



## Effect of collaborative instructional strategy on secondary school students' achievement on essay writing in English language

Udeh Judith Chinedu, Ubi Veronica, Okpube Nnaemeka Michael  
Ebonyi State University, Abakaliki, Ebonyi State, Nigeria

### Abstract

The study investigated the efficacy of collaborative instructional strategy on senior secondary school two (SS II) students' achievement on essay in English Language. Three research questions and three null hypotheses guided the study. The quasi-experimental research design of the pretest-posttest non-equivalent control group design was adopted for the study. The study population comprised 6,797 SSII students in all the 56 public secondary schools in Abakaliki Urban, Ebonyi State Nigeria. The sample of the study comprised 330 students in all the intact classes of six-co-educational schools randomly drawn for the study. English Essay Writing Achievement Test (EEWAT) with reliability coefficient of 0.87 was used for data collection. Mean and standard deviation were used to answer the research questions while analysis of covariance (ANCOVA) was used to test the hypotheses at 0.05 alpha level of significance. Results showed that: students taught essay writing using collaborative approach had higher mean score than those taught using the conventional talk and chalk approach. Also, there was no significant difference in the mean achievement scores of male and female students taught essay writing using the collaborative strategy. Equally, there was no interaction between methods and gender on the students mean achievement scores in essay writing as both male and female students in the treatment group respectively achieved higher mean scores than their counterparts in the control group. In line with the findings, it was recommended that collaborative instructional strategy be adopted by English language teachers at the senior secondary school level because of its proven efficacy in enhancing students' academic achievement.

**Keywords:** English language, essay writing, collaborative instructional strategy, secondary school students and academic achievement.

### Introduction

English language is a second language to many nations colonized by Britain, but has reached a high global position which other languages have not. The history of English language in Nigeria can be traced back to the colonial era. It was a language of high status of great importance. It has since then continued to enjoy a very high status within the Nigerian society, 60 years after independence. As it stands presently, it has become an international language. Since it has gained access into all aspects of life including, science, technology, international relations policy-making and administrative records. Babalola and Agbaje (2019) [5], states that it is practically used as an official language in publishing many learning resources globally because of its relevance and appearance in the curriculum of most schools. Notwithstanding the Nigerian multilingual situation, English language is one of the core subjects in the secondary schools and a pre-requisite for admission into the tertiary institutions with a minimum of credit pass. The significant role it plays in the teaching-learning process from the primary to tertiary levels of education in Nigeria makes it a very essential tool to the academic success of the students. Examinations are conducted in English language, textbooks recommended for students in every subject (except for the mother tongue) are all written in English language. Akakuru, Onah and Opara (2020) [11] posit that Nigerian would not have functioned well without English language as a unifying language considering its numerous indigenous and tribal languages. Kanno, Onwukwe & Maduabum (2002) observe that though, there is a welcome trend in the development of indigenous Nigerian language, English language will remain

a functional national language in the future. Nkechinyere and Otdu (2018) [12] attest that education should equip its products to communicate adequately, expressing their opinions, emotions, thoughts, attitudes, clearly in an organized manner. Aliyu (2014) [7] states emphatically that: "English language is in effect, the second language of Nigeria, essential for success in the educational process and in other areas of national life. It is not surprising therefore; that so much attention and resources have been and continued to be devoted to its teaching and learning in Nigerian schools, and it is likely to continue for many years" (p:33).

Ibe (2020) states that English language is part of student's environment and therefore should be gripped by students in senior secondary school not only for examination purpose but for total competence in future endeavours. No wonder some scholars having seen the relevance of English language in the country attest that it serves as the lifeblood of the whole educational system and life success in Nigeria as a whole (Ibe, 2020) [10]. The Federal Republic of Nigeria (FRN, 2014) [7] in its national policy on education buttresses the importance of English language that virtually all human activities revolve around it. Therefore, English language is very imperative to life.

