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Improving Biology Students' Interest and Achievement through Collaborative Instructional Strategy

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Authors' contributions

This work was carried out in collaboration among all authors. Authors OWO and ANJ designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. They both also managed the analyses of the study. Author UAU managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Aims: The study was designed to determine the effect of collaborative instructional strategy in improving students' interest and achievement in Biology.
Study Design: The study was adopted quasi-experimental research design and was conducted in Obollo-Afor education zone.
Place and Duration: The study was conducted in Obollo-Afor education zone of Enugu state and spanned 7 months, between October 2018 to May 2019.
Methodology: Population of the study comprised of 1,691 SSI Biology students, from where a sample of 200 students from six (6) intact classes was sampled using multi-stage sampling procedure, to take part in the study. Biology achievement test and Biology interest inventory were instruments used to collect data for the study. Data were analysed using mean, standard deviation and ANCOVA.

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Results: Findings revealed that students taught Biology using collaborative instructional strategy had better achievement and interest ratings, than those taught with the conventional method, female Biology students have slightly better interest and achievement that male Biology students when taught with collaborative instructional strategy and the interaction effect of gender and instructional method on achievement is significant.
Conclusion: The study concludes that considering the ability of the collaborative instructional strategy to improve interest and achievement in Biology, it should be adopted as a method of teaching the subject in Nigerian secondary schools.

Keywords: Interest; achievement; collaboration; instructional; strategy.

1. INTRODUCTION

Over time, science and technology have evolved to become a very important aspect of life and living. The myriads of development noticeable in society today is as a result of practical application of scientific knowledge, ideas, laws, theories and principles–technology. That has made the ways and methods of doing things easier and faster [1,2]. Science culminates in a body of verifiable knowledge, and/or the acquisition of skills to seek out such knowledge or test one. Science could thus be a field of study, a process or an attitude/skill. In Nigerian senior secondary schools, science, whatever form it assumes, is taught through such subjects as Chemistry, Physics, Mathematics, Agricultural Science, Animal Husbandry, Geography, Computer science, Economics, Health Science and Biology.

Biology is a natural science which studies the existence (evolution, morphology and physiology) of living things, as well as their interactions with non-living components of the earth. Simply described, Biology is the study of life and living organism. Knowledge of Biology prepares students to undertake further studies and eventually build careers in such scientific fields as medical sciences and allied fields, pharmaceutical sciences, Environmental Biology, Biotechnology, plant and animal sciences/ husbandry, agricultural sciences, food sciences, among others. Nigerian students recognise this importance, hence it being the most subscribed science subjects in Nigerian secondary schools, the with 1, 087, 884 candidates in 2018, as against 728, 998 for Chemistry, 704, 504 for Physics and 495, 920 for Agricultural science [3].

Notwithstanding its importance and continued massive enrolment, achievement in Biology has continued to remain poor. The WAEC Chief Examiner's report (2018) revealed that the mean achievement score of students in the 2018 May/June WASCE is 30 (with a standard deviation of 9.00). This score is poorer than that of 2017 when Biology students posted a mean score of 31 and a standard deviation of 11.92. This implies that the average score of students who sat for Biology in 2017 and 2018 WASCE was 31 and 30 respectively, and as indicated by the standard deviation rating, the scores that contributed to this average were far apart from each other.

This data is a cause for serious concern as it is nowhere close to the acceptable pass score of 50 required to get a “C” grade in Biology, indicating average failure. It is even more concerning that the mean achievement dropped by 1 point, from 2017 to 2018. Research endeavours to unravel the cause of this consistent poor achievement in Biology have among other things implicated shortage of interest in Biology, lack of functional Biology laboratories, poor grasp of Biological concepts and terminologies, gender dimensions/ differences, socio-economic status, inadequate number of teachers, lack of teaching and learning materials, students’ attitudes towards Biology, shortage/total lack of instructional materials, and teaching strategy adopted by Biology teachers [4]; Farooq, Chaudhry et al. [5].

Biology teachers are saddled with the responsibility of implementing the Biology curriculum at the classroom level. The Nigerian Biology curriculum has four themes, broken down into 64 units. These contents are arranged spirally, such that some of the concepts to be taught are repeated yearly, throughout the three-year duration of the subject, to cover all units in the curriculum. All repeated concepts are presented with greater depth and complexity, which increases as the subjects progresses over the three-year period [6]. The Biology curriculum is broken down into a scheme of work, which allows teachers to implement it in parts as the

students graduate from one senior secondary school class to another.

