JOURNAL OF SCIENCE, TECHNOLOGY AND EDUCATION (JSTE) VOL. 9. NO. 2

JSTE PUBLICATIONS, 2024 www.nsukjste.com/

ISSN: 2651-5539

EFFECT OF STUDENT TEAMS ACHIEVEMENT DIVISION ON FIELD DEPENDENT AND FIELD INDEPENDENT STUDENTS ACHIEVEMENT AND RETENTION IN NERVOUS SYSTEM

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Citation: Mustapha-Salami S. Y., Uzoechi. B. C. & Musa D. C. (2025). Effect of student teams' achievement division on field dependent and field independent students' achievement and retention in nervous system. *Journal of Science, Technology, and Education (JSTE)*; www.nsukjste.com/ *9*(3), 33-45

Abstract

This study investigated the effect of Student Teams Achievement Division on field dependent and field independent students' achievement and retention in nervous system in Abuja, Nigeria. The study was a quasi-experimental research of pretest, posttest control group design. A sample of 257 SS2 students used for the study was drawn using multi stage sampling technique from a population of 7,756 SS2 students in Bwari Area Council. For the purpose of data collection for the study, two instruments, Nervous System Achievement Test (NSAT) and Group Embedded Figure Test (GEFT) were used. The reliability of the instruments was determined using Kuder-Richardson formula 21 (K-R_{21}) and both yielded reliability coefficients of 0.88 for NSAT and 0.81 for GEFT. The research questions were answered with means and standard deviation while Analysis of Covariance (ANCOVA) was used to test the hypotheses at 0.05 level of significancee. Findings from the study revealed that students taught nervous system using STAD achieved more and retained the subject matter better than their counterparts taught with conventional method. It was also found that students' cognitive style and gender is a significant factor that affect their achievement and retention in nervous system. It was therefore recommended that biology teachers should adapt instructional strategies like STAD to teach nervous system. Also teachers should consider students learning styles to enable them tailor instructions to meet the need of their students.

Keywords: Student Teams Achievement Division, Field Dependent Students, Field Independent Student, Achievement and Retention.

Introduction

It is globally acknowledged that science and technology are integral to the changing world because they supply man's basic needs such as food, clean water, energy, shelter, basic health care and education among others. A qualitative and functional Science, Technology, Engineering and Mathematics (STEM) education plays a vital role in determining the level of scientific and technological development in every nation. Onu (2017) asserts that no nation can become great, without science and technology. It is in this realization that all nations including Nigeria lay emphasis on science education at all levels including secondary school. Federal Republic of Nigeria

(FRN, 2014) in the National Policy on Education (NPE) states that the objective of Post -Basic Education and Career Development (PBECD) among others shall be to provide trained manpower in the applied sciences, technology and commerce at sub-professional grades. The science subjects identified by the National Policy on Education (Biology, Physics, Mathematics and Chemistry among others) are very important in the preparation of an individual for useful living and for higher education which are the objectives of PBECD. According to Nwafor and Oka (2016), the study of these science subjects equips its beneficiaries with necessary scientific skills required for human survival, sustainable development and societal transformation.

Biology is a natural science concerned with the study of life and living things, including their structure, function, growth, evolution, distribution and scientific exploration (Hadjichambis, et al. 2015). Biology is offered in all Senior Secondary Schools in Nigeria by both Science oriented and Arts based students. The effective study of biology will contribute to the improvement of Agriculture which is basically one of the 17 Sustainable Development Goals to be achieved by the year 2030. Likewise, it has a vital role in controlling environmental pollution and making the planet a safer place which is also one of the global goals for sustainable development come year 2030. Biology also serves as prerequisite subject for courses like medicine, pharmacy, nursing and a host of other courses in the tertiary institutions.

Despite the importance of Biology, it is however worrisome to note that Chief Examiners Report had pointed out that there is fluctuating achievement of students in Biology in the Senior Secondary School Certificate Examination (SSCE) in Nigeria from 2015-2023.

