EFFECT OF NUMBER HEAD TOGETHER STRATEGY ON STUDENTS' ACHIEVEMENT IN JUNIOR SECONDARY BASIC SCIENCE AND TECHNOLOGY IN BASSA, PLATEAU STATE, NIGERIA

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Abstract

The study investigated the effect of Number Head Together strategy on students' achievement in junior secondary Basic Science and Technology in Bassa, Plateau State, Nigeria. The researcher adopted quasi experimental design with the use of experimental and control group. The research had two research questions and two hypotheses. The population of the study was all the 18 senior secondary schools' Bassa Local Government Area of Plateau State, Nigeria with the total number of 1,807. The population was made up of males and females. The sample of the study was taken from the population of all public junior secondary schools tudents.in Bassa LGA, Plateau State. The sample of the study was taken from the population of all public junior secondary school students in Bassa LGA State. This study focused on two junior secondary schools. The two schools had a total number of 70. There were 18 male and 16 female in school while the second school had male 19 and female 17 in Bassa LGA which were used as experimental and control groups. The simple random sampling technique was used to select two schools that were involved in the study. The instrument used for the collection of data was a Basic Science and Technology Achievement Test (BSTAT).To ensure that the BSTAT for the study was valid, the instrument was subjected to scrutiny of 3 experts, one in the Department of Research Measurement and Evaluation and two from the Department of Science and Technology Education, all in University of Jos. These experts assessed the content and relevance of the items.In order to establish the reliability of the BSTAT. Kuder Richardson (K-R20) method was used to estimate the internal consistency of the instrument. The resulting test scores was correlated to get the reliability coefficient of 0.73It was found out that there was significant deference in the Post-test achievement mean scores. The achievement mean scores for the Pre-test and Post-test for experimental group was 54 before treatment and 82 after treatment. The control group had 44 before and had 61 after treatment. The mean difference for experimental and control group was 11. Based on the result of the study, it was recommended that the use of Numbered Heads Together Strategy was effective and efficient in improving teaching and learning of Basic Science and Technology in junior secondary schools.

Introduction

Education is widely recognized as a fundamental catalyst for societal development, with science and technology education playing a crucial role in shaping individuals' understanding of the world and fostering innovation and progress. Science and technology play a vital role in the

lives of individuals and in the development of a nation. It is widely and generally acknowledged that the gateway to the survival of any nation socially and economically is through scientific and technological literacy which can only be achieved through science and technology education. Alebiosu&Ifamuyiwa, (2018). In Nigeria, the Basic Science and Technology (BST) curriculum at the Junior Secondary School (JSS) level serves as a foundational component for cultivating students' interest and competence in scientific and technological disciplines. However, the effectiveness of teaching methods employed in delivering this curriculum significantly influences students' achievement and long-term engagement with science and technology subjects. BasicScience and Technology, formerly known as Integrated science, is the first knowledge of science and technology which a child encounters at the junior secondary school level. Hence, Basic Science and Technology curriculum prepares students at the JSSlevel for the study of core science and technical subjects at the senior SSS level (Adebayo &Edeh, 2020). This implies that for a student to be able to study science and technical subjects at the SSSlevel successfully, the person has to be well grounded in Basic Science and Technology at the JSSlevel. In view of this, Basic Science and Technology is being given greater emphasis at the junior secondary school in Nigeria.

In order to promote science and technology education, the Federal Government of Nigeria (FGN, 2014), came up with 6-3-3-4 policy on education which stipulates that a child should spend six years at the primary school level, three years at the JSSlevel, three years at the SSSlevel, and a minimum offour years in the University. This system of education was reviewed by the Federal Government of Nigeria in 2012 and came up with 9-3-4 system which stipulates that a child should spend 9 years compulsorily from primary school to Junior Secondary School level, three years at the Senior Secondary School, and four years in the University. The systems of education in Nigeria (6-3-3-4 and 9-3-4) have been designed with special provisions for learning science and technology in schools. To further promote the study of science and technology, the (FGN,2014)stressed in the same policy document that 60 percent of the students seeking admission into the nation's tertiary institutions should be admitted into science and technicaloriented programmes while the remaining 40 percent of the students could be admitted into Arts and Social Science programmes.This is to encourage students to select the study of science and technologysubjects. In this connection, educators are of the view that changes in students' outcomes must be supported by parallel changes in curriculum and methods of instruction (Egbunike&Obidiegwu, 2019).