When English language is properly taught in a second language (ESL) situation, it needs the proper teaching of the complex interrelated skills: listening, speaking, reading and writing. The Senior School Certificate Examination (SSCE) syllabus clearly categorized English language into five: comprehension, lexis and structure, summary, essay and letter writing and oral English of which a good knowledge

of the first three enhances performance in essay writing.

The word essay is derived from the French infinitive 'essayer' meaning "to try" or "to attempt". In English, essay first of all meant "a trial" or "an attempt" and still an alternative meaning. Essay can be seen as a short piece of writing given to students to examine their level of understanding of the mastery and use of the language. Agwu and Nweke (2020) assert that the organization and arrangement of ideas in a logical and sequential order to make a complete meaning is referred to as essay. Thus, an essay must have a topic or subject matter which is developed in paragraphs with a coherent start or introduction, a well-arranged body and short conclusion. Essay and letter writing skills are very fundamental in the development of language learning. It is expressive and lasts longer compared to speaking and mostly, less understood by students. Essay writing is the most important compared to other language skills and determines to a great extent the success of students in both internal and external examinations.

Ghaith (2016) sees essay writing as a complex process that allows writers to explore thoughts and ideas and make them visible and concrete. It is therefore important that continuous efforts be made at enhancing the teaching and learning of essay writing among learners of English language. Hence writing well is not an option but a necessity. It is of different types namely: argumentative, narrative, expository, and descriptive essays. Oba (2015) defines narrative essay as relating to a number of events in narrating a story and it is used as a means of explaining an idea when anecdote is introduced. However, narrative essay is just telling a story which gives account to the reader. In a writer's point of view, this story telling goes beyond having a beginning, middle and the end but must have a plot which it should bear and develop throughout the story. This plot should be filled with major happenings of the story which will together give it a point or theme. In a nutshell, a narrative, good narrative essay gives human interest, triggers our curiosity and brings us near to the writer. It equally provides entertainment and insights by helping to discover values, explores options and examines motives.

A descriptive essay is a kind of essay that gives the learners the chance to desire a person, place, object, emotion, experience, situation, etc. it allows the student to paint the picture of what he has in mind in words. It also enables students to illustrate something with words using the five senses. Expository essay on the other hand, combines the qualities of all the other types of essays. It investigates an idea, evaluates evidence, expounds on ideas and also sets argument about idea in clear and concise manner. While argumentative essay expects students to investigate a topic, collect, generate and evaluate evidence and establish a stand on the topic in a concise manner (Anasi, 2015). It is mainly devoted to arguing out an issue, ideally looking at both sides and lastly gearing to a rational and logical conclusion. It further aims to persuade the reader to accept the writer's point of view.

Good essay writing skills are expected for secondary school students to pass at credit level in the West African Secondary School Certificate Examinations (WASSCE). Essay writing is allocated the highest mark in the WASSCE. It is therefore imperative that continuous efforts be made cum directed at enhancing the teaching and learning of essay writing skills among students to meet the growing

demand of the secondary school curriculum (Kamil, 2013; Snow & Biancorosa, 2013)<sup>[3]</sup>.

Nigeria is not an exception to the above/preceding assertion. In the national curriculum for senior secondary school English, FRN (2014)<sup>[7]</sup> states that the curriculum is made, to attain a high level of proficiency in the Nigerian students' use of the English language in preparing students for tertiary and vocational education for the world of work after leaving school. However, this dream cannot come true without achieving competency in the art of writing. Unfortunately, Nigerian students are far below this expectation in mastering the skills of written English. This has generated serious alarm for stakeholders in education sector; parents, teachers, school authorities and the government. The poor performance of students in English language is attributed to some factors such as poor learning atmosphere, parents interest to education, students interest, available human and material resources for teaching and learning and instructional methods.

