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EFFECT OF BRAIN-BASED LEARNING STRATEGY ON ACADEMIC PERFORMANCE & RETENTION AMONG SECONDARY SCHOOL GEOGRAPHY STUDENTS IN KATSINA STATE-NIGERIA

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Abstract

The study investigated the effect of Brain-Based Learning Strategy on Academic Performance and Retention among Secondary School Geography students in Katsina State, Nigeria. The study developed four research objectives and tested four null hypotheses. The study adopted Quasi-experimental research design. The population of the study comprised of 6,623 Geography students from 21 public Secondary Schools in Katsina Zonal Education Quality Assurance. 122 students from 2 intact classes of SS II were sampled for the study using cluster sampling technique. A validated Geography Performance Test (GPT) was used for data collection with reliability coefficient of 0.82 using Pearson Product Moment Correlation. The experimental group was taught using Brain-Based Learning strategy while the control group was taught using lecture method. The null hypotheses were tested using t-test independent and Mann-Whitney U-test Statistics at p ≤0.05 level of significance. The major findings of the study revealed that there was a significant difference in the mean performance and retention level between those taught using Brain-based learning strategy and those taught using lecture method, the study concluded that the students taught Geography using Brain-based learning performed significantly far better than those taught using lecture method and that Brain-Based learning is gender friendly. Based on the findings, the study recommended among others that Geography teachers should adopt the used of Brain-based learning to improve students' academic performance and retention.

Introduction

Geography is a science subject taught in secondary schools and tertiary institutions in Nigeria. It is the study of natural features and phenomena on the earth's surface and in the atmosphere. It also focuses on locations, space relations, and changes of physical phenomena on the earth's surface. Thus, Geography is suited towards teaching the interrelationships between phenomenon on the earth's surface and those in the atmosphere (Salisu,2015). Geography supplies opportunities to evolve key knowledge, skills, and values that enable students to become responsible citizens. Full and healthy geography education provides a connection to other people in the world, relationship with the environment, perceive the skills, knowledge and concepts and fundamental that help human understand (Dhakal, 2017). The study of geography is diverge into location, place, human/environment interaction, movement, and region which offer a mode of reasoning about the earth. These themes can assist in studying every geographic issue locally, nationally and globally (Boehm, 2000 in Dhakal 2017). Being varied topography and other physical environment, the necessity of geography education is very vital in Nigeria. Amosun (2016) further described Geography to be the study of the earth's dispersal of its living and non-living things. Geographers have duly categorized these into physical and human features. Hence the main focus of geography is the physical and human or cultural phenomena on earth. Amosun (2016) believes that geography lays emphasis on peoples, places, phenomena as they occur in particular patterns and as they evolve in a process in any environment and that it is a subject that studies and teaches realities in the learners' environment and around the world. He further focus that classroom, outdoors, and far away are the workshops and fields of its endeavor and that geography makes learners travel thousands of kilometers on their seats right in the classrooms, and it also supposed to be very much an interesting and exciting subject that should keep learners stir and alert throughout the time of teaching and learning either in the classroom or outside the classroom.

The objectives of teaching Geography at Senior Secondary Schools level are clarify out in National Policy on Education (FGN,2004), affirmed by examination bodies namely, West African Examination Council (WAEC,2021), curriculum development body such as Nigerian Educational Research and

Development Council (NERDC,2008) as well as National Examination Council (NECO,2021).These objectives are spotted in terms of the contribution of Geography to the realization of secondary education in Nigeria which include: to gives students a good knowledge of their immediate environment; to inculcate in students' useful skills and outlooks that will enable them to make useful contribution to their community and nation at large; To evolve students critical thinking ability, accuracy and objectivity for proper and logical investigation among others(salisu,2015).

Uzoma and Amadi (2018) disclosed that when students find learning of a concept difficult in a subject, the students ends up hating the subject. Ishaku (2019) stated that learners face many difficulties in learning science subjects, particularly Geography in our schools. To overcome these barriers, teachers need to make use of learning strategies that will engage the learners within the learning processes. Abdulhamid (2016) reported that teaching strategies affect the responses of students' performance and intent whether they are intricate in the learning and teaching processes. There are several teaching strategies that could be used to teach Geography among which includes discussion method, lecture method, laboratory method, discovery method, field-trip strategy to mention but a few. What constitutes a good teaching and learning of geography is the use of appropriate alternative means of imparting knowledge to ensure that all important concepts are passed on to the learner and not relegated to the background (Ogunkunle & Onwunedo, 2017).