Table 1: WAEC Result in Biology FCT, Abuja from 2015 – 2023

Year	No. of candidates Reg.	Total credit A1-C6	%credit grade A1-C6	Total pass D7-F9	%Failure for D7 - F9
2015	3,114	1,823	58.5%	1291	41.5%
2016	3,930	2,950	75.1%	480	24.9%
2017	4,005	2,528	63.1%	1477	36.9%
2018	4,811	2,862	59.5%	1949	40.5%
2019	5,254	3,492	66.5%	1762	33.5%
2020	4,506	3,112	69.1%	1394	30.9%
2021	4,001	2,672	66.8%	1329	33.2%
2022	4,758	2,968	62.4%	1,790	37.6%
2023	4,532	3,199	70.6%	1,333	29.4%

Source: Education Resource Centre Abuja (2023)

The likely causes of fluctuating performance have continuously grabbed the attention of stakeholders in science education and how to combat this continuous trend. Several reasons have been found to be responsible. Badmus and Omosewo (2018) noted that government plays a role because education is underfunded below the recommended United Nations Education, Scientific and Cultural Organization (UNESCO) benchmark of 26%. This could only lay credence to why the field of education and science education in particular has not met or surpass its expectations. In addition, Badmus and Omosewo (2018) identified teacher- factors such as incompetency of teachers, lack of motivation to teach science, scarce supplementary teachers' training through workshops, conferences and fora alike, poor implementation of curriculum, inadequate science teachers and inadequate teaching and learning resources. It can be deduced that these teacher -factors contribute to students' poor achievement and retention in biology.

Furthermore, Badmus and Omosewo (2018) study on student-related -factors revealed that students perceive science to be abstract and a difficult field essentially because they have difficulties in problem solving which is an essential ingredient in science. Students are faced with challenges which includes but not limited to; teachers' incompetence in the delivery of the subject matter, outdated laboratories, obsolete textbooks, unavailability of instructional materials, unrealistic methods of teaching, lack of requisite mathematical background for effective calculation and manipulations, attitudinal decay in science as a result of lack of mass and real representation of the subject. More specifically, Chief Examiners report on nervous system indicates that students find it extremely difficult to spell technical terms, they illustrate reflex arcs with poor diagrams which are either untitled or improperly titled. In many cases guidelines were drawn with freehand and did not touch the structure to be labelled. In addition, most students omit vital parts when required to draw a nerve cell /neuron. Idoko and Njoku (2017) also reported poor laboratory facilities and poor pedagogical characteristics of teachers.

Statement of Problem

The rapid development in the field of neuroscience has made teaching about the nervous system to become a back breaking task in secondary biology and science education. Curricula goals are often too general to guide instruction, and information about the nervous system has become overwhelming and diverse with widespread relevance in society. Being a topic in the field of human anatomy, learning about nervous system may be a daunting task for students for several reasons, such as, understanding anatomical terminology and

learning complex physiological processes which are somewhat abstract. Consequently, there is need to explore instructional strategies that will address the challenges students face when learning nervous system as a topic they find difficult.

Equally, the Chief Examiner's report from year 2008 to 2023 posits that students find it extremely difficult to spell technical terms, they illustrate reflex arcs with poor diagrams which are either untitled or improperly titled. In many cases guidelines were drawn with freehand and did not touch the structure to be labeled. In addition, most students omit vital parts when required to draw a nerve cell /neuron. Regrettably, all these observations from the chief examiner's report indicated students' poor achievement in nervous system as a topic and Biology as a whole. Hence, the thrust of this study is to determine the effect of Student Teams Achievement Division on Field Dependent and Field Independent Students Achievement and Retention in Nervous System in Abuja, Nigeria.

Objectives of the Study

The main purpose of this study was to investigate the effect of Student Teams Achievement Division (STAD) on Field Dependent and Field Independent Students Achievement and Retention in Nervous System in Abuja, Nigeria. Specifically, this study sets out to:

1. determine the effect of STAD on SS2 students' achievement in Nervous System.
2. determine the effect of field-dependent and field independent on SS2 students' achievement when taught nervous system with STAD.

Research Questions

The following research questions were formulated to guide this study:

1. What are the mean achievement scores of Senior Secondary 2 biology students taught nervous system using conventional method and those taught using STAD?
2. What are the mean achievement scores of field-dependent and field independent on Senior Secondary 2 biology students when taught nervous system with STAD?

Research Hypotheses

The following null hypotheses were formulated and were tested at P = 0.05 level of significance:

H_{O1}: There is no significant difference in the mean achievement scores of Senior Secondary 2 biology students taught nervous system using conventional method and those taught using STAD.

H_{02}: There is no significant difference in the mean achievement scores of field-dependent and field independent Senior Secondary 2 biology students taught nervous system using STAD.

