Effect of Graphic-Advance-Organizers on Junior Secondary School Students' Performance in Basic Science in Potiskum Education Zone, Yobe State, Nigeria

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Abstract
This study determines the Effect of Graphic-Advance-Organizers on Junior Secondary School Performance in Basic Science in Potiskum Education zone, Yobe State, Nigeria. The study adoptedquasi experimental of the pre-testposttestwith control group design.Two Intact classes from two schools were used as experimental with One hundred and Fifty-three (153) and control group with One hundred and twenty-three (123) totaling Two hundred and seventy-six (276) students formed the study sample. The instrument used for data collection was Basic Science Performance Test (BSPT).Two research questions and two null hypotheses were raised and formulated for the study.Data collected were analyzed using descriptive and inferential statistics involving mean, mean difference as well as ANCOVAStatistical analysis. The findings from the study indicated that Graphic-Advance-Organizers has the potential of improving Junior Secondary School Students' performance in Basic Science, also the study revealed there is no significant difference in the performance of male and female students in Basic Science. Based on the findings of the study, it was recommended that Basic Science teachers should be encouraged to use Graphic-Advance-Organizers in teaching of Basic Science at Junior Secondary schools.

Keywords: **Graphic-Advance-Organizers, Performance, Basic Science**

Background

Basic science formally called integrated science is one of the science subjects developed to enable students learn scientific skills, principles and values at the junior secondary school levels. It is a multi-disciplinary subject that comprises concepts in Biology, Chemistry, Physics, environment and society. It is taught at lower, middle and upper basic education levels. Basic science is one of the core subjects for basic education and is a foundation of subsequent science learning. It exposes students to basic of skills of scientific enterprises and provides the learner with necessary skills required for learning of science which is the foundation on which subsequent science learning is built (Okeyefi & Nzewi, 2015).

Educationist have proposed different definition of the subject Basic science. Datom (2015) saw Basic Science as a grassroot subject that introduces children into the field science, considering it integrated name between the core science subjects. The knowledge of Basic Science is a pre-requisite to further learning in other physical sciences such as physics, Chemistry and Biology. A good foundation in the field of Medicine, Engineering Pharmacist, Agriculture to mention just a few (Shuaibu, 2012).

Considering the importance of Basic Science in the field mentioned above, the Federal Government of Nigeria in National Policy on Education (2014) emphasized the need for planned experience that will build the child understanding in the subject. The philosophy of the subject is to prepare the learner for future learning experience in physical sciences.

Despite the efforts of the Government in improving the teaching and learning of basic science at this level of education, research evidence still shown that student's performance in the subject is not encouraging (Okeyefi & Nzewi, 2015). Some of the reasons adduced for the poor performance in the

subject according to the authors are: teachers' attitude toward the teaching of basic science, poor instructional methods as well as lack of students' interest in the subject. As a result, the authors called for introduction of innovative methods of teaching that can improve the performance of learners in basic science. One of those methods is the Graphic-Advance-Organizers.

Advance organizers are links that have capacity to introduce and also organize the new learning material as well as enhancing learners' experience. Meyer (2003) reported an advance organizer is information presented by an instructor that helps the student organize new incoming information.

A Graphic Organizer (GO) is a spatial representation of text concepts. It is an instructional tool that can help students to organize, structure the information and concepts to relate with the other concepts. In addition, the spatial arrangement of GOs allows the students to identify the missing information or absent connections in one's strategic thinking (Ellis, 2004). GOs have many names including visual maps, mind mapping and visual organizers. As an instructional tool, Graphic Organizers used to illustrate students' prior knowledge about a topic or section of text that have been highly recommended to be used in classrooms.

The idea of Graphic Organizers is based on Ausubel's assimilation theory of cognitive learning (Ausubel, Noval & Hanesian, 1978). According to them, the information is organized by mind in a hierarchical top-down fashion.

The concept of "gender" in teaching and learning process has attracted the attention of many psychologist, biologists, and researchers as a result of which a lot of literatures exist on different aspects of the concepts.Several researches conducted by scholars on the effect of academic performance on gender in science education significant differences between boys and girls (Bichi, 2002, Usman, 2007, Obeka, 2009) while others opined no difference between genders academic performance (Usman, 2010). Alpha (2007), in his research on Gender disparity on performance in mathematics of senior secondary school, opine that performance of boys is higher than that of girls. In support of this, Usman (2007) in his work "relationship between students' performance and their academic achievement in Biology using NISTEP mode of teaching revealed that senior secondary male biology students perform well in any rigorous work than their female counter part.

