

WEST AFRICAN SCHOOL CERTIFICATE PHYSICS EXAMINATION ACHIEVEMENT AS PREDICTOR OF PHYSICS EDUCATION STUDENTS' CLASS OF DEGREE IN PUBLIC UNIVERSITIES IN NORTH CENTRAL, NIGERIA

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Abstract

This study investigates the West Africa School Certificate Physics Examination Achievement as predictors of Physics Education students' class of degree in North Central, Nigeria. The study adopted ex-post facto design. The population of the study comprised 989 Physics Education graduates from the State and Federal Universities in the North Central, Nigeria who completed their programme in 2014/2015, 2015/2016, 2016/2017, 2017/2018 and 2018/2019 sessions, from which a sample of 694 (442 Males and 252 Females) Physics Education students were selected for the study, using multistage sampling techniques. Physics Entry Qualifications and Universities Degree Proforma (PEQUDP) were employed as instruments for data collection. The proforma had a reliability index of 0.84 using Cronbach alpha. The research questions were answered with Pearson Product Moment Correlation Coefficient while the null hypotheses were tested with Regression analysis. The findings of the study reveal that WASSCE Physics grades significantly predicted students' class of degrees in Physics Education in State Universities ($t=6.135$; $p=0.000$ $\alpha=0.05$); and WASSCE Physics grades significantly predicted students' class of degrees in Physics Education in Federal Universities ($t=8.841$; $p=0.000$ $\alpha=0.05$). The study recommends that WASSCE Physics grades should be used as a criterion for admitting students into Physics Education in public Universities since it significantly predicts students' academic achievement. The government and school administrators should provide the necessary teaching and learning facilities to enhance students' learning and achievement in Physics.

Keywords: Physics Education, Physics Grades, Class Of Degree, Predictor, Achievement, Examination

INTRODUCTION

Education is considered as the key to the development of the individual and the society at large. That is why the government had accorded it a priority in its policy. The national policy on education has emphasis on the relevance of educating its citizens by providing policy documents for the formal system of education. Government commitment to education is often demonstrated through the development and implementation of policy frameworks that guide educational practices and ensure access for citizens (Federal Republic of Nigeria, 2019; UNESCO, 2021).

Physics has been one of the core Science subjects in secondary school that is compulsory for science students. The subject is usually taught in senior secondary school one (SSS1) to senior secondary school three (SSS3) of the programme. Physics deals with the study of matter in relation to its motion and energy associated with it. The relevance of Physics to the development of the individual has been emphasized. Physics knowledge has broad application across multiple sectors, including medicine, geophysics, instrumentation, agriculture, Environment, Energy development and Electronics among others (Serway & Jewett, 2019; American Institute of Physics, 2020). The subject has been regarded as the mother of all Sciences. The objectives of Secondary school Physics emphasis on the acquisition of fundamental concepts and principles necessary for everyday living as well as for further academic pursuits as outlined in curriculum documents (NERDC, 2020). These objectives are attainable through the teaching and learning of Physics at secondary schools. Students' achievement in the subject is very important in attaining the objectives of secondary school Physics which is evaluated in the teaching and learning process and at the end of the academic programme. Academic achievement of students is usually assessed during instruction and formally measured through examination administered at the end of instructional periods (Black& William, 2018 Harlen, 2019). At the end of the secondary school programme, students' achievements are evaluated by the West Africa Examination Council (WAEC) which conducts the West Africa Secondary School Certificate Examination for final year students in senior secondary school three (SS3) in all subjects. The examination is based on a prescribed syllabi of which students are expected to cover at the terminal year in preparation for the examination.