It is apparent that many teachers todayare caught in the web of change for which they may not have been professionally prepared. It appears too that many teachers were educated in the classrooms where the role of the students was to memorize information, conduct well-regulated experiments and be tested on their ability to repeat these tasks or remember specific facts memorized (Ibrahim, 2020). In an attempt to improve the standard of science and technical subjects teaching and learning, a lot of research studies have been carried out. Studies in Basic Science and Technology education have reported that many students at the junior secondary school level have developed negative attitudes towards the study of the subject. At this level, perhaps, many students, because of their low achievement in the subject, do not seem to benefit much from the Basic Science and Technology curriculum (Adeyemo, &Adedoyin, 2021;Fakokunde, &Ajadi, 2021,)

Teachers have predominantly adopted teacher-centered instructional approaches, where teachers serve as the primary source of knowledge dissemination, and students play a passive role in the learning process. This traditional pedagogical model often relies on rote memorization and limited opportunities for critical thinking and active participation (Jimoh, 2020).Many factors have been attributed to the under-achievement of students offering Basic Science in BECE according to the chief examiners report of 2018-2022.The poor instructional strategies employed by teachers in teaching Basic Science and Technology science subject contributes to students' low

achievements. This might be as a result continuous use of lecture method of teaching used by the teachers. The lecture method is a unidirectional method of teaching where the students are passive listeners.

In view of the lapses inherent in the lecture method of teaching which involves verbal presentation of ideas, concepts, generalization and facts. The objective of this method is just to stuff the students with information. Most of the teaching is by talking while students are just passive or slightly involved by taking down notes and asking few or no questions. It is an expository method because it is teacher-dominated and learner's passive method (talk-and-chalk method). In a situation when the teacher decides to write the summary of the points, he/she has taught on the board. The learners' involvement and participation are at low ebb because communication is often one way for most of the time during the teaching-learning process. Teachers predominately used lecture method to teach and students are not actively involved in the learning process, most of the students remain passive listeners. Therefore, there is need for a more active method which is student-centred approach in order to improve their achievement. Some of these approaches are the use of peer instruction, target-task, graphic organizer, number head together, experiential learning, project method, number head together, field trip, enquiry, exposition, demonstration, experimentation and guided discovery method. However, some are more activity- oriented than others. Among the various student-centred approaches, number head together have gained prominence for its potential to enhance students' understanding, critical thinking skills and retention of subject matter (Yinusa&Omolewa, 2017).

Numbered Heads Together (NHT)is a cooperative learning strategy that holds each student accountable for learning the material by having students work together in a group (Sandbox, 2019). This is a cooperative strategy for teaching accountability in the classroom because the students will be actively involved. This cooperative learning strategy promotes discussion for both individual and group accountabilities. The strategy is beneficial for reviewing and integrating subject matter. Students with special needs often benefit when this strategy is used. After direct instruction of the material, the group supports each member and provide opportunities for practice, rehearsal, and discussion of content material. The teacher calls a specific number to respond as spokesperson for the group. By having students work together in a group, this strategy ensures that each member knows the answer to problems or questions asked by the teacher because no one knows which number will be called, all team members must be prepared. This strategy encourages participation from all students and reduces the potential for dominance by a few outspoken individuals. It also promotes listening and a high thinking skills as students have to carefully consider and evaluate their answers before sharing them with the class. The Number Head Strategy can be implemented in various ways. For example, the teacher may write a question on the board and ask students to individually come up with their response. Then, the teacher randomly calls out a number, and the student with that number stands up and shares the answer with the whole class to arouse the interest of the group.

Achievement is the level of knowledge and skills that students acquire through their educational experiences (Guskey, 2014). Achievement is not only indicative of students' mastery of subject content but also reflects their ability to apply knowledge, think critically, and solve problems effectively. Investigating the impact of the number head together method on the achievement of JSS II students in BST involves assessing their performance in various learning outcomes, such as comprehension of scientific principles, application of technological concepts, and ability to analyze and evaluate information.