Bhowmik (2016)<sup>[6]</sup>, revealed that the problem with respect to teaching strategies is that most teachers still believe that the most effective means of communicating knowledge is through the conventional "talk and chalk" strategy. The 'talk and chalk' as used in this context is the traditional way of imparting knowledge whereby students' participation is limited during teaching process (Gull & Shehzad, 2015)<sup>[8]</sup>. Hence, it is a teacher-centered strategy. More importantly, the conventional teaching approach has not been able to meet learners' needs as mass failure of students in Use of English is a reoccurring issue (Akakuru *et al*, 2015)<sup>[4]</sup>. The WAEC Chief Examiners Reports indicated that constant use of conventional teaching strategies contributed to students' poor achievement and retention in some English language topics such as essay writing. The conventional talk and chalk method does not give students opportunity to think, form basic concept, plan or even write coherently. Experiences have shown that writing skills are often the most neglected and badly taught by teachers especially at the senior secondary school level. This affects the achievement of students in essay writing. It is therefore needful that an instructional approach like the collaborative strategy be employed by teachers to enhance students writing skills and achievement in essay writing. A method that will be students and activity-based; and will remedy the conventional teaching method. This is why this study considered collaborative strategy as a possible remedy.

Collaborative instructional strategy is innovative and learner-based designed to prepare learners with effective writing skills that will make them become better writers (Shara, 2018)<sup>[14]</sup>. It will also help the students to move from known to unknown and while the students contribute, the teacher modifies and moderates. According to Achufusi-Aka and Okpanachi (2021)<sup>[2]</sup>, collaborative method enables the learners to dialogue and examine different perspectives that make them to discuss and examine various aspects that make learners become more knowledgeable, strategic, self-determined and emphatic. In a collaborative classroom, students are divided into smaller groups while the teacher encourages active participation and healthy interaction among students (Ihejiamaizu, Neji & Agiande, 2020)<sup>[10]</sup>. The strategy enables students not only to perform better in English language (Makini *et al*, 2020)<sup>[11]</sup> but for general academic success (Adolphus, Alamina & Aderonmu, 2013)<sup>[3]</sup>. It also helps students to work in pairs to produce co-

authored paragraphs and well thought out essay writing. Hence its consideration by the researchers to examine its efficacy in enhancing students essay writing proficiency in secondary schools in the study area.

Consequently, in collaborative instructional strategy, gender is also considered to be an important factor in students leaning of essay writing because of the interplay of masculinity and femininity in different aspects which ranges from observations and real-life interactions (Umoh, 2016; Emmanuel & Samuel, 2016) [16]. Gender differences in academic achievement in some fields of learning have been attributed to interactions between physical, psychological and physiological attributes of the learners (Uzobuiké & Okoli, 2020; Agu & Iyamu, 2020; Ibe & Abamuche, 2019 [9]; Uzoechi & Gimba, 2015). Although collaborative strategy has been widely advocated and applied in sciences, arts and social sciences, its workability in essay writing classroom has not been subjected to empirical verifications irrespective of the various claims and counterclaims by researchers in the fields of English language concerning the technique. As such the workability or otherwise, of this approach in the teaching and learning of essay writing in senior secondary schools in Nigeria, need to be empirically investigated.

### Problem Statement

Achievement in Use of English in SSCE over the years has remained continually poor. It has raised a lot of eyebrows on the quality of Nigerians educational system as evident in the WAEC chief examiners reports of 2022 to 2024 [17, 19]. This problem could be traced to poor knowledge and lack of progress in essay writing, weighing down the importance of English language in total academic success. Equally, the poor knowledge could be attributed to the use of conventional methods of teaching which do not help develop the mental and writing skills of the learners. Evidence of poor achievement of Nigerian students in May/June WASSCE Use of English examinations between 2022 – 2024 [17, 19] as reported by the examination body is a cause for worry as presented in table 1 below.

