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Contents

Demographic Factors as Determinants of Risky Sexual Behaviour Among Adolescents with Visual Impairment in South-West, Nigeria <i>Okoli, Bibiana Ifeoma; Nwazuoke, Ambrose Ikechukwu; Adebayo F. Komolafe and Fatima M. Umar</i>	1
Teachers' Perceptions Towards Training and Implementation of a Pilot Inclusive Education Programme in Ghana <i>Kofi Asiamah Yeboah</i>	15
Teachers' Awareness and Use of Assistive Technology Devices for Teaching Children with Special Needs in Inclusive Schools in North Central Nigeria <i>Abani G. Shikden</i>	29
Effect of Cooperative Learning and Peer Tutoring on Performance in Biology Among Students with Hearing Impairment in Ibadan, Oyo State, Nigeria <i>Amarachukwu Francisca Chinaka and Ayodele Osisanya</i>	39
Caregiving Variables as Correlates of Patients' Recovery from Stroke in Selected Private Hospitals in Ibadan Metropolis, Oyo State, Nigeria <i>Aghanti, C.K. and Mojinyinola, J.K.</i>	57
Effect of Star Strategy on Word Problem-Solving Ability of Pupils with Dyscalculia in Ibadan Metropolis <i>Abiodun T. Adewunmi and Bamidele T. Akindele</i>	69
The Pivotal Roles of Teachers and Parents in Fostering Creativity Among Gifted Learners <i>Abdullahi Babatunde Asiru</i>	79
Demographic Factors Influencing the Attitude of Special and General Education Teachers Towards Persons with Hearing Impairment in Rivers State, Nigeria <i>Ubani, N. Samuel, Ben-Chioma A. Erinma and Tanu T. Aberiate</i>	89
Perception of Students with Visual Impairment on the Use of Assistive Technology Devices for Learning in Special Schools, Osun State, Nigeria <i>Sunday Abimbola Abodunrin</i>	99
Self-Efficacy and Emotional Intelligence as Predictors of Creativity Among High Ability Students in Secondary Schools in Ibadan, Oyo State, Nigeria <i>Augusta N. Molokwu and Adewale O. Olabisi</i>	111
Effects of Guided Note and Ogle's Metacognitive Strategies on Performance in Biology Among Students with Learning Disabilities in Oyo State, Nigeria <i>Kehinde Oyelayo Oyelade and Kelechi Lazarus</i>	123
Supporting Learning in the Post COVID-19 Pandemic for Children with Special Needs in Nigeria <i>Edozie Isioma Sitamalife and Fakolade Olufemi Aremu</i>	135

Barriers to Social Inclusion of Persons with Visual Impairment in Nigeria <i>Ejimanya, Ekeledirichukwu Emmanuel; Zaram, G. Nyam; Umbugadu, Ashelo Mary and Yakubu, Andrew</i>	139
Special Education as a Tool for Realising Sustainable Development Goals in Nigeria <i>Bamidele Timothy Odedele</i>	149
Transition of Students with Learning Disabilities to Post-Secondary Education <i>Osundina, David Olaniyi; Ajagbe, Adesina Adufe and Fagbemi, Olusegun Olujide</i>	159
Empowering Students with Disabilities During the Covid-19 Crisis <i>Ogundoro Elijah Olufemi</i>	167

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Effect of Cooperative Learning and Peer Tutoring on Performance in Biology among Students with Hearing Impairment in Ibadan, Oyo State, Nigeria

