

**A COMPARATIVE STUDY OF STUDENTS' PERFORMANCE IN S.S.C.E PHYSICS
AND NCE PHYSICS IN COLLEGE OF EDUCATION, BILLIRI, GOMBE STATE,
NIGERIA**

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Abstract

This research ascertains the predictive strength of the Senior Secondary Certificate Examinations Physics (SSCE) in predicting the performance of students in the National Certificate Examinations (NCE) in College of Education Billiri, Gombe State, Nigeria. As an ex-post facto and descriptive research, the study population comprised of 13 students from the first two sets admitted into the College of Education Billiri, Gombe State, Nigeria in 2016 and 2017 and have their academic record intact. The instrument used to collect the data for the study was an inventory while the data collected was analyzed using percentages to determine the degree of relationship existing between the student's academic achievements in while correlation was used to test the hypothesis at 0.05 level of significance. The results of the investigation revealed that the academic achievement scores (grades) in SSCE Physics relates positively with their NCE achievement scores (CGPA) in Physics.

The study also reveals that the predictive power of SSCE in predicting achievement in NCE is moderated by gender and that a noticeable difference was observed on male and female students' achievement in the NCE.

Keywords: Better predictor, Comparative, Analysis, Physics, Achievement performance, Examination

Physics is one of core science subject offered in Nigerian schools and it forms the basis for the nation's technological advancement and human resource development (Abubakar, 2012). It is a branch of science, which deals with energy and matter and their interactions. Its knowledge has contributed greatly to the production of instruments and devices of tremendous benefits to the human race. Physics is seen as the most fundamental of all science responsible for real development and breakthrough in science and technology (Chukwunenye, 2015; Ugwu, Nwokocha & Ozioko, 2016). This is because physics offers greatest opportunity for discoveries of fundamental facts of nature. Equally, physics is the engine that drives modern technology in the world today. According to Aseidu-Addo and Ridana (2000), the power of Physics is found in its relevance to the solution of problems facing humanity.

The Oxford Dictionary (2010) defines physics as the study of laws that determine the structure of the universe with reference to the matter and energy of which it consist. Despite the relevance of physics to nation building and technological advancement, students' enrolment and performance in the subject has been poor over the years. Many factors have been indicated for the poor performance of students in the subject at all levels. These include motivation, interest, phobia, others students related, parent related and government related factors (Chukwunenye, 2015).

The term 'academic performance' has been described as the scholastic standing of a student at a given moment. It refers to how an individual is able to demonstrate his or her intellectual abilities (Adeboyeje, Olaniyi & Adepoju, 2003). According to Caliskan (2017), this scenario of poor academic achievement in science is very disturbing. It is a matter of regret that despite the utility value of physics and its involvement in the science related courses that gives prominence to a nation, students' performance in physics in the senior secondary school remains at very low ebb, this situation is causing a lot of concern to science educators. Onah and ugwu (2010) asserted that the teaching of science subjects, especially physics and performance of students at the secondary school level have been the concern of government and parents due to poor achievement by the students.

Virginia (2004) said that we live in a world that is increasingly dependent on physics and fueled by breakthroughs in physics research. Technology continually advances, we are beginning to answer questions about the beginning and end of the universe, and we are discovering amazing things about the interaction of sub-atomic particles. Unfortunately, less and less students are studying physics, which is causing the public to mitigate their understanding about scientific concepts. Without Physics, the understanding of natural problems would be superficial. In Nigeria for instance, attention has been made on the teaching and learning of physics, as a way of improving students' academic achievement in science subjects at levels of Nigeria Education System (Kolawale, 2007).

It has been observed that secondary school students have phobia for physics and therefore perform poor in both terminal and standardize examinations such as SSCE. This

very serious problem should be tackle because physics is a prerequisite in admission into courses that are Science, Technology, Engineering and Mathematics (STEM) related courses.

Accordingly, in a study that attempted to find variables that affect physics achievement, Lawrenz et al. (2009) found out that students who underwent "active physics" scored higher for the greater part of the year compared to those who did not undergo the same experience. While at the same time, the study claims that the achievement gap between boys and girls narrowed for those groups who took "active physics".

Gender difference in interest emerge when other factors come into play, which can compromise self-concept of performance in physics. Hoffmann (2002) stressed that gender difference in interest seems to be sufficiently, explained by gender differences in self-concept.

Although the curriculum of the Senior Secondary Schools differs a little from that of National Certificate Examination (NCE), it is speculated that achievement of students in the SSCE, which also stand, as entry qualification for the NCE programme could positively predict student's performance in National Certificate Examination (NCE).

In addition, research reports on the influence of gender and ownership of school are also not conclusive. Establishing the predictive validity of SSCE on achievement in NCE would go a long way in fulfilling some of the important uses of evaluation; for placement and for certification.

