

**IMPACT OF FOUR SELECTED FACTORS ON PHYSICS STUDENTS' ACADEMIC
ACHIEVEMENT IN SENIOR SECONDARY SCHOOLS IN JOS METROPOLIS OF
PLATEAU STATE, NIGERIA**

by

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Abstract

This study investigates the impact of selected factors on physics students' academic achievement in senior secondary schools in Jos Metropolis of Plateau State, Nigeria. Of particular interest to the researcher were the factors of students' interest, availability of physics laboratory facilities, teachers' qualifications and teaching methods. The study adopted the cross sectional survey design. The population of the study comprises physics teachers and students of senior secondary II (SSII) in one hundred and seventy (170) schools situated in Plateau State. Out of this population, ten (10) subject teachers (physics) and two hundred and twenty-three physics students were sampled from five schools randomly selected from the area of study. Three instruments were used for the study namely Physics Teachers' Bio-data (PTB), Physics Students' Interest Rating Scale (PSIRS) and Physics Achievement Test (PAT). The instruments were validated by three experts in the Department of Science and Technology Education, University of Jos. Data collected was analysed using mean and standard deviation for the research questions while t-test was used for the null hypotheses at 0.05 level of significance. The results of the study revealed that students' interest, availability of physics laboratory facilities, teachers' qualifications and teaching methods have immense impact on the achievement of students studying physics in senior secondary schools.

Keywords: Impact, factor, achievement, physics and senior secondary school

Introduction

Education is a sequential process of acquiring knowledge, functional skills and values which can either be formal, informal or both. Generally, education has been viewed as an instrument for developing human skills and capacities in diverse fields towards improving the standard of living of any nation. The Federal Republic of Nigeria (FRN) in the National Policy on Education (NPE,

2104) identified that education as the greatest investment that a nation can make for the quick development of its economical, political, sociological and human resource.

Physics is a branch of science that seeks to provide answers to questions about nature and how it affects the technological development of any nation. The study of physics as a subject should be regarded as a necessary part of human endeavour. Unfortunately many students find the subject as an abstract or difficult subject. Asikhai (2010), asserted that education at secondary school level is supposed to be the bedrock and the foundation towards higher knowledge in tertiary institutions. It is an investment as well as an instrument that can be used to achieve a more rapid economic, social, political, technological, scientific and cultural development in a country. It is rather unfortunate that the secondary schools today are not measuring up to the standards expected of them. There have been public outcries over persistent poor academic achievement of secondary school students in public examinations especially in physics. The reason for students' poor academic achievement in physics can be linked to several factors.

Different factors have different level of impact on students' academic achievement in physics in senior secondary schools. While several studies have investigated the impact of one or two factors a time, the present study sought to determine the impact of four selected factors on the academic achievement of physics students in senior secondary schools in Jos Metropolis of Plateau State. The factors that are of particular interest to the researcher in this study include, students' interest in the subject, availability of laboratory facilities, teachers' qualifications and teaching methods. The rationale for the selection of these four factors is based on the fact that among all the factors that affect students' achievement in physics, these four appear to be more critical in the view of the researcher. Djamarah, (2002) mentioned that if a student has high study interest, the study result tends to be high. In contrast if the interest is less, the study result will be

low. Aremu&Sokan (2003) as cited in (Ogundele G.et al (2014) also noted that the students' factors of poor academic performance were poor study habits, psychological adjustment problems, lack of interest in school programme, low retention, association with wrong peers, low achievement motivation and emotional problems.

Learning physics is also related to the ability of the students to solve physics problem. Several research have allied students' achievement in physics to physics teachers' qualification, method of teaching and experience to the practical world of physics. Okoronka and Wada (2014) identified poor teaching methodology as one of the effects of students' poor performance in science subjects. This on the other hand could affect students' academic achievement in physics. Wambugu&Changeiywo (2008), state that teaching methods are crucial factors that affect the academic achievement of students. Similarly, the presence of adequate physics laboratory facilities in addition to appropriate teaching methods could enhance the academic achievement of physics students. The most effective approach to physics teaching according to Ojediran et al, (2014) is to support theoretical explanations with actual practices in laboratory. In this connection, Taale & Antwi, (2012) discovered that inadequate exposure to science laboratory work at the secondary school level causes student inability to comprehend and apply scientific knowledge.

The use of appropriate teaching methodology and a well-equipped physics laboratory to teach physics students depends on the qualifications of the teachers. In Nigeria, Nigerian Certificate in Education (NCE) is stipulated as the basic qualification for teaching at primary and lower basic schools (JSS 1-3) but today one finds that NCE holders teach Senior Secondary Schools. In another instance, graduates of mathematics or other subjects may be made to teach physics. This phenomenon is often referred to as Out-of-teaching; meaning teachers who are assigned to teach

subjects and levels that they are not suitably qualified to do so (Du Plessis et al, 2013). This out-of-teaching syndrome, very clearly is not helping the system and as long as it continues there may not be any improvement in terminal examinations (WAEC, NECO, NABTEB, e.t.c.).