The packed nature of the Biology curriculum translates into an equally overloaded Biology scheme of work, making teachers struggle to cover the termly contents. With stringent measures like deducting or in some cases, withholding the salary of teachers who fail to cover their scheme of work per term, adopted by some schools, Biology teachers do everything possible to meet up. This drives them to adopt the conventional method of teaching, a method adjudged to allow for more content to be covered in little time, but with its inability to sustain interest, make for better academic achievement, and foster retention (Elton, 2017). If the consistent poor achievement of students in Biology is to be stemmed, there thus is need for Biology teachers to explore other instructional strategies.

1.1 Collaborative Instructional Strategy

Collaborative instructional strategy is a conventional teaching-learning strategy that actively involves the learners in learning from one another while working in groups. Srinivas [7] reckons that it establishes a relationship among students, and then taps into that relationship to promote positive interdependence. The students in collaboration constantly negotiate and share ideas in an attempt to achieve certain learning objectives.

The instructional strategy is important because it create an environment where students are actively involved in the teaching-learning process, and possess four broad attributes: knowledge sharing (the teacher building upon the already existing knowledge the students possess about the course content), sharing ability (teacher encourages students to use what they know, share among themselves and correct each other), mediation (the teacher mediates and directs learning) and heterogeneity (students are grouped heterogeneously, with their diverse backgrounds, experiences and perspectives contributing to a more meaningful collaboration.

Collaborative instructional strategy facilitates learning because working as a group creates better understanding than doing so individually, students get to voluntarily take part in discussions and there is more opportunity for the student to become more aware of what s/he knows and does not know. The instructional strategy encourages critical thinking (Gokale, 1995), promotes positive attitude towards learning, increases students' self-esteem, helps them build oral communication skills, social interaction skills, take responsibility in learning [8], among others, all of which have the potential to raise students' interest in a subject and subsequently improve achievement.

This continued poor achievement is an indication that it is either Biology teachers do not utilize conventional, student-centred strategies to teach, or that there are other factors which possibly impact achievement. Some of these factors put forward by researchers as potentially impacting achievement include interest. Jumoh, (2010) defined interest in learning as personal preferences with regard to learning, which sometimes means what an individual chooses one thing rather than other things and sometimes a positive psychological state occurs during his/her interaction with the circumstances that engenders further learning motives. As a way of contributing to ascertaining which method would be ideal for improving students' achievement in Biology, this study was designed to investigate the effect of collaborative instructional strategy on students' interest and achievement in Biology, with gender as moderating variable.

1.2 Significance of the Study

Theoretically, the study is anchored on Lev Vygotsky social learning theory. In his examination of how our social environments influence the learning process, Vygotsky [9] suggested that learning takes place through the interactions students have with their peers, teachers and other experts. Consequently, teachers can create a learning environment that maximizes the learner's ability to interact with each other through discussion, collaboration, and feedback. In ascertaining the effect of collaborative learning environments on students' achievement and interest, this study will serve to validate or invalidate Vygotsky's learning theory.

Practically, the study's findings when made public via presentation at conferences/workshop sessions for stakeholders in education, or published in journals, will be of immense significance to Biology teachers (and by extension teachers of other subjects), Biology students, educational administrators, the society and researchers in the areas relating to the studies.

1.3 Study Aims

Geographically, the study will be conducted in Obollo-Afor Education zone 'cell'. The choice of the topic 'cell' was informed by the WAEC chief examiner's report [3], which indicated that students who sat for the Biology paper in the WASCE for that year among other weaknesses, made poor drawings, and demonstrated inability to properly label Biology drawings. The cell is a topic replete with diagrams of various cell types/forms and considering that it is taught at the SS I, it is ideal for use to train students to acquire Biology drawing and labelling skills before they venture into more complex studies of the subjects in SS II and SS III classes.

