

## **Peer Tutoring Teaching Strategy and Academic Achievement of Secondary School Biology Students in Umuahia Education Zone, Nigeria**

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**Abstract:** *This study investigated the effect of Peer Tutoring teaching strategy on academic achievement of Biology students. Four research questions were posed and four hypotheses were set for analysis at  $p \leq 0.05$  level of significance. Quasi experimental design was utilized. Purposive sampling was used to draw 40 students from two private schools in Umuahia education zone. Mean and, Standard Deviation were used to analyze the research questions and Analysis of Covariance was used to analyze the hypotheses. Results show that the mean achievement scores of student taught peer tutoring was 56.100 and those taught with Conventional teaching method, 47.100. The mean gain in achievement scores of students taught with Peer tutoring was 11.65 and that for Conventional teaching method was 9.20. The mean achievement scores of High ability, Average ability and low ability level students taught with Peer Tutoring were 74.000, 69.111 and 70.000 respectively. The mean achievement scores of High ability, Average ability and low ability level students taught with Conventional teaching method are 49.889, 50.222 and 40.000 respectively. There was no statistically significant difference in the mean achievement scores of students exposed to Peer Tutoring and Conventional Teaching methods, mean gain in achievement of students taught with the two strategies, male and female students taught with the two strategies. However a statistically significant difference was found between adjusted mean of the students' ability level and the two techniques used, implying that there is interaction effect of instructional techniques and ability level on academic achievement of students. Recommendations were made among which the need for Biology teachers to utilize peer is tutoring alongside conventional teaching method in teaching Biology.*

**Key Words:** *Peer, Tutoring, Achievement, Biology, Strategy*

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### **I. Introduction**

The issue of students academic achievement has been of concern to educators globally especially in Nigeria. Over the years reports of both internal and external examinations especially in Biology has revealed unimpressive performance of students in secondary school Biology. Biology as a subject is very important as it stands as a prerequisite to many biology-related carriers in tertiary institutions. The study of Biology is very relevant to man's successful living. In recognition of its importance, Biology is one of the core subjects at the senior Secondary. Biology is a natural science subject consisting of contents from microscopic organisms to the biosphere general, encompassing the earth's surface and all living things (Okwo and Tartiyus, 2004).

Biology has quite a large enrolment at the secondary school level and its study should naturally appeal to students since majority of the concepts in Biology are familiar to students in their life processes and in their environment. Despite this, the performance of students in Biology in external examinations has continued to be poor.

The analysis of students' performance in Biology between 2008 -2013 revealed that: in 2008, out of 12,844 candidates examined for Biology in MAY/JUNE WASSCE, only 2,771 (21.57%) scored A1 to C6 grade, 4,021 (31.30%) got pass and 6,052 (47.10%) candidates failed. In 2009, 12,345 candidates were examined for Biology, only 3,851(31.20%) recorded A1 to C6 grade, 4,144 (33.60%) scored pass and 4350 (35.20%) failed. Also, in 2010, out of 14,588 candidates that were examined for Biology, only 7,692 (52.70%) had A1 to C6 grade, 3,762 (25.80%) scored pass and 3,134 (21.50%) failed. In 2011, out of 17,132 candidates that were examined for Biology, only 7453 (42.50%) had A1 to C6 grade, 6,126 (35.80%) scored pass and 3553 (20.70%) failed. In 2012, 11,527 candidates were examined, 2461 (21.35%) recorded A1 to C6 grade, 4,175 (36.20%) scored pass and 4891 (42.40%) failed. Finally, in 2013, 7,339 candidates were examined, 385 (5.25%) recorded A1 to C6 grade, 4,636 (63.17%) scored pass and 2318 (31.60%) failed. The analysis further revealed that not very many of the candidates had credit pass in Biology over the period of observation. In addition, over 40% of the candidates that were examined over the period of observation scored below passes level (i.e. A1 to C6 ) grade required for admission purpose to read Biology based courses in the tertiary institutions. This situation is disturbing and not in the best interest of the science and technological growth and development of the country (Owoeye, 2006).