Literature Review

Gana etal (2023) investigated the effects of system concept mapping on academic performance and retention in nervous system among secondary school students in Niger State,

Nigeria. It used a combined Pre-test, Post-test, Non-equivalent groups' Quasi-Experimental design. The population is the 20,413 public senior secondary school biology students for 2020/2021 academic session in the seven educational zones of 25 Local Government Areas of Niger State. 173 participants were sampled through multistage random sampling. The study had an adapted test instrument from past West African Senior School Certificate Examination questions and one adapted treatment tool. The instrument and tool were validated by experts. The validated test instrument was tested and retested during pilot study to establish its reliability using Pearson product moment correlation coefficient where a reliability index of 0.78 was obtained. The data was analysed using Mean and Standard Deviation and independent samples t-test at 0.05 alpha level. The study found that; Students taught Nervous System using System Concept mapping performed and retained significantly better than those taught using the conventional method and hence, concluded that the use of System Concept mapping was more effective in teaching Nervous system than the conventional method among Secondary School Biology Students in Niger State. It was recommended that System Concept mapping be encouraged among Biology Teachers in teaching the Nervous system and other Biology concepts in Nigerian Secondary School.

The gap between this study under review and this present study is that reviewed study did not take into account the learning style of the students while this present study is on the effect of Student Teams Achievement Division on field dependent and field independent senior secondary students' achievement and retention in nervous system in Abuja, Nigeria. While the reviewed study used concept mapping as an instructional strategy, this present study used a cooperative learning strategy; Student Teams Achievement Division. The reviewed study was carried out in Niger State; while in the present study was carried out in Abuja. Likewise, the reviewed study did not take into account the gender of the students while the current study considered gender as a moderating variable. The reviewed and the current study were conducted in nervous system. It is against this backdrop that the current study seeks to investigate the effect of student teams achievement division on field dependent and field independent students achievement and retention in nervous system in Abuja, Nigeria.

Sada and Adamu (2023) investigated the effect of Collaborative Teaching Strategy on Academic Performance and Retention among Senior Secondary school students in Dutsinma Education Zonal Quality Assurance, Katsina State, Nigeria. The study was guided by four research questions and four null hypotheses. A quasi-experimental research design using the pre-test, post-test, and post-post-test control group was adopted. The population of the study comprised 3,761 SS II students. Two intact classes containing 158 students (Experimental group = 81 and Control group = 77) were used in this study. A 30-item multiple-choice Biology Performance Test with reliability (Pearson Product Moment Correlation r= 0.720) was used

to collect data. The treatment and data collection process lasted for eight weeks. The data collected were analysed using mean, standard deviation, and independent t-tests. The result of the findings shows that there is a significant difference in the academic performance of the experimental and control groups (p=0.000.05) and retention scores (p=0.32>0.05) of male and female students in the experimental group. It was therefore concluded that collaborative teaching strategies have a more significant effect on students' performance in biology than the traditional chalk/talk method. On the basis of findings from the study, it was recommended among others that, teachers of biology should adopt the use of collaborative teaching strategy to improve academic performance and retention ability among students regardless of gender.

The gap between this study under review and this present study is that reviewed study did not take into account the learning style of the students while this present study is on the effect of Student Teams Achievement Division on field dependent and field independent senior secondary students' achievement and retention in nervous system in Abuja, Nigeria. The cooperative learning strategy used for the study under review was not stated while, this present study used Student Teams Achievement Division. The reviewed study was carried out in Katsina State; while the present study was carried out in Abuja. Also, the reviewed study focused on photosynthesis while the current study is on nervous system. It is against this backdrop that the current study seeks to investigate the effect of student teams achievement division on field dependent and field independent students achievement and retention in nervous system in Abuja, Nigeria.

Saka and Onanuga (2022) investigated the mediating influence of cognitive style on the relationship between academic motivation and students' academic achievement in senior School Biology in Remo North Local Government Area of Ogun State. The descriptive survey research design was adopted to conduct the research. The sample consisted of 180 students randomly selected from ten public senior secondary schools out of the 13 public schools present in the local government area. Data were collected using three instruments: Cognitive Style Questionnaire (r=0.71); Academic Motivation Scale (r=0.72); and Students' Achievement Test in Biology (r=0.82). The data collected were analysed using regression and t-test statistics at 0.05 level of significance. The findings revealed that cognitive styles significantly mediated the relationship between academic motivation and students' academic achievement in Biology. It was also found that there was no significant difference in the mean achievement scores of field-dependent and field-independent learners. The study concluded that cognitive style is a potent factor in the learning of Biology in senior secondary school. Although students can be motivated to learn, aligning instructional activities with their cognitive style by biology teachers is more important than motivation.

