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Developing a Positive Attitude towards the Learning of Biology in Secondary Schools through Peer Led Team Learning Strategy

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Abstract: ***Learning strategies have a considerable effect when explaining attitude towards science. This study investigated the effects of peer tutoring and peer led team learning strategies on students' attitude towards Biology. It was guided by two research questions and three hypotheses. The study adopted quasi-experimental design; it was specifically a non-equivalent control group design. The population of the study comprised all senior secondary I students in all the government senior secondary schools in Port-Harcourt metropolis, made up of two local government areas (Obio/Akpor and Port-Harcourt)in Rivers state. Using stratified random sampling and purposive sampling techniques, a multi-stage sampling procedure was employed to select four intact classes from four schools in the study area. Out of these schools, two schools were randomly (by balloting) assigned to peer tutoring learning strategy while the remaining two were assigned to peer led team learning strategy. A total of 182 SSI students form the sample size. Biology Attitudinal Scale (BAS) was used for data collection. Mean and standard deviation were used to provide answers for the research questions while analysis of covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significance. The result of the study among others revealed that peer led team learning strategy has significant effect on students' attitude towards Biology. Although male and female students show difference in mean attitudinal scores in favour of the females, further analysis show that gender has no significant influence on attitude of students towards Biology. Finally, the result of the study also showed that the interaction effect of learning strategy and gender was statistically insignificant for students' attitude towards Biology. Based on these findings, the researcher among others recommended that Biology students should be encouraged to adopt peer led team learning strategy in learning Biology. Also government should support Biology teachers for regular workshops and training on the development and use of PLTL as instructional strategy in Biology.***

Keywords: Attitude, Peer, Tutoring, Team, Learning, Biology

1. Introduction

Biology is complex and diverse, so is its teaching and learning. Biology teachers at the secondary school level have been finding it difficult to effectively teach these students due to large class sizes (Ogunkola, 2004). Apart from the Core Compulsory Subjects such as English and Mathematics, Biology has the highest students' enrollment at the secondary school level in Nigeria (Akinsolu, &Fadokun, 2016). This is so because biology is the only science subject taken by most non-science students and almost all the science student's offer Biology. In order for students to develop positive attitude towards Biology, there has to be a deliberate plan to make the learning of biology a worthwhile experience.

Going forward, attitude plays an important role in the future of Science, Technology, Engineering and Mathematics (STEM) Education. A positive attitude to the learning of science will bring about improved achievement. The learner with a positive attitude to learning a subject will be intrinsically motivated to study harder and pass whatever examination that comes after the learning process. Developing positive attitude towards the learning of Biology is one challenge that Biology educators are struggling to overcome.

In a study on attitudes of secondary school students towards Biology as a school subject, Hussaini, Foong and Kamar (2015) indicated that Biology is an important subject for both science and art students in Nigeria secondary schools. They also made it clear that the knowledge of Biology contribute to nation building. Hussaini, Foong and Kamar (2015) found out that secondary school students in Birnin Kebbi metropolis had positive attitude towards Biology and recommended that to enhance students' attitude, educational material should be provided in the schools, students should be engaged in practical work, and extra lessons should be organized for students with negative attitudes towards Biology. This implies that innovative supplementary strategies like peer tutoring (PT) and peer led team learning (PLTL) can serve for extra lessons that can produce a positive attitude that will further yield high achievement.

Although disparity exists in the way researchers view the interactive effect of teaching/learning strategies, achievement and gender, Nwagbo (2006) found out that teaching method has no interaction effect on achievement, while Adesoji (2008) established the fact that teaching strategies or methods are capable of changing students' attitude towards science. Oludipe (2012) noted that interaction effect of teaching method on gender was not significant.

