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Effect of brainstorming on student achievement and attitude in business statistics at Federal Colleges of Education in North-Eastern, Nigeria

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Abstract
This research is aimed at finding out the effect of Activity-based approach on students' achievement and attitude in Business statics at federal colleges of education in North-East Nigeria. quasi experimental design was used for the study with an intact class of 97. Students achievement and attitude was measured using structured Business Statistic Achievement Test (BUSA)T and Business Statistic Attitude Scale Questionnaire (BUSASQ). The data collected was analyzed using kudder Richardson 20 (K-R20) formula. The reliability of the test instrument was established at .8
The test -retest method was used to assess the reliability of BUSAT and BUSASQ at 0..The research questions were analyzed using mean and standard deviation while ANCOVA was used to test the hypothesis at 0.The study found that brainstorming has significant effect on students achievement and attitude in bysiness statistic than the traditional method based on the findings, it is recommended that business educaturs shoud adopt brainstorming in teaching business statistic and other related vocational courses.

Keywords: Brainstorming, attitude, business statistics

Introduction

Education is the bedrock of development of any nation. The success and failure of any educational system depends largely on the successful planning and execution of its curriculum. Nigeria as a country is faced with many socio-economic problems that require the attention of its Educationists for proper solution (Okoro, 2019). In recognition of this, Nigeria has been using the curriculum as an instrument for social transformation to address national issues and moral decadence in the society. One of the goals of education in Nigeria as enshrined in the National Policy on Education (FRN, 2013) is to develop individual into a morally sound, patriotic and productive citizen. This is achievable through educational activities that are learners centered for maximum development and self-fulfillment (Okoro, 2019). The Nigerian education sector is divided into three (3) subsectors, namely: basic education (nine years' program), senior secondary school education (three years program), and tertiary education (four to seven years program, depending on the course of study). The tertiary education comprises of Universities, polytechnic and colleges of education (FRN, 2014).

Colleges of education are some of the Nigerian Tertiary institution that are vested with the responsivity of educating students after secondary education (NPE, 2004). The goals of colleges of education according to the National policy on education include contributing to national development through high-level relevant manpower training, developing and inculcating proper values for the survival of the individual and the society, developing the intellectual capability of individuals to understand and appreciate their local and external environments, acquiring both physical and intellectual skills which will enable individuals to be self-reliant and useful members of the society, promoting and encouraging scholarship and community service, and forging and cementing national unity and promoting national and international understanding and interaction Denga (2019). These goals show that colleges of education should embark on teaching, research, and development of programs that will maintain minimum educational standards and prepare the individual for valuable living within the society. The curriculum designed for the colleges of education is comprehensive and mainly aimed at lengthening students' knowledge and attitude of becoming teachers through acquisition of. practical skills, knowledge, and understanding necessary for employment in a particular profession, trade or group of occupations (NCCE, 2012).

Business Education is one of the vocational programs offered in both Federal and state Colleges of Education in Nigeria; the aim of which is to equip the learner with the required knowledge and skills of the business world for resourcefulness and for effective teaching of the course after graduation (NCCE, 2012). In an attempt to meet up with the National objective, Business statistics is introduced into the NCE III business education curriculum as a background to equip the learner with the basic necessary statistical concept, business practices, statistical principles, and their applications in modern business activities (NCCE, 2012). Business statistics is very vital to the Nigerian economy as it provides the basis for preparing future entrepreneurs, business managers, and other economic regulators **(**Loveland, 2014**).** In fact, statistical training to business education programme has been shown to be necessary to serve individuals and their communities in many ways, (Gal, 2004). He further asserted that, the institution of business statistic into Business education program curriculum can help improve the economic orientation of students as well as leading to economic growth and success in variety of businesses

However, business statistics have historically been reported to be difficult for many students, especially at the college and university level. (delMas, R. C., Garfield, J., Ooms, A., & Chance, B. 2007; Petocz & Kalceff 2015). Previous

studies (see for example, Majoka, Khan, & Shah, 2011; Hossain & Ahmad, 2013; Adeleke, Binuomote, & Adeyinka, 2013; Ezeagba, 2014; Inuwa, 2017 [24] Eriyagama, 2018 [21]; Okoro 2019) has cautioned that the consequence of this difficulty has always been associated with the quality of instructional method used. That the conventional method mostly used by the educators in Nigerian colleges and universities is less effective in improving the academic achievement of college students. This is due to the fact that in conventional approach, the learners are less engaged in the learning process. Eriyagama, 2018 [21]; asserted that Business statistic being mathematically oriented course cannot be learned by simple memorization of basic rules and principles, rather it requires the full participation of learners in the learning process. He suggested on an activity-based teaching strategy in form of brainstorming among others to be employed in teaching mathematically related courses as it engages the students fully in the learning process and help students build their knowledge of mathematical concepts and procedures.