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Abstract

Specialized instructional techniques are believed to have the required potency to enhance the academic performance of learners with hearing challenges in the school system. However, reports have shown that some of the techniques were not effective in enhancing the academic performance of students with disabilities offering science subjects. Thus, this study was therefore designed to investigate the impact of co-operative learning and peer tutoring on Biology performance among students with hearing impairment in Ibadan, Oyo State, Nigeria. The study adopted a pretest-posttest, control group, quasi-experimental research design with a 3 x 2 x 2 factorial matrix. Three special secondary schools were randomly selected and purposive sampling was used in selecting fifty (50) Senior Secondary School Two students with hearing impairment, comprising thirty (30) males and twenty (20) females. These students were randomly assigned into Experimental Group I (17), Experimental Group II (16) and Control (17). Biology Achievement Test Questionnaire (BATQ; $r=0.87$) and General Self-efficacy Scale (GSS; $r=0.60$) were the major instruments used for the study. Participants in the experimental groups were taught Biology with the instructional strategies while those in control group were instructed using the conventional method. Seven hypotheses were raised and tested at 0.05 level of significance, while data were analyzed, using Analysis of Covariance (ANCOVA) and mean scores. There was a significant main effect of treatment on the participant's performance in Biology ($F_{(2,42)} = 21.32$; Partial $\eta^2 = 0.50$). Co-operative learning and peer tutoring were effective in enhancing the participant's performance in Biology. The participants exposed to peer tutoring had the highest mean score (23.60), followed by those in co-operative learning (17.76), while those in the control group, had the lowest mean score (13.20). The two-way interaction effects of treatment and self-efficacy was significant ($F_{(1,42)} = 13.80$, $P < .05$, $\eta^2 = .43$) in favour of participants exposed to peer tutoring, although the interaction effects of treatment and gender were not significant ($F_{(1,42)} = .420$, $P > .05$, $\eta^2 = 0.16$). The three-way interaction effect of treatments, gender and self-efficacy on performance in Biology was significant ($F_{(1,42)} = 17.480$, $P < .05$, $\eta^2 = .30$). Based on these findings, peer tutoring and co-operative learning should be incorporated into the teaching of students with

hearing impairment, especially in teaching Biology in secondary schools. Attention should also be paid to academic self-efficacy of female students by the teachers and the guidance counsellors so that their learning can be positively impacted upon.

Keywords: *Peer tutoring, Co-operative learning, Academic self-efficacy, Performance of students with hearing impairment in Biology*

Introduction

Biology as a natural science, consisting of contents from microscopic organisms to the biosphere general, encompassing the earth's surface, is very relevant to man's successful living. Biology is a core subject at the senior secondary school level of education in Nigeria, as its study appeals to students since majority of the concepts contained in its curriculum are familiar to the learners. The subject enables the students to understand themselves and their immediate environments. According to Okwo and Tartiyus (2004), the importance of Biology includes a prerequisite for career development. This presupposes that knowledge acquired in Biology is applied in many fields of study such as Medicine, Biochemistry, Pharmacy, Microbiology, Agricultural Science, among others. However, a large enrolment of students in Biology at the senior school certificate examination has clearly shown that Nigerian students have a lot to do with the subject.

In contrast, reports on secondary school external examinations in Biology, over the years, have revealed unimpressive performance of students. This is indicated in the West African Senior School Certificate Examinations (WASSCE) (May/June 2002-2007), as reported by Awosanya, Adewole, Awofaju and Jonathan (2015) below:

Table 1: Percentage of Biology students' performance at Distinction, Credit and Pass levels in WASSCE (2002-2006)

Year	Distinction Level (A1-B3) %	Credit Level (C4-C6) %	Pass Level (D7-E8) %
2002	5.42	30.57	38.03
2003	10.70	45.79	36.81
2004	11.48	45.91	42.32
2005	21.12	48.04	27.85
2006	8.32	37.55	41.03
2007	1.19	29.86	33.65

Table 1 shows that the performance of Biology students at distinction, credit and pass grades from 2002 to 2007 was clearly unimpressive. At credit and pass levels, the performance of the students over the years was below average. Since 2007, general Biology performance of students has been on the wane.

Table 2: Poor performance of Biology students in WASSCE (2007-2012)

Year	The Total No. of Candidates	Credit Passed (A1– C6)	Percentage Pass
2007	1,238,163	413,211	33.37
2008	1,59,964	427,644	33.94
2009	1,259,964	453,928	33.87
2010	1,300,418	427,644	32.88
2011	1,505,199	579,432	38.50
2012	1,646,150	587,044	35.66

Source: Statistics Section of the WAEC Office, Yaba, Lagos

Another statistical evidence of the disturbing performance of Biology students in WASSCE is shown above. The percentage pass from 2007 to 2012 was appalling (less than 40%), considering the candidates who obtained A1 – C6 grades. The situation has generated a lot of concern among researchers since then (Gambari, Awako, Ughovwa & Gana, 2014; Badmus & Omosewa, 2018; Inyang, 2019; Joda, 2019). The implication of the above performance among Biology students is that an upsurge in the number of enrolments in the subject on a yearly basis is non-negotiable. At this juncture, it should be noted that students with hearing impairment are among those identified with discouraging performance in and incessant re-run of the subject above. Students with hearing impairment are special learners, because they are characterized by inability to hear and discriminate sound. Therefore, specific factors contributing to their poor performance in Biology include abstraction of certain aspects of the subject, lack of interpreters and lack of concrete teaching models.