Gender refers to being male or female. Gender is one of the important variables related towards students' academic

achievement. Fin-Wiens, Depping, Wallerich, Van-Laar, and Juhl, (2003) made it clear that Biology is a gender friendly science. Sotonade (2004) went further to say that there may be fewer women in science generally but not in Biology. Biology seems to be a gender-neutral science throughout the educational system (Usak, Propkop, Ozden, Ozel, Bilen, and Erdogan, 2009). Due to the inconclusive nature of the research in this area of gender and science, the researcher intends to find out the situation in Port Harcourt Rivers State, Nigeria with regards to attitude towards learning science (Biology).Again, Ahmed and Asghar (2011) examined the attitude of students towards Biology and its effect on students' academic achievement. Findings indicated that there is no significant difference between girls and boys on attitude towards Biology. Furthermore, Sofiani, Maulida, Fadhillah and Sihite (2017) investigated students' attitude towards science and the effect of gender on students' attitude. Results showed that students' positive attitude towards science was at medium level and there was no significant difference in attitude towards science between the female and male students.

Understanding that biology is gender friendly, coupled with a report by Ossisioma in Ebuoh (2011) that females work better in cooperative settings while males do better in individualized settings, the researcher was motivated to look out for instructional strategies that are learner-centred with cooperative setting. Effective Biology instruction is pivotal in the preparation of students to be effective in society. Therefore the need to introduce peer tutoring (PT) and peer led team learning (PLTL) to see whether students' attitude towards Biology will be enhanced.

Peer tutoring is an individualized learning strategy in which a student (tutor) with better understanding of a particular topic gives a one-on-one teaching to his or her classmate (tutee) in order to help them achieve greater confidence, independence and success as learners. Both the tutor and tutee benefit greatly from this learning strategy (Igbo, 2004). In a related study, Tella (2013)tested the interaction effect of peer tutoring (PT) strategy on primary school pupils in Mathematics and found out that there was a significant interaction effect of treatment and pupils' ability on pupils' attitude towards Mathematics. Tella recommended that peer tutoring should be an integral part of mathematics teaching at the primary school level. While peer tutoring is an innovative individualized learning strategy, peer led team learning (PLTL) is rather an innovative group learning strategy in science education (Cracolice & Deming, 2012).

Innovative instructional strategies like PLTL are a solid paradigm shift to student-powered or centred learning, wherein successful students who recently passed a subject with good grades (A or B) are selected, trained and elevated to co-ordinate the activities of six to eight students each. In a study to assess the effectiveness of Peer Led Team Learning (PLTL) approach against the traditional teaching approach (TTA) in enhancing students' conceptual understanding and attitude towards Chemistry, Bramaje and Espinosa (2013) found out that PLTL positively improved attitude towards Science (Chemistry) as compared to TTA class. Since when compared to TTA, PLTL strategy showed positive influence on attitude towards Chemistry (a science subject) then it's important to compare the effect of PLTL and a similar strategy Peer Tutoring (PT) on attitude towards Biology.

In another study, Chan and Bauer (2015) examined the effect of participation in PLTL on students' attitude towards science (Chemistry) especially with respect to gender and found out thatmales have higher positive attitude and self-concept than females, and first-year students have higher positive attitude, self-concept, and achievement than non first-year students. Some learning theories formed the basis of this study.

The learning theories connected to PT and PLTL in this study are Albert Bandura's social learning theory and Lev Vygotsky's social development theory. Albert Bandura's social learning theory is precisely based on the human interactions involved in learning. Bandura stated that observational learning is based upon learning by watching them, "modeling" or acting similarly to others. While Vygotsky asserts three major themes; i). social interaction plays fundamental roles in the process of cognitive development, ii). the More Knowledgeable Other (MKO) will make learning more effective, and iii). the zone of proximal development (ZPD), which is the distance between a student's ability to perform a task with peer collaboration and the student's ability to solve the problem independently. According to Vygotsky, learning occurred in this zone of proximal development.

Considering the theories above, it is evident that one of the most influential factors that affect the behaviour of learners is their peer. There is this saying; "tell me who your friends are and I will tell you who you are". This may be true in most cases because friends have great influence over friends. This premise informed the decision to try out these learning strategies; peer tutoring (PT) and peer led team learning (PLTL).