Consequently, secondary school students are examined by the West Africa Examination Council based on prescribed Physics syllabus. The performance of students in the West Africa School Certificate Examination (WASCE) is usually scored and graded to reflect students' performance in the subject. In the WASCE examination, students' performance is reported using standardized grading systems that reflect their level of achievement in each subject (West Africa Examination Council, 2022). Moreover, these WASSCE grades are relevant qualifications students obtain on graduation from secondary schools which justify the level of knowledge and skills acquired in Physics. The grades awarded to students are generally interpreted as indicators of the knowledge and skills they have acquired in a subject area (Brookhart, 2018; Sadler, 2019). Based on students' performance in the WASSCE examination, students could obtain grades such as A1, B2, B3, C4, C5, C6, D7, E8 and F9. These grades are referred to as qualifications which are used for admission into tertiary institutions. The minimum qualification accepted for admission is credit pass in relevant subjects for the course of study of their choice. The minimum grade that is required for admission into Science and Technology courses is credit level pass in science subjects (Joint Admission and Matriculation Board, 2021). The University offers students' courses of study based on the basic requirement of a programme. To study Physics Education at the University, students must possess a minimum grade of credit pass of C6 in Science subject with Physics inclusive. In addition, students must acquire a minimum required cut-off point in Unified Tertiary Matriculation Examination (UTME) in order to be admitted to study Physics Education at the University.

Tertiary institutions have been in forefront in enrolling students into various course of studies. Before the

advent of Private Universities, Public tertiary institutions such as State and Federal Universities have played a dominant role in facilitating students' access to higher education and programme enrollment (National Universities Commission, 2021). These public tertiary institutions are established by the State and Federal Government that spread across the country. Public universities have been training students in different courses that lead to an increase in manpower requirements in various sectors of the economy. These higher institutions provided by the government have been of great benefit to students' achievement and upliftment to meet up to the high demand for tertiary education. Adebayo & Oluwaseun (2020) opined that students' enrollment into public tertiary institutions have had a great impact on their academic achievement. Physics Education is among the programmes that is offered in Nigerian universities with the aim of training Pre-service Physics teachers. The quality of these teachers produced by the universities is largely influenced by the effectiveness of teaching, learning environments, and training processes within those institutions (Darling-Hammond, 2020). In order to produce quality Physics teachers, Public Universities ensure the quality of its inputs is maintained and improved on through the quality of its teaching and learning. To ensure quality input in the admission process, Universities admit students based on a minimum requirement of five credits in science subjects and cut-off point scores in Unified Tertiary Matriculation Examination (UTME). Therefore, students admitted into Physics Education programmes at the universities must have a credit pass in West Africa Secondary School Certificate Physics Examination in order to qualify for the programme. Hence, Physics serves as the basis for their further studies in Physics Education. This means that it becomes necessary for students studying Physics Education in State or Federal Universities to have secondary school Physics background in order to further their studies in the programme. Moreover, students' entry requirement for studying Physics as an achievement is assumed to be reflected in students' performance in the Universities as they further their studies but most often students are found to perform below expectation. Therefore, the extent to which WASSCE Physics grades as entry qualifications have influenced Physics education students' class of degree in State and Federal Universities is uncertain. This has prompted the researcher to investigate the extent to which students' entry qualification such as WASSCE Physics examination achievement could predict their university class of degree on graduation in the State and Federal Universities which is uncertain and need to be established to widen the scope of knowledge.

There are scant research works in regard to secondary school students' results that predict their class of degree or Cumulative Grade Point Average (CGPA) in Sciences in Public Universities in Nigeria and elsewhere. However, a study was conducted by Nweze (2019) who investigated the prediction of students' performance in Chemistry-based courses in Public Universities using University Tertiary Matriculation Examination (UTME) scores in Chemistry. The finding of the study reveals that UTME Chemistry significantly predicted students' CGPA in Industrial Chemistry while UTME Chemistry did not significantly predict students' CGPA in Biochemistry, Medicine and Surgery at Federal Universities. The result also shows that UTME Chemistry did not significantly predict students' CGPA in Industrial Chemistry, Biochemistry, Medicine and Surgery in Federal Universities.