Gender plays a significant role in educational contexts, influencing students' achievement in various subjects (Halpern, Benbow, Geary, Gur, Hyde, & Gernsbacher, 2017). Studies have shown that males and females may exhibit different preferences and learning styles, which can impact their engagement with instructional methods such as number head

together.Studieson Basic Science and Technology showed persistent failure of female students. As study conducted byKabang, Bash andKeswet, (2014) in Basic Science and technology resulted that male performed better than the female student. This difference in achievement could be attributed to gender stereo typing by the schools. Understanding how the Number Head Together method affects the achievement of male and female students in JSS is crucial for designing inclusive and effective teaching strategies that cater to the diverse needs of all students.

This study, therefore, set out to find out to investigate the Effects of Number Head Together strategy on students' achievement in Junior Secondary Basic Science and Technology in Bassa, plateau state, Nigeria

Statement of the Problem

The problem of low achievement in Basic Science and Technology has become a serious issue in the Nigerian educational system. The Chief Examiners' Report for BECE from 2019 to 2024 identified some significant weaknesses observed in students that sat for Basic Science and Technology examination. These weaknesses ranged problems with understanding the science language. Some had the idea but lack expressing and communication skills of the candidates were all contributing factors. Candidates failed to read and understand the demand of the questions; such as the difference between state, name, explain, define and 'what' is as used in the questions. Writing of the formula for power, force work was a big challenge for many candidates. Some Lack of understanding of basic scientific concepts as seen in their inability to identify what derived quantities are and lack of concentration during examination was evident as some candidates did not number their answers and were not keen to identify compulsory questions, few candidates could not identify the set-up for practical's and so could not label the parts of the diagram or set-up correctly.

Considering the magnitude of the students' low achievement in the subject has become imperative to identify the more suitable teaching strategies that could enhance students' achievement in the subject. Furthermore, many researches carried out on number head together teaching approach were focused on junior secondary school level and had not been extended to junior secondary school level. It therefore becomes imperative to investigate the effect of number head together teaching approach on the junior secondary school students' achievement in Basic Science and Technology. This study therefore, is set to find answers to this broad question: What are the effects of number head together teaching strategy on students 'achievement in Basic Science and Technology in Plateau State, Nigeria?

Aim And Objective of theStudy

The aim of the study was to investigate the effects of number head together strategy on students' achievement in Junior Secondary School in Bassa Local Government Area of Plateau State, Nigeria. Specifically, the study seeksto:

1. determine the pre-test and post-test achievement mean scores of experimental and control groups in Bassa LGA, Plateau State, Nigeria.
2. find out the post-test achievement mean scores of male and female Basic Science and Technology students in the experimental group in State, Nigeria.

Research Questions

The following questions were raised to guide this study:

1. What are the pre-test and post-test mean achievement scores of students taught Basic Science and Technology using Number Head Together in the experimental and control group in Bassa LGA, Plateau State, Nigeria?
2. What is the post-test achievement mean score of male and female Basic Science and Technology students in the experimental group in Bassa LGA, Plateau State, Nigeria?

Hypotheses

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

1. There is no significant difference in the post-test of achievement of students using Number Head Together in Bassa LGA, Plateau State, Nigeria.
2. There is no significant difference in the post-test achievement mean score of male and female Basic Science and Technology students using Number Head Together in Bassa LGA, Plateau State, Nigeria.

Methodology

This study adopted the quasi-experimental design. Specifically, the pre-test and post-test design in which intact classes within the study area were randomly assigned to experimental and control groups in Bassa Local Government Area of Plateau State, Nigeria. The design was chosen due to the fact that it will not be possible to carry out random assignment of subjects to group the students and schools that will be involved in the study. The population of the study cover all the 18 senior secondary schools' Bassa Local Government Area of Plateau State, Nigeria with the total number of 1,807. The population is made up of males and females.