This poor performance has been a source of concern to parents, Biology teachers and science educators in general. Several researchers have also pointed out different reasons for students' poor performance, some of which are due to the abstractness of certain aspects of Biology, lack of understanding on the students' part of certain biological concepts such as ecology (Nzelum, 2010 in Owoeye, 2016). Even though many reasons are attributed for the failure, a sizeable chunk of the blame goes to teachers because it is believed that student's performance in examination is partly a function of teacher's effectiveness (Ndirika and Boniface, 2016). According to National Policy on education, no education system can rise above the quality of teachers in the system (F.R.N, 2013). Ogunsanju (2004) corroborated this view when he reported that the decline in the quality of education cannot be ignored by anyone who is aware of the signification role of education as an instrument for societal transformation and development. Okafor (2004) remarked on the issue of training and retraining of teachers when he stated that the way to produce good science teacher is through such means that both pre-service and service science teachers will be equipped with the needed competencies. Competency of the science teacher in the application of modern strategies such as cooperative or collaborative strategies has become vital. There is need for a shift from teacher-centered methods of teaching to student centered method. Cooperative teaching strategies are among the strategies that are student centered.

Most teachers want to provide the best instruction and create the best learning environment for their students. Yet, research indicates that females are getting a significantly poorer science education than males, even when they are in the same classroom. The consequences of this poorer education can be seen in gender differences in attitude toward science and differential course enrollment patterns. Females hold more negative attitudes toward science than males and are less likely to continue studying science in high school and beyond. Of course, these male-female differences in attitude and enrollment are not solely the result of what happens in classrooms. However, many teacher behaviors and teaching strategies have been identified that contribute to these problems. These teacher behaviors and strategies are often employed without malicious intent. Nevertheless, the result is gender inequity in science instruction which contributes to negative attitudes toward science and science avoidance on the part of females.

Cooperative learning groups have been promoted as a good way to bring about positive attitudes toward instruction, mastery of content, and self-esteem. For example, students who score in the 50<sup>th</sup> percentile when learning competitively would score in the 69<sup>th</sup> percentile when taught cooperatively (McKeachie, 2002). In a meta-analysis of research on cooperative learning in high school and college chemistry courses, Bowen (2000) found that students in the 50<sup>th</sup> percentile with traditional instruction would be in the 64<sup>th</sup> percentile in a cooperative learning environment. Affective outcomes were also improved by the use of cooperative learning. Relative to students involved in individual or competitive learning environments, cooperatively taught students exhibited better social skills and higher self-esteem, as well as more positive attitudes about their educational experience, the subject area, and the college (Johnson, Johnson & Smith, 1998). Towns, Kreke and Fields, (2000) used field notes and survey data to analyze students' attitudes toward group activities in a physical chemistry class. The students viewed the group work as a positive force in their learning, and they also valued the interactions for promoting a sense of community in the classroom.

One of the cooperative strategies, which is the focus of this study is Peer Tutoring learning approach. Peer tutoring is a flexible, peer-mediated strategy that involves students serving as academic tutors and tutees. Usually, a higher performing student is paired with a lower performing student or students to review critical academic or behavioral concepts. Peer tutoring allows students to receive individual assistance. Moreover students have increased opportunities to interact in smaller groups. According to Spencer (2006), Peer tutoring increases self-confidence and self-efficacy.

Some frequently used peer tutoring models used in the classroom include:

1. **Classwide Peer Tutoring (CWPT):** Classwide peer tutoring involves dividing the entire class into groups of two to five students with differing ability levels. Students then act as tutors, tutees, or both tutors and tutees. Typically, CWPT involves highly structured procedures, direct rehearsal, competitive teams, and posting of scores (Maheady, Harper, and Mallette, 2001). The entire class participates in structured peer tutoring activities two or more times per week for approximately 30 minutes (Harper and Maheady, 2007).
2. **Cross-age Peer Tutoring (CAPT):** In this model, older students are paired with younger students to teach or review a skill. The positions of tutor and tutee do not change. The older student serves as the tutor and the younger student is the tutee. The older student and younger student can have similar or differing skill levels, with the relationship being one of a cooperative or expert interaction. Tutors serve to model appropriate behavior, ask questions, and encourage better study habits. This arrangement is also beneficial for students with disabilities as they may serve as tutors for younger students.
3. **Peer Assisted Learning Strategies (PALS):** PALS is a version of the CWPT model which involves a teacher pairing students who need additional instruction or help with a peer who can assist (Fuchs, Fuchs, & Burish, 2000). Groups are flexible and change often across a variety of subject areas or skills. Cue cards, small pieces of cardstock upon which are printed a list of tutoring steps, may be provided to help students

remember PALS steps (Spencer, Scruggs, & Mastropieri, 2003). All students have the opportunity to function as a tutor or tutee at differing times.

