry**	**Biology**
Pre- attitude mean score	0.23	0.40	0.80
Post- attitude mean score	4.87	4.27	3.89
Mean gain	4.64	4.27	3.09

Table 3 presents the mean attitude score of physics, chemistry and biology students in the experimental group. The table reveals that before the treatment, the students have a very low attitude toward physics, chemistry and biology (0.23, 0.40 and 0.80). After the administration of the PLML approach the attitude of the students in the was much favourable (4.87, 4.27 and 3.89) in physics, chemistry and biology with a mean gain of 4.64, 4.27 and 3.09 in physics, chemistry and biology respectively.

Hypothesis 1: There is no significant difference among the mean academic performance score of physics, chemistry and biology students taught using the PLML approach.

Table 4: ANOVA Analysis for Students' Performance in Physics, Chemistry and Biology Taught Using PLML

Group	Sum of squares	Df	Mean square	F	Sig
Between group	.40	2	.20	.31	.74
Within group	3.88	6	.64		
Total	4.28	8			

Table 4 presents an ANOVA which determines the students' mean performance scores. The table reveals $F_{(2,6)}$ =0.31 at P = 0.74. the difference performance among physics, chemistry and biology students when taught with PLML was not significant since p = 0.74 > P = 0.05. The hypothesis was therefore not rejected. It was concluded that the performance scores of physics, chemistry and biology students was similar. Therefore, the hypothesis which states that physic, chemistry and biology students do not differ significantly in their performance scores when taught using PLML was not reject

Table 5: Post-Hoc Multiple Comparison for Students' Performance in Physics, Chemistry and Biology Taught Using PLML

(I)subjects	(J)subjects	Mean Diff (I-J)	Std.Error	Sig
Biology	Chemistry	-.49	.66	0.77
	Physics	-.11	.66	0.99
Chemistry	Biology	.39	.66	0.83

The result from Table 5 shows that p=0.75 for the difference in performance between biology and chemistry students' performance score. This indicates that there was no significant difference between students' performance (P > α = 0.05). Table 5 also reveals P=0.99 for the difference between biology and physics students' performance. Since P > α=0.05, its indicated that there was no significant difference between the mean performance of biology and physics students' performance. The table further revealed P=0.83 for the difference in the mean of chemistry and physics students' performance. Since P > α = 0.05, it implies that the difference in the mean performance of chemistry and physics students was not significant

Hypothesis 2: There is no significant difference among the attitude of physics, chemistry and biology students when exposed to PLML approach.

Table 6: ANOVA Analysis for Students' Attitude in Physics, Chemistry and Biology Taught Using PLML

Group	Sum of squares	Df	Mean square	F	Sig
Between group	.82	2	.41	1.09	.40
Within group	2.26	6	.38		
Total	3.09	8			

Table 6 presents an ANOVA which determines the difference in students' attitude towards their subjects (physics, chemistry and biology). The table shows $F_{(2,6)}$ =1.09 at P = 0.40. Since P = 0.4 > 0.05 it was concluded that there is no significant difference in the mean attitude rating of physics, chemistry and biology students when taught using PLML approach. The hypothesis was not therefore rejected.

Table 7: Post-Hoc Multiple Comparison for Students' Attitude

(I)subjects	(J)subjects	Mean Diff (I-J)	Std.Error	Sig
Biology	Chemistry	.50	.50	.61
	Physics	.22	.50	.90
Physics	Biology	.72	.50	.38

Table 7 shows P=0.61 for the difference between biology and chemistry students. The difference between attitude toward their subject was not considered significant since P>0.05. The P-value for biology and physics was shown as 0.90. This was also greater than 0.05, therefore, the difference in mean attitude scores of the two groups was not considered significant. The P-value for chemistry and physics was 0.38 which was also greater than 0.05, indicating that the difference between chemistry and physics students' mean attitude rating was not significant

Hypothesis 3: There is no significant difference among physics, chemistry and biology students in their academic performance based on gender.

Table 8: ANOVA Analysis for students' Performance by Gender in Physics, Chemistry and Biology Taught Using PLML

Group	Sum of squares	Df	Mean square	F	Sig
Between group	1.31	2	.66	1.87	.23
Within group	2.11	6	.35		
Total	3.42				

Table 8 presents the difference in students' attitude to science (physics, chemistry and biology). The table shows $F_{(2,6)}$= 1.87 at P = 0.23. Since P = 0.23 > P = 0.05, it was concluded that there was no significant in the attitude of science students towards the study of physics, chemistry and biology when taught with PLML. The difference among each subject attitude of students towards was determined through a post-hoc test.

Table 9: Post-Hoc Multiple Comparison for Students' Attitude

(I)subjects	(J)subjects	Mean Diff (I-J)	Std.Error	Sig
Biology	Chemistry	-.42	.48	.61
	Physics	-.52	.48	.90
Chemistry	Biology	-.92	.48	.38

Post-hoc test from Table9 reveals P = 0.61 as the significant value for biology and chemistry. Since P = 0.61 > P = 0.05, it shows that the mean difference between the attitude of chemistry and biology students' attitude was not significant. Table 9 also shows p-value for biology and physics to be 0.38 while that of chemistry and physics was=0.90, which are both greater that P=0.05, this indicates that the differences between them all were not significant.