The sample of the study is taken from the population of all public junior secondary school students in Bassa LGA State. However, this study focused on two junior secondary school two students offering Basic Science and Technology. The two (2) junior secondary schools were selected from the population. The two schools had a total number of 34 and 36 respectively. There were 18 maleand 16 female in school while the second school had male 19 and female 17 in Bassa LGA which were used as experimental and control groups. The simple random sampling technique was used to select two schools that will be involved in the study. This was done in order to ensure spontaneity, accuracy and unbiased coverage and also broaden the chance for everyone in the targeted population to be sampled. These two schools were serving as the sample schools. In these schools, one arm from each of the selected senior secondary school II was engaged in the study. However, the two schools were not tempered with as intact classes were used. The instrument used for the collection of data was a Basic Science and Technology Achievement Test (BSTAT). The BSTAT seek to elicit information from the students.

To ensure that the BSTAT for the study was valid, the instrument was subjected to scrutiny of 3 experts, one in the Department of Research Measurement and Evaluation and two from the Department of Science and Technology Education, all in University of Jos. These experts assessed the content and relevance of the items. The imputes of these experts were used to prepare the final draft of the study. The reliability of the instrument was determined through a pilot test on the school that were not among the sampled schools. This is to ensure the internal consistency of the test instruments, test-Retest method was used in order to ascertain a measure of stability of BSTAT. In order to establish the reliability of the BSTAT. Kuder Richardson (K-R20) method was used to estimate the internal consistency of the instrument. The resulting test scores was correlated to get the reliability coefficient of 0.73.

The method of data analysis that was used in the study was based on the research questions and hypotheses. The statistical package for social science (SPSS) was used to analyze the data. Specifically, the ANCOVA method of data analysis was employed for testing the hypotheses, while the mean and standard deviation was used to answer the research questions.

Results

Table 1: Pre-Test And Post-Test Mean Score Jssii Basic Science And Technology Students Achievement In Bassa Lga, Plateau State.

The experimental and control groups.

Group	N	Pre-test		Post-test			
		X	SD	X	SD	Mean Gain	??
Experimental	34	54	5.53	82	8.88	28	
							11
Control	36	44	5.87	61	6.21	17	

Table 1 reveals the pre-test and post-test achievement mean score of students offering Geography in the experimental and control groups. The result for experimental group yielded a mean score ($\overline{X}$ $\overline{X}$ = 82., SD = 8.88) after treatment. The control group had a mean score of ($\overline{X}$ =44, SD = 5.53) before treatment and had a mean score of ($\overline{X}$ =61, SD = 6.21) The mean difference is 11, indicating that the mean score of students for the experimental group was higher than the control group. The result further indicated that those taught with number head together strategy performed better than those taught using lecture method.

Table 4: Post -test mean scores of Male and Female students' achievements in Basic Science and Technology after treatment.

Gender	N	Mean	SD	Mean Difference
Male	18	42.78	7.28	
				3.05
Females	16	44.50	10.33	

Table 2 shows the post-test mean achievement scores of genders in the experimental group. The male students had a mean score of 42.78 with a standard deviation of 7.28 while, the female students had a mean score of 44.50 with a standard deviation of 10.33. This implies that the female students performed better than the male with a mean difference of 3.05

Table 3: Summary Result of ANCOVA on the post achievement Mean Scores of Students Taught Using Number Head Together.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	4068.186[a]	2	2034.093	34.745	.000	.509
Intercept	4032.015	1	4032.015	68.872	.000	.507
Pre-achievement	48.585	1	48.585	.830	.366	.012
GROUP	1086.143	1	1086.143	18.553	.000	.217
Error	3922.400	67	58.543			
Total	216781.000	70				
Corrected Total	7990.586	69				

R Squared = .509 (Adjusted R Squared = .494)

The Analysis of Covariance was conducted to determine if there is any significant difference in the achievement of students in the experimental and control groups in Bassa LGA, Plateau State, Nigeria. Table 8 shows F (1, 67) = 18.55, p < 0.00. Since the p-value of .000 was less than 0. 05 level of significance. the null hypothesis was rejected. The result further reveals that an adjusted R square value of .494 which means that 49.4 percent of the variation in Basic Science and Technology achievement can be attributed to the treatments. This implies that there is a significant difference between the achievement of students taught Basic Science and Technology using Number Head Together.