Active learning strategy was explained by Erigayama (2018) to include any methods of teaching that involve the students more directly in their learning process these include; brainstorming, group discussions, problem solving, case studies, assignment method, role plays, journal writing and structured groups work. In fact, Active learning requires more than listening to the instructor; students must be involved in the learning process through discussion, writing, reading, brainstorming, exploring, and more. The present study will concentrate on the effect of Brainstorming on students' achievement in business statistic.

Brainstorming is a creative, collaborative method you can use to generate a list of ideas or possible solution to a problem. It is a very powerful team building activity because all participants can play a role. Everyone is invited to share their ideas without fear of critics. It is an open-ended activity that celebrate original thinking. It is a creative problem-solving technique with a goal of generating as many new and innovative ideas to solve a problem. It often takes place in an informal relax setting where participants are encourage to share their thought freely built upon the ideas of others and explore a wide range of possibilities. Mary-Rose (2022)

On the other hand, a common goal for any course would be to cultivate positive student attitudes towards that field of study. Awang, *et al* (2013) and Sutarso (1992) argued that there is strong relationship between teaching strategy and student attitude; that it would be useful for an instructor to detect the students' attitudes towards a subject in order to help the educator to use better teaching approach to overcome the students' learning problems This study defines attitude as the students' feelings and beliefs towards Business statistic Lawal (1993)**.**

Based on the objectives, the following hypotheses guide the study

1. There is no significant difference in the mean achievement score of the pre-test and post-test of the experimental group.
2. There is no significant difference in the attitude of the pre-test and post-test of the experimental group.

Methodology

Research Design

The study adopted a pre-test, post-test non-equivalent quasi-experimental design for the achievement test and a survey design for the attitude test. Both the experimental and control group will be exposed to pre-test and post-test

Population of the Study

Population of the study will cover all 249 NCE III Business education students offering Business statistic at Federal Colleges of Education in the North-East Nigeria.

Validity and Reliability of the Instrument

The instruments were validated by three (3) experts from the department of vocaional education ATBU, Bauchi. The reliability of the test items were established at .875 using (PPMC).

Procedure

Data Analysis

Result

The result are presented based on research questions and hypothesis that guided the study

Research Question One

What is the mean difference in the achievement of the pre-test and post-test of the experimental group

Table 1: Mean difference in the Pretest Posttest mean achievement of the experimental group

Group	Test	N	Mean	SD	MD	Effect size
Exp	Pre-test	43	10.790	3.928	8.03	0.6
	Post-test	43	18.819	2.131		
Field Work	2023					

Table 1 above shows the pre-test and post-test of students' mean academic achievement in business statistic of the experimental group. Data obtained from the pre-test and post-test were analyzed using mean and standard deviation. The pre-test mean of students in the experimental group was 10.790 and standard deviation of 3.928. While for the post-test obtained the mean of 18.819 and standard deviation of 2.131 were obtained. The mean difference of these tests was 8.03 and magnitude of their effect size was high (0.6 eta square) which indicates that their academic achievement has significantly improved as a result of the new teaching method use as treatment

Research Question Two

What is the mean difference in the attitude of the pre-test and post-test of the experimental group?

Table 2: Mean difference in the pre-test and post-test mean attitude of the experimental group?

Group	Test	N	Mean	SD	MD	Effect size
Exp	Pre -Attitude	43	2.690	1.928	4.13	0.4
	Post-Attitude	43	6.987	4.567		

Source: field work (2023)

Table 2 shows the pre-test and post-test mean attitude of students taught business statistic of the experimental group.

The pre-test mean score of students in the experimental group was 2.690 and standard deviation of 1.928 while the post-test means of 6.987 and. standard deviation of 4.567 was obtained. The mean difference of these groups therefore is 4.13 with effect size of 0.4 which showed that the posttest attitude score is higher than the pretest attitude of the students.