Brain-Based Learning (BBL) instructional strategy is a learner-centered and teacher-facilitated strategy that harness learners' cognitive endowments. Brain-Based Learning is defined as any teaching strategy that harness information about the human brain to organize how lessons are designed and assisted with focus placed on how the brain learns naturally. It is a procedure for developing creative solutions to problems. It is an open sharing activity which encourages all students to participate (Olaoluwa & Ayantoye 2016). BBL is a learning that related to how our brain works naturally in the learning process (Kartikaningtyas, Kusmayadi & Riyadi, 2018). The teacher's roles are important. The teacher should motivate, support, and guide the students in the process. So, it builds the positive environment for the students. Brain-based learning is one of the development potentials of students' brains, namely by implementing the concept of

learning brain-based learning, namely creating a challenging learning environment, fun and creating a functioning and substantial learning environment for students (Active Learning). The Brain-based learning educational approach is a natural way and able to increase motivation in learning to support and maximize teaching and learning (Salem, 2018).

Academic performance is the realm to which student, teacher or institution has achieved their short- or long- term educational goals. According to Anthony (2018), Academic performance of students is a key feature in education it is the center around which the whole education system revolves. Narad and Abdullah (2016) opined that the performance of students decides the success or failure of any academic institution. And sees it as a measure of output and that the main outputs in education are expressed in terms of learning, that is, changes in knowledge, skills and attitudes of individuals as a result of their experiences within the school system.

Retention is the capability of individual to reserve what has been learnt and remember what has been stored in the memory. Olarewaju (2017) defines retention as the ability to retain and later recall information or knowledge gained after learning into memory. The sort of the materials to be coded contributes to the retention level. Instructional strategies contribute to quality and level of retention in terms of substantial, concreteness and image evolving characteristic (Wushishi, Danjuma & Usman, 2017). Retention could be elucidate as the process or ability to retain and remember things and experiences learned by an individual later time. Suitable coding of incoming information provides the index that may be consulted so that retention takes place without an elaborate search in the memory imaginary path. The retention level is mostly decided by the teaching method used in teaching and learning concept in Geography. Contrary to this background, this study therefore is set to determine the effect of Brain- based learning strategies on students' performance and retention in geography among secondary schools of Katsina State-Nigeria.

Statement of the Problem

Geography is among science subjects taught at secondary school, it helps individual to facilitate learning of all different places on earth and their cultural and physical characteristics to be more productive and effective in a world that has become interdependent. In recent time, the challenges that educators face in the 21st century is so diverse that using better and appropriate teaching methods is more vital now than ever before. With current research findings on how the brain perceives, processes, stores and retrieves information, which is significant to guide pedagogy; it is important that teachers embrace instructional strategies that would improve learners' interest within the learning process. Despite the significance of Geography there is still low persistence and low retention ability which is due to inappropriate method used by teachers, lack of interest, lack of motivation among others. Therefore, this study intends to determine the effect of Brain-based learning on Academic Performance and Retention among Secondary Geography Students in Katsina State-Nigeria.

Objective of the Study

The study.

1. Examine the effect of Brain -Based Learning Strategy on academic performance of secondary school geography students in Katsina State.
2. Find out the effect of Brain- Based Learning Strategy on retention of secondary school geography students in Katsina State.
3. Determine the effect of Brain- Based Learning Strategy on male and female secondary school students' academic performance in geography.
4. Investigate the effect of Brain- Based Learning on male and female secondary school students' retention in geography.

Research Hypothesis

1. There is no significant difference between the mean Academic Performance scores of secondary school students taught using Brain -Based learning and those taught using lecture method.
2. There is no significant difference between the mean Retention scores of secondary School Students taught Geography using Brain-based learning and those taught using lecture method.
3. There is no significant difference between the mean academic performance scores of male and female secondary school students taught geography using Brain-based learning.
4. There is no significant difference between the mean retention scores of male and female secondary school students taught geography using Brain- Based learning.