**Table 1:** 3 – year percentage performance of Nigerian candidates in Use of English language in May/June SSCE

Subject/year	% of Passes (A1 – C6)			% of Passes (D7 – F9)		
	2022	2023	2024	2022	2023	2024
English Language	34.67	35.09	35.82	65.33	64.91	64.18

**Source:** Statistics Department of the WASSCE Office Yaba, Lagos (2023) [18].

Several studies (Agu & Iyamu, 2020; Uzobuiké & Okoli, 2020; Ibe & Abamuche, 2019; Achor, Danjuma & Orji, 2019; Okeke, 2018; Umar, Fugu & Aliyu, 2018 [1, 9, 13, 15], among others) have identified instructional approaches as a major factor responsible for the poor achievement of students at the secondary school level. Although collaborative instructional strategy is pin-pointed as a viable approach for teaching essay writing, little is known about the effect of collaborative instructional strategy on students' achievement in essay writing. It is against this premise that the major issue of academic concern for this study posed as a question is: what is the effect of collaborative instructional strategy on the academic achievement of senior secondary school students in essay writing?

### Research questions

1. What is the effect of collaborative instructional strategy on the mean achievement scores of students in essay writing?
2. What is the effect of collaborative instructional strategy on the mean achievement scores of male and female students in essay writing?
3. What is the interaction effect of methods and gender on the mean achievement scores of students in essay writing?

### Hypotheses

Ho<sub>1</sub>: There is no significant effect of collaborative instructional strategy on the mean achievement scores of students in essay writing.

Ho<sub>2</sub>: There is no significant difference in the mean achievement scores of male and female students taught essay writing using collaborative instructional strategy.

Ho<sub>3</sub>: There is significant interaction between methods and gender on students mean achievement scores in essay writing.

### Methods

The quasi-experimental design of the pretest-posttest non-equivalent control group design in which intact classes of SS II students were studied was adopted for the study. The study was conducted in randomly drawn six-co-educational secondary schools in Abakaliki Urban, Ebonyi State, Nigeria. The study population comprised 6,797 SSII students in all the 56 co-educational public secondary schools in Abakaliki Urban. Sample comprised 330 (177male and 153 female) students in all the intact classes of the six sampled schools. English Essay Writing Achievement Test (EEWAT) with reliability coefficient of 0.87 established using Kendell's Coefficient of Concordance (w) was used for data collection. Pretest was administered to the students in their respective groups by their classroom English teachers who served as research assistants. After a period of six weeks for the treatment administration, the same test was re-administered to the students as posttest. Mean and standard deviation were used to answer the research questions while ANCOVA was used to test the hypotheses at 0.05 alpha level of significance.

### Results

#### Research Question 1

**Table 2:** mean achievement of students in essay writing based on methods

Strategies	N0.	Mean (X)	Standard Deviation (SD)
Collaborative	154	72.79	7.42
Conventional chalk and talk	176	52.18	7.60

Based on the results in Table 2, students taught essay writing with collaborative instructional strategy had a mean achievement score of 72.79 and a standard deviation score 7.42 while those taught with conventional talk and chalk method had a mean achievement score of 52.18 and standard deviation score of 7.60. This implies that collaborative instructional strategy is more efficacious in enhancing students' academic achievement in essay writing than the conventional talk and chalk method.

## Research question 2

**Table 3:** mean result of male and female students taught essay writing using collaborative strategy

Gender	N0.	X	S. D
Male	81	72.85	7.88
Female	73	72.74	7.89

Result in table 3 showed that male students had a mean score of 72.85 and standard deviation score of 7.88 while their female counterparts had a mean score of 72.74 and standard deviation score of 7.89. it showed that male students slightly achieved better than the female ones.

## Research question 3

**Table 4:** summary of interaction between gender and teaching strategies on students mean achievement scores in organic chemistry

Gender group	Adjusted mean for 4MAT	Adjusted mean for Control
Males	72.85	52.35
Females	72.74	51.98

Summary of result presented in table4 reveal clearly that there is no significant interaction effect of gender and teaching methods on students' achievement scores in essay writing. Result presented in the table indicated that collaborative strategy is superior to conventional chalk and talk method at the two levels of gender (male and female).