Discussion

The finding of the study revealed that PLML has a significant impact on the mean performance scores of physics, chemistry and biology students with a mean gain of 14.44, 11.05 and 5.11 in physics chemistry and biology respectively. From the result, it shows that the performance of physics, chemistry and biology students do not differ by gender, thus, physic male=6.2, female =8.0, chemistry male=9.1, female=9.5 and biology male=4.5 and male =2.9). It was also revealed that PLML approach impact favourably on the students' attitude in the sciences. with a mean gain of 4.64, 4.27 and 3.09 in physics, chemistry and biology. Thus, physics attitude was favoured followed by chemistry students and biology when the PLML is used in teaching. This contradicts the submission of Ajeyalami and Buusari (2019) who found that the poor enrolment of students in sciences was due to poor teaching approach employed by science teachers.

The ANOVA analysis revealed no significant difference in the mean performance scores of physics, chemistry and biology students when taught using PLML in the post test($p=0.74>p=0.05$). The result shows that between physics and chemistry $p=0.83>p=0.05$) taught using the PLML do not differed in their mean performance scores compared to between physics and biology ($p=0.99>p=0.05$) and between chemistry and biology($p=0.75>p=0.05$). Furthermore, it was revealed that after exposing the students to PLML instruction, there was a great changed in their attitude towards physics, chemistry and biology with no significant among students' attitude in the three science subjects ($F_{(2,6)}$ =1.09at $p=0.4>0.05$)

The study also revealed no significant difference in students' performance by gender when exposed to PLML approach ($F_{(2,60)}$ =1.87at P=0.23).the multiple comparison by subject revealed that students' attitude to chemistry do not differed significantly from those in physics($p=0.21>p=0.05$) and between chemistry and biology $p=0.68>P=0.05$ with the same between physics and biology ($p=0.57>p=0.05$).This contradicts the finding of Eryimaz (2017) whose study found that gender influences students' performance in sciences. It means that when students are taught science using PLML approach, the performance of female and male do not differ and therefore, contradicts the findings of Gonzuk and Chargok (2012) whose study revealed that the number of females who study science in secondary school and tertiary institution is small compared to males, due to poor performance of girls in science and thus, creating disparity between boys and girls.

Conclusion

The Peer-led mastery learning approach is suitable for teaching physics, chemistry and biology in secondary schools in Nigeria. This is because the strategy has been found to have a positive effect on secondary school students' performance in the sciences. The strategy has also been found to be gender friendly; it does not discriminate against gender.

Recommendations

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

1. Physics, chemistry and biology teachers should adopt the use of Peer-Led Mastering learning strategy because it enhances students' performance.
2. Curriculum planners and education policy makers should incorporate PLML approach into secondary school physics, chemistry and biology science curriculum so that

teachers can effectively implement the strategy in schools.

References

Ajeyalami, D. & Busari, I.(2019). *Science and technology education in Africa focus on seven sub-Saharan Countries*. Lagos: University of Lagos Press, Lagos.

Akinyele, B.A (2018). Non-Cognitive correlates of senior secondary Students' Performance in Physics. *Journal of Science Teachers' Association of Nigeria. 22(2), 78-88.*

Ariyo, A. O. (2016). School and student factors as determinants of students' performance in physics at the senior secondary school level in Oyo State, Nigeria. *An unpublished Ph.D thesis, University of Ibadan, Ibadan.*

Bloom, B. S. (1971). *Mastery learning*. New York: Holt, Rinehart & Winston.

Cracker, U. (2016). The Effect of Constructivist Implementation with Computer Based Physics Instruction on Cognitive and Affective Domain. *Euroasian Journal of Educational Research,* 21, 273-284.

Esiobu, F. (2019). Effect of videotaped instruction on secondary school students' performance in Physics. *Journal of the Science Teacher Association of Nigeria, 38*(1&2), 88-93.

Eryilmaz, H. (2017). The effect of peer instruction on high school students' Performance and attitudes toward physics. Ph.D thesis of Middle East Technical University

Fakorede A.D. (2017). An investigation into gender difference and students' performance in secondary school biology: A case study of Oyo State. An unpublished M.Ed project.

Gafney, L., & Varma-Nelson, P.(2018). *Peer-led team learning: Evaluation, dissemination, and institutionalization of a college level initiative*. Dordrecht, The Netherlands: Springer.

Gonzuk , S. & Chargok, H. (2012) , Gender differences in science: Parallels in interest, experience, and performance, *International Journal of Science Education* ***9***, 467-481 (1987).

Gosser, D. K. (2018). *Peer-led team learning general chemistry. 2nd ed*. Upper Saddle River, NJ: Prentice-Hall, Inc.

Kibett, R. & Kathuru, U., (2015). The efficacy of the mind map study technique. *Medical Education, 36* (5), 426-431.

Mbajiorgu, M. (2003). The development of science performance in Middle and High School. Individual difference and school effects. *Evaluation Review, 26(4), 395-417.*

Obih, S. O. & Ekomaru, C. I. (2011). Innovative teaching strategies emerging myths and realities in teaching and tearning. *International Association for Teaching and Learning*, 271-277.

Ogunleye, B. (2012). Researching problem in introductory physics: towards a new understanding of familiarity. *African Journal of Research in Mathematics, Science and Technology, 8:* 29 – 40.

Olubunmi A, (2011). The impact of school location and gender difference on students' performance in agricultural science: A case study of Ogun State.

Varma-Nelson, P., & Coppola, B. P. (2015). "Team learning. "In: N. J. Pienta M. M. Cooper T. J. Greenbowe, (Eds.) *Chemists' guide to effective teaching*: Volume I (pp. 155-169). New Jersey: Prentice-Hall: Upper Saddle River.

West African Examinations Council (2018. West African senior school certificate examination May/June 2018 chief examiners' report (Nigeria). Yaba – Lagos: WAEC.

Yang, D. H. (2010). Gender and classroom learning. *Psychology in the Schools, 22*, 08–223.