The study under review investigated the mediating influence of cognitive style on the relationship between academic motivation and

students' academic achievement in senior School Biology while the present study is on the effect of STAD on field dependent and field independent students' achievement and retention in nervous system in Abuja. The reviewed study adopted descriptive survey research design while this present study is a quasi-experimental design. This present study focuses specifically on nervous system, while the reviewed study used a random test on Students Achievement Test in Biology. The study under review considered cognitive styles as an independent variable which affects motivation and academic achievement in biology while this present study also considered cognitive style as an independent variable The reviewed study was conducted in Ogun state while the present study was conducted in Abuja. It is against this backdrop that the current study seeks to investigate the effect of student teams achievement division on field dependent and field independent students achievement and retention in nervous system in Abuja, Nigeria.

Methodology

This study employed a quasi-experimental design comprising four groups: two control groups and two experimental groups, all of which participated in the pre-test, post-test and post post-test focused on achievement and retention in nervous system. The population of the study was 7,756 senior secondary II students in all eleven schools in Bwari Area Council. From this population, a sample of 257 students were selected using multistage sampling technique. The sample comprised 140 males and 117 females respectively. Data were collected using two instruments; Nervous System Achievement Test (NSAT) which yielded a reliability index of 0.88 and Group Embedded Figure Test (GEFT) adapted from Herman Witkin which yielded a reliability index of 0.81. NSAT comprised 40 multiple choice test items adopted from past questions in JAMB and SSCE to determine achievement and retention in nervous system. While GEFT comprised 18 complex figures administered within 20 minutes to test cognitive style of the respondents. The higher the score of the respondents, the more field-independent the respondent is. A respondent who scores 9 or more marks is classified as field independent while a respondent who scores lesser than 9 is classified as field dependent. Data analysis was conducted using mean and standard deviation and Analysis of Covariance(ANCOVA) was used to test the hypotheses at 0.05 level of significance.

Results

Research Question One:

What are the mean achievement scores of Senior Secondary 2 biology students taught nervous system using conventional and those taught using STAD?

The result that answered this research question is presented in Table 2

Table 2: Mean Achievement Scores and Standard Deviations of Students Taught Nervous System Using STAD and Conventional Method

Group		Pretest	Post-test
Experimental (STAD)	Mean	16.22	24.97
	N	133	133
	Std. Deviation	4.025	4.273
Control (CM)	Mean	14.18	21.70
	N	124	124
	Std. Deviation	3.464	3.236

Table 2 shows mean achievement scores and standard deviations of students taught nervous system using STAD and conventional method. The results from the table indicate that the sample sizes of 133 for the experimental group and 124 for the control group. STAD students had a pretest score of 16.22 with a standard deviation of 4.025 and a post-test score of 24.97 with a standard deviation of 4.273 while the control group students had a pretest score of 14.18 with a standard deviation of 3.464 and a post-test score of 21.70 with a standard deviation of 3.236.

Hypothesis One:

Ho_1: There is no significant difference in the mean achievement scores of Senior Secondary 2 biology students taught nervous system using conventional method and those taught using STAD.

The result of the test to this hypothesis is presented in Table 3.

Table 3: ANCOVA Result of Mean Achievement Scores of Students Taught Nervous System using Lecture Method and Those Taught Using STAD

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1895.532[a]	2	947.766	96.766	.000	.432
Intercept	3119.663	1	3119.663	318.515	.000	.556
Pretest	1210.064	1	1210.064	123.547	.000	.327
Group	**260.424**	**1**	**260.424**	**26.589**	**.000**	**.095**
Error	2487.775	254	9.794			
Total	145022.000	257				
Corrected Total	4383.307	256				

a. R Squared = .432 (Adjusted R Squared = .428)

Table 3 reveals the results of ANCOVA of the mean achievement scores of students taught nervous system using STAD and conventional method. It is observed from the table that an F ratio of 26.589 was obtained with associated probability value of 0.000. i.e. ($F = 26.589$; $P = .000 < \alpha = .05$). Since the associated probability 0.000 is less than 0.05 set as level of significance, the hypothesis was rejected. It therefore implies that there was a significant difference between the mean achievement scores of students taught nervous system using STAD and those taught using conventional method, in favour of the students taught using STAD. This indicates that the experimental group both pretest and post-test after the treatment were higher than those of control group respectively.

Research Question Two

What are the mean achievement scores of field- dependent and field independent on Senior Secondary biology students when taught nervous system with STAD?