## Ho<sub>1</sub> and Ho<sub>3</sub>

Summary of result on table6 revealed that the sig. value of 0.481 is greater than 0.05. Because the sig. value is greater than 0.05, the null hypothesis was upheld. The researcher concludes that there was no significant difference in the mean achievement scores of male and female students taught essay writing using collaborative instructional strategy.

## Discussions

Result revealed that the collaborative strategy with an adjusted mean of 72.79 was more facilitating than the conventional talk and chalk method with a mean score of 52.15. This means that students taught with collaborative strategy would perform better academically than those taught with the conventional talk and chalk method in easy writing. The result is in tandem with that of Babalola and Agbaje (2019) <sup>[5]</sup> who found collaborative strategy more facilitating than the conventional talk and chalk method in English language. The result could not have been otherwise because Makini, Barasa, and Chemwei (2020) <sup>[11]</sup> found out in their study that collaborative instructional strategy leads

**Table 5:** ANCOVA results of students based on teaching methods

Source of variation	Sum of Squares	df	Mean Sum of Squares	F.cal.	Sig. of F.
Corrected Model	30256.249 <sup>a</sup>	4	7564.062	1428.929	.000
Intercept	1637.767	1	1637.767	309.391	.000
Pretest	2872.545	1	2872.545	542.653	.000
Method	1839.540	1	1839.540	347.508	.000
Gender	1079.218	1	1079.218	203.875	.000
Method*Gender	383.515	1	383.515	72.450	.714
Error	1535.121	2	5.294		
Residual	18536.870	327	56.688		
Total	49236.800	329	149.656		

Significant at P < 0.05

For hypothesis 1, the ANCOVA result in table5 shows the sig. value of 0.000 is less than 0.05. The decision rule is to reject the null hypothesis when the sig. value is less than alpha value of 0.05. Since the sig. value is than 0.05, the null hypothesis was rejected. The researcher concludes that there is a significant difference in the mean achievement scores of students taught essay writing using collaborative instructional strategy and those taught essay writing using the conventional chalk and talk strategy. For hypothesis 3, result in table5 revealed that for two-way interaction, F.Sig. is 0.71 which is greater than 0.05. Based on the decision rule, the researcher upheld the null hypothesis and concludes that there is no significant interaction between gender and teaching strategies on students' mean achievement scores in essay writing.

## Ho<sub>2</sub>

**Table 6:** ANCOVA results of students based on gender

Source of variation	Sum of Squares	df	Mean Sum of Squares	F.cal.	Sig. of F.
Corrected Model	3779.340 <sup>a</sup>	2	1889.670	353.486	.000
Intercept	1808.303	1	1808.303	338.266	.000
PRETEST	957.983	1	957.983	179.203	.000
GENDER	1530.218	1	1530.218	286.246	.481
Error	785.834	2	5.346		
Residual	48428.957	152	148.101		
Total	216028.000	154			

to higher academic achievement than the conventional talk and chalk method. Equally, Akukuru, Onah, and Opara (2015) <sup>[4]</sup> found the same effect on English language performance of secondary school students. By implication, using collaborative strategy is result oriented because students learn better when they are in groups and also learn from one another. This method also allows students to interact with one another, air their minds, ask questions and above all share ideas. All these activities support Bnadura's social learning and Vygotsky learning theories where students learn in group socially. The students obtained better results with collaborative strategy than the conventional talk and chalk method because working in group helped them gain better understanding of the essay topic, brainstorm to form sentences into paragraphs using appropriate works. This implies that teaching method adopted by the teacher was good and learner-centered, and therefore, effective for enhancing achievement in essay writing. On the test of significance of the hypothesis one, the result in table5 revealed a significant difference in the mean achievement of students taught essay writing with collaborative

instructional strategy and those taught with the conventional talk and chalk method. This further justifies that using collaborative instructional strategy enhances students' academic achievement in essay writing than the conventional talk and chalk method of instruction. It further justifies that clearly that collaborative instructional strategy ensures and encourages active exchange of ideas within the group, of end to increase interest and subsequently promotes critical thinking resulting into better or higher academic achievement.