Statement of the Problem

A review of the literature reveals that many science educators have recognized that students view about science course is different from scientific ones. Craker (2006) suggested that prior knowledge has a great effect on students' knowledge of scientific concepts. It has been observed that secondary school students have phobia for physics and therefore perform poor in both terminal and standardize examinations such as SSCE. This serious problem should be tackle because physics is a prerequisite in admission into courses that are Science, Technology, Engineering and Mathematics (STEM) related courses. In addition, physics is the gate and key to modern technology, medicine and other sciences (Okeke &Nwadinigwe, 2015) this is the spur for the present study. It is against these backgrounds that we are derived to conduct this research on "A Comparative Study of Students' Performance in S.S.C.E and NCE Physics in COE Billiri, Gombe State Nigeria.

The problem of this study, therefore, was to determine whether any significance differences exist between the performance level of secondary schools' students in their senior Secondary Certificate Examination (SSCE) and National Certificate examination (NCE) in College of Education Billiri, Gombe State, Nigeria. In addressing this problem, it is necessary that the following research questions considered:

Purpose of the Study

It is an undeniable fact that the standard of the SSCE will vary from state to state (in Nigeria) depending upon its human and material resources, level of educational development, and the general state of its school.

The purpose of this study therefore was to examine the relative contributions of predictor variable (SSCE) on the criterion variable (Cumulative Grade Point Average) of

physics students who were admitted in 2016 and 2017 academic session in College of Education Billiri, Gombe, Nigeria.

Objective of the study

The objective of the study is to

1. To find out whether there is significant relationship between the overall performance in the aggregate NCE III results
2. To find the extent to which the performances of student at the NCE could be predicted from their entry qualification, (SSCE)
3. To determine the nature and strength of the relationship whether it is gender related.

Research Questions

The study was carried out through answering the following research questions:

1. What is the performance level of students in SSCE in College of Education Billiri, Gombe state?
2. What is the performance level of students in SSCE in College of Education Billiri, Gombe state?
3. Is there any difference between physics students' SSCE result and their NCE academic performance?
4. Is there any difference between male and female physics students' NCE academic performance?

Significance of the Study

The study will help in investigating the following objectives

1. To find out the extent to which students' performance at the NCE could be predicted from their entry qualification (SSCE)
2. To determine the nature and the strength of the relationship between SSCE physics and NCE physics.
3. Help students to develop awareness for physics and avoid a repulsive approach to it in relation to other subjects;
4. To determine whether academic performance in physics is gender related

Scope and Limitations of the study

The estimated population of the study was NCE I students who were admitted in 2016/2017 and 2017/2018 academic session in COE Billiri, Gombe state Nigeria to study physics from which a sample of five (13) graduated students was drawn (seven male and six are female).

Generalizations made with respect to this study are subject to the following limitations:

1. Study could not reach out to a substantial number of colleges of education/NCE awarding institutions in the country
2. The students' scores used could suffer from teacher's bias.
3. Data collected were not analyzed set by set or according to the institutions.

Hypotheses

H_0 : There is no significant difference between physics students SSCE result and their NCE academic performance.

Methodology

This study was designed along the line of an ex-post facto and a descriptive survey. This study is meant to compare the performance of students in SSCE Physics with their performance in NCE.

Instruments for Data Collection

The instrument used to collect data for the study was an inventory titled the Secondary Schools Academic Performance Inventory (SSAPI). The first set consist of the records which contained all the WAEC/NECO/NABTEB grades of physics students admitted during the 2016/2017 and 2017/2018 academic session. The second set consisted of the records which contained all the Cumulative GradePoint Average (CGPA) of the sampled students in physics at the NCE level in College of Education Billiri, Gombe, Nigeria.

Sample and Sampling Techniques

The data were collected directly from the school of science in COE Billiri, The SSCE is retrieved from their respective files in the department while their corresponding Cumulative Grade Point Aggregate (CGPA) of physics students were obtained from the department of natural science in which physics is one of the units, in schools of science COE Billiri,

Method of Data Analysis

The method used to analyze the data were as follows

Procedure for Data Analyses

The percentage was used to determine the degree of relationship existing between the student's academic achievements in physics were used to answer the research questions while correlation was used to test the hypothesis at 0.05 level of significance.

Analyses and Presentation of Results

For the purpose of scoring, SSCE grade of A, C, P and F were awarded 4, 3, 2 and 0 points respectively, while the NCE grade of Distinction, Credit, Pass and Fail were treated likewise.