The lacklustre performance of students with hearing impairment in Biology has been a major concern to parents, teachers and other stakeholders. Apart from the peculiar factors affecting the students, as noted above, unavailability of textbooks on Biology, laboratory apparatus and other learning materials are significantly contributing to failure being recorded in the subject examination (Dinah, 2013). Largely, the problem can be traced to teachers ineffectiveness and non-scientific methods adopted. According to *National Policy on Education*, no education system can rise above the quality of its teachers (Federal Republic of Nigeria, 2013). Therefore, the significance of teachers and approaches to their teaching is

central to better performance in Biology among students with hearing impairment. Specific strategies to assist the students improve on their performance in the subject should be considered at this juncture. Against this background, the researchers of this study investigated co-operative learning and peer tutoring as strategies of intervention in Biology performance.

As an independent variable, co-operative learning is a process in which learners with hearing impairment acquire knowledge in a small group with the help of each other. The strategy gives importance to co-operation as against the present educational system which is based on competition (Singh, 2011). It affords the students the opportunity to share ideas, thought or information in Biology in a group for an understanding or a formulation. Duplass (2006) noted that co-operative learning is an instructional package that involves students working as a team to accomplish a goal, under conditions that include the positive interdependence, individual as well as group accountability, appropriate use of collaborative skills and group processing. Amita (2006) emphasized that the students learn together and take advantage of each other's expertise to achieve a common goal.

For a comprehensive co-operative learning, teachers as instructors are responsible for guiding students with hearing impairment to manage their groups accordingly. Emmer, Emund, Gerwels and Claire (2005) reiterated that teachers teach the students the procedure of learning together and how to manage group activities in co-operative learning context. More so, the strategy coupled with computer-mediated tools makes the group learning more efficient and enjoyable among students with hearing impairment. When technology is integrated in the co-operative learning environment, the strategy is helpful in achieving a common goal of group learning (Steelman, 2005). According to Barbara (2002), the first premise underlying co-operative learning is respect for students with hearing impairment regardless of their ethnic, intellectual, educational or social backgrounds and a belief in their potential for academic success. All students in the group work and learn together in environments where their individual strengths are recognized and individual needs are addressed.

Similar to the above learning strategy is peer tutoring. This strategy allows sharing of ideas, information and knowledge among students with hearing impairment in order to meet the needs, interest, attention, learning style and attitude of each student. The ideas and knowledge shared are achieved through a relationship framework planned by the teacher (Duran, 2002). Kunsch, Jiteendra and Sood (2007) stressed that peer tutoring works best when students of different ability levels work together. The teaching strategy helps students with hearing impairment have higher academic achievements, improved relationships with peers, improved personal and social development and increased motivation (Burnish and Fuchs, 2005).

Peer tutoring has been promoted as a good way to bring about positive attitudes towards Biology instruction and mastery of contents of the subject among students with hearing impairment (McKeachie, 2002). Peer tutoring allows students with hearing impairment to receive individual assistance in Biology instruction. Moreover, students have increased

opportunities to interact in smaller groups in a way that a higher performing student is paired with a lower performing one to review critical Biology concepts. According to Spencer (2006), peer tutoring increases self-confidence and self-efficacy.

Self-efficacy, as a moderating variable in the present study is a key contributing factor to the success of students with hearing impairment in Biology. It has also been reported that self-efficacy influences the choices the students make and the course of action they pursue (Pajares, 2002). Self-efficacy is the belief of a student with hearing impairment and an innate ability to achieve his goals. Scheetz (2014) stated that adolescents with hearing loss who have acquired sophisticated use of language have increased chance of being accepted by their hearing peers and develop superior quality of life. On the other hand, for adolescents with hearing impairment whose language skills lack proficiency and social interactions may become frustrating, struggle leading to social isolation, loneliness and poor quality of life, including poor performance in Biology.

Another factor that can influence Biology performance among students with hearing impairment is gender. Mangvwat (2006) defines gender as a specifically constructed phenomenon that is brought about as society ascribes different roles, duties, behaviours and mannerisms to the two sexes. Gender, according to Lahey (2003), is a psychological experience by being a male or female. It has to do with personality and central components of self-concept, unlike sex which is concerned with only the distinction between male and female based on biological characteristics. Findings from Coerts and Mills cited in Ugwuanyi (2009) revealed that boys who are hearing impaired achieve better than girls with hearing impairment in school subjects. Crouch (1997) showed that gender plays no significant role in their academic work, since all students with hearing impairment experience diminished language skills. Also, a study carried out by Eze (2010) on the effect of training of teachers on the use of local sign language revealed that gender had no influence on the performance of students with hearing impairment. In view of these controversies, there is need for a new study to contribute to resolving the issue concerning gender influence on performance in Biology among students with hearing impairment.

In general, students with hearing impairment have their intellectual well-being affected in a way; and resultantly, found it difficult to cope in a regular school setting where their condition is not taken into consideration. In spite of the fact that the learners need specialized instruction, the teacher still use conventional methods to teach them Biology. The use of group fieldwork and methods that foster inter-personal relationships in teaching Biology to the students have yet to be comprehensively addressed. Studies investigating the effect of cooperative learning and peer tutoring on performance in Biology, moderated on self-efficacy and gender, among students with hearing impairment in Nigeria are rare in literature. Therefore, the current study intends to bridge the research gap.

Purpose of the study

The purpose of this study is to determine the effectiveness of cooperative learning and peer tutoring on performance in Biology with moderating effect of self-efficacy and gender among students with hearing impairment in Ibadan, Oyo State, Nigeria.

Significance of the study

This study would be of great benefit to students, teachers, parents, curriculum planners, and the government. The study would provide information on the factors influencing the performance in Biology of students with auditory impairment. The students would be guided on how to improve on their performance in the subject. The result of the study would provide a basis for improvement of training programme for teachers, by addressing the knowledge gap on the type of instructional strategies to be used in teaching students with hearing impairment and factors that can influence the learners' performance in Biology. In addition, it would provide a framework for organizing seminars and workshops for teachers and educational administrators. The study would equally enable the parents to know their involvement and participation in the amelioration of Biology performance of their children with hearing impairment. The result of the study would also be good assistance for curriculum planners for appropriate planning and inclusion of co-operative learning and peer tutoring in the curriculum as educational strategies for the students with hearing impairment. The study would be of much importance to the government because it would provide areas that the government will need to provide necessary services, programmes, assistive devices, policy, legislation, funds, etc. to improve the education of students with hearing impairment.

Hypotheses

Seven (7) null hypotheses were tested at 0.05 level of significance:

- Ho₁:** There is no significant main effect of treatments (cooperative learning and peer tutoring) on the performance in Biology among students with hearing impairment;
- Ho₂:** There is no significant main effect of gender on the performance in Biology among students with hearing impairment;
- Ho₃:** There is no significant main effect of self-efficacy on performance in Biology among students with hearing impairment;
- Ho₄:** There is no significant interaction effect of treatments and gender on performance in Biology among students with hearing impairment;
- Ho₅:** There is no significant interaction effect of treatments and self-efficacy on performance in Biology among students with hearing impairment;
- Ho₆:** There is no significant interaction effect of gender and self-efficacy on performance in Biology among students with hearing impairment;
- Ho₇:** There is no significant interaction effect of treatments, gender and self-efficacy on the performance in biology among students with hearing impairment.

Methodology

The study adopted a pretest, post-test, control group, quasi-experimental research design with a 3 x 2 x 2 factorial matrix. The population for the study comprised all students with hearing impairment in Ibadan Metropolis, Oyo State, Nigeria. The study adopted random sampling and purposive sampling techniques in selecting special schools and participants for the study. Random sampling was used to select three schools in Ibadan and purposive sampling was used to select a total number of fifty (50) senior secondary school (SSS) 2 students with hearing impairment, comprising thirty (30) males and twenty (20) females. These were randomly divided into Experimental Group I (Co-operative Learning) with 17

students, Experimental Group II (Peer Tutoring) with 16 students and Control (Conventional Method) with 17 students.

Two major research instruments were utilized in the study, namely: Biology Achievement Test Questionnaire (BATQ) developed by the researchers and General Self-efficacy Scale (GSS) developed by Swchwazer and Jerusalem (1995). BATQ was standardized with coefficient of 0.87 while GSS standardized with co-efficient of 0.60 after a pilot test of each of the instruments. BATQ was used as pretest-posttest measures and ASS was used to measure academic self-efficacy of students with hearing impairment. The treatments lasted for seven weeks out of which two (2) weeks was used for pre- and post-treatment assessments. The researchers employed the services of four (4) trained assistants who were Biology teachers. Participants were exposed to treatments for five (5) weeks. During the period, participants in each of the experimental groups were taught with co-operative learning and peer tutoring, while control was taught with the conventional method for two (2) hours per week, covering forty (40) minutes as duration for each lesson. The researchers moved round the three special schools to supervise the trained research assistants and offered assistance where need required. Analysis of Covariance (ANCOVA), and mean scores were used to analyze the results obtained in the study.

Results

Ho₁: There is no significant main effect of treatments (cooperative learning and peer tutoring, conventional method) on performance in Biology among students with hearing impairment.

Table 3: ANCOVA summary of treatments, gender, self-efficacy on performance in Biology of students with hearing impairment

Source of Variance	Sum of Squares	DF	Mean Square	F	Sig.	η^2
Corrected Model	1023.757	7	146.251	11.211	.000	.651
Intercept	3213.910	1	3213.910	246.356	.000	.854
Pre-Test	55.847	1	55.847	4.281	.045	.092
Main Effect:						
Treatment group	556.193	2	278.097	21.317	.000	.504
Gender	60.311	1	60.311	4.623	.037	.099
Self-efficacy	33.239	1	33.239	12.548	.012	.195
2-way Interactions:						
Treatments x Gender	8.640	1	8.640	.662	.420	.016
Treatments x Self-efficacy	30.230	1	42.390	13.800	.040..	.430
Gender x Self-efficacy	10.120	1	63.290	22.548	.000	.240
3-way Interactions:						
Treatments x Gender x Self efficacy	35.230	1	53.239	17.480	.012	.302
Error	547.923	42	35.432			
Total	17916.000	50				

From Table 3, it is shown that there is a significant main effect of treatments (co-operative learning and peer tutoring) on performance in Biology among students with hearing impairment.

Table 4: Estimated Marginal Means of students with hearing impairment based on their performance in Biology according to treatment groups

Treatment Groups	Mean	Std. Error
Co-operative Learning (Exp. I)	17.79	.923
Peer Tutoring Learning (Exp. II)	23.60	1.013
Conventional (Control Group)	13.20	.910

Table 4 shows the estimated marginal mean scores of academic performances in Biology among students with hearing impairment. The participants in Peer Tutoring Learning (Experiment II) obtained the highest mean score of (=23.60), followed by the Cooperative Learning (Experiment I) with mean score of (=17.88) and Control group had the low mean score of (=13.20). This means that cooperative learning and peer tutoring were effective. However, peer tutoring was more potent than co-operative learning in improving Biology performance among students with hearing impairment. The hypothesis is therefore rejected.

Ho₂: There is no significant main effect of gender on performance in Biology among students with hearing impairment.

From Table 3, it is shown that there is a significant main effect of gender on performance in Biology of students with hearing impairment ($F_{(1,42)} = 4.623, p < .05, \eta^2 = .037$). The null hypothesis is therefore rejected. This means that gender has influence on performance in Biology of students with hearing impairment. The estimated marginal mean scores obtained by males and females are as follows:

Table 5: Estimated Marginal Means of effect of gender on the performance in Biology among students with hearing impairment

Gender	Mean	Std. Error
Male	20.49	.816
Female	16.94	.769

Table 5 shows the estimated marginal mean scores of students with hearing impairment according to their gender. This result reveals that the male participants had higher mean score (=20.49) than the female participants with mean score (=16.94) when Biology performance was considered.

Ho₃: There is no significant main effect of self-efficacy on performance in Biology among students with hearing impairment.

From Table 3, it is shown that there is a significant main effect of self-efficacy on the performance in Biology among students with hearing impairment ($F_{(1,42)} = 12.548$, $p < .05, \eta^2 = .19$). The null hypothesis is therefore rejected. This means that the self-efficacy (high and low) had influence on the academic performance in Biology among students with hearing impairment. To find out the mean scores obtained by the students based on the two levels of self-efficacy (high and low), the estimated marginal mean is computed as follows:

Table 6: Estimated Marginal Mean scores showing the effect of self-efficacy (High and Low) on performance in Biology among students with hearing impairment

Self - efficacy	Mean	Std. Error
High Self-Efficacy	20.64	.948
Low Self-Efficacy	17.72	.702

Table 6 shows the estimated marginal mean scores establishing the effect of self-efficacy (high and low) on the performance in Biology among students with hearing impairment. The result reveals that the hearing impaired participants with high self-efficacy had the higher mean score (=20.64) while the hearing impaired participants with low self-efficacy had lower mean score (=17.72) in terms of their performance in Biology.

Ho₄: There is no significant interaction effect of treatments and gender on performance in Biology among students with hearing impairment.

From Table 3, it is shown that there is no significant interaction effect of treatments and gender on the performance in Biology among students with hearing impairment $F_{(1,42)} = .420$, $p > .05, \eta^2 = .016$). The null hypothesis is therefore accepted. This implies that the treatments and gender had no interaction influence on the academic performance in Biology among students with hearing impairment. To find out the mean scores obtained by the students based on treatments and gender, the estimated marginal mean is computed as follows:

Table 7: Interaction effect of treatments and gender on performance in Biology among students with hearing impairment based on estimated Marginal Mean Scores

Treatment Group	Gender	Mean	Std. Error
Cooperative Learning (Exp1)	Male	20.30	1.185
	Female	15.28	1.416
Peer Tutoring Learning (Exp II)	Male	23.96	1.368
	Female	22.87	1.325
Conventional (Control Group)	Male	13.75	1.325
	Female	12.66	1.249

Table 7 shows the estimated marginal mean scores of students with hearing impairment according to treatments and gender in terms of their performance in Biology. Males in peer tutoring (Experiment II) had highest mean score (= 23.96), and their females counterparts had lower mean score (=22.87), followed by the participants in co-operative learning (Experiment I) with males having higher mean score (=20.30) than females with mean score of (=15.28). The participants in conventional (control group) with males having a higher mean score (=13.75) than females with mean score of (=12.66).

H₀₅: There is no significant interaction effect of treatments and self-efficacy on performance in Biology among students with hearing impairment.

From Table 3, it is shown that there is a significant interaction effect of treatments and self-efficacy on the performance in Biology among students with hearing impairment ($F_{(1,42)} = 13.80, p < .05, \eta^2 = .43$). The null hypothesis is therefore rejected. This implies that the treatments and self-efficacy (high and low) had a significant interaction influence on the performance in Biology among students with hearing impairment. To find out the mean score obtained by the students at two levels of high and low self-efficacy, the estimated marginal mean is computed as follows:

Table 8: Interaction effect of treatments and self-efficacy (High and Low) on performance in Biology among students with hearing impairment based on estimated Marginal Mean Scores

Treatment Groups	Self-efficacy	Mean	Std. Error
Cooperative Learning (Exp1)	High	17.79	.923
	Low	11.97	.700
Peer Tutoring Learning (Exp II)	High	26.33	2.163
	Low	22.23	1.068
Conventional (Control Group)	High	17.31	.631
	Low	13.20	.910

Table 8 shows the estimated marginal mean scores of students with hearing impairment according to interaction effect of treatments and self-efficacy (high and low) in terms of their performance in Biology. The table above shows that participants with high self-efficacy in peer tutoring (Experiment II) had the highest mean score (=26.33), while their counterparts with low self-efficacy had mean score of (=22.23). Also, the self-efficacy of participants in cooperative learning (Experiment 1) performed in the following manner: those with high self-efficacy had the mean score of (=17.79), while those with low self-efficacy in the group had mean score of (=11.97). Accordingly, participants in the conventional (control group) with high self-efficacy had higher mean score (= 17.31) than those with low self-efficacy, having the mean score of (=13.20).

Ho₆: There is no significant interaction effect of gender and self-efficacy on performance in Biology among students with hearing impairment.

From Table 3, it is shown that there is a significant interaction effect of gender and self-efficacy on performance in Biology among students with hearing impairment ($F_{(1,42)} = .22.548, p < .05, \eta^2 = .24$). The null hypothesis is therefore rejected. This implies that gender and self-efficacy had effect on performance in Biology among students with hearing impairment. To find out the mean scores obtained by the students at two levels of gender and self-efficacy, estimated marginal mean scores are computed as follows:

Table 9: Interaction effect of gender and self-efficacy on performance in Biology among students with hearing impairment based on estimated Marginal Mean Scores

Gender	Self-efficacy	Mean	Std. Error
Male	High	23.31	1.233
	Low	17.67	1.068
Female	High	17.77	1.416
	Low	15.28	.910

Table 9 shows the estimated marginal mean scores of students with hearing impairment according to the interaction effect of gender and self-efficacy in terms of their performance in Biology. Male Participants with high self-efficacy had higher mean score (=23.31) than those with low self-efficacy, having lower mean score of (=17.67). Also, the marginal mean score of the female participants with the high self-efficacy had the higher mean score of (=17.77) than those with low self-efficacy, having lower mean of (=15.28).

Ho₇: There is no significant interaction effect of treatments, gender and self-efficacy on performance in Biology among students with hearing impairment.

From Table 3, it is shown that there is a significant interaction effect of treatments, gender and self-efficacy on performance in Biology among students with hearing impairment ($F_{(1,42)} = 17.480, p < .05, \eta^2 = .30$). The null hypothesis is therefore rejected. This implies that there is interaction effect of treatments, gender and self-efficacy in relation to performance in Biology among students with hearing impairment. The estimated marginal mean scores as presented in Table 9 reveals the mean scores obtained by the students, based on the three levels of treatments, gender, self-efficacy.

Table 10: Interaction effect of treatments, gender and self-efficacy on performance in Biology among students with hearing impairment based on estimated Marginal Mean Scores

Treatment Groups	Gender	Self-efficacy	Mean	Std. Error
Cooperative Learning (Exp1)	Male	High	20.30	1.185
		Low	17.97	1.797
	Female	High	15.28	1.416
		Low	17.97	1.797
Peer Tutoring Learning (Exp II)	Male	High	26.33	2.163
		Low	21.60	1.676
	Female	High	17.97	1.797
		Low	22.87	1.325
Conventional (Control Group)	Male	High	17.97	1.797
		Low	13.75	1.325
	Female	High	17.97	1.797
		Low	12.66	1.249

Table 10 above shows the estimated marginal mean scores of students with hearing impairment according to the interaction effect of treatments, gender and self-efficacy on performance in Biology. The marginal mean scores further reveal that there is a significant interaction effect of treatments, gender and self-efficacy on performance in Biology among the students.

Discussion of Findings

Main effect of co-operative learning and peer tutoring on Biology performance among students with hearing impairment

The findings of the study indicate that co-operative learning and peer tutoring are effective strategies in improving Biology performance among students with hearing impairment. However, peer tutoring is more potent than peer tutoring as clearly revealed under result analysis. The effectiveness of peer tutoring as a strategy that fosters the students' performance in Biology is underpinned by extensive research. (Calhoon, Otaiba, Cihak, King and Avalos, 2007; Kunsch, Jitendra and Sood, 2007; Vasquez and Slocum, 2012). The present finding also confirms that the teaching strategy plays a significant role in bolstering the performance level of students in Biology as maintained by Burnish and Fuchs (2005) who reported that peer tutoring helps the students' academic achievement, peer interaction, individual as well as social development and improves motivation among them. The current result however contradicts Ndirika and Ubani (2017) who carried out a study on the effect of peer tutoring and Biology achievement of students and found that there was no statistically

significant difference in the mean scores of students exposed to peer tutoring and conventional method. The reason for this contrast in the results may be traced to categories of students and school type considered in the study.

On the other hand, co-operative learning is also an effective strategy in improving Biology performance among students with hearing impairment. Duplass (2006) and McKeachie (2007) affirmed that co-operative learning is an instructional package that enables students to accomplish a common goal under the condition that involves positive interdependence, group accountability, appropriate use of collaborative skills and group processing. Co-operative learning has a lot of academic and social advantages. The strategy promotes academic performance as learners improve their critical thinking and intellectual skills by learning from one another. It is also a socially packaged technique that accommodates one or two small groups of students learning together. The present results lends credence to Amita's (2006) assertion that co-operative learning affords students to work and learn together and take advantage of each other's professionalism to achieve general objectives in groups.

Main effect of gender on Biology performance among students with hearing impairment

The result of the present study reveals that gender has influence on Biology performance among students with hearing impairment. The finding further shows that male participants have higher mean score than the female counterparts. It has been observed that various biological differences in human make-up that are in male and female students may be responsible for some disparities between the sexes. The argument is that since no two human beings are the same in intellectual attributes, then one should not expect both male and female students with hearing impairment to perform uniformly in Biology. This assertion is in tandem with Coerts and Mills (2006) who reported that boys with hearing impairment achieve better than girls in school subjects.

Main effect of self-efficacy on Biology performance among students with hearing impairment

The finding in this study indicates that there is main effect of self-efficacy on Biology performance among students with hearing impairment. The finding further shows that participants with hearing impairment, especially those with high self-efficacy have higher mean score than their counterparts with low self-efficacy. Self-efficacy has been considered a pivotal tool for academic success of students with hearing impairment, because the construct influences the choices the students make in the course of action being pursued (Pajares, 2002). Self-efficacy is relevant to academic outcomes especially Biology performance, because it leads to specific motivations that encourage or discourage effective performance. This informs high or low self-efficacious beliefs among students with hearing impairment. The present study corroborates the finding of Ali, Munira, Jaafa and Nobaya (2017) who investigated the levels of students' academic self-efficacy and relationship between academic self-efficacy and academic performance among final year students and found that 80.82% of the respondents had higher levels of academic self-efficacy.

Interaction effect of co-operative learning, peer-tutoring and gender on Biology performance among students with hearing impairment

The finding reveals that there is no interaction effect of treatments (co-operative learning and peer tutoring) and gender. This means that biological sex role does not influence performance levels in Biology among students with hearing impairment on the basis of exposure to co-operative learning and peer tutoring. Male and female students with hearing impairment exposed to the two treatment packages in the study benefitted equally. This finding is in contrast with Odagbyi's (2015) who examined the effect of gender on the achievement of students in Biology, using the Jigsaw Method and reported that there was a significance difference between male and female scores. Boys' score was significantly higher than the girls' as the former gained more from the method used.

Interaction effect of co-operative learning, peer tutoring and self-efficacy on Biology performance among students with hearing impairment

As indicated in the results, there is a significant interaction effect of treatments (co-operative learning and peer tutoring) and self-efficacy among students with hearing impairment. This implies that there is a discrepancy in the self-efficacy of the students exposed to the treatment packages. Those with high self-efficacy have higher mean scores than their contemporaries with low self-efficacy. These are students with hearing loss who are at a risk for low self-efficacy due to the verbal communication skills deficiency and social maturity. Those with high self-efficacy who have acquired sophisticated use of language have an increased chance of developing superior quality of life (Scheetz, 2004). The present finding establishes Eke and Oladayo's (2015) result when the researchers reported that self-efficacy predicts academic achievement among special needs learners in Port Harcourt, Rivers State, Nigeria, especially when the students are taught with adequate strategies.

Interaction effect of co-operative learning, peer tutoring, gender and self-efficacy on Biology performance among students with hearing impairment

The result of the study shows that there is a significant interaction effect of treatments (co-operative learning and peer tutoring), gender and self-efficacy on Biology performance among students with hearing impairment. This means that male and female students with hearing impairment exposed to co-operative learning and peer tutoring are different in their self-efficacy when it comes to performance in Biology. It has been established in the present study that peer tutoring and co-operative learning are effective in improving performance in Biology among students with hearing impairment. This current finding is in consonance with the submission of Ikechukwu (2011) who found the effect of co-operative learning and peer teaching on students' achievement and interest in Chemistry. Additionally, male and female students with hearing impairment were found to have different levels of self-efficacy. As well, current finding is in compliance with that of Ademokoya and Shittu (2007) who carried out a study on hearing loss, gender, self-efficacy and achievement in English Language of students with hearing impairment and found that post-lingual students with hearing impairment were superior to their pre-lingual counterparts while male students were reported to have higher self-efficacy than the female ones.

Conclusion and Recommendations

Peer tutoring and co-operative learning as teaching strategies have been found potent in enhancing performance in Biology among students with hearing impairment. Although, peer tutoring strategy is found to be more effective than the cooperative learning. Gender and self-efficacy as moderating variables have significant influence on the academic performance in Biology among the students with hearing impairment. Therefore, it can be concluded that the two teaching techniques alongside self-efficacy go a long way in assisting students with hearing impairment perform better in Biology. Based on the above, teachers should endeavour to use peer tutoring and cooperative learning, especially in teaching the science subjects to students with hearing impairment, coupled with the use of hearing aids for those students with hard-of hearing, appropriate setting arrangement, and the use of concrete materials in teaching Biology to the students with hearing impairment. This can greatly influence their performance in Biology positively. More attention should be paid to the female students' self-efficacy, while teaching them with a view to improving their psychological wellness should be considered appropriately. School guidance counsellors should also work towards enhancing the students' academic self-efficacy, as well as to reduce the associated academic anxiety. Parents of students with hearing impairment are advised to be more involved in the Biology learning of the children in order to offer adequate support. Curriculum planners should consider the relevance of peer tutoring and co-operative learning, and factor them into the academic planning and design in a bid to cater for students with hearing impairment. Federal and State Ministries of Education are encouraged to provide assistive devices, sustainable policy and legislation, as well as the required funds to ameliorate the condition of students noted for hearing challenges in Nigerian secondary schools.

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