EFFECTS OF NUMBER-HEAD-TOGETHER (NHT) INSTRUCTIONAL STRATEGY ON STUDENTS' RETENTION IN NUCLEAR AND ATOMIC SCIENCE IN SENIOR SECONDARY SCHOOLS IN IKERE LOCAL GOVERNMENT OF EKITI STATE

By

[*1]Alaba Lawrence ALADEJANA, Ph.D

[2]Funke Aina FALEMU, Ph.D

[3]Mercy Adesola DARAMOLA, Ph.D

[4]Tunji Henry OGUNYEBI, Ph.D

[5]Funmilayo Elizabeth OLU-AJAYI, Ph.D

[6]Adijat Oluwatoyin AYANDA, Ph.D

[1,2,3,4,5]Department of Science Education, Faculty of Education, Bamidele Olumilua University of Education, Science and Technology, Ikere-Ekiti, Ekiti State, Nigeria.
[*1]aladejana.alaba@bouesti.edu.ng;alabalawrence1@gmail.com, +2347037982387; +2348150915237, ORCID No: 0000-0001-5565-8377

And

[6]Department of Science Technology and Mathematics Education, College of Education, Ipetu-Ijesha Campus, Osun State University, Osogbo, Osun State, Nigeria; +2348060682236

adijat.ayanda@uniosun.edu.ng

[*1] Corresponding author

Abstract

The study investigated the effect of Number Head Together (NHT) learning strategy on students' retention in nuclear and atomic physics in senior secondary schools in Ikere Local Government of Ekiti State. The sample size for the study consisted sixty (60) secondary school students who were selected with the use of simple random sampling techniques from Senior Secondary School Two (SSS II) in Ikere Local Government Area of Ekiti State. In all, forty (40) respondents experimental group were taught using number head together instructional strategy while twenty

(20) respondents in control group were taught using conventional method. The study employed a quasi-experimental pre-test and post-test research design. The instrument used for data collection was an achievement test tagged "Physics Retention Test (PRT)". Three research questions was raised to guide the study and answered descriptively using mean and standard deviation. Three research hypotheses were also formulated for the study and tested using Analysis of Covariance (ANCOVA) and Multiple Linear Regression. Based on the data analysis, findings revealed that there was significant effect of number head together instructional strategy on students' retention of nuclear and atomic science. Also, it was revealed that there was significant effect of ability level in students' retention of nuclear and atomic science in the experimental and control groups after the treatment. Lastly, it was revealed that there was significant interaction effect of number head together strategy and ability levels on students' retention of nuclear and atomic science. The study recommended that Number head together learning strategy teaching method should be incorporated into the teaching of science subjects at the secondary school level since it stimulate students to effectively learn and retain the concepts presented to them. Also, Teachers should ensure they plan their lessons with equal learning chances for both male and female students for effective delivery in secondary schools in Ekiti State.

Keywords: Number Head Together, Retention, Nuclear, Atomic, Science

Introduction

The desire of every citizen of any country is to enjoy uninterrupted power supply but Sub-Saharan Africa experiences a continuous energy problem orchestrated by insufficient access to electricity (Odoi-Yorke, 2026; Aladejana, 2023a). Globally, most of highest producers of electricity use nuclear power and to be among them, that is why the continent of Asia is planning nuclear capacity by 2035 by constructing nuclear plant in China. Nuclear power has capacity of producing around 1 gigawatt of electricity (IAEA, 2025). Sadly, nuclear energy sector in Nigeria is still in planning and regulatory stage. This nuclear energy is one of the forms of energy released from the nucleus. It is being utilized majorly for the generation of electricity through fission where there is splitting atom for the generation of immense heat. From fission to the generation of heat (creation of heat through fission process). This heat causes steam, which result to turning of turbines that are connected to generator to create electricity. Apart from generation of electricity, nuclear energy helps exploration of space, sterilization of medical instruments for the treatment of cancer. This nuclear power is an aspect of physics, chemistry, biology and basic science known as nuclear and atomic science that is taught in our Nigerian secondary schools. Worrisomely, most students, according to WAEC Chief Examiner's report (2025), could not answer correctly questions set on atomic and nuclear and atomic aspects of physics, chemistry, biology and basic science. This issue is not farfetched from their inability to retain and recollect has been taught/read prior to the examination (Aladejana, 2023b)The conventional method of teaching physics is reported as the primary cause of this poor retention (WAEC Chief Examiner