Research Questions

1. How does interest impact on the academic achievement of physics students in senior secondary schools?
2. What is the impact of teaching methods on the academic achievement of physics students in senior secondary schools?
3. How does teachers' qualification affect the academic achievement of physics students in senior secondary schools?
4. What is the impact of physics laboratory facilities on the academic achievement of physics students in senior secondary schools?

Hypotheses

- HO₁:** Students' interest does not significantly affect their academic achievement of physics students in senior secondary schools.
- HO₂:** Teaching methods have no significant impact on the academic achievement of physics students in senior secondary schools.
- HO₃:** The extent of availability of physics laboratory facilities has no significant impact on the academic achievement of physics students in senior secondary schools.
- HO₄:** Teachers' qualification has no significant impact on the academic achievement of physics students in senior secondary schools.

Methodology

The study employed a cross-sectional survey design. The population of the study comprises physics teachers and students of senior secondary II (SSII) in one hundred and seventy (170) schools situated in Jos Metropolis of Plateau State of Nigeria. Out of this population, ten (10) subject teachers (physics) and two hundred and twenty-three physics students representing 10% of the population were sampled from five schools randomly selected from the area of study. Three instruments were used for the study namely Physics Teachers' Bio-data (PTB) which consist of four questions for the teachers; Physics Students' Interest Rating Scale (PSIRS) with a four point rating scale of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) and Physics Achievement Test (PAT) consist of multi-choice forty (40) physics question for the students. The instruments were validated by three experts in the Department of Science and Technology Education, University of Jos. Data collected was analyzed using mean and standard deviation for the research questions while t-test was used for the null hypotheses at 0.05 level of significance. Tables were employed for the presentation and analysis of the data.

Results

Research Question 1: How does interest impact on the academic achievement of physics students in senior secondary schools?

The data for answering question 1 is presented in table 1.

Table 1: Mean Difference Between the Students' Achievements Based on Low and High Interest.

Interest Level	No. of Responses	Mean	Mean Difference	Remark
High	184	3.50	1.76	Infavour of
Low	39	1.74		high interest

Table 1 shows that the mean difference between students taught physics with high interest and those with low interest is 1.76. This is a clear indication that students with high interest in the subject of physics have the potential of doing better than those with low or no interest.

Hypothesis 1: Students' interest does not significantly affect their academic achievement of physics students in senior secondary schools.

Table 2: t-test Comparing Students Interest Level in Physics based on Low and High.

Interest Level	N	\bar{X}	SD	Df	t-cal	t-crit.	Remark
High	184	3.50	9.29	221	4.29	1.96	significant
Low	39	1.74	4.62				

Table 2 reveals that the calculated t-value (t-cal) is greater than the t-critical at 0.05 level of significant. Hence the null hypothesis of no significant difference is hereby rejected. This implies that students' interests have significant impact on the academic achievement of students in their study of physics in senior secondary schools.

Research Question 2: What is the impact of teaching methods on the academic achievement of physics students in senior secondary schools?

The data for answering question 3 is presented in table 3.

Table 3: Mean Difference Between the Academic Achievement of physics students based on the Teaching Methods used.

Teaching Methods	No. of Responses	Mean	Mean Difference	Remark
Conventional (Lecture Method)	140	29.49	11.08	In favour of Non - Conventional Method
Non-Conventional (Other Methods)	83	40.51		

Table 3 shows that the mean achievement difference between students taught physics using the two (2) groups of teaching methods is 11.08. This means that students who are taught physics using other methods do better than those taught using conventional method (Lecture Method).

Hypothesis 2: Teaching methods have no significant impact on the academic achievement of physics students in senior secondary schools.

Table 4: t-test Comparing Teaching Methods used by Teachers Based Conventional (Lecture Method) and Non-Conventional (Other Methods).

Teaching Method	N	\bar{X}	SD	Df	t-cal	t-tab	Remark
Conventional (Lecture Method)	140	29.49	7.56	221	32.12	1.96	significant
Non-Conventional (Other Methods)	83	40.57	4.76				

Table 4 reveals that the calculated t-value (t-cal) is greater than the t-critical at 0.05 level of significant. Hence the null hypothesis of no significant difference is hereby rejected. This implies that the teaching methods used to teach physics students have significant impact on their academic achievement.

Research Question 3: How does teachers' qualification affect the academic achievement of physics students in senior secondary schools?

The data for answering question 5 is presented in table 5.

Table 5: Mean Difference Between the Academic Achievement of Students based on Teachers' Qualifications (Trained and Non-Trained Physics Teachers).