The result of analysis that answered this research question is presented in Table 4

Table 4: Mean Achievement Scores and Standard Deviations of Field- Dependent and Field Independent Senior Secondary Biology Students Taught Nervous System with STAD

STAD		Pretest	Post-test
Field Dependent	Mean	13.38	22.10
	N	68	68
	Std. Deviation	2.902	2.505
Field Independent	Mean	19.18	27.97
	N	65	65
	Std. Deviation	2.669	3.636

Table 4 shows the mean achievement scores and standard deviations of Field Dependent and Field Independent students taught nervous system using STAD strategy. The results from the table indicate sample sizes of 68 and 65 for field dependent and field independent students respectively. Field Dependent had a pre-test score of 13.38 with a standard deviation of 2.902 and a post-test score of 22.10 with a standard deviation of 2.505 while the field independent student had a pre-test score of 19.18 with a standard

deviation of 2.669 and a post-test score of 27.91 with a standard deviation of 3.636.

Hypothesis Two

Ho_2: There is no significant difference in the mean achievement scores of field- dependent and field independent Senior Secondary biology students taught nervous system with STAD.

The result of the test to this hypothesis is presented in Table 5

Table 5: ANCOVA Result of Mean Achievement Scores of Field Dependent and Field Independent Students Taught Nervous System Using STAD

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	1157.244[a]	2	578.622	60.050	.000	.480
Intercept	2004.533	1	2004.533	208.033	.000	.615
Pre-test	13.582	1	13.582	1.410	.237	.011
STAD	**427.970**	**1**	**427.970**	**44.415**	**.000**	**.255**
Error	1252.636	130	9.636			
Total	85335.000	133				
Corrected Total	2409.880	132				

a. R Squared = .480 (Adjusted R Squared = .472)

Table 5 shows results of analysis of co-variance of the mean achievement of field dependent and field independent students taught nervous system with STAD strategy. It is observed from the table that an F ratio of 44.415 was obtained with associated probability value of 0.000. i.e. ($F = 44.415$; $P = .000 < \alpha = .05$). Since the associated probability 0.000 is less than 0.05 set as level of significance, the hypothesis was rejected. It therefore implies that there was a significant difference between the mean achievement scores of field dependent and field independent students taught nervous system using STAD.

Discussion of Results

The findings from hypothesis one reveals that there was a significant difference in the mean achievement scores of senior secondary student taught nervous system using STAD strategy compared to those taught using conventional method. The results favoured the group of students taught using STAD. The finding aligns with previous research conducted by Chopel etal (2023); Gana (2023); Sada and Adamu

(2023); Jacob, Akarinwa and Okolo (2022); Jack and Yawe (2021); Ihejiamaizu, Neji and Agiande (2020) and Sangeeta and Sunita (2019). These earlier studies also found that students who were taught using cooperative learning achieved better than their counterparts taught with conventional method. The finding of this study is therefore not surprising because, cooperative learning has its root from the Positive Interdependence Theory which simply stated that students in cooperative learning group like STAD impacts one another through joint work and motivation such that individual achieve personal goals and common goals of the group (Johnson & Johnson, 2009).

The second finding from this study is that there was a significant difference in the mean achievement of field-dependent and field independent Senior Secondary 2 biology students taught nervous system using STAD. The results favoured the field independent students taught nervous system with STAD. The findings agree with that of Ahmed and Aliyu (2020); and Agu and Samuel (2019). In contradiction, the finding refutes the report of Saka and Onanuga (2022) that there was no significant difference in the mean achievement of field dependent and field independent students. One potential factor behind the outcome is that cognitive styles of dependence – independence significantly influenced the achievements of students in biology due to difference in the visual, social and environmental perceptions of the various cognitive styles.

Conclusion

The findings of this study have shown the effectiveness of STAD as a superior teaching approach, especially when compared to the traditional conventional method, in conveying complex and abstract concepts such as nervous system in Biology. The evidence suggests that STAD not only enhances understanding but also promotes student engagement in challenging topics. It equally encourages students to collaborate in order to improve their achievement and retention individually and as a team. Additionally, it implies that the benefits of STAD may extend beyond nervous system, potentially benefiting the teaching of other difficult biology concepts as well. The study's findings highlight ongoing issues in biology education, such as student under-achievement and their struggles with difficult and abstract topics like nervous system. These problems can be effectively addressed by integrating students' cognitive styles and STAD into the teaching strategy.