Furthermore, result in table3 indicates that male students had almost the same result as the female students (mean scores 72.85 vs 72.74) respectively. This shows that a very slight or moderate effect on the males over the females. However, the male students did better than female students. On a general note, the males and females in the treatment group (collaborative instructional strategy) performed better than their counterparts in the control group (conventional talk and chalk method). The result is in disagreement with Umeanyo (2013) <sup>[3]</sup> who in research on verbs in English using written composition opined that boys commit more errors than girls. When applied in this study, the females were expected to have a higher achievement than the males. But it is not so; the strategy is favourable to both sexes because the performance of the students; did not vary in anyway. The collaborative strategy is considered appropriate in teaching and improving students' performance and output in essay writing since both male and female students alike achieved higher compared to those taught with the conventional talk and chalk method. The researchers therefore, disagreed with Umeanyo (2013) <sup>[3]</sup> whose result was that male students commit more errors in English composition than female students. Based on the findings, it was discovered that both male and female students do commit errors in English composition. The idea here is that collaborative strategy improves students' achievement in writing irrespective of sex. On test of significance, the result in table6 shows that the f.cal. of 0.089 is less than f.crit. of 5.84, hence the null hypothesis ( $H_0$ ) was not rejected. This connotes that there is no significant difference in the mean achievement of male and female students' when taught with collaborative strategy. This result agrees with Ogbu (2019) <sup>[5]</sup> who found no significant effect difference on male and female students' achievement when taught with corporative strategy.

More so, male students taught essay with collaborative strategy had a mean achievement score of 72.85 while their female counterpart taught with the same strategy had a mean achievement score of 72.74. When these figures were placed against the background of the results on gender as shown in tables 4 and 5, there was no interaction effect of methods and gender on students' mean achievement in essay writing. This result aligned with Achufusi-Aka and Okpanachi (2021) <sup>[2]</sup> study that reported no interaction effect of methods and gender on students' achievement in selected chemistry topics. Though the strategy was successful in science subject such as chemistry, it involves practices on the part of the students. It means that intensive methods and gender have positive effect on students' achievement in essay writing. On the test of significance, the result indicated no significant interaction effect as shown in table5. This result agrees with Babalola and Agbaje (2019) <sup>[5]</sup> who examined the effect of collaborative instructional strategy on students' achievement in social studies and

found that it enhances students achievement in the subject than the conventional talk and chalk method. This is also corroborated in Ihejiamaizu, Neji, and Agiande (2020) <sup>[10]</sup> study that reported no interaction effect of methods and gender on students' achievement in essay writing.

### Conclusion

The major findings of this study revealed that students performed credibly well when taught with collaborative instructional strategy than with the conventional lecture method. Based on the educational implications of the findings, the researchers conclude that collaborative instructional strategy is efficacious in enhancing students' academic achievement in essay writing.

### Recommendations

Based on the results of this study, the following recommendations were made:

1. The collaborative instructional strategy should be adopted by secondary school English language teachers since it is more facilitating and yields better results for students;
2. The findings of this study should be exposed to teachers of English language through conference, seminars and school workshops by the researchers;
3. Principals and secondary education board (SEB) should encourage the acquisition of this strategy through sponsoring the teachers to conferences, seminars and workshops; and
4. Curriculum planners should in the course of reviewing school textbooks, integrate the usage of innovative instructional strategies such as collaborative instructional strategies into the curriculum.

