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Effect of Video-Enriched Conventional Teaching Strategy on Performance of Students with Varied ability in Nuclear Chemistry

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Abstract

The study investigated the Effect of Video-Enriched Teaching Strategy on Performance of Students with Varied ability in Nuclear Chemistry**.** Pretest posttest Quasi experimental design was adopted for the study. The population of the study comprised of 925 SS III chemistry in Zaria metropolis. A sample of 174 students was selected at random. The experimental group was exposed to Video-enriched teaching strategy while the control group was taught using conventional method. Nuclear Chemistry Performance Test (NCPT) instrument was pilot tested and validated with reliability coefficient of 0.67 was used to collect data for the study. One research objective one research question and one hypothesis were raised and tested at $p \leq 0.05$ level of significance. Data collected were analysed using descriptive statistics (mean and standard deviation) and ANCOVA. Major finding from the study was: Chemistry students with varied ability taught Nuclear chemistry using Video-enriched strategy performed better than those taught using lecture method. Based on the finding, it was recommended among others that teachers should be encouraged to adopt Video-enriched strategy in order to improve the students' academic performance and interest level in chemistry. This can be achieved by organizing workshops to improve the teachers' skills and motivate them to adopt the method.

Keywords: Academic performance, conventional method, Nuclear chemistry, varied ability, Video-enriched strategy

Introduction

Education is a strong instrument that shapes the universe through positive influence on the individual learner. It is a tool that helps the recipient to appreciate his cultural heritage and live more satisfying life. It also leads to the enlightenment of man in intellectual growth, emotional maturity and ethical awareness [1]. Science Education on the other hand is an instrument per excellence for individual and National growth and development [2]. In Nigeria, there is rapid transformation in education as a result of massive revolutions in knowledge and information technology, and public needs for better learning, schools all over the world are slowly but surely restructuring themselves. Therefore, the development in technology of the 21st century necessitate the preparation of students with all the

necessary gadgets to cope with the challenges. This includes the use of technological tools like computer, internet, multimedia learning aids and so on. This will help in the attraction of the learners' attention and assist them in the understanding of subjects like Chemistry.

Chemistry is the study of matter, its properties, how and why substances combine or separate to form other substances, and how substances interact with energy [3]. [4], sees chemistry as the branch of science that deals with the study of composition, properties and uses of matter. The Senior Secondary Chemistry curriculum categorically identified the objectives of teaching Chemistry which are to: develop students' interest in Chemistry, acquire basic theoretical and practical knowledge and skills, develop interest in science, technology and mathematics, acquire basic STM knowledge and skills, develop reasonable level of competence in ICT applications that will engender entrepreneurial skills, apply skills to meet societal needs of creating employment and wealth, be positioned to take advantage of numerous career opportunities offered by chemistry and be adequately prepared for further studies in chemistry.

Nuclear chemistry is a sub-discipline of chemistry that involves the chemical reaction both electronic and nuclear changes of the unstable and radioactive elements where changes occurs[4]. Looking at the content of nuclear chemistry, one would think that it shall be part of chemistry that students would be more interested on and as a result they shall perform more on it. However, it happens to be one of the most difficult topics in O'level chemistry [5]. The difficulty of the concept has greatly affected the students' learning outcome. Academic performance is the outcome of education and the extent to which teachers, students or an institution have achieved their educational goal through proper measurement and evaluation [6].

According to [7], Video-enriched Teaching strategy is an approach to instruction that incorporates the use of video content to enhance learners' understanding and engagement in the teaching and learning process. This strategy can be achieved through the use of pre-recorded lectures, downloaded educational videos, or multimedia presentations. Through videos, learners can view phenomena, events, processes and activities that may not have been available, or may be too fast or too slow to occur and which may be too small, too big or too dangerous to be done or studied in a classroom. The types of video-enriched teaching strategies include; Video Demonstrations which is the type in which a teacher uses video demonstrations to show students how to perform a particular task or skill. For example, in science classes, teachers can use videos to demonstrate chemical reactions, dissections, or laboratory procedures [8]. Student-created Videos which involves students creating their own videos to demonstrate their understanding of a concept or to present their research findings. This not only engages students in the learning process but also enhances their creativity and communication skills [9] and Flipped Classroom which is the type of Video-enriched strategy, teachers assign video

lessons or lectures for students to watch at home before coming to class. The in-class time is then used for activities, discussion, and resolving any problem related to the video content [7].

