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Effects of Project Based Strategy on Students Academic Performance in Scientific Concepts in Senior Secondary Schools in Irepodun Local Government, Kwara State, Nigeria

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Abstract

This study investigated the effect of project based strategy on students' academic performance in Scientific concepts. The study adopted the pretest-posttest control group, quasi-experimental design. 95 SSII Science students from two schools in Irepodun Local Government Areas, Kwara State, Nigeria were randomly assigned to treatment group. The instrument used was Science Students Performance Test ($r=0.78$). Two Research Questions and hypotheses guided the study. Descriptive statistics of means and standard deviation were used to answer the research questions and inferential statistics of Analysis of Covariance was used to test the hypotheses at 0.05 level of significance. The results of the study showed that project strategy improved students' academic performance in scientific concepts than lecture method. There is a significant difference between the academic performance mean scores of the students exposed to scientific concepts using project based strategy and compare with their counterpart taught using lecture method. Based on the findings, science teachers should adopt project based strategy to teach the science subjects, so that students can learn speedily and better as it could simultaneously foster confidence in the students and improve their academic performance.

Keywords: Project based strategy, academic performance in Science, gender, Scientific concepts.

Introduction

Science subjects such as biology, chemistry and physics are taught at the Senior Secondary Schools level in Nigeria. The study of science subjects enable the learners to study some professional courses related to areas of human endeavor such as Medicine, engineering, agricultural technology, pharmacy, biotechnology etc (Jibrin, 2014). Therefore, it is very important that man knows about the nature and the phenomenon surrounded him and consequences of the interactions between man and his environment (ecology). Adewumi, (2024) reported that Science occupies a unique position in the senior secondary school curriculum. Science as teaching subjects in senior secondary have some laudable objectives. The objectives of Science curricula in senior secondary schools as highlighted by Nigerian Educational Research and Development Council (NERDC, 2018) Science is designed to enable students acquire suitable laboratory and field skills, meaningful and relevant knowledge in Science, etc. Despite the fact that the Science objectives includes robust and

practical goals for the comprehension of scientific concepts, students still find some scientific concepts difficult to understand such as ecology, genetics, enzyme, and chromosome. It has been observed and reported that Science students in Irepodun Local Government Kwara State, Nigeria has been experiencing some setback due to ineffective teaching and learning strategies which teachers employed in teaching the subject. Students' academic performance in Science at senior secondary school level in Nigeria has been persistently poor of which students performing more poorly in science subjects in external examinations yearly (Sodangi et al., 2022). The senior secondary school students' unsatisfactory academic performance in Science has been blamed on several factors such as inadequate qualified teachers, large classes, and current mode of learning mostly based on lecture method.

The inappropriate teaching strategies used by most Science teachers that do not enable learners the chance to build up knowledge and skills through engaging projects set around challenges they may encounter in future have been identified as the primary cause of the underperformance of students in Science (Jibrin et al., 2016; Bamidele & Yoade 2017). The instructional approach designed to equip students with the ability to develop knowledge and skills through engaging projects set around challenges and problems they may face in the real world is referred to as project based strategy. Project strategy has been broadly described as a teaching method where students are engaged as active participants in learning (Buchanan et al., 2016). Project based strategy integrates critical thinking ability in the students, since it calls for the formation of groups in some cases to enable the learners in each group to plunge into the exploration phase. It is a hands-on experience which starts with driving questions or problems that create activities and lead to the meaningful products at the end (Adewumi & Akanbi 2023).

Also, In the course of focusing on the students' performance, gender was factored in. It has been noted that gender refers to the amount of masculinity and femininity found in human beings. According to Adigun et al., (2015), gender is the range of physical, biological, mental and behavioral characteristics pertaining to and differentiating between the feminine and masculine population. Controversies exist as to the performance of gender groups in Science subjects. This is verifiable because, there is a general belief among Nigerians that males are superior to females in terms of physical physique, cognition, logical reasoning and even in academic performance and this has led to certain vocations being attributed to a particular gender. Oludipe, (2016) is of the view that male students perform better than their female counterparts while Eze, et al., (2021) is of the opinion that there are no differences in academic performance of gender groups in science subjects and found that females achieve better than males in sciences.