### References

1. Achor EE, Danjuma IM, Orji ABC. Classroom interaction practices and students' learning outcomes in physics: implications for teaching - skill development for physics teachers. *Journal of Education and e-Learning Research*,2019:6(3):96-106.
2. Achufusi-Aka NN, Okpanachi EE. Effect of collaborative learning strategy on students' academic achievement in chemistry in Onitsha education zone, Anambra state, Nigeria. *International Scholars Journal of ARTS and Social Science Research*,2021:3(3):182-189.
3. Adolphus T, Alamina J, Aderonmu T. The effects of collaborative learning on problem-solving abilities among senior secondary school physics students in simple harmonic motion. *Journal of Education and Practice*,2013:4(5):95-100.
4. Akukuru O, Onah TA, Opara DC. Cooperative learning and students academic achievement in English language in Imo state, Nigeria. *Journal of Research and Method in Education*,2015:5(3):2320-7388. <https://doi.org/10.9790/7388-05342629>
5. Babalola JO, Agbaje FI. Collaborative pedagogy and students' academic achievement in English language in Ekiti state, Nigeria. *Advances in Social Sciences Research Journal*,2019:6(11):36-44. <https://doi.org/10.14738/assrj.611.7266>
6. Bhowmik M. Impact of collaborative learning on academic achievement in mathematics of secondary school students in the school hostel in rural area in

- India. *British Journal of Education, Society & Behavioural Science*,2016:14(1):1-7.
7. Federal Republic of Nigeria (FGN). National policy on education. Lagos: NERDC Press,2014.
  8. Gull F, Shehzad S. Effects of cooperative learning on students' academic achievement. *Journal of Education and Learning*,2015:9(3):246.  
<https://doi.org/10.1159/edulearnv9i3.2017>
  9. Ibe E, Abamuche J. Effects of audiovisual technological aids on students' achievement and interest in secondary school biology in Nigeria. *Heliyon*,2019:5(6):e01812.  
<https://doi.org/10.1016/j.heliyon.2019.e01812>
  10. Ihejiamaizu CC, Neji HA, Agiande IU. Effect of cooperative learning strategy on senior secondary school students academic performance in biology in Cross River state, Nigeria. *European Journal of Scientific Research*,2020:156(2):138-144.
  11. Makini VS, Barasa FS, Chemwei B. Effect of cooperative learning approach on students' academic achievement in English in co-educational public secondary schools, Nakuru County, Kenya. *Journal of Literature, Languages and Linguistics*,2020:64(7):54-60.
  12. Nkechinyere OM, Ordu OK. Impact of collaborative learning strategy on the academic achievement of senior secondary school chemistry students in Obio-Akpor local government area. *International Journal of Education and Evaluation*,2018:4(2):11-18.
  13. Okeke OJ. Effects of students' interaction patterns on achievement and interest in chemistry among secondary school students in Agwu Education Zone of Enugu State, Nigeria. *Science Education Journal of Academic Research*,2018:1(1):21-26.
  14. Shara Y. Cooperative learning for academic and social gain: valued pedagogy, problematic practice. *European Journal of Education*,2018:45(2):300-313.  
<https://doi.org/10.1111/j.1465-3435.2020.01430x>
  15. Umar HM, Fugu YA, Aliyu H. Prediction of academic performances in biology among public senior secondary school students in Kwara State, Nigeria. *International Journal of Education and Research*,2018:6(12):79-90.
  16. Umoh SW. Problems and prospects of effective science, technology and mathematics (STEM) education delivery in Nigeria. *Knowledge Review*,2016:35(1):1-5.
  17. West African Examination Council (WAEC). Chief examiners report. Lagos: Nigeria, 2022.
  18. West African Examination Council (WAEC). Chief examiners report. Lagos: Nigeria, 2023.
  19. West African Examination Council (WAEC). Chief examiners report. Lagos: Nigeria, 2024.