Others are **;** Case Studies and Scenario-based Videos, a video-enriched strategy where videos are used to present real-life scenarios or case studies to engage students in problem-solving and critical thinking. Students analyze the situation presented and suggest solutions or provide decisions based on their understanding[10] and Virtual Field Trips, a strategy where Videos can be used to take students on virtual field trips to places they may not have access to visit physically. For example, a history teacher can use videos to virtually explore historical landmarks or a science teacher can take students on a virtual trip through the rainforest [11].

Despite the role of Chemistry and its importance in the national development as it's one of the requirement to study Medicine, Pharmacy, Veterinary medicine and Engineering at the tertiary institutions, students continue to have low performance in Chemistry O' level [12]. To address this issue, there is the need to employ effective instructional strategies that will improve the academic achievement in science through and the high level of awareness [13]. [14], opined that to deal with the more challenging topics like Atomicity and Radioactivity, it is important to explore methods of teaching and learning that will enable the students to appreciate and understand the concepts even when the laboratories with sophisticated equipment are not there. The use of computer simulations and videos open up a new chapter for science educators giving learners the chance to situate learning with the use of technological tools to have become part of their lives [14].

The objective of this study is to find out the effect of Video-enriched Strategy on the performance of Secondary School Students with Varied Abilities on Nuclear Chemistry concept while, the null hypothesis Ho_1 formulated and tested at $p \leq 0.05$ levels of significance is "there is no significant difference in the mean academic performance of Secondary Students with Varied Abilities in Zaria taught Nuclear Chemistry using Video-enriched Strategy and those taught using conventional method"

Methodology

The research design employed for this study was quasi experimental design where intact classes were used without randomization. A pretest, posttest method was used. Two groups of students each consisting of males and females were used for data collection; The population of the study comprises all public co-educational Senior Secondary (SS III) Students offering Chemistry as a subject in Zaria metropolis which are 925 consisting of 533 males and 392 females. The sample size was 174 students from the two schools out of which 90 from school A (experimental group) and 84 were from school B (control group). In sample selected High Ability (HA) with 60%-Above scores, Medium Ability (MA) with 50-59%

scores and Low Ability (LA) with 0-49% scores as recommended by [15] was used for this study.

Experimental Group (EG) and Control Group (CG). The groups were pretested using Nuclear Chemistry Performance Test (NCPT) to determine their Academic Performance. This is to ensure that the two groups are not significantly different in their Academic Performance before the treatment. The two groups were taught the concept of Nuclear Chemistry for six weeks. The experimental group was Video-enriched Strategy teaching strategy while the Control group was taught using Conventional method. After the treatment, a posttest was administered to both groups using the same instrument (that is; Nuclear Chemistry Performance Test, NCPT) to determine the impact of the two different instructional strategies on students' Academic Performance.

Results and Discussion of Findings

Research Question One: What is the difference in the mean academic performance scores in Nuclear Chemistry among Secondary Students with varied abilities exposed to Video-enriched Strategy and those taught with conventional method?

To answer research question one, posttest scores of Chemistry students with varied abilities in the experimental and control groups were subjected to descriptive analysis. The mean scores and standard deviation of the statistics is presented in Table 1.

Table 1: Mean and Standard Deviation for Performance Scores of Chemistry Students with Varied Abilities in the Experimental and Control Groups

Ability Levels	Groups	n	Mean	Std. Deviation	Mean Difference
Low Ability	Experimental Group	23	37.07	8.07	0.01
	Control Group	24	37.08	8.36	
Medium Ability	Experimental Group	48	48.28	8.63	8.28
	Control Group	42	40.00	8.00	
High Ability	Experimental Group	19	58.42	7.27	9.78
	Control Group	18	48.64	8.38	
	Total	174			

Table 1 revealed that among the low ability levels the mean difference between experimental group (Video-enriched Strategy) and control group (conventional method) is ($\bar{X}$= 37.07 and 37.08) respectively in favour of low ability students in the control group. The Table also showed that Chemistry students performed better when taught using Video-enriched Strategy in students with medium and high ability levels. It is observed in the Table that students with high ability obtained the highest mean score of 58.42 among the three ability levels.

To find out how significant the difference in the groups was, the data were subjected to Analysis of Covariance.