This study investigated effect of project strategy on academic performance of senior secondary schools science students in Irepodun local GovernmentArea, Kwara State, Nigeria. The moderating variable of gender was also examined.

Purpose of the Study

The purpose of this study was to investigate the effect of project basedstrategy on academic performance of science students in senior secondary schools in Irepodun Local Government Area, Kwara State, Nigeria. Specifically, the study sought to;

1. Determine the difference between the academic performance mean scores of students taught scientific concepts using project based strategy and compare with their counterpart taught using lecture method.
2. Examine the difference between the academic performance mean scores of male and female students taught scientific concepts using project based strategy.

Research Questions

The following research questions were raised to guide the study:

1. What is the difference between the academic performances mean scores of students taught scientific concepts using project based strategy and compare with their counterpart taught using lecture method.
2. What is the difference between the academic performance mean scores of male and female students taught scientific concepts using project based strategy?

Research Hypotheses

The following research hypotheses were formulated to guide the study and were tested at 0.05 level of significance:

Ho1: There is no significant difference between the academic performance mean scores of students taught scientific concepts using project strategy and compare with their counterpart taught using lecture method.

Ho2: There is no significant difference between the academic performances mean scores of male and female students taught scientific concepts using project strategy.

Methodology

This study adopted the pretest-posttest control group quasi-experimental research design. The population consisted of all senior school students in Irepodun Local Government Areas of Kwara State, Nigeria. The sample of the study made up of ninety five (95) SSII students comprising 43 males and 52 females. Simple random sampling technique was used to select the sample for the study. Two (2) schools were randomly selected for the study. The instrument used for the study was Science Performance Test (SPT) which was constructed by the researcher. The instrument consist of two sections: Section A and B, Section A was for student's bio-data information while section B consisted of twenty (20) items, four (4) options multiple choice test. The instrument was validated by one secondary school Science teacher who is a seasonal WAEC/NECO examiner and two (2) University lecturers one (1) from department of science education and one from department of test and measurement. The marking schemes and lesson plan was developed by the researcher and it were examined for face validity and appropriateness for the two groups. The Science Performance Test Instrument (SPT) was pilot – tested to establish its reliability. A reliability index of $r=0.78$ was obtained. The Science performance test (BPT) was administered to both students in the experimental and control groups. The data collected were subjected to both descriptive and inferential statistics. The treatment lasted for six weeks. The research questions were answered with the use of means and standard deviation while research hypotheses were tested using inferential statistics, Analysis of Covariance (ANCOVA) at 0.05 level of significance.

Results

Research Question 1: What is the performance mean scores of students taught scientific concepts using project based strategy and those taught with lecture method?

Table 1: Descriptive Statistics of Performance Associated with Treatment

Treatment	N	Mean scores		Mean scores		Means
		Pre-test		Post-test		
		X1	SD1	X2	SD2	Gain
Project strategy	39	31.30	8.61	58.69	10.75	+27.39

Lecture method	56	29.12	7.62	43.45	8.20	+14.33
Mean Difference		2.18		15.24		+13.06

Table 1 shows that the pre-test and post-test mean scores of students taught with Project strategy (experimental group) was 31.30 and 58.69. While the pre-test and post-test means score of students taught with lecture method was 29.12 and 43.45. From the above analysis, there is a mean gain of 27.39 for the experimental group and 14.33 for the control group. The experimental group has a mean gain difference of 13.06 from the control group. This indicated that students taught Science using project strategy performed better in scientific concepts than their counterpart taught with lecture method.

Research Question 2: What is the mean performance scores of male and female students taught with scientific concepts using project based strategy?