Teachers' Qualification	No. of Responses	Mean	Mean Difference	Remark
Trained Physics Teachers	96	25.65	6.40	In favour of Trained Physics Teachers
Non-Trained Physics Teachers	127	19.25		

Table 5 shows that the mean difference between the academic achievement of students physics trained and non-physics trained teachers is 6.40. This is a clear indication that students taught by teachers who have degree in Physics Education do better than students taught by teachers who have other qualifications.

Hypothesis 3: Teachers' qualification has no significant impact on the academic achievement of physics students in senior secondary schools.

Table 6: t-test Comparing Teachers' Qualification Based on Trained and Non-Trained Physics Teachers.

Teachers' Qualification	N	\bar{X}	SD	Df	t-cal	t-tab	Remark
Trained Physics Teachers	96	25.65	4.99				
				221	22.38	3.88	Significant
Non-Trained Physics Teachers	127	19.25	3.80				

Table 6 reveals that the calculated t-value (t-cal) is greater than the t-critical value of 1.96 at 0.05 level of significant. Hence, the result null hypothesis of no significant difference is rejected. This means that there is a significant difference between the achievement of students taught physics by teachers with trained qualifications and those not trained to teach physics.

Research Question 4: What is the impact of physics laboratory facilities on the academic achievement of physics students in senior secondary schools?

The data for answering question 7 is presented in table 7.

Table 7: Mean Difference Between Academic Achievements of Students Taught Physics with Adequate Laboratory Facilities and those without Adequate Laboratory Facilities.

Physics Laboratory	No. of Response	Mean	Mean Difference	Remark
Adequate	103	15.96		In favour of
			5.43	those with
Inadequate	120	10.53		adequate facilities

Table 7 shows that the mean difference between the academic achievement of students in schools with adequate and inadequate physics laboratory facilities is 5.43. This is a clear indication that students in schools with adequate physics laboratory facilities do better than those students in schools with inadequate or no physics laboratory.

Hypothesis 4: The extent of availability of physics laboratory facilities has no significant impact on the academic achievement of physics students in senior secondary schools.

Table 8: t-test comparing Physics Laboratory Facilities Based on the Adequate and Inadequate Laboratory Facilities.

Physics Laboratory	N	\bar{X}	SD	Df	t-cal	t-tab	Remark
Adequate	103	15.96	7.59	221	16.15	3.34	significant
Inadequate	120	10.53	4.76				

The table 8 above revealed that the calculated t-value (t-cal) is greater than t-critical value of 1.96 at 0.05 level of significant. Hence the null hypothesis of no significant difference is rejected. This signifies that students taught physics in schools with adequate laboratory facilities have the potential of doing better than those taught in schools without adequate laboratory facilities.

Discussion

The major issue addressed in the study was to determine the impact of four selected factors on physics students' academic achievement in senior secondary schools in Jos metropolis of Plateau State. From the results, it was found that students' interest in physics had a significant impact on their academic achievement. This findings collaborates with the findings of Aremu&Sokan (2003) as cited in Ogundele (2014) which found that the students' factors of poor academic performance were poor study habits, psychological adjustment problems, lack of interest in school programme, low retention, association with wrong peers, low achievement motivation and

emotional problems. The researchers, in this study also found out that the teaching methods used by physics teachers, their qualifications and use of appropriate teaching methodologies had positive impact on the academic achievement of physics students. This is in agreement with Wambugu & Changeiywo (2008) who stated that teaching methods are crucial factors that affect the academic achievement of students, and no matter how well-developed and comprehensive a curriculum is, its success is dependent on the quality of the teachers implementing it (Ajaja, 2009). It was also discovered from the bio-data filled by physics teachers that most of the teachers teaching physics have no familiarity with physics concepts and had degrees outside Physics Education. This factor is likely one of the causes of students' poor academic achievement in physics because the teachers were not fully trained in the appropriate teaching methodologies for physics. The researcher also discovered from the study that the absence or lack of laboratory materials contributes to students' poor achievement in physics. This is in agreement with Taale&Antwi, (2012) also discovered that inadequate exposure to science laboratory work at the secondary school level causes student inability to comprehend and apply scientific knowledge.

Conclusion/Recommendation

Based on the results from the study, the study concludes that students' interest, availability of physics laboratory, teachers qualification and appropriate teaching method have immense impact on physics students' academic achievement in senior secondary schools. In light of the above, the following recommendations are made:

1. Appropriate measures should be put in place by school authorities to arouse students' interest in the study of physics.

2. Sufficiently trained physics trained teachers should be employed to teach the subject of physics in senior secondary schools.
3. Physics teachers should be encouraged to use appropriate methods other than the conventional lecture methods to teach physics in senior secondary schools.
4. Adequate laboratory facilities should be provided in all senior secondary schools for effective teaching of physics.

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