Predictive validity is concerned with the extent to which a test or examination relates or estimates another future test or examination. Emaikwu (2020) states that predictive studies deal with measuring a variable that can be used to foretell some future events. It can be deduced that predictive validity is concerned with the usefulness of test scores in predicting or estimating how the individual will perform on some subsequent criteria tasks. Predictive validity of the use of West Africa Secondary School Certificate Examination (WASSCE) as bases for success in the university examinations has continued to pose great concern to educators, parents and researchers. Examinations serve as an essential tool for testing, assessment, evaluation and certification within educational systems (Nitko & Brookhart, 2019). This has

made the outcome of such examinations to be used for selection, placement, certification and promotion. However, examinations have been criticized by the citizens for their credibility. This is evident in the problem of confidence entrusted by the populace in the examination conducted by national and international examination bodies in the country is still in doubt. In the same vein, people tend to attach significantly different values, attitude, preferences and interpretations to WASSCE especially with respect to the perceived quality of their questions papers and the worth of their results or certificates. This is as a result of the concern raised about the credibility of such examinations, with issues such as malpractice and systematic weaknesses leading to public skepticism about their reliability (Afolabi, 2020; Transparency International, 2021). This same situation can be extended to selection examinations of which WASSCE is a major component. The use of WASSCE Physics grade as criteria for admission into Physics Education programme is assumed to be related and the extent to which it is related is not certain. Thus, this study intends to investigate whether WASSCE Physics grades could predict the class of degree of Physics Education students in State and Federal Universities in North Central, Nigeria.

Statement of the Problem

Improving the quality of Physics teachers for effective service delivery in the teaching profession is a very important factor in education. Secondary school education is the foundation for preparing students for tertiary education which plays a crucial role in providing qualified students for various courses of studies at the universities. The performance of students in Senior Secondary Schools Certificate Examination has been worrisome. This has raised concern on the use of WASSCE examination by students for admission by stakeholders. Students of Physics Education programme are admitted based on their WASSCE qualifications to proceed with their studies. Physics Education programmes at both State and Federal Universities that undergo such programmes produce graduate students with various classes of degree based on the quality of their entry qualifications. To improve the quality of Physics Education students as they progress with their studies at the universities, there is the need to be certain on how WASSCE has contributed to achievement at the universities. The difference in students' achievement in State and Federal Universities has been attributed to students' achievement at WASSCE examination as entry qualification and as determinant of students' background in Physics. However, the extent to which WASSCE Physics grades of students have predicted their Physics education class of degree in State and Federal Universities is uncertain. Therefore, this study intends to investigate whether West Africa School Certificate Physics Examination could predict Physics Education students' class of degree in Public University in North Central, Nigeria.

OBJECTIVES OF THE STUDY

The general objective of the study is to explore the extent to which students' West Africa Secondary School Certificate Physics grades predicts their class of degree in State and Federal Universities in North Central, Nigeria. In a more specific terms, the study was designed to:

1. Determine the extent to which students' WASSCE Physics grades predict their class of degree in Physics Education in State Universities in North Central, Nigeria.
2. Investigate the extent to which students' WASSCE Physics grades predict their class of degree in Physics Education in Federal Universities in North Central, Nigeria.

Research Questions

1. What is the relationship between students' West Africa Secondary School Certificate Physics grades and their class of degree in State Universities in North Central, Nigeria?
2. What is the relationship between students' West Africa Secondary School Certificate Physics

grades and their class of degree in Federal Universities in North Central, Nigeria?

Research Hypotheses

To facilitate the investigation, the following null hypotheses postulated were tested at 0.05 level of significance:

1. H_{01} : WASSCE Physics grades do not significantly Predict the class of degree of Physics Education students in State Universities in North Central, Nigeria.
2. H_{02} : WASSCE Physics grades do not significantly predict the class of degree of Physics Education students in Federal Universities in North Central, Nigeria.