Statement of the Problem

Basic science is one of the core subjects for basic education and is a foundation of subsequent science learning. It exposes students to basic skills of scientific enterprises and provides the learner with necessary learning experience for science foundation upon which the subsequent science learning is built. Research findings have continued to reveal that our classrooms are heavily dominated by the use of traditional teaching methods (Barde, Ezugwu, Muhammad& Mustapha2003).These methods emphasize on the procedure of instruction in which majority of learners are merely passive listeners, while teacher plays the role of dispenser of knowledge. Recent researches have debunked the use of this mode of instruction because ofinadequacies to solve and address learner's immediate problems.Despite several efforts by the Nigerian government to make teaching and learning of basic science more effective and meaningful at the basic level, learning is confronted with a lot of inhibiting factors such as persistent failure, lack of student interest toward the subject, poor reasoning abilities and cognitivepreference, as well as poor learning styles among the students (Okeyefi & Nzewi, 2015).

The SUBEB external report (2017) in Yobe state indicated that one of the problems militating against the effective teaching of Basic Science is the consistent use of traditional (lecture) method of teaching otherwise known as chalk and talk method. The report stated further that most teachers shy away from

innovative/activity based instructional strategies such as Advance Organizer. The present study therefore investigated the effectiveness of Graphic-Advance-Organizers in Basic Science classroom in Potiskum Zone, Yobe State, Nigeria to determine it influence in improving students' performance in the subject.

Objectives of the Study

This study is guided by the following objectives.to:

i. determine the effect of Graphic-Advance-Organizers on students' performance of basic science.
ii. determine the effect of Graphic-Advance-Organizers on students' performance based on gender.

Research Questions

Based on the stated objectives, the following research questions were raised to guide the study.

i. What is the difference between the mean performance scores of students taught Basic Science concepts using Graphic-Advance-Organizers and those taught using lecture method?
ii. What is the difference between the mean performance scores of male and female students taught Basic Science concepts using Graphic-Advance-Organizers?

Research Hypotheses

The following null hypotheses were formulated and tested at $P \leq 0.05$ level of significance.

Ho_1. There is no significant difference between the mean performance scores of students taught basic science concepts using Graphic-Advance-Organizers and those taught using lecture methods.

Ho_2. There is no significant difference between the mean performance scores of male and female students taught basic science concepts using Graphic-Advance-Organizers.

Methodology

The study employedquasi experimental of pretest and posttest control group design. Two Intact classes from two schools were used because school administration usually does not allow disruption of the classes. The Experimental Group (EG) were exposed to treatment that is teaching with using Graphic-Advance-Organizers while the control group were taught using the lecture method. The two groups were pre-tested before the treatment to ascertain their ability level. The treatment was given five weeks, after which the two groups were post tested again to ascertain the level of improvement in performance of the students. A total of two hundred and seventy-six (276) students randomly selected into the experimental and control groups participated in the study. The research instruments that is Basic Science Performance Test (BSPT) was validated by two expert and pilot tested over sample of students that do not took part in the study was used to collect data for the study. Data collected were recorded, coded and subjected to statistical analyses.

Results

Research Question one: What is the difference between the mean performance scores of students taught Basic Science concepts using Graphic-Advance-Organizers and those taught using lecture method?

Table 1: Mean, Standard Deviation and Mean Difference for Students' Performance among the two groups

Group	N	Mean	Std. Deviation	Mean Difference
Experimental	153	14.86	5.19	
				2.54
Control	123	12.32	4.45	

Table 1 shows that the difference between the mean performance scores for experimental group (14.86) and control group was (12.32) and Mean Difference (2.54) in favour of experimental group. Therefore, the mean performance scores for students taught energy concept using Graphic-Advance-Organizers was higher than the mean performance scores for those taught with lecture method among Upper Basic Science Students in Potiskum educational Zone, Yobe State, Nigeria.