The review of related studies highlighted the findings of previous studies on effect of learning strategy on attitude towards Biology. However none of the reviewed study compared Peer Tutoring (PT) and Peer Led Team Learning (PLTL) strategies in terms of effectiveness in Biology, none of the reviewed study was conducted in Port-Harcourt Nigeria. The current study investigated the effect of Peer Tutoring (PT) and Peer Led Team Learning (PLTL) strategies on attitude of students towards Biology in Port-Harcourt, Nigeria.

Research questions: The following research questions were posed to guide the study:

1) What is the effect of Peer Tutoring (PT) and Peer Led Team Learning (PLTL) strategies on students' mean attitudinal scores in Biology?
2) What is the influence of gender on students' attitude towards Biology?

Hypotheses: The following null hypotheses were tested at alpha level of 0.05

HO_1: There is no significant difference in the mean attitudinal scores of Biology students exposed to Peer Tutoring (PT) and those exposed to Peer Led Team Learning (PLTL) learning strategies.

HO_2: There is no significant gender influence on mean attitudinal scores of Biology students.

HO_3: There is no significant interaction effect of learning strategies and gender on students' mean attitudinal scores in Biology.

2. Methodology

Quasi-experimental design was used to estimate the causal impact of an intervention on its target population without random assignment. Quasi-experimental designs are typically employed if random assignment is not practical, or even impossible (Bradley, 2009 &Nworgu, 2016).One hundred and eighty two (182) senior secondary one (SS1) students, 70 females and 112 males, drawn from four intact classes, constituted the sample for the study. A Multi- stage sampling procedure was used in constituting the sample for the study. Firstly, the population was stratified along the two local government areas. Secondly, two coeducational schools were selected from each local government area through simple random sampling technique. Thirdly, one school from each local government area was randomly assigned peer tutoring and the other peer led team learning respectively. By this, each LGA has a PT group and a PLTL group. In all the selected schools, SSIA which was designated science class was used.

Biology Attitudinal Scale (BAS) was developed by the researcher for the purpose of data collection.

The instrument consist of two sections (A and B).Section A sought information on demographic data of the students including school name and gender. The section B of the instrument contains Twenty five (25) items designed to determine students' attitude towards Biology. The students' Attitude towards Biology is structured on a four point rating scale of Strongly Agreed (SA) =4 points, Agree (A) = 3 points, Disagree (D) = 2 points and Strongly Disagree (SD) = 1 point, for positive statements while the scoring is reversed for negative statements. The students were required to express their attitude towards Biology by ticking (√) in the most appropriate column against the item stated.

3. Results

Research Question One: What is the effect of Peer Tutoring (PT) and Peer Led Team Learning (PLTL) strategies on students' mean attitudinal scores in Biology?

Table 1: Mean and standard deviation of attitudinal scores of students taught Biology using peer tutoring and those taught using peer led team learning strategies

Treatment	Pre-test			Post-test		
	N	Mean	SD	Mean	SD	Mean Gain Score
Peer Tutoring	92	51.74	5.96	58.01	7.93	6.27
Peer Led Team Learning	90	51.56	6.04	64.91	13.62	13.35

Table 1 shows that the students who were exposed to peer tutoring in the learning of biology had pre-test mean attitudinal score of 51.74 with a standard deviation of 5.96 and post-test mean attitudinal score of 58.01 with standard deviation of 7.93, while those who were exposed to peer led team learning in the learning of biology had pre-test mean attitudinal score of 51.56 with a standard deviation of 6.04 and post-test mean attitudinal score of 64.91 with standard deviation of 13.62. Mean gain scores of 6.27 and 13.35 for the two groups respectively indicate that the students who were exposed to peer led team learning had higher post-test mean attitudinal score than those exposed to peer tutoring. Post-test standard deviations of 7.93 and 13.62 for the two groups of students respectively indicate that the variation in the individual scores of the students exposed to peer led team learning is higher than those exposed to peer tutoring.