4. **Reciprocal Peer Tutoring (RPT):** In RPT, two or more students alternate between acting as the tutor and tutee during each session, with equitable time in each role. Usually, higher performing students are paired with lower performing students.
5. **Same-age Peer Tutoring:** Peers of same age or within one or two years of age similarity are paired to review key concepts. Students may have similar ability levels or a more advanced student can be paired with a less advanced student. When pairing students with differing levels, the roles of tutor and tutee may be alternated, allowing the lower performing student to quiz the higher performing student. The effectiveness of Peer tutoring strategy is supported by many researches (e.g., Calhoun, Al Otaiba, Cihak, King, & Avalos, 2007; Kunsch, Jitendra, & Sood, 2007; Vasquez & Slocum, 2012). However, not very many studies have been carried out on peer tutoring in the study area. This study thus sets out to investigate the effect of peer tutoring teaching strategy on the academic achievement of male and female Biology students.

The specific objectives were to determine the:

1. mean achievement scores of students taught with Peer Tutoring teaching strategy (PT) and Conventional teaching method (CT)
2. mean gain in achievement scores of students taught with Peer Tutoring teaching strategy and Conventional teaching method
3. mean achievement scores of male and female students taught with Peer Tutoring teaching strategy and Conventional teaching method
4. interaction effect of instructional techniques and ability level on academic achievement of students.

The following research questions were posed for answer in this study:

1. What are the mean achievement scores of students taught with peer Tutoring and Conventional teaching method?
2. What is the mean gain in achievement scores of students taught peer Tutoring teaching strategy and those taught using Conventional teaching method?
3. What are the mean achievement scores of male and female students taught with Peer Tutoring teaching strategy and Conventional teaching method?
4. What is the interaction effect of instructional techniques and ability level on achievement of students?

### **Hypotheses**

HO1: There is no significant difference in the mean achievement scores of students exposed to Peer Tutoring teaching strategy and those exposed to Conventional teaching method

HO2: There is no significant difference in the mean gain in achievement scores of students exposed to Peer Tutoring teaching strategy and those exposed to Conventional teaching method

HO3: There is no significant difference in the mean achievement scores of male and female students exposed to Peer Tutoring teaching strategy and those exposed to Conventional teaching method

HO4: There is no significant difference in the interaction effect of instructional techniques and ability level on academic achievement of students

## **II. Method**

This study adopted a 2X2 factorial quasi-experimental research design that involved one experimental group and one control group. This study used a pre-test post-test in which students in the experimental group were taught the topics- Ecological Management and Conservation of Natural Resources using Peer Tutoring teaching Strategy. Students in group two which is the control group were taught the same topics using the conventional teaching method.

The sample of this study is 40 Senior Secondary two (SS2) students from two private secondary schools in Umuahia education zone. The sampling technique is purposive sampling.

The instrument used for data collection in this study is a 50-item multiple choice achievement test. The instrument was trial-tested and the reliability index determined using test-retest method. Reliability coefficient was calculated using Pearson Product Moment Correlation Formula, which was found to be 0.71.

Data were analyzed using Analysis of Covariance (ANCOVA) for the post-test achievement scores with the respective pre-test scores used as covariates.

### **Results**

The results obtained from the study are as shown in the following tables:

**Table 1:** The Mean Achievement Scores of Students Taught with Peer Tutoring(PT) Teaching Strategy and Conventional Teaching(CT) Method

VARIABLES	N	MEAN	SD
PT	30	56.1000	15.25192
CT	30	47.1000	13.32153
<b>POOLED MEAN</b>		51.6000	14.2867

Table 1 shows the mean achievement scores (56.1000) of students taught with Peer- Tutoring teaching strategy, is higher than those taught with Conventional teaching method (47.1000).

**Table 2:** Mean gain in Achievement Scores of Students Taught with Peer Tutoring Teaching Strategy and Conventional Teaching Method

VARIABLE	N	PRETEST MEAN	POSTTEST MEAN	MEAN GAIN
PT	30	41.00	52.65	11.65
CI	30	37.90	47.10	9.20

Table 2 shows the mean gain in achievement scores (11.65) of students taught with Peer Tutoring teaching strategy, is higher than those taught using Conventional teaching method (9.20).

**Table 3:** Mean Achievement Scores of Male and Female Students Taught with PT and CT

VARIABLE	N	MEAN	SD
<b>MALE</b>	30	51.6667	12.87696
<b>FEMALE</b>	30	53.6667	13.53497
POOLED MEAN		52.6667	13.13640

Table 3 shows that female students performed better (53.6667) than male students (51.6667).