1.4 Research Questions

The following research questions were constructed to guide the study:

1. What is the effect of collaborative instructional strategy on students' achievement in Biology?
2. What is the influence of gender on achievement of students taught Biology with collaborative instructional strategy?
3. What is the effect of collaborative instructional strategy on students' interest in Biology?
4. What is the influence of gender on interest of students taught Biology with collaborative instructional strategy?

1.5 Hypotheses

The following null hypotheses guided the study, and were tested at 0.05 level of significance.

Ho_1: There is no significant difference in the mean achievement of students taught Biology with collaborative instructional strategy and those taught with conventional method.

Ho_2: There is no significant difference in the mean achievement of male and female students taught Biology with collaborative instructional strategy.

Ho_3: There is no significant difference in the mean interest score of students taught Biology with collaborative instructional strategy and those taught with conventional method.

Ho_4: There is no significant difference in the mean interest rating of male and female students taught Biology with collaborative instructional strategy.

Ho_5: There is no significant interaction effect of gender and instructional strategy on students' achievement in Biology.

Ho_6: There is no significant interaction effect of gender and instructional strategy on students' interest in Biology.

2. METHODS

Design: The design of this study is quasi-experimental design; specifically, the non-equivalent control group design, which does not allow for randomization of subjects, but for random assignment of intact classes to treatment and control as the researcher sees fit. This design is ideal for this study because it will permit for use of subjects in their classes without disrupting normal class activities in the schools involved in the study. Symbolically, the design for the study is represented thus:

O_1	X	O_2
---	---	---
O_1	~X	O_2

O_1	=	Pre-test
O_2	=	Post-test
X	=	Treatment (collaborative instruction)
~X	=	No Treatment
---	=	Non-equivalence of the groups

Area of the study: The study was conducted in Obbollo-Afor Education Zone, in Enugu State, Nigeria, an area reported by Tide News Online [10] to have low achievement in Biology.

Population and sample: The population comprised of all senior secondary school I (SSS I) students in the education 1, 691 students studying biology in the education. A sample of 200 SSS I students constituting six (6) intact classes, were selected through multi-stage sampling procedure, to take part in the study.

Instrument for data collection: The instruments used to collect data for the study were a 50 – item Biology Achievement Test (BAT); a multiple choice-based test, meticulously following a constructed 30-item test blue print, and a 31 – item Biology Interest Inventory (BII), designed on a 4-point Likert scale. Scores from the BATC as assigned following a developed marking scheme will serve as data for determining the achievement of the students in Biology. Each correctly responded item as prescribed by the marking guide, will draw a mark of 1. The BII is designed on a 4-point response scale of SA (Strongly Agree), A (Agree), D (Disagree) and SD (Strongly Disagree). Weights were assigned to the scale ranging from 4 – 1. The BII was used to elicit data on students' interest in Biology.

Validity and Reliability of Instruments: The instruments were validated by experts in Biology education, as well as measurement/evaluation. The estimate of internal consistency (0.83) for the BAT was ascertained using Kuder-Richardson ($K\text{-}R_{20}$) and estimate of internal consistency for the BII (0.85) was obtained using Cronbach's Alpha.

Experimental Procedure: The study spanned 4 weeks and involved two groups of subjects – experimental group taught with collaborative instructional strategy, and control group taught using conventional method. Letters requesting permission to conduct the research was sent to sampled schools and upon receiving permission, the researcher discussed the purpose of the study with the SS I Biology teachers, who were subsequently trained to serve as research assistants. These teachers taught the experimental and control groups in their respective schools. Week one was used by the researcher to get the biology teachers and students for the experimental group in tune with what the study entails, explaining the process of collaboration among students in the classroom, highlighting what students are expected to do once task is assigned to them. The researcher at the end of the training administered pre-test BAT and BII, then collected scores which served as pre-experimentation achievement and interest in Biology.

The teaching-learning phase began in the second week, during which the teachers for the various groups taught the introductory part of the lesson on cell – definitions and forms in which cells exist. For the collaborative group, the teacher introduced the topic, outlined the lesson objectives and then allowed the students to use resources available to them to interact and achieve those learning objectives. Week three was used to teach contents on cell theory; and then cell structures/functions and differences/ similarities between plant and animal cells in the fourth week. This weekly chart ran concurrently for both the experimental and control groups, with defined tasks given to collaborative group and control group taught using conventional method by their teacher. Post-test BATC and BII was then administered after the experimental procedure. Several measures were adopted to control extraneous variables which potentially could have impacted on the study.