Significance of the study

The findings of this study would immensely benefit Physics students, teachers, and school authority to consider the relevance of WASSCE Physics grades as a predictor of their class of degree in Physics Education. In specific terms, the finding of this study would contribute to widening the scope of knowledge in the following ways:

The finding of this study would help students by exposing them to the extent to which the West Africa Secondary School Physics grades contribute to their class of degree in Physics Education. It would help them to understand the relevance of WASSCE Physics and how it relates to their class of degree. Hence, they would be guided on how to improve their learning and achievement in WASSCE Physics in order to come out with flying colors in their Physics examination.

The finding of the study would make Physics teachers understand the importance of students' WASSCE Knowledge of Physics as predictor of their class of degree. This would serve as a source of information to Physics teachers on WASSCE Physics as a factor affecting students' performance in Physics Education in the Universities.

The Department of Science, Technology and Mathematics Education in the Universities would use the finding as a guide in students' admission by ensuring that the University management admits more qualified students into the department. This would help in the quality input in admitting students into the departments.

METHODOLOGY

The study adopted ex-post facto research design. The ex-post facto design is a type of design that requires the use of existing data to establish the effect between the variables under study. The respondents were Physics Education students whose data were used for the study. The population for the study comprised graduates of Physics Education from Science, Technology and Mathematics Education Department in the Universities in the North Central, Nigeria. The students that made up this population are Physics Education students that had SSCE Physics grades and graduated with their class of degree in Physics Education in 2014/2015, 2015/2016, 2016/2017, 2017/2018 and 2018/2019 sessions. The population of the study was nine hundred eighty-nine. A multistage sampling procedure was employed to obtain a sample of 689 Physics education students. The data were obtained from students' academic files in the Science, Technology and Mathematics Education department where Physics Education students' WASSCE Physics grades, and class of degree in State and Federal Universities were obtained. The instrument used for data collection was a Proforma, "Physics Entry Qualification and University Degree Proforma". The data were entered in the Proforma and were analyzed with Pearson Product Moment Correlation Coefficient and linear regression analysis. The instrument was subjected to face validity by three research experts in Science, Technology and Mathematics Education and Educational Measurement and Evaluation at

Nasarawa State University, Keffi. The validity index of the Proforma obtained was 0.91. The instrument was pilot tested by obtaining data from students not involved in the study. Cronbach Alpha coefficient method of estimating reliability was employed to compute coefficients of internal consistency of which the reliability index of 0.84 was obtained. The research questions were answered with Pearson Product Moment Correlation Coefficient while the Research hypotheses were tested with linear regression analysis at 0.05 level of significance.

Results

Research Question One: What is the relationship between students' West African Secondary School Certificate Physics grades and their class of degrees in Physics Education in State Universities in North Central Zone of Nigeria?

Table 1: Relationship between Students' West African Secondary School Certificate Physics Grades and their Class of Degree in Physics Education in State Universities in North Central Zone of Nigeria

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.342 ^a	0.117	0.114	0.688

a. Predictors: (Constant), WAEC

Table 1 reveals the correlation coefficient of the relationship between students' West Africa Secondary School Certificate Physics grades and their class of degrees in Physics Education in State Universities in North Central Zone of Nigeria. The correlation coefficient of the relationship between the students' WASSCE Physics grades and their class of degree in Physics Education in State Universities in North Central Zone of Nigeria as indicated on Table 1 is 0.342 with standard error of estimate of 0.688. The correlation coefficient value of 0.342 indicates a low correlation between the WASSCE Physics grades and their class of degree in Physics Education in State Universities in North Central Zone of Nigeria.

Hypothesis One: WSSCE Physics grades do not significantly predict the class of degrees of Physics Education students in State Universities in North Central Zone of Nigeria.

Table 2: Regression Analysis of WASSCE Physics Grades and the Class of Degree of Physics Education Students in State Universities in North Central Zone of Nigeria

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.938	0.321		2.926	0.004
	WAEC	0.619	0.101	0.342	6.135	0.000

a. Dependent Variable: DegreeState

Table 2 reveals the calculated linear regression's t-value of students' WASSCE Physics grades as predictor of the class of degrees of Physics Education students in State Universities in North Central Zone of Nigeria