Table 4: Summary Result of ANCOVA on the post Achievement Mean Scores of Students Taught Basic Science and Technology Using Number Head Together.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	343.978[a]	2	171.989	2.361	.111	.132
Intercept	851.961	1	851.961	11.695	.002	.274
Covariate	241.853	1	241.853	3.320	.078	.097
Gender	56.651	1	56.651	.778	.385	.024
Error	2258.258	31	72.847			
Total	135040.000	34				
Corrected Total	2602.235	33				

R Squared = .132 (Adjusted R Squared = .076)

Analysis of Covariance was conducted to determine if a significant difference exists in the post test achievement means score of students offering Basic Science and Technology in the experimental and control groups. Table 4 shows that F (1, 31) = .778, p >0.05. Since the p-value of .385 was greater than 0. 05 level of significance. the null hypothesis was accepted, indicating that there was no significant effect of gender on students' achievement in Basic Science and Technology. The result further reveals an adjusted R square value of .076 which means that 7.6 percent of the variation in the treatment, while the remaining is due to other factors not included in the study. This implies that there is no significant difference between the achievement of male and female students in the experimental group. It also means that Number Head Together can help to improve both male and female students' achievement in Basic Science and Technology.

Discussion

The major findings in this study determined the effects of number head together strategy on senior secondary students' achievement in Basic Science and Technology Bassa LGA, Plateau State, Nigeria. Based on the data obtained through the Pre-test and Post-test achievement mean scores of students offering Basic Science and Technology, it was found that the use of Numbered Heads Together Strategy was effective in enhancing teaching and learning of Basic Science and Technology in secondary school education. It was found out that there was significant difference in the Post-test achievement mean scores The achievement mean scores for the Pre-test and Post-test for experimental group was 54 before treatment and 82 after treatment. The control group had 44 before and had 61 after treatment. The mean difference for experimental and control group is 11, this indicated that those taught with numbered head achieved better than those in the control group, and it also shows that there is significant difference in the achievement of students taught Basic Science and Technology using numbered head together and those taught without.

The finding was parallel to the study carried out by Schukajlow and Krug (2014) on Are interest and enjoyment important for students' performance? Through the application of

Numbered Heads Together (NHT) approach. It was found out that the application of NHT in teaching and learning model promoted engagement within the learning activity and enhanced the level of achievement.

The findings on Post-test mean scores of Male and Female students' achievements in Basic Science and Technology after treatment. The study determined the effects of number head together strategy on senior secondary students' achievement of male and female in Basic Science and Technology in Bassa LGA, Plateau State, Nigeria. Based on the data obtained it was found that the use of Numbered Heads Together Strategy was effective in enhancing teaching and learning of Basic Science and Technology, it was found out that there was significant different in the mean achievement scores for male and female after post-test in favor of female students. The male students had a mean score of 42.78 while, the female students had a mean score of 44.50. It implied that the female students performed higher than the male with the mean difference of 1.72. The number head together strategy has the capability to generate and boost the achievement of students irrespective of gender.

Conclusion

The study concluded that the use of number head together strategy enhances students' achievement in Basic Science and Technology. The strategy can be used in teaching Basic Science and Technology since there was a significant difference in the achievement of students. The study also showed that gender has no effect on the achievement of students.

Recommendations

1. Based on this study, it clearly indicated that the use of Numbered Heads Together Strategy was effective and efficient in improving teaching and learning of Basic Science and Technology in junior secondary schools. Having achieved research objectives, Numbered Heads Together Strategy increases learning achievement of the students. Therefore, the Basic Science and Technology teachers should adopt this strategy in teaching and learning in all level of education. Number Head Together is an activity-based and student-centered strategy which allowed students to take center stage of the learning.
2. It motivates active participation and facilitates individual accountability during teaching and learning process. Based on this strategy, Number Head Together can be used to promote class participation and individual role. Numbered Heads together can be used to improving or encouraging or promoting communication skills, social interaction, reasoning skills and observation skills aside learning of the content.

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