Table 1: Simple Information on Grading System of the Research Samples

Percentage	75	70	65	60	55	50	45	40	0 – 39
%	100	74	–	–	–	–	–	–	
From - To			69	64	59	54	49	44	
Grading System	A ₁	B ₂	B ₃	C ₄	C ₅	C ₆	D ₇	E ₈	F ₉
Weight	8	7	6	5	4	3	2	1	0

Source: WAEC 2002

Table2: The College CGPA grades

Percentage (%)	70 - 100	60 - 69	50 - 59	45 - 49	40 - 44	0 - 39
CGPA	4.50 - 5.00	3.50 - 4.49	2.40 - 3.49	1.50 - 2.39	1.00 - 1.49	0.00 - 0.99
Grades	A	B	C	D	E	F
Weight	5	4	3	2	1	0

Source: NCCE curriculum implementation framework, 2014

Research Result Analysis

In computing performance, the frequency counts of the number of students who obtained credit grades 1 to 6 in physics in the examinations were transformed from discrete data into continuous data through secondary analysis. The weighted average credit performance is computed using the formula Adeyemi (2004).

$$P = \frac{n_1A+n_2C+n_3P}{N} \dots\dots\dots 1$$

Where: p = performance;

n_1, n_2, \dots, n_6 = number of times each grade occurs;

While A, C, P, F = numeric weights of each grade.

while N – represent the number of candidates who obtained such grades (WAEC 2002). In the SSC examinations, low-level results were also obtained.

Table 3:Physics students’ grade points in SSCE teaching and NCE.

S/N	Registration Number	Gender	SSCE GRADE	NC GRADE	SSCE (X)	NC (Y)	d = X - Y	d ² = (X - Y) ²	\bar{x} = (X - \bar{X})	\bar{y} = (Y - \bar{Y})	$\bar{x} \cdot \bar{y}$	\bar{x}^2	\bar{y}^2
1	INT/PHY /0024	F	C6	C	3	3	0	0	1	0	1	1	0
2	INT/PHY /0087	F	C6	B	3	4	-1	1	1	1	1	1	1
3	INT/PHY /0088	M	C6	B	3	4	-1	1	1	1	1	1	1
4	INT/PHY	F	C6	D	3	2	1	1	1	-	-	1	1

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	/0135									1	1		
5	INT/PHY /0161	F	C6	D	3	2	1	1	1	-	-	1	1
6	INT/PHY /0220	M	C6	C	3	3	0	0	1	0	0	1	0
7	INT/PHY /0259	M	C6	C	3	3	0	0	1	0	0	1	0
8	INT/PHY /0448	M	C6	C	3	3	0	0	1	0	0	1	0
9	INT/PHY /0461	M	C4	B	3	4	-1	1	1	1	1	1	1
10	INT/PHY /0464	F	C5	C	3	3	0	0	1	0	0	1	0
11	INT/PHY /0100	F	C6	D	3	2	1	1	1	-	-	1	1
12	INT/PHY /0162	M	C6	C	3	3	0	0	1	0	0	1	0
13	INT/PHY /0176	M	P7	C	2	3	-1	1	0	0	0	0	0
TOTAL					26	39	7	7	7	1	12	6	

Source: School of Science C.O.E Billiri, Gombe, Nigeria

$$\bar{X} = \frac{\sum fX}{N} = \frac{26}{13} = 2$$

$$\bar{Y} = \frac{\sum fY}{N} = \frac{39}{13} = 3$$

$$r = \frac{\sum \bar{x} \cdot \bar{y}}{\sqrt{\sum \bar{x}^2 \times \sum \bar{y}^2}} = \frac{1}{\sqrt{12 \times 6}} = \frac{1}{\sqrt{72}} = \frac{1}{8.453} = 0.12$$

$$R = \left(1 - \frac{6 \sum d^2}{N(N^2 - 1)}\right) = \left(1 - \frac{6 \times 7}{13(169 - 1)}\right)$$

$$R = \left(1 - \frac{42}{13 \times 168}\right) = 1 - \frac{42}{2184}$$

$$R = 1 - 0.019 = 0.981$$

$$\text{Variance} = R^2 = 0.981^2 = 0.96\%$$

Table 4: Performance Level of Students in the SSCE

$$\begin{aligned} \text{the Performance (P)} &= \frac{n_1A_1 + n_2B_2 + n_3B_3 + n_4C_4 + n_5C_5 + n_6C_6}{N} \\ &= \frac{11 \times 3 + 2 \times 2}{13} = \frac{37}{13} = 2.845 \end{aligned}$$