Methodology

The study employed pre-test, post-test, and post-posttest Quasi- experimental and control group design. The study has two group; experimental and control. Experimental group (EG) are group exposed to experimental treatment , that is, teaching using Brain-based Learning .While, control group (CG) were taught using lecture method. Before treatment the two groups were pretested to ascertain group equivalence. The treatment and teaching last for six weeks. Posttest was administered to determine the students' academic performance and post-post test was administered after a period of two weeks of post-test to determine the retention level of the students to retain the concepts.

The population of the study comprised of all public secondary schools (SS II) offering geography in Katsina ZEQA. There are twenty 25 public schools in the Katsina zonal educational quality assurance out of which only 21 schools are offering Geography as at 2022 due to the insecurity and withdrawal of teaching Geography in some areas that leads to the disclosed of some areas with total population of 6,623 Secondary School SSII Geography students. From this figure 3,765 were males and 2,858 were females.

The study has a total of 122 students as samples (62 males and 60 females) drawn from two (2) schools in the study area. Cluster sampling technique was used to select 2 schools from the population based on their

comparative abilities from the pre-test result, while intact classes were used as samples (one from each school sampled), in both the experimental and control groups**.**

A validated Geography Performance Test (GPT) was used for data collection. The Geography Performance Test is a 50- items multiple choice objectives questions A-D, adapted from previous West African Examination Council (WAEC) and National Examination Council (NECO) Geography questions which was validated and reliability coefficient was obtained at 0.82 using Pearson Product Moment correlation

Results

There is no significant difference between the mean Academic Performance scores of secondary school students taught, using Brain -Based Learning and those taught using lecture method.

Table 1: t-test Analysis of Students' Academic Performance between the Experimental and Control groups

Groups	N	Mean	Std. Dev.	Df	t value	P value	Remark
Experimental	65	34.46	5.22	120	7.39	0.00	Significant
Control	57	27.81	4.65				

*Significant at $P \leq 0.05$

Table 1 revealed that the t-value obtained for the difference between the mean Performance scores of secondary school students taught using Brain -Based Learning and those taught using lecture method among secondary school students in Katsina state, Nigeria is 7.39, the P- value is 0.00 at degree of freedom 120. Since the p-value of 0.00 is less than the alpha value of 0.05, the null hypothesis which states that there is no significant difference between the mean Performance scores of secondary school students taught using Brain -Based Learning and those taught using lecture method is hereby rejected. Consequently, there is significant difference between the mean Performance scores of secondary school students taught using Brain -Based Learning and those taught using lecture method among secondary schools of Katsina State.

Ho2 There is no significant difference between the mean Retention scores of Secondary School Students taught Geography using Brain based learning and those taught using lecture method.

Table 2: t-test Analysis of Students' Retention scores between the Experimental and Control groups

Groups	N	Mean	Std. Dev.	df	t value	P value	Remark
Experimental	65	36.74	5.79	120	9.35	0.00	Significant
Control	57	28.05	4.22				

*Significant at $P \leq 0.05$

Table 3 revealed that the t-value obtained for the difference between the mean Retention scores of Secondary School Students taught Geography using Brain- based learning and those taught lecture method in secondary school students in Katsina state, Nigeria is 9.35; the P- value is 0.00 at degree of freedom 120. Since the p-value of 0.00 is less than the alpha value of 0.05, the null hypothesis which states that there is no significant difference between the mean Retention scores of Secondary School Students taught Geography using Brain based learning and those taught lecture method is hereby rejected. Consequently, there is significant difference between the mean Retention scores of Secondary School Students taught Geography using Brain based learning and those taught lecture method in secondary schools of Katsina State.

There is no significant difference between the mean academic performance scores of male and female secondary school students taught geography using Brain -based learning.

Table 3: t-test Analysis of male and female students' performance scores in the Experimental groups

Groups	N	Mean	Std. Dev	Df	t value	P value	Remark
Female	35	34.26	5.79	63	0.339	0.736	Not Significant
Male	30	34.70	4.54				

***Significant at $P \leq 0.05$

Table 3 revealed that the t-value obtained for the difference between the mean performance scores of male and female secondary school students taught geography using BBL among secondary school students in Katsina state, Nigeria is 0.339, the P- value is 0.736 at degree of freedom 63. Since the p-value of 0.736 is greater than the alpha value of 0.05, the null hypothesis which states that there is no significant difference between the mean academic performance scores of male and female secondary school students taught geography using Brain -Based learning is hereby retained. Consequently, there is no significant difference

between the mean performance score of male and female secondary school students taught geography, using Brain -Based learning among senior secondary school students of Katsina State.