Research Question Two: What is the difference between the mean performance scores of male and female students taught Basic Science concepts using Graphic-Advance-Organizers?

Descriptive statistics of Mean, Standard Deviation and Mean Gain were used to answer the research question. The result of the analysis is presented in Table 2

Table 2: Mean, Standard Deviation and Mean difference for Male and Female Students' Performance

Variable	N	Mean	Std. Deviation	Mean Difference
Male	66	16.79	4.89	
				3.39
Female	87	13.40	4.95	

The results shown in table 2, indicates the mean performance scores of male and female students taught energy concepts using Graphic-Advance-Organizers. The mean difference between the mean performance scores for male is 16.79 and female is 13.40 with a mean difference of 3.39 in favour of the male students. Therefore, the male students have high performance scores than their female counterpart.

Hypotheses Testing

The following hypotheses were tested at P≤0.05 as follows:

Ho_1: There is no significant difference between the mean performance scores of students taught basic science concepts using Graphic-Advance-Organizers and those taught using lecture methods.

Analysis of Covariance (ANCOVA) statistics was used to test the null hypothesis stated at P≤0.05 level of significance. The result is presented in Table 3:

Table 3: Analysis of Covariance (ANCOVA) for Students' Performance Scores in Experimental and Control Group

Source	Sum of Squares	Df	Mean Square	F	P-Val	Decision
Corrected Model	1484.012[a]	2	742.006	37.083	.001	**S**
Intercept	2030.792	1	2030.792	101.491	.001	S
Covariates	1042.144	1	1042.144	52.082	.001	S
Groups	410.551	1	410.551	20.518	.001	**S**
Error	5462.608	273	20.010			
Total	58963.000	276				
Corrected Total	6946.620	275				

Significant at P<0.05

From Table 3, the result showedthat there is a significant difference between the mean performance scores of students in experimental and Control groups. The results of F=20.52 at P =0.001, which showed a significant difference in the performance scores among the students taught with Graphic-Advance-Organizers and those taught with lecture. That is, P=0.001is less than P=0.05**,** therefore the null

hypothesis which states that there is no significant difference in the mean performance scores of students taught basic science concepts using Graphic-Advance-Organizers and those taught using lecture method is rejected.

Ho$_2$: There is no significant difference between the mean performance scores of male and female students taught basic science concepts using Graphic-Advance-Organizers.

An Analysis of Covariance (ANCOVA) was used to test the null hypothesis stated at P≤0.05 level of significance. The result is presented in Table 4.

Table 4: Analysis of Covariance (ANCOVA) for Male and Female Students' Performance Scores in Experimental group

Experimental Group	Sum of Squares	Df	Mean Square	F	Sig.	Decision
Corrected Model	863.925[a]	2	431.962	20.071	.015	**S**
Intercept	1571.099	1	1571.099	73.002	.011	**S**
Covariates (Pretest)	433.757	1	433.757	20.155	.012	**S**
Gender	272.731	1	272.731	12.673	.323	**NS**
Error	3228.193	150	21.521			
Total	37890.000	153				
Corrected Total	4092.118	152				

From Table 4, the result demonstrated that there is no significant difference in the mean performance scores of students in experimental and Control groups. The results of P =0.323, which showed no significant difference in the performance scores among the students taught with Graphic-Advance-Organizers and those taught with lecture. That is, P=0.323 is greater than 0.05**,** therefore the null hypothesis which states that there is no significant difference in the mean performance scores of male and female students taught basic science concepts using Graphic-Advance-Organizers is retained, meaning that Graphic-Advance-Organizers is gender friendly

Summary of Findings

The finding of this study shows that there is a significant difference between the mean performance of students taught Basic Science concepts using Graphic-Advance-Organizers and those taught using lecture method .However, there is no significant difference between the mean performanceof male and female students taught Basic Science concepts using Graphic-Advance-Organizers.

Conclusion

Based on the findings of this study, it was concluded that the use of Graphic-Advance-Organizers improve Student'sperformance in Basic Science and the strategy is gender friendly.

Recommendations

From the findings of this study, it was recommended that Basic Science teachers should be encouraged to use Graphic-Advance-Organizers in teaching Basic Science concepts where prior knowledge is lacking.

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