Research Question Two: What is the influence of gender on students' attitude towards Biology?

Table 2: Mean and standard deviation of attitudinal scores of male and female students towards Biology

Gender	Pre-test			Post-test		
	N	Mean	SD	Mean	SD	Mean Gain Score
Male	112	51.40	5.88	60.71	11.01	9.31
Female	70	52.04	6.18	61.87	12.56	9.83

Table 2 shows that the male students had pre-test mean attitudinal score of 51.40 with a standard deviation of 5.88 and post-test mean attitudinal score of 60.71 with standard deviation of 11.01 while female students had pre-test mean attitudinal score of 52.04 with a standard deviation of 6.18 and post-test mean attitudinal score of 61.87 with standard deviation of 12.56. Mean gain scores of 9.31 and 9.83 for the male and female students respectively indicate that the female students had higher post-test mean attitudinal score than the male students. However, the post-test standard deviations of 11.01 and 12.56 for the male and female students indicate that the variation in the individual scores of the female students is higher than that of the male students.

Research Question Three: What is the effect of PT and PLTL strategies on students' mean achievement scores in Biology?

Table 3: Analysis of covariance of the effect of peer tutoring and peer led team learning on students' attitudes towards Biology

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Strategy	2622.183[a]	4	655.546	5.329	.000	.107
Intercept	6760.756	1	6760.756	54.957	.000	.237
Pre-attitude	146.974	1	146.974	1.195	.276	.100
Treatment	2431.352	1	2431.352	19.764	.000	.446
Gender	279.676	1	279.676	2.273	.133	.013
Treatment * Gender	67.411	1	67.411	.548	.460	.003
Error	21774.240	177	123.018			
Total	711045.000	182				
Corrected Total	24396.423	181				
a. R Squared = .107 (Adjusted R Squared = .087)						

Table 3 shows that the probability associated with the calculated value of F (19.764) for the effect of peer tutoring and peer led team learning on students' attitudes towards Biology is 0.000. Since the probability value of 0.000 is less than the 0.05 level of significance, the null hypothesis was rejected. This implies that there is a significant difference in the mean attitudinal scores of Biology students exposed to Peer Tutoring (PT) and those exposed to Peer Led Team Learning (PLTL) strategies in favour of the mean attitudinal score of those exposed to PLTL. Besides, the Partial Eta Square (effect size) value of 0.446 shows that PLTL had moderate effect on students' attitudinal score in Biology.

HO_2: There is no significant gender influence on mean attitudinal scores of Biology students.

Table 3 shows that the probability associated with the calculated value of F (2.273) for the influence of gender on students' attitudes towards Biology is 0.133. Since the probability value of 0.133 is greater than the 0.05 level of significance, the null hypothesis was not rejected, meaning that there is no significant gender influence on students' mean attitudinal scores towards Biology. In addition, the Partial Eta Square (effect size) value of 0.013 shows that gender does not have significant influence on students' attitudinal score in Biology.

HO_3: There is no significant interaction effect of learning strategies and gender on students' mean attitudinal scores in Biology.

Table 5 shows that the probability associated with the calculated value of F (.548) for the interaction effect of learning strategies and gender on students' attitudes towards Biology is 0.460. Since the probability value of 0.460 is greater than the 0.05 level of significance, the null hypothesis was accepted. This indicates that there is no significant interaction effect of learning strategies and gender on students' mean attitudinal scores in Biology. In addition, the Partial Eta Square (effect size) value of 0.003 shows that learning strategies and gender do not interact significantly to produce effect on students' attitudinal score in Biology.