Method of data analysis: The research questions were answered using mean and standard deviation. The hypotheses were tested at 0.05 level of significance, using Analysis of Covariance (ANCOVA).

3. RESULTS

Research Question I: What is the effect of collaborative instructional strategy on students' achievement in Biology?

Data on Table 1 reveal that students taught Biology using collaborative instructional strategy had a post-test mean achievement score 45.14 while the post-test mean achievement score of those taught using conventional method was 35.05. This is an indication that students taught Biology using collaborative instructional strategy performed better than their counterparts taught using conventional method. The mean gain of 12.8 for the experimental group represents a significant increase from the pre-test mean score, an indication that collaborative instructional strategy did improve students' achievement in Biology. The fall in standard deviation score from pre-test to post-test also indicates that students' achievement scores which were significantly apart from each other (pre-test standard deviation = 5.15), became a more similar (post-test standard deviation = 3.12).

Research Question II: What is the influence of gender on achievement of students taught Biology with collaborative instructional strategy?

Table 1. Mean and standard deviation of instructional strategy and students' achievement scores in biology

Treatment	Pre-test			Post-test		
	n	Mean	SD	Mean	SD	Mean gain
Experimental	104	32.34	5.15	45.14	3.12	12.80
Control	96	27.01	6.73	35.05	12.15	8.04

Table 2. Mean and standard deviation of gender and students' achievement scores in biology

Gender	Pre-test			Post-test		
	n	Mean	SD	Mean	SD	Mean gain
Male	46	32.15	4.77	42.22	2.27	10.07
Female	58	32.48	5.47	47.47	1.06	14.99

Table 3. Mean and standard deviation of instructional strategy and students' interest rating in biology

Treatment	Pre-test			Post-test		
	n	Mean	SD	Mean	SD	Mean Gain
Experimental	104	2.05	0.27	2.97	0.77	0.92
Control	96	2.02	0.27	2.81	0.62	0.79

Table 4. Mean and standard deviation of gender and students' interest rating in biology

Gender	Pre-test			Post-test		
	n	Mean	SD	Mean	SD	Mean Gain
Male	46	2.03	0.27	2.95	0.94	0.92
Female	58	2.05	0.28	2.99	0.62	0.94

Table 2 presents data on the mean and standard deviation scores of male and female biology students. The data reveal that the post-test mean achievement score for male biology students is 42.22, while the female biology students had mean achievement score of 47.47. Female students therefore, had a slightly higher post-test mean achievement score than their male counterparts in biology when taught with collaborative instructional strategy.

Research Question III: What is the effect of collaborative instructional strategy on students' interest in Biology?

Table 3 presents data on the mean and standard deviation interest rating of biology students. The data reveal that the post-test mean interest rating for biology students taught with collaborative instructional strategy is 2.97, while that of students taught with conventional method is 2.81. Students taught biology with collaborative instructional strategy thus had higher interest score than their counterparts taught biology conventional method.

Research Question IV: What is the influence of gender on interest of students taught Biology with collaborative instructional strategy?

Table 4 presents data on the mean and standard deviation interest ratings of male and female biology students taught with collaborative instructional strategy. The data reveal that the post-test mean interest rating for male biology students is 2.95, while the female biology students had mean achievement score of 2.99. Female biology students therefore, had a slightly higher post-test mean interest rating than their male counterparts when taught with collaborative instructional strategy.

Hypothesis I (Ho_1): There is no significant difference in the mean achievement of students taught Biology with collaborative instructional strategy and those taught with conventional method.

Table 5 presents data used for testing Ho_1. The data on Table 5 shows that the probability associated with the calculated value of F (41.391) for the effect of collaborative instructional strategy on the achievement of students in Biology is 0.000. Since the probability value of 0.000 is less than 0.05 level of significance, the null hypothesis is rejected. Thus, there is significant difference between the mean achievements scores of students taught

Biology with collaborative instructional strategy and those taught with conventional method.

Hypothesis II (Ho_2): There is no significant difference in the mean achievement of male and female students taught Biology with collaborative instructional strategy.