Report, 2015-2024) because this method does not encourage students' active participation during lesson either individually or at group level. Therefore, the strategy that addresses this challenge which makes both group and individual active, accountable and collaborative during and after instruction is referred to as Number Head Together strategy (Rusmiati, 2016). This strategy makes students working in groups to discuss and respond to questions collaboratively, promoting accountability, interaction, and positive interdependence (Sari & Surya, 2017). NHT, according to Nwuba, Egwu, Awosika, & Osuafor (2023) is described as a cooperative strategy in which members of a group work on a duty together with every member making sure he/she understands the solution(s) to the task or learned material, since the group is not aware in advance the person that will represent the team will be.

Precisely, this strategy developed by Spencer Kegan and associates in 1994 is an effective strategy that enhance students' retention (Shaukat & Afzal, 2025), increase understanding and engagement of students in science(Zrar & Sabri, 2025), improves academic achievement and interest of learners (Mukhtar & Musa, 2024), gender friendly (Nwuba, Egwu, Awosika, & Osuafor, 2023), enhances learners' involvement, academic performance, and positive forms of behavior in learning when efficiently used (Lustyantie and Emzir, 2021)

Statement of Problem

The importance of roles of nuclear energy in production of electricity cannot be overemphasized. For any country like Nigeria to benefit maximally, the need for teaching and learning of nuclear and atomic science is very critical. However, the performance of students is worrisome. Several reasons were advanced for this, such as inability to retain what been learnt and conventional method of teaching it. To address it, several strategies had been employed with little effects due to the facts that most of these methods failed to give opportunity to the students to actively participate during lesson on group basis. Number Head Together strategy allows students to actively participate actively on group levels. Therefore this research wok examined the effects of Number Head Together strategy on Senior Secondary School Students' Retention in Nuclear Atomic Science in Ekiti State, Nigeria.

Hypotheses

H_o1: There is no significant effect of number head together strategy on students' retention of nuclear and atomic science.

H_o2: There is no significant effect of ability level in students' retention of nuclear and atomic science.

Literature Review

In a research executed on the investigation on the effectiveness of NHT strategy on scientific concepts acquisition by 8th grade female students. A post-test one with two equivalent groups design was employed . The sample comprised 72 8th grade students from Parwa Girls' schools randomly assigned to experimental and control groups. The finding revealed substantial difference in favour of experimental group. Furthermore, in a research conducted by Shaukat & Afzal (2025) on improving the learning outcomes of learners using NHT model in the subjects of mathematics, the study employed a quasi experimental design, with population comprising of secondary level learners in the Science Group, between ages14 and 17. An institution was chosen employing purposive sampling above 60 learners of grade 9. One of the sections was selected as the Experimental Group (EG) and the other one as Control Group (CG). The obtained data were analysed utilizing Mean Scores(MS) from the pre-test, post-test and retention test in both groups. The independent sample t-test and paired sample t-test were utilized to compare the MS of the EG and CG for application level of achievement and retention. The finding of the data revealed that NHT strategy has a substantial effect on student's application level of achievements and retention. Similarly, Nwuba, Egwu, Awosika, & Osuafor,(2023). The study investigated the effect of NHT on secondary school students' interest in biology in Awka Education Zone. The study adopted quasi-experimental research using 2x2 factorial research design.. The sampled learners who were in two intact classes were randomly distributed to EG (23 girls and 10 boys) and CG (20 girls and 11 boys) groups utilising a flip of a coin. A 20-item Biology Students Interest Scale (BSIS). Mean and Standard deviation were utilised in answering the research questions while Analysis of Covariance (ANCOVA) was employed to test the null hypotheses at 0.05 alpha level. The findings of the study showed that Number Head Together is more effectual in developing learners' interest in biology than lecture method. Gender had no significant influence on students' interest in biology. Also, there was no interaction effect of NHT and gender on students' interest in biology.