Recommendations

The following recommendations are made based on the findings of the study:

1. Biology teachers should be encouraged to adapt Student Teams Achievement Division to enhance overall achievement and retention in nervous system and other difficult topics in biology like homeostasis, evolution, skeletal system and genetics to mention just few.
2. Biology teachers should consider students learning style to enable them tailor their instructions to meet the needs of their students.

References

Agu, P. A., & Samuel, I. R. (2018). Effect of cooperative learning (STAD, jigsaw II, and TAI) strategies on basic science and technology students' achievement and retention. *International Journal of Modern Education Research, 5*(2), 26-31.

Ahmed, A., & Aliyu, A. (2020). Influence of field dependence and independence learning styles on academic performance of secondary school students in Katsina zonal education. *Al-Hikmah Journal of Education, 7*(1), 17-23.

Badmus, O. T., & Omosewo, E. O. (2018). Improving science education in Nigeria: The role of key stakeholders. *European Journal of Health and Biology Education, 7*(1), 11-15.

Chopel, S., Tshewang, P., Wangdi, P., Wangdi, U., & Jamtsho, S. (2023). Implementing Student Teams Achievement Divisions (STAD) learning model in grade 9 Biology and its impact on learning achievement. *International Research Journal of Science, Technology, Education, and Management, 3*(2), 65-77. https://doi.org/10.5281/zenodo.8139804

Federal Republic of Nigeria. (2014). *National policy on education of Nigeria.* NERDC Press.

Gana, B. K., Gana, M. N., Buda, M. K., Mamman, R., & Thomas, T. (2023). Effects of system concept mapping on academic performance and retention in the nervous system among secondary school students in Niger State, Nigeria. *Rivers State University Journal of Education, 26*(1), 130-137.

Hadjichambis, A. C., Georgiou, P., Kyza, E. A., & Mappouras, D. (2015). Investigating an inquiry-based intervention on human reproduction in relation to students' gender, prior knowledge, and motivation for learning Biology. *Journal of Biology Education, 50*(3), 261-274.

Idoko, C., & Njoku, A. (2017). *Problems of teaching biology practical in senior secondary schools* (Unpublished B.Sc. project). Department of Science Education, University of Nigeria, Nsukka.

Ihejiamaizu, C. C., Neji, H. A., & Agiande, I. U. (2020). Effect of cooperative learning strategy on senior secondary school students' academic

performance in Biology in Cross River State, Nigeria. *European Journal of Scientific Research, 156*(2), 138–144.

Jack, G. U., & Yawe, J. G. (2021). Student Teams Achievement Division (STAD) model: Effect on students' attitude and academic achievement in Chemistry. *Unizik Journal of Educational Research and Policy Studies, 8*, 59-75.

Jacob, N. I., Akarinwa, C., & Okolo, N. M. (2022). Effects of STAD cooperative learning strategy on the academic achievement of senior secondary school students in Biology in Bauchi metropolis. *Galaxy International Interdisciplinary Research Journal, 10*(6), 642–658.

Johnson, D. W., & Johnson, R. (2009). Educational psychology success story: Social interdependence theory and cooperative learning. *American Educational Research Association.* Retrieved from http://www.jstor.org/stable/20532563

Nwafor, C. E., & Oka, O. O. (2016). Effects of computer-assisted instruction on junior secondary school students' achievement in basic science. *International Journal of Scientific & Engineering Research, 7*(10), 1940-1952.

Onu, O. (2017). Teaching Mathematics and Sciences in Nigerian language. *The Sun Newspaper.* Retrieved on February 9, 2017, from https://sunnewsonline.com/teaching-maths-and-science-in-nigeria-languages/

Saka, A. O., & Onanuga, P. A. (2022). Achievement motivation and students' achievement in secondary Biology: Is the relationship mediated by cognitive style? *Sakarya University Journal of Education, 12*(1), 58-76. https://doi.org/10.19126/suje.980052

Sada, A. I., & Adamu, B. A. (2023). Effect of collaborative instructional strategy on academic performance and retention among senior secondary school students in Dutsinma Education Zonal Quality Assurance, Katsina State, Nigeria. *International Journal of Research in Education, Humanities and Commerce, 4*(4), 158-169. https://doi.org/10.37602/IJREHC.2023.4415

Sangeeta, Y., & Sunita, S. (2019). Fostering achievement of low-, average-, and high-achieving students in Biology through structured cooperative learning (STAD Method). *Hindawi Education Research Journal, 2019*, 1-10. https://doi.org/10.1155/2019/1462179