Table 6 presents data used for testing Ho_2. The data on Table 6 shows that the probability associated with the calculated value of F (250.994) for the effect of gender on the achievement of students taught Biology with collaborative instructional approach is 0.000. Since the probability value of 0.000 is less than 0.05 level of significance, the null hypothesis is rejected. Thus, there is significant difference between the mean achievement scores of male and female students taught Biology with collaborative instructional approach and those taught through the conventional approach.

Hypothesis III (Ho_3): There is no significant difference in the mean interest score of students taught Biology with collaborative instructional strategy and those taught with conventional method.

Table 7 presents data used for testing Ho_3. The data on Table 7 shows that the probability associated with the calculated value of F (2.240) for the effect of collaborative instructional strategy on interest of students in Biology is 0.136. Since the probability value of 0.136 is greater than 0.05 level of significance, the null hypothesis is retained. Thus, there is no significant difference between the mean interest rating of students taught Biology with collaborative instructional strategy and those taught through the conventional approach.

Table 5. Analysis of variance of students' mean achievement score in biology

Source	Type III sum of squares	df	Mean square	F	Sig.
Corrected Model	5681.973	2	2840.986	38.807	.000
Intercept	7594.818	1	7594.818	103.743	.000
PreTest	597.549	1	597.549	8.162	.005
Treatment	3030.181	1	3030.181	41.391	.000
Error	14422.027	197	73.208		
Total	344922.000	200			
Corrected Total	20104.000	199			
R Squared = .283 (Adjusted R Squared = .275)					

Table 6. Analysis of variance of students' mean achievement score in biology

Source	Type III sum of squares	df	Mean square	F	Sig.
Corrected Model	716.625	2	358.313	126.443	.000
Intercept	5580.269	1	5580.269	1969.199	.000
PreTest	10.046	1	10.046	3.545	.063
Gender	711.260	1	711.260	250.994	.000
Error	286.211	101	2.834		
Total	212955.000	104			
Corrected Total	1002.837	103			
R Squared = .715 (Adjusted R Squared = .709)					

Table 7. Analysis of variance of students' mean achievement score in biology

Source	Type III sum of squares	df	Mean square	F	Sig.
Corrected Model	2.394	2	1.197	2.418	.092
Intercept	18.905	1	18.905	38.193	.000
PreTest	1.189	1	1.189	2.401	.123
Treatment	1.109	1	1.109	2.240	.136
Error	97.513	197	.495		
Total	1773.984	200			
Corrected Total	99.907	199			
R Squared = .024 (Adjusted R Squared = .014)					

Table 8. Analysis of variance of students' mean interest score in biology

Source	Type III sum of squares	df	Mean square	F	Sig.
Corrected Model	.840	2	.420	.695	.501
Intercept	9.464	1	9.464	15.668	.000
PretTest	.790	1	.790	1.307	.256
Gender	.037	1	.037	.061	.805
Error	60.405	100	.604		
Total	972.826	103			
Corrected Total	61.245	102			
R Squared = .014 (Adjusted R Squared = -.006)					

Table 9. Interaction of gender and instructional strategy on students' achievement

Source	Type III sum of squares	df	Mean square	F	Sig.
Corrected Model	6375.056	4	1593.764	22.637	.000
Intercept	7386.145	1	7386.145	104.910	.000
PreTest	583.858	1	583.858	8.293	.004
Treatment	2700.254	1	2700.254	38.353	.000
Gender	236.437	1	236.437	3.358	.068
Treatment * Gender	418.576	1	418.576	5.945	.016
Error	13728.944	195	70.405		
Total	344922.000	200			
Corrected Total	20104.000	199			
R Squared = .317 (Adjusted R Squared = .303)					