Research Design

The study used a quasi-experimental research method to explore the relationship between variables. The quasi-experimental design for this study was the non-randomized pretest, post-test control group design

Population of the Study

The schools that participated in the study were in Ikere Ekiti Local Government Area. The target population was all secondary school students two (SSS 2) in Ikere Ekiti Local Government Area that offers Science subjects such as physics, chemistry and biology. The schools involved are public secondary schools.

Sample and Sampling Techniques

A total of sixty (60) respondents from SSS2 intact classes formed the study sample which comprises of forty (40) respondents that were taught using number head together learning strategy and twenty(20) respondents in control group. Balloting was used to select the sampled schools. Simple random sampling technique was used to select two (2) secondary schools. One school was randomly assigned to the experimental group and one control group accordingly. The schools selected were co-educational schools and the reason for this was for the researcher to gather data for analysis based on gender of the students.

Research Instrument

The Science Retention Test (SRT) was used to collect the required data. The same instrument was used to collect data for the pre-test and the posttest. The PRT was developed by the researcher. It was a 20 item instrument that tested the student's knowledge, comprehension, retention and academic skills on working out short answer questions that was set from nuclear and atomic science. The total score for the instrument was 100 marks. These scores were distributed over the 20 items. The items were allocated 5 marks each.

Method of Data Analysis

The software that was used for data analysis is the Statistical Package for Social Sciences version 23. The scores obtained from pre-test and post-test for experimental and control groups were compared in terms of mean scores and standard deviation. Analysis of Covariance (ANCOVA) and Multiple Linear Regression was used to test the hypotheses formulated for the study alpha level of 0.05.

Testing of Hypotheses

Hypothesis 1

There is no significant effect of number head together learning strategy on students' retention of nuclear and atomic science.

To test this hypothesis, posttest mean scores of the students in each of the experimental and control groups were computed and compared for statistical significance using a two-way Analysis of Covariance (ANCOVA) at 0.05 level. The results are presented in Table 4 as follows;

Table 1: A two-way Analysis of Covariance (ANCOVA) summary of effect of number head together learning strategy on students' retention of nuclear and atomic physics in Experimental group after treatment.

Tests of Between-Subjects Effects

Dependent Variable: Post-test

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[b]
Corrected Model	41388.077[a]	3	1306.021	3.011	.031	.095	9.188	.701
Intercept	11059.939	1	14259.922	37.361	.000	.282	31.154	1.000
Pre-test	1847.411	1	1847.411	5.087	.019	.047	5.094	.605
Group	220.878	1	220.878	.622	.421	.006	.656	.127
Retention	28.418	1	28.418	.074	.718	.001	.079	.060
Group * Retention	.012	1	.012	.003	.001	.031	.002	.001
Error	27436.617	89	351.122					
Total	428475.000	100						
Corrected Total	33574.814	99						

a. R Squared = .096 (Adjusted R Squared = .067)

b. Computed using alpha = .05

Table 1 showed the effect of number head together learning strategy on students' retention of nuclear and atomic science in Experimental group after treatment. A Levene test was used to analyze the homogeneity of the variances. As a result of the analysis, it was found that the variances for students' performance are homogeneous ($F=0.364$, $p>0.05$). Based on this result, a two-way ANCOVA was conducted. It was found that there were significant effect of number head together learning strategy on students' retention of nuclear and atomic science in Experimental group after treatment $F(1, 89) = 0.003$, $p = 0.001$, partial $\eta^2 = 0.31$. Since 0.001 is less than 0.05 (at the 95% level of confidence), this implies that there is a statistically significant two-way interaction effect. This indicated that there was a significant effect of number head together learning strategy on students' retention of nuclear and atomic science in Experimental group after treatment. Hence, the null hypothesis was not upheld.

Hypothesis 2

There is no significant effect of ability level in students' retention of nuclear and atomic science.