Table 2: Descriptive Statistics of Performance Associated with Gender

Treatment	N	Mean scores		Mean scores		Means
		Pre-test		Post-test		
		X1	SD1	X2	SD2	Gain
Male	42	29.00	7.12	51.42	8.61	+22.42
Female	53	35.23	9.45	58.70	9.82	+23.70
Mean Difference	95	6.23		7.28		+1.05

Table 2: shows that the pre-test and post-test mean scores of male and female students taught using Project based strategy (experimental group). From the analysis, the pre-test and post-test mean scores of male students were 29.00 and 51.42. While the pre-test and post-test means score of female students were 35.23 and 58.70. From the above analysis, the mean scores indicate that the female students had higher performance mean scores than the male counterpart using project method. The difference between the mean gain scores of male 22.42 and female 23.70. The difference in their mean gain is 1.05 in favour of female.

H₀₁: There is no significant differences between the performance mean scores of students taught scientific concepts using Project and compare with their counterparts taught with lecture method.

Table 3 Analysis of Covariance (ANCOVA) of Post-Performance by Treatment and Gender

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	3546.237	2	2117.17	14.632	0.004	0.107
Intercept	2521.317	1	2286.250	307.345	0.000	0.251
Pre-Test	2023.373	1	2036.149	29.531	0.001	0.004
Treatment	2110.624	1	2110.624	68.167	0.003*	0.075
Gender	53.919	2	26.960	0.827	0.586	0.006
Error	97231.200	94	29.135			
Total	11311.000	95				
Corrected Total	12298.820	95				

R S * denotes significant $p < 0.05$

Table 3 shows that the value associated with the calculated value of F (68.167) for the effect of project strategy on the academic performance of students in Science is 0.003. Since this value (0.003) is less than the 0.05 level of significance. Thus, null hypothesis is thereby rejected and the alternative hypothesis is accepted; which means that there is a significant difference between the post-test score of the students exposed to scientific concepts using project based and compare with their counterpart taught with lecture method.

H02: There is no significant difference between the performance mean score of male and female students taught scientific concepts using project based strategy.

Table 3 shows that the value associated with the calculate value of F (0.827) for the effect of gender on students' academic performance in Science is 0.586. Since this value 0.586 is greater than 0.05 level of significance, the null hypothesis was accepted. Thus, there is no significant difference between the mean performance score of male and female students exposed scientific concepts in Science using project based strategy.

Discussion of the Findings

The result shows that project strategy has a significant effect on students' academic performance in Science. The students exposed to scientific concepts using project based strategy performed better than those taught with lecture method. The project based strategy encourages learners to explore the Science concepts or content through the use of concrete experiences to comprehend especially the complex Scientific concepts easily. The result is in line with the study of Yanan and Lei (2022); Zudonu (2021); Adewumi & Adeoye (2023), who hypothesized that project-based learning is significant for students' academic performance in sciences. Besides, the study is also, disagreed with the study of Simpson's (2013); Yates et al (2020) who reported that students enrolled in project method tend to have lower performance rates than those who attend lecture method.

The finding revealed that both male and female students performed better when exposed to project method. The finding revealed that there is no significant differences between the academic performances mean scores of male and female students when exposed to project strategy. This implies that gender has no significant effect on student academic performance in Science when exposed to project strategy. The finding of the study is in line with Adewumi, et al., (2024b); Mbaba, (2019) & Okwor, et al., (2016) who reported that there is no significant difference in the achievement of male and female students in science subject. Interestingly, this finding contradicts with the findings of Olatoye et al., (2022); Ajibade, (2019); Iwendi(2012), reported that students' gender influences their academic performance in some subject areas.

Conclusion

Based on the findings of this study, it can be concluded that project based strategy is superior to lecture method in teaching scientific concepts in senior secondary schools in Irepodun Local Government Area of Kwara State, Nigeria. Project based strategy improved students' academic performance in Science far better than lecture method. It can also be concluded that students' gender has no significant effect on students' academic performance when exposed to scientific concepts using project strategy. This means that both the male and female students perform excellently when taught scientific concepts using project based strategy.

Recommendations

From the results of this study the following recommendations are therefore made:

1. Project strategy should be employed in teaching topics that are practical oriented in senior secondary schools Science, since is activity-oriented.
2. Lecture method should be discouraged being used in teaching practical oriented subjects, precisely Science, since it does not have high capability to enhance students' psychomotor skills and critical thinking ability.

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