There is no significant difference between the mean retention scores of male and female secondary school students taught geography, using Brain- Based learning.

Table 4: t-test Analysis of Male and Female Students Retention Score in the Experimental group

Groups	N	Mean	Std. Dev.	Df	t- value	P value	Remark
Female	35	35.71	5.70	63	1.55	0.124	Not Significant
Male	30	37.93	5.77				

*Significant at $P \leq 0.05$

Table 4, shows that the difference between the mean retention scores of male and female secondary school students taught geography using BBL ($t = 1.55$, $df = 63$, and $P = 0.124$). Since the p-value (0.124) is greater than the alpha value (0.05), the null hypothesis is hereby retained. Consequently, the researcher concluded that there is no significant difference between the mean retention scores of male and female secondary school students taught geography using Brain-based learning among senior secondary schools in Katsina State, Nigeria.

Discussion of the findings

From the results, it shows that there was a significant difference in mean performance scores and mean retention score, between those taught Geography using BBL and those taught using lecture methods among secondary schools in Katsina Zonal Education Quality Assurance, in favour of those in the experimental group. This finding is in agreement with that of other researchers that reported BBL to have significantly influenced students' academic performance and improved their retention ability while motivating them to learn.

Findings to Research Hypothesis 1 indicated that significant difference exist between the mean Performance score of secondary school students taught using Brain -Based Learning and those taught using lecture method which is in correspondence to that of Satria (2015) whose finding revealed significant improvement of students' scientific skills, cognitive learning outcomes and learning interest in natural science class IV

when exposed to Brain- Based Learning approach with science KIT. The finding is also in agreement with that of Jack and kyado (2017) which revealed that the Brain-Based Learning approach used in experimental group was more effective in increasing student achievement, attitude and motivation of students towards chemistry than the Lecture-Based approach used in the control group. However, Kartikaningtyas, Kusmayadi and Riyadi (2017) reported that GDL-contextual has no different effect than BBL-contextual on mathematics achievement in geometry learning but BBL-contextual is better than direct learning on mathematics achievement. It means BBL- Contextual could be an effective and innovative models.

Finding number 2 revealed that there is significant difference between the mean Retention scores of Secondary School Students taught Geography, using Brain -based learning and those taught lecture method which agrees with that of Jack and kyado (2017) whose study revealed that the Brain-Based Learning approach used in the experimental group was more effective in increasing student achievement and identified that the difference between retention test scores was also statistically significant in favor of experimental group. The study also agree with the study of Suasana, Widiashi & Suparta (2018)that students' mathematic conceptual understanding who were taught by Brain-based learning strategy is better than using lecture method.

Finding to research hypothesis 3 and 4 revealed that there is no statistical difference between the mean performance and retention of male and female students when exposed to BBL. The disparity in achievement and retention of male and female students is of great concern to science educators particularly Geography (inclusive), this finding however proves that BBL is gender friendly strategy that can be used by teachers to improve students' performance and retention. The findings are not in line with that of Okoro (2015), Filgona and Sababa (2017) whose findings revealed that females performed better than males when co-operative learning is used and on the other hand, when individual learning strategy is used males did better than females. Thus, concluded teachers' instructional strategy may create a gap between the male and female (gender) achievement and retention in Ecology. Jack and Kyado (2017) is in consonance with the finding of this study that Brain- based learning strategy is gender friendly.

Conclusion

Based on the findings of this study, the researcher concluded that Brain-based Learning strategy capable of improving student's academic performance and Retention in Geography far better than lecture methods and that Brain-based learning strategy is capable of improving both male and female student's academic performance and retention far better than lecture methods.

Recommendations

Based on the findings of this study, the following recommendations were made;

1. Geography Teachers should be encouraged to use Brain-based learning Strategy in teaching geography to improve students' academic performance and retention.
2. Teachers should ensure a relaxed environment with low threat and challenging environment to ensure that learning environment is stress- free and making it a good source of motivation.
3. The use of Brain-based learning strategy in teaching geography in schools should be encouraged by State Ministries of Education through training of teachers periodically using seminars and workshops to teachers on how to use Brain-based learning strategy in teaching
4. Geography teachers should be encouraged to use Brain-based learning in teaching geography to improve students' performance and retention irrespective of gender because Brain-based learning strategy is a gender friendly in teaching.

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