To test this hypothesis, post-test mean scores of students in both experimental and control groups computed and compared for statistical significance using a two-way Analysis of Covariance (ANCOVA) at 0.05 level. The result is presented in Table 5 as follows;

Table 2: A two-way Analysis of Covariance (ANCOVA) summary of effect of ability level in students' retention of nuclear and atomic science in the Experimental and Control Groups after treatment

Tests of Between-Subjects Effects

Dependent Variable: Post test

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power[b]
Corrected Model	4035.660[a]	4	1008.915	3.015	.022	.124	12.062	.779
Intercept	13038.136	1	13038.136	38.969	.000	.314	38.969	1.000
Pretest	1846.376	1	1846.376	5.519	.021	.061	5.519	.642
Group	1033.246	1	1033.246	3.088	.082	.035	3.088	.412
Ability level	697.503	1	697.503	2.085	.152	.024	2.085	.298
Group * Ability level	188.051	1	188.051	.032	.006	.007	.562	.115
Error	28439.062	89	334.577					
Total	413375.000	100						
Corrected Total	32474.722	99						

a. R Squared = .124 (Adjusted R Squared = .083)

b. Computed using alpha = .05

Table 2 showed the effect of ability level in students' retention of nuclear and atomic science in the experimental and control groups after the treatment. A Levene test was used to analyze the homogeneity of the variances. As a result of the analysis, it was found that the variances for the students based on their ability level are homogeneous ($F=0.127$, $p>0.05$). Based on this result, a two-way ANCOVA was conducted. It was found that there was no significant effect of ability level in students' retention of nuclear and atomic science in the experimental and control groups after the treatment $F(1, 89) = 0.032$, $p = 0.006$, partial $\eta^2 = 0.007$. Since 0.006 is less than 0.05 (at the 95% level of confidence) obtained for students' ability level in the study was significant at 0.05 level of significance. This implies that there is a statistically significant two-way interaction effect. This indicated that there was a significant effect of ability level in students' retention of nuclear and atomic science in the experimental and control groups after the treatment. Hence, the null hypothesis was not upheld.

Discussion

The study investigated the effects of number head together strategy on students' retention in nuclear science. There was a significant effect of the strategy on students' retention in nuclear and atomic science. This finding corroborates the earlier findings of Shaukat & Afzal (2025) that number head together strategy was an effective strategy that enhance students' retention. Also,

the finding is in agreement with Zrar & Sabri (2025), who reported that number head together strategy increases understanding and engagement of students in science. Similarly, the finding is in tandem with Mukhtar & Musa (2024) who found that number head together strategy improves academic achievement and interest of learners. Finally, the finding is line with Lustyantie and Emzir (2021) who established that number head together strategy enhances learners' involvement and academic performance.

Conclusion

Based on the findings of this study, it is evident that students that were exposed to number head together learning strategy significantly outperformed their counterparts who were exposed to conventional method strategy. Also the study concludes that significant effect of number head together learning strategy existed on students' retention of nuclear and atomic science, as well as significant effect of ability level in students' retention of nuclear and atomic science. The study further established that significant interaction effect of number head together strategy and ability levels existed on students' retention of nuclear and atomic science.

Recommendations

This study has established the effects of number head together learning strategy on students' retention in nuclear and atomic science in senior secondary school students in Ikere Local Government Area of Ekiti State. The following recommendations are therefore given to be positively considered:

1. Number head together learning strategy teaching method should be incorporated into the teaching of science at the secondary school level since it stimulate students to effectively learn and retain the concepts presented to them.

2. Teachers should ensure they plan their lessons with equal learning chances for both male and female students for effective delivery in secondary schools in Ekiti State.

3. Teachers should make adequate use of teaching facilities for effective transfer of knowledge in teaching science.

4. Science teachers should lay more emphasis on the use of number head together learning strategy in the teaching and learning of science for improving achievement among students.

5. The conventional method commonly used in teaching science should be modified and improved upon by making lessons activity-based.

6. In addition, the government, in conjunction with curriculum developers, the federal and state government; other professional bodies like the Science Teachers Association should create resource centers that can sensitize other stakeholders in the education sector on the efficacy of number head together learning strategy teaching approach.

7. Students should be encouraged to be more focus and show seriousness towards their academics.

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