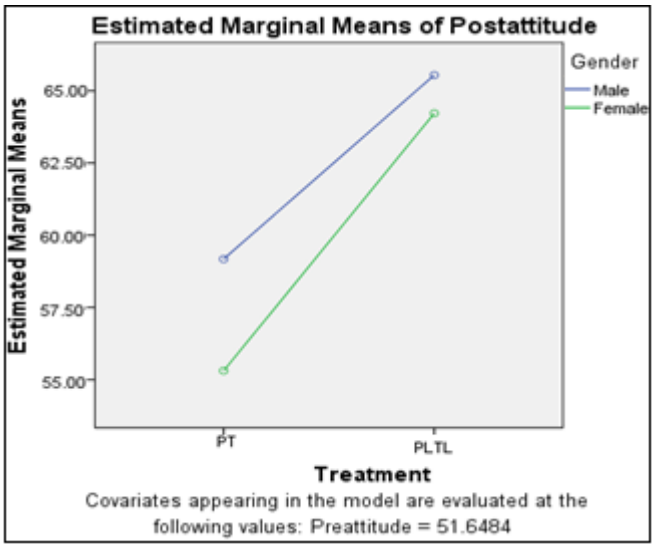

Figure 1: Graph of the interaction effect of learning strategies and gender on students' attitudes towards Biology

Figure 1 shows that there is no interaction effect of learning strategies and gender on students' attitudes towards Biology. This is indicated by the separate lines for the male and female students' attitudes towards Biology in the respective instructional methods.

4. Summary of the Findings

The following are the findings of the study;

1) Students who were exposed to peer led team learning had higher post-test mean attitudinal score than those exposed to peer tutoring. It was further found that there is a significant difference in the mean attitudinal scores of Biology students exposed to Peer Tutoring (PT) and those exposed to Peer Led Team Learning (PLTL) learning strategies in favour of the mean attitudinal score of those exposed to PLTL. Besides, the Partial Eta Square (effect size) value of 0.446 shows that PLTL had moderate effect on students' attitudinal score in Biology.
2) Female students had higher post-test mean attitudinal score than the male students. However, further analysis showed that there is no significant gender influence on mean attitudinal scores of Biology students.
3) There is no significant interaction effect of learning strategies and gender on students' mean attitudinal scores in Biology.

5. Discussion of Findings

The result of this study on the effect of Peer Tutoring (PT) and Peer Led Team Learning (PLTL) strategies on students' mean attitudinal scores in Biology showed that peer led team learning (PLTL) strategy had moderate effect on students' attitudinal scores in Biology, with a Partial Eta square (effect size) value of 0.446. Attitudinal scores of students exposed to PLTL was found to be higher than that of those exposed to Peer Tutoring (PT). Peer led team learning strategies strategy appears to have facilitated a positive attitude among students towards biology. Further analysis as shown on table 3 indicates that the difference in the mean attitudinal scores of the two groups was significant. The null Hypothesis

(HO_1) which states that there is no significant difference in the mean attitudinal scores of Biology students exposed PT and PLTL strategies is rejected. Implying that there was a significant difference in the mean attitudinal scores of students taught Biology using peer tutoring and those taught using peer led team learning strategies. This finding is consistent with Bramaje and Espinosa (2013) which stated that Peer Led Team Learning strategy positively improved attitude towards science. Conversely, the finding of this study did not agree with Tella (2013) who stated that peer tutoring strategy has significant main effect on students' attitude towards mathematics. This disparity in significant effect of learning strategies (PT and PLTL) on students' attitude towards biology may be due to the fact that in the study on peer tutoring strategy conducted by Tella (2013) primary school pupils were used and those in the secondary schools needed more time to get used to each other in the group (pair). While Peer led team learning produced positive attitude because each group was made up of six or seven students who learnt how to relate to one another within the few weeks of interaction and developed the right attitude towards Biology. On a general note, this finding agrees with Adesoji (2008) who found out that teaching strategies or methods are capable of changing students' attitude towards science. Sofiani, Manlida, Fedhilah and Sihite (2017) also indicated that there is no significant difference in the attitude of male and female students. The reason PLTL seem to produce positive attitude towards biology is that it is a special group strategy whereby students interact among themselves, feel free to ask questions with a more knowledgeable peer, presented by Vygotsky (1978) as a "More knowledgeable Other" (MKO) very handy to guide. The students are not threatened by the presence of a teacher who may just be interested in covering the syllabus. Peer led team learning should be an integral part of instruction in the secondary schools, to help the students develop positive attitude towards Biology.