Null Hypothesis: There is no significant difference in the mean academic performance of Secondary Students with Varied Abilities in Zaria taught Nuclear Chemistry using Video-enriched Strategy and those taught using conventional method.

To test the null hypothesis, the posttest scores of Chemistry students obtained from Nuclear Chemistry Performance Test (Table 1) of the experimental and control groups were subjected to Analysis of Covariance at $\alpha \leq 0.05$ level of significance. Summary of the analysis is presented in Table 2.

Table 2: Summary of Analysis of Covariance (ANCOVA) of Students' Performance in Nuclear Chemistry of Experimental and Control with Varied Ability

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	8117.02[a]	5	1623.40	24.10	0.00
Intercept	305178.05	1	305178.05	4530.96	0.00
Ability Levels	5604.01	2	2802.00	41.60	0.00
Groups	1368.35	1	1368.35	20.32	0.00
Ability Levels * Groups	668.71	2	334.35	4.96	0.01
Error	11315.47	168	67.35		
Total	362440.25	174			
Corrected Total	19432.49	173			

Table 2 shows the summary of Analysis of Covariance of Students' Performance in Nuclear Chemistry by Treatment (Video-enriched Strategy) and (Conventional Method) and their varied ability levels. The ANCOVA was conducted to examine the effect of ability levels and teaching strategies on performance in Nuclear Chemistry. There was a statistically significant interaction between the effects of ability levels and teaching strategies on performance in Nuclear Chemistry, F (2,168) = 4.96, α = 0.01. Consequently, the null hypothesis which stated that there is no significant difference in the mean academic performance of Secondary Students with Varied Abilities in Zaria taught Nuclear Chemistry using Video-enriched Strategy and those taught using conventional method is therefore rejected. This implies that both ability levels and treatment significantly affected the performance of secondary school students in Nuclear Chemistry. In order to determine which ability level differs significantly among the three ability levels, Scheffe's Post-hoc analysis was carried out and the results are presented in Tables 4.3.

Table 3: Scheffe's Post hoc Test of Multiple Comparison for Performance and the Ability Levels of Chemistry Students

(I) Ability Levels	**(J) Ability Levels**	**Mean Difference (I-J)**	**Sig.**	**Remarks**
Low Ability	Medium Ability	-7.34*	0.00	Sig.
	High Ability	-16.59*	0.00	Sig.
Medium Ability	Low Ability	7.34*	0.00	Sig.
	High Ability	-9.25*	0.00	Sig.
High Ability	Low Ability	16.59*	0.00	Sig.
	Medium Ability	9.25*	0.00	Sig.

The mean difference is significant at $p \leq 0.05$ level.

Table 3 showed the post hoc test of multiple comparison for performance and ability levels of Chemistry students. The table revealed that there is a statistically significant difference between the low, medium and high ability levels (α = 0.00 <0.05).

The findings in Table 2 revealed that students exposed to video-enriched teaching strategy in Nuclear Chemistry concept performed significantly better than those expose to conventional method in teaching Nuclear chemistry concept. This finding is in agreement

with [16] in which the use of short videos in teaching Mechanical Engineering students improve the students' performance and engagement. Another research conducted by [17] found Video-Demonstration to improve the performance of students in General Chemistry after visualization. [18] also, found that exposing students to Video Assisted Learning has a positive impact on the performance of slow learners. [14], found that integrating computer simulation and videos significantly enhances the performance of learners in studying Atomic Physics and Radioactivity concept.

Conclusion

Based on the findings of this study, the conclusion drawn was that; students with varied ability taught nuclear chemistry concept using Video-enriched strategy performed better than those taught using conventional method. This is applicable to all three ability levels involved in the experimental groups which high ability, medium ability and low ability. Teachers should adopt video-enriched teaching strategy as it is effective towards the improvement of students' academic performance in chemistry. This can be achieved by organizing workshop to improve the teachers' skills and motivate them to adopt the method. Curriculum planners and curriculum development bodies in Nigeria like NERDC should design a program and policies to incorporate the use of Video-enriched strategy in teaching sciences and other areas at secondary school level.

The federal government through its agencies like Federal and state ministries of education, Teacher Training Institutions like NTI, and professional bodies like CSN and STAN should organize special trainings, workshops and seminars to chemistry and other sciences teachers on developing video-enriched teaching strategy.

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