Null Hypothesis One

Table 3: There is no significant difference in the pre-test and post-test mean achievement of the experimental group.

Group	Test	N	Mean	SD	df	probability	t-ca	t-tab	Decision
Exp	Pre-test	43	9.821	3.928	42	0.05	27.62	1.66	Rejected
	Post-test		18.819	3.323					

Source: field work (2023)

In table 10, Paired sample t-test was used to calculate the significant difference between the mean achievement of students at pre-test and post-test of the experiment group. The pre-test mean score of students in the experimental group was 9.821 and standard deviation of 3.402 while the control group obtained the mean score of 18.819 and standard deviation of 3.323. The result showed that there was a statistically significant difference between the mean success scores of the students in the experiment group who received activity-based learning strategy and those in the control group who received traditional method of teaching. Therefore, there was significant difference between pre-test and post-test mean academic achievement score of students in the experimental group in business statistics since the t-calculated value of 27.62 exceed the t-tabulated value of 1.66 (27.62>1.66) with a degree of freedom 42 and probability of 0.05. The null hypothesis was therefore, rejected.

Null Hypothesis Two

There is no significant difference between the pre-test and the post-test mean attitude of the experimental group.

Table 4: paired sample t-test on the students' mean attitude at pre-test and post-test of the experimental group

Group	Test	N	Mean	SD	df	probability	t-cal	t-tab	Decision
Exp	Pre-attitude	43	11.995	3.201	85	0.05	20.01	1.66	Rejected
Group	Post-attitude	44	17.918	2.293					

Source: field work (2023)

Table 4 above shows the pre-test and post-test mean attitude of the experimental group. paired sample t-test was used to determine whether this difference was significant. The pre-attitude mean score of students in the experimental group was 11.995 and standard deviation of 3.201 while the post-attitude obtained the mean score of 17.918 and standard deviation of 2.923. Therefore, there was significant difference between students' attitude in the experimental at pre-test and post-test since the t-calculated value is greater than the t-tabulated value (20.01>1.66). The null hypothesis was therefore, not accepted which revealed that the students' post-test mean attitude score exceed the pre-test mean attitude of the experimental group.

Discussion

The results of research question one and its corresponding null hypothesis revealed that there was a statistically significant difference between the mean success of the students in the experiment group who received brainstorming strategy and those in the control group who received traditional method of teaching

The finding agreed with Mokiwa and Agbenyeku (2019), Siaw (2019) and Celik (2018) who found in their various studies a significant difference in the academic performance between the experimental group exposed to the activity-based teaching strategy when compared to the control group exposed to the traditional lecture method. According to Celik (2018), Kim (2006), and Kuo *et al*., (2020) activity-based teaching could potentially increase a student's attitude or perception of students toward learning.

The results of research question two and its corresponding null hypothesis revealed that there was significant difference between students' attitude in the experimental group at pre-test and post-test since the t-calculated value is greater than the t-tabulated value (20.01>1.66). The null hypothesis was therefore, not accepted which revealed that the students' mean post-test attitude is higher than the pre-test mean attitude of the experimental group. The finding is consistent and supported by other researches who found a direct relationship of attitude and academic performance of students (Newton & Mwisukha, 2009; Akpinar, *et al*., 2009; Bakar, *et al*., 2010; Geddes, *et al*., 2010; Amrai *et al*., 2011; Kazami, *et al*., 2013; Veresova & Mala, 2016). Also in the same vein, the finding of Mazana, Montero and Casmir (2019) showed that initially students exhibit a positive attitude, but their attitude becomes less positive as the students move forward to higher levels of education, this disagreed with findings of the present study. Additionally, Melad (2022), Rafiu (2020) and Donga (2019) found the same result with the finding of the current study that there was significant difference in student's attitude towards students' achievement tests in the experimental and control group. On the other hand, the results of the current study are contrary to the findings of Celik (2018) and Kinniard (2010) that there is no significant relationship on the attitude of the student to their academic achievement, while the attitude in the experimental group decreased significantly, there was an increase in the control group. The result is also contrary to the finding of Hukriede (2020) that found students' attitudes not significantly different between the two groups that were taught. The results were inconclusive and showed that there needs for further studies

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