Students' attitudinal scores in Biology was not significantly influenced by gender. Although in table 2, there is a slight difference in the mean attitudinal scores of male and female students. The result shows that having mean gain scores of 9.31 and 9.87 for male and female students respectively, the female students had higher post-test mean attitudinal score than the male students. However, looking at the post-test standard deviations of 11.01 and 12.56 for male and female students respectively indicates a variation in the individual attitudinal scores with the variation higher among the female students than the male students. Meaning that the individual attitudinal scores were not clustered around the mean attitudinal score. A further analysis as shown on table 3, indicates that the null hypothesis (HO_2) which states that there is no significant gender influence on mean attitudinal scores of Biology students was not rejected. An indication that gender does not have any significant influence on students' attitudinal scores in Biology. This finding is in consonance with Ahmed and Asghar (2011) who examined students' attitude towards Biology and found out that there was no significant difference between girls and boys attitude towards Biology. The findings of this study also corroborate the findings of Hassaini, Foong and Kamar (2015) that differences between attitudes of male and female students were insignificant. This implies that gender does not necessarily influence attitude towards Biology. On the other hand the result of this study disagrees with Chan and Bauer (2015) who states that when science students were exposed to PLTL, males have a higher positive attitude than their female counterpart. Chan and Bauer (2015) worked with science (Chemistry) students in a post-secondary school (University), which may be responsible for the difference noticed in that study. Again, research has shown that Biology is gender neutral, which may be responsible for the result in the current study.

Further analysis presented on table 3, showed that there was no significant interaction effect of learning strategies and gender on students' mean attitudinal scores in Biology. The null hypothesis (HO_3) of no significant interaction between learning strategy and gender on mean attitudinal scores in Biology was not rejected. The relationship is further represented in Figure 1 on a graph which indicated by the separate lines for the male and female students' attitudes towards Biology in the respective instructional strategies. The finding supports Tella 2013 who stated that there is no significant interaction between learning strategies, gender and students' attitude towards Biology.

6. Conclusions Reached from the Findings of the Study

Based on the findings of the study, the researcher drew the following conclusions.

- The use of peer led team learning strategy in learning Biology concepts leads to positive attitude of students towards Biology more than when peer tutoring strategy is used.
- Although slight differences seem to exist in the mean attitudinal score of male and female students, gender is not a significant factor affecting students' attitude towards Biology after being exposed to peer tutoring and peer led team learning strategies.
- There was no interaction effect of learning strategy and gender on students' attitude towards Biology when exposed to peer tutoring and peer led team learning strategies.

Educational Implications of the Findings

This research contributes to academic knowledge by providing empirical evidence for the use of peer tutoring and peer led team learning strategies in Biology teaching. It has some implications for teachers and students, policy makers, curriculum developers as well as various examination bodies.

One clear implication is that Biology teachers could enhance students, attitude towards Biology through the use of peer led team learning strategy. The learning strategy that has different approaches embedded in it and encourages students of different background and gender to learn Biology effectively.

Both peer tutoring and peer led team learning strategies were effective in reducing gender gap in students' attitude in Biology and this implies that the regular use of the strategies by Biology teachers could greatly enhance the learning of Biology.

For curriculum planners, this does suggest a careful reappraisal of Biology curriculum implementation strategies to ensure the incorporation of activities that will encourage the use of peer led team learning strategy which will guarantee a better future for Biology education and the nation at large.

7. Recommendations

1) Biology teachers should adopt peer led team learning strategy as it would enhance overall attitude to Biology as well as help reduce gender gap that may occur in Biology.
2) There should be regular sensitization workshops organized by the government through the Post primary schools board and Science Teachers Association (STAN) to retrain Biology teachers on the development and use of peer led team learning strategy.
3) Pre- service teachers should be trained on how to develop and implement peer led team learning strategy.

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