**Table 4:** Mean Analysis of Interaction Effect of Instructional Techniques and Ability Level on Academic Achievement of Students

TEACHING APPROACH	ABILITY LEVEL	MEAN	SD	N
PT	High Ability Level	74.0000	5.91608	10
	Average Ability Level	69.1111	17.98656	10
	Low Ability Level	70.0000	9.53939	10
	Total	70.4286	14.92308	30
CT	High Ability Level	49.8889	6.97802	10
	Average Ability Level	50.2222	5.69600	10
	Low Ability Level	40.0000	1.0000	10
	Total	49.0000	6.8481	30

Table 4 shows the interaction effect of instructional techniques and ability level on academic achievement of students. PT favoured the High ability level students the most, while CT favoured the Average level students the most.

**Table 5:** Analysis of Covariance on the Mean Achievement Scores of Students Exposed to Peer- Tutoring teaching strategy and Conventional Teaching Methods

Source of Variation	Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
<b>Corrected Model</b>	900.048 <sup>a</sup>	2	450.024	3.280	.049	.151
<b>Intercept</b>	671.064	1	671.064	4.891	.033	.117
Pretest	592.023	1	592.023	4.315	.045	.104
Technique	126.655	1	126.655	.923	.343	.024
<b>Error</b>	5076.327	57	137.198			
<b>Total</b>	105477.000	60				
<b>Corrected Total</b>	5976.375	59				

a. R Squared = .151 (Adjusted R Squared = .105)

Table 5 shows the analysis of covariance on the mean achievement scores of students exposed to Peer Tutoring teaching strategy and those exposed to Conventional instruction. P-value of .343 being more than 0.05 level of significance indicates a no significant difference in the mean achievement scores of the two groups. Thus HO1 is retained.

**Table 6:** Analysis of Covariance on the Mean gain in Achievement Scores of Students Exposed to Peer Tutoring and Conventional Instruction

Source of Variation	Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
<b>Corrected Model</b>	2843.644 <sup>a</sup>	2	1421.822	9.136	.001	.331
<b>Intercept</b>	97.500	1	97.500	.627	.434	.017
Pretest	2033.644	1	2033.644	13.068	.001	.261
Technique	17.357	1	17.357	.112	.740	.003
<b>Error</b>	5757.956	57	155.620			
<b>Total</b>	115104.000	60				
<b>Corrected Total</b>	8601.600	59				

a. R Squared = .331 (Adjusted R Squared = .294)

Table 6 shows the analysis of covariance on the mean achievement scores of male and female students taught with Peer Tutoring and those exposed to Conventional teaching methods. P-value of .740 being more than 0.05 level of significance indicates a no significant difference in the mean achievement scores of the two groups. Thus HO2 is retained.

**Table 7:** Analysis of Covariance on the Mean Difference in Achievement Scores of Male and Female Students Exposed to Peer Tutoring and those exposed to Conventional Technique

.Source of Variation	Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
<b>Corrected Model</b>	2039.076 <sup>a</sup>	2	1019.538	7.137	.002	.200
<b>Intercept</b>	1079.241	1	1079.241	7.555	.008	.117
Pretest	1979.076	1	1979.076	13.855	.000	.196
Gender	189.551	1	189.551	1.327	.254	.023
<b>Error</b>	8142.257	57	142.847			
<b>Total</b>	176608.000	60				
<b>Corrected Total</b>	10181.333	59				

a. R Squared = .200 (Adjusted R Squared = .172)

Table 7 shows the analysis of covariance on the male and female Students Exposed to Peer Tutoring and those exposed to Conventional Technique. P-value of .254 being more than 0.05 level of significance indicates a no significant difference in the mean achievement scores of the two groups. Thus HO3 is retained.