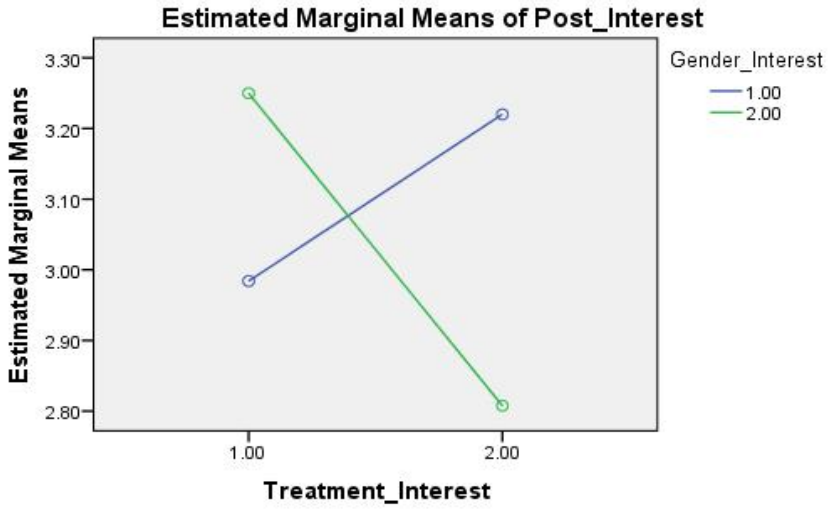

Fig. 1. Gender and instructional strategy on achievement

Hypothesis IV (Ho_4): There is no significant difference in the mean interest rating of male and female students taught Biology with collaborative instructional strategy.

Table 8 presents data used for testing Ho_4. The data shows that the probability associated with the calculated value of F (0.061) for the effect of collaborative instructional strategy on interest of students in Biology is 0.805. Since the probability value of 0.805 is greater than 0.05 level of significance, the null hypothesis is retained. Thus, the difference between the mean interest rating of male and female students taught Biology with collaborative instructional strategy is not significant.

Hypothesis V (Ho_5): There is no significant interaction effect of gender and instructional strategy on students' achievement in Biology.

Table 10. Interaction of gender and instructional strategy on students' interest

Source	Type III sum of squares	df	Mean square	F	Sig.
Corrected Model	2.730	4	.683	1.370	.246
Intercept	18.962	1	18.962	38.050	.000
PreTest	1.182	1	1.182	2.372	.125
Treatment	.937	1	.937	1.880	.172
Gender	.029	1	.029	.058	.811
Treatment * Gender	.316	1	.316	.063	.042
Error	97.177	195	.498		
Total	1773.984	200			
Corrected Total	99.907	199			
R Squared = .027 (Adjusted R Squared = .007)					

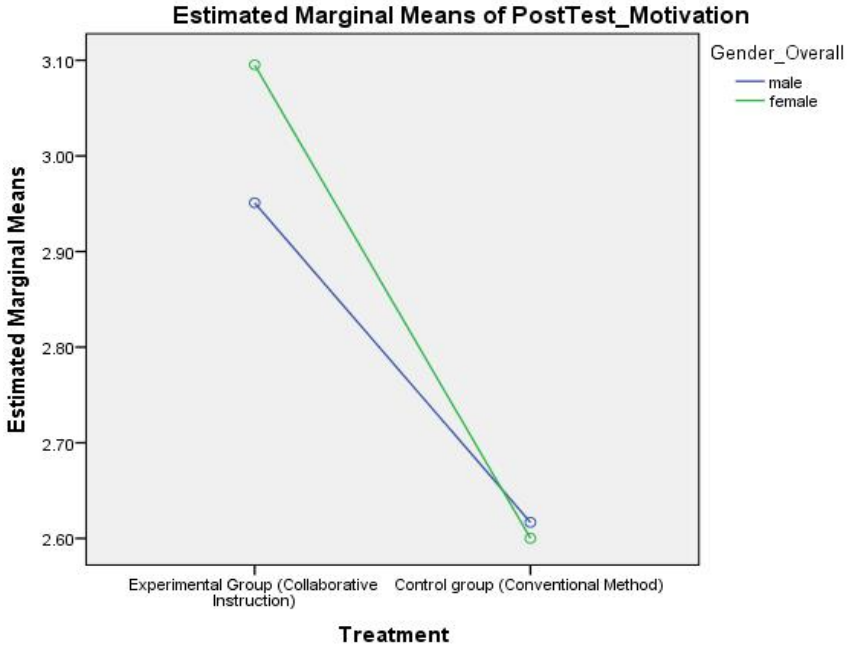

Fig. 2. Gender and instructional strategy on interest

The result presented on Table 9 showed that with respect to the interaction effect of instructional strategy/treatment and gender on students' achievement in Biology, an F-ratio of 5.945 was obtained with associated probability (p) value of 0.016. Since the probability (p) value of 0.016, is less than 0.05. The null hypothesis (Ho5) which stated that there is no significant difference in the interaction effect of gender and instructional strategy on students' achievement in Biology is thus rejected.