GENDER	Number	SSCE					NCE				
		A	B	C	P	F	A	B	C	P	F
MALE	7	0	0	5	2	0	0	2	5	0	0
FEMALE	6	0	0	6	0	0	0	1	2	3	0

$$\text{Percentage} = \frac{2.845}{4} \times 100 = 71.13\%$$

Table 5: Performance Level of Students in the NCE

$$\text{The performance (P)} = \frac{3 \times 4 + 7 \times 3 + 3 \times 2}{N} = \frac{39}{13} = 3$$

$$\text{Percentage} = \frac{3}{4} \times 100 = 75\%$$

Table 6: Performance Level of Students in the SSCE based on gender

COURSE	NUMBER(N)	SSCE Performance				
		A	B	C	P	F
PHYSICS	13	0	3	7	3	0
PERFORMANCE	13	0	12	21	6	0

Table 7: Calculated Performance Level of Students in the NCE based on gender

COURSE	NUMBER(N)	SSCE Performance				
		A	B	C	P	F
PHYSICS	13	0	0	11	2	0
PERFORMANCE	13	0	0	33	4	0

$$\text{Total male performance } (P_m) \text{ in SSCE} = \frac{15 + 4}{7} = \frac{19}{7} = 2.71 = 67.86\%$$

$$\text{Total female performance } (P_f) \text{ in SSCE} = \frac{18}{6} = \frac{18}{6} = 3 = 75.00\%$$

$$\text{Male performance } (P_m) \text{ in NCE} = \frac{4 + 15}{7} = \frac{19}{7} = 2.71 = 67.86\%$$

GENDER	Number	SSCE performance					NCE performance				
		A	B	C	P	F	A	B	C	P	F
MALE	7	0	0	15	4	0	0	4	15	0	0
FEMALE	6	0	0	18	0	0	0	4	6	6	0

$$\text{Total female performance } (P_f) \text{ in NCE} = \frac{16}{6} = \frac{16}{6} = 2.67 = 66.67\%$$

Discussions of Result

Research question 1: What is the level of performance of students in their senior secondary school certificate (SSCE)?

The performance level of students in the Senior Secondary school Certificate examinations (SSCE) in physics were excellent which is 71.13 %. This can be seen in table 4. This is in contrary to Caliscan (2017). He observed that, it is a matter of regret that, despite the utility value of physics and its involvement in the science related courses that gives prominence to a nation; students' performance in physics in the senior secondary school remains at very low ebb, this situation is causing a lot of concern to science educators.

Research question 2: What is the level of performance of students in the National Certificate in Education(NCE) in College of Education Billiri, Gombe State, Nigeria?

In answering this question, data on the grades obtained by students in the National Certificate of education (NCE III) were collected from the school of science. In computing performance in the examinations, the frequency counts of the number of students who obtained credit grades 1 to 6 in each subject were transformed from discrete data into

continuous data through secondary analysis. The weighted average performance is computed using equation (1) above, (all symbols have their usual meanings).

The performance levels of students in the National Certificate in Education (NCE) in physics were excellent (75.00 %) as shown in table 5.

Research question 3: Is there any difference between physics students' SSCE result and their NCE academic performance?

The results shows that 3 students scored distinction, seven (7) obtained and 3 scored passes, thus 10 of 13 students obtained credit in physics (75.00%) in the NCE which is 3.87% higher than their performance in SSCE. The result is in line with previous similar studies by Kolawole and Ilugbusi (2007) and Ayodele (2004), respectively who found that there was significant contribution from entry grades to the first year and final year academic performance of students in tertiary institutions. This finding is in line with Craker (2006) who suggested that prior knowledge has a great effect on students' knowledge of scientific concepts.

Research question 4: Is there any difference between male and female physics students' NCE academic performance?

There is but a little difference between male and female physics students' NCE academic performance of about 1.19%. This shows that gender is not a barrier to students' NCE academic performance. This finding is related to the finding of Hoffmann (2002) who stressed that gender difference in interest seems to be sufficiently, explained by gender differences in self-concept.

Conclusion

Considering the findings of this study, it was concluded that Students' achievement scores in SSCE Physics relates positively with their NCE achievement scores (GPA) in Physics.

Based on the findings of this study, we can conclude that Student's academic achievement in SSCE can be used as a predictor to their later achievement in NCE.

Recommendations

Based on the findings of this study, the researcher makes the following recommendations.

1. Science teachers should ensure that all students; male and female, are given equal opportunity in science lessons by giving students equal attention, fair tasks, and inspire students through mixed group works and projects. This will help close the gap between male and female students concerning their performance in the sciences.
2. Only qualified, competent, teachers of good character should be employed and deployed in all of the public/private schools regardless of location. This can be done by implementing a stringent vetting process for would be teachers, providing necessary support and conducive habitat for teachers, and ensure that rural teachers receive attractive compensation to reduce attrition.
3. The MOE should use the results of SSCE to revitalize the education system by providing professional development training for in-service teachers, intentionally hiring qualified teachers, and reforming the curriculum to align it with contemporary trend.

4. WAEC, NECO and NABTEB results should remain the mode of entry of students into Physics department.
5. Teachers should be conscious or meticulous in their award of marks as these scores are the only determinant of achievement by the students.

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