**Table 8:** Analysis of Covariance on the Mean Achievement Scores on the Interaction Effect of Instructional Techniques and Ability Level on Academic Achievement of Students

Source of Variation	Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
<b>Corrected Model</b>	7421.213 <sup>a</sup>	8	927.652	7.491	.000	.431
<b>Intercept</b>	190179.109	1	190179.109	1535.704	.000	.951
<b>Technique</b>	5266.162	2	2633.081	21.262	.000	.350
<b>Ability</b>	63.152	2	31.576	.255	.776	.006
<b>Technique * Ability</b>	655.198	4	163.800	1.323	.269	.063
<b>Error</b>	9783.230	51	123.838			
<b>Corrected Total</b>	333165.000	60				

a. R Squared = .431 (Adjusted R Squared = .374)

### III. Discussion

Table 1 shows that the mean achievement scores of students taught Peer Tutoring is 56.10; while those exposed to Conventional instruction is 47.10. However, the study statistically revealed that the instructional techniques had no significant influence in the academic achievement of the Biology students (Tables 5). This work impugns the submissions of Ali and Awatif (2014), and Oviawe Ezeji and Uwameiye (2015) who documented volumes on the effectiveness of peer tutoring over teacher-centered method of instruction.

Table 2 reveals that the mean gain in achievement scores of students taught with Peer Tutoring is 11.65; while that of those exposed to Conventional instruction is 9.20. Statistically, there is no significant difference in the mean gain in achievement scores of students exposed to Peer Tutoring and Conventional teaching method.

Table 3 submits that the male and female students taught with the two teaching approaches have mean achievement scores of 51.667 and 53.667 respectively with pooled mean score of 52.6667. Statistically, there is no significant difference in the mean achievement scores of male and female students exposed to Peer Tutoring teaching strategy and Conventional teaching method. The influence of gender on academic achievement is seemingly topical and controversial among educationists and psychologists. The difference in male and female anatomy could account for the supposed difference in personalities of males and females. It is suspected that for most secondary school students, cultural and societal expectations alongside career prospects and opportunities

within the socio-cultural milieu are factors that play a major role in their instructional technique preference. Gender role stereotyping continues to permeate the educational system.

This finding corroborates the proposition of Oviawe *et al.* (2015) who reported that there is no significant interaction effect of gender and teaching methods on students' performance. However, this work is in deviance with the study of Ezenwosu and Nworgu (2013) on gender and peer tutoring. The authors submitted that male students slightly performed better than their female counterparts. The variation in result could however be attributed to differences in subject and population of study.

Table 4 holds the view that High level, Average level and Low level ability students exposed to Peer Tutoring teaching strategy has mean achievement scores of 74.0000, 69.1111 and 70.0000 respectively. High level, Average level and Low level students exposed to Conventional Instruction has mean achievement scores of 49.8889, 50.2222 and 40.0000 respectively. Thus, there is significant difference in the ability level of students exposed to Peer Tutoring teaching strategy and Conventional teaching method (Table 8).

Though the efficacy of a teaching method is the reciprocal index of teacher and student(s), peer tutoring stands out to bridge the gap for both excellent and poor students; hence, could be best adopted in Nigerian educational system where students belonging to different educational backgrounds, social set-ups, possessing different abilities and motivational levels are placed in one class. This work partly agrees with Adedeji (2013) who investigated the effect of explicit and peer tutoring instructional strategies, pupil's ability and gender on learning outcomes in primary school mathematics. Adedeji enthused that the use of explicit and peer tutoring instructional techniques should be encouraged irrespective of pupil's ability and gender.

#### **IV. Conclusion**

There is no significant interaction effect between instructional techniques- peer tutoring and Conventional instruction with academic achievements of Biology students. Thus, the acclaimed paradigm shift from traditional method of instruction to some of the modern teaching strategies like peer tutoring, may not always be suitable in all situations.

More so, there is significant interaction effect of instructional techniques and ability level on academic achievement of students. Peer tutoring serves as a bridge for high, average and low ability level students. Furthermore, there is no significant interaction effect of instructional techniques and gender on academic achievement of students. Hence, gender biases on instruction technique could have socio-cultural implications.

#### **V. Recommendations**

The following recommendations are hereby proffered:

1. The existing traditional method used in teaching Biology at the secondary level should be sustained but regularly reviewed to incorporate the new methodology described in the study.
2. In the existing system of education in Nigeria, a single teacher is considered responsible for teaching the whole class. Peer tutoring could be used by teachers to reduce the overburden of teaching tasks and enhance better results.
3. Peer tutoring should be introduced in the curriculum of Colleges of Education. This will enable the teacher-trainees to be acquainted with numerous teaching methods as one instructional technique (Traditional) could lead to boredom on the part of the students.
4. The secondary school curriculum should be designed such that it will allow students to construct their learning activities based on their own interpretation of what is needed.
5. Teachers should be around to supervise students during peer tutoring to limit unwarranted arguments.
6. Teachers should deliberately avail themselves to new teaching methods lest they are relegated to the background.

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