Fig. 1 further illustrate this finding and shows that gender and instructional strategy plots did intercept, highlighting that the interaction of gender and instructional strategy in affecting students' achievement in Biology. Suffice it therefore to say that the interaction effect of gender and instructional strategy on students' achievement in Biology is significant.

Hypothesis VI (Ho_6): There is no significant interaction effect of gender and instructional strategy on students' interest in Biology.

In the result presented on Table 10 showed that with respect to the interaction effect of instructional strategy/treatment and gender on students' interest in Biology, an F-ratio of 0.063 was obtained with associated probability (p) value of 0.042. Since the probability (p)

value of 0.0427 is less than 0.05, the null hypothesis (Ho_6) which stated that there is no significant difference in the interaction effect of gender and instructional strategy on students' interest in Biology is rejected.

Result from the test of hypothesis is explained by Fig. 2. The interaction plot (Fig. 2) showed that gender and instructional strategy plots did intercept, indicating interaction. Therefore, the interaction effect of gender and instructional strategy on students' interest in Biology is significant.

4. DISCUSSION

Findings revealed that students taught Biology using collaborative instructional strategy posted better achievement scores and interest ratings than their counterparts taught using conventional method. Female students had a slightly higher post-test mean achievement score and mean interest rating than their male counterparts in biology when taught with collaborative instructional strategy. This is an indication that collaborative instructional strategy significantly improved students' interest and achievement in Biology. By positively affecting students' interest in Biology, collaborative instructional strategy thus turns students' attention and focus to studying Biology, which significantly improves their achievement. The study's findings are consistent with those of Jirgba, Eriba and Achor [12] and Al-kaabi [11], that collaborative instructional strategy significantly enhanced students' achievement in Basic Science and Chemistry respectively.

Collaborative instructional strategy requires s working together to achieve spelt out instructional objectives. Collaborative instructional strategy requires that students establish a relationship among themselves and it is this relationship that fosters positive interdependence among them [7]. The instructional strategy also creates an environment where students are actively engaged in the teaching-learning encounter making contributions and learning from each other. It all these that stir their interest in the subject and eventually spur improved achievement. The findings are consistent with the submission of Malik [13], who posits that students' academic achievement in Biology can be improved if the teacher achieves a right blend of instructional material and method, an indication of the fact that using collaborative instructional strategy contributes to improving students' achievement.

The study's findings also revealed a significant interaction effect between gender and instructional strategy on students' achievement on student's achievement, but not interest in Biology. The latter is consistent with Nwafor [14] though in Chemistry, that gender and instructional strategy does not significantly influence students' interest in Biology. The finding however is also in line with Aniaku [15], Umoke and Nwafor [16] and Onah [17] that there was no significant interaction effect of teaching method/treatment and gender on students' achievement in Biology. This simply shows that female students are not less intelligent than male students but among what makes the differences is the instructional strategies teachers adopted during teaching/learning episode as well as learning environment [18]. The result therefore contradicts Ugwu [19] who found a significant interaction effect of teaching method and gender on students' achievement, though in Basic science. This disparity could be attributed to the way the teacher uses the instructional strategy and as such calls for appropriate use of collaborative teaching strategy.

5. RECOMMENDATIONS

The study recommends that:

1. Collaborative instructional strategy should be used to improve teaching and learning of Biology, as well as students' interest and achievement in Biology.
2. More time should be allotted to Biology teaching in the secondary timetable. This would help teachers effectively implement collaborative instructional strategy.
3. Considering its positive effect on achievement, collaborative instructional strategy should be inculcated in the secondary school Biology curriculum as one of the recommended strategies for teaching Biology.
4. Students' evaluation of the teacher's instructional strategy should make up criterion for routine inspection.

6. CONCLUSION

Collaborative instructional strategy is very significant in improving students' interest and achievement in Biology. However, when misused or not properly implemented, it could have little or

no effect on either learning outcome. It is therefore imperative that the teacher properly understands what the method is about, as well as how to effectively use it in delivering Biology lessons, if the rewards would be reaped.

CONSENT

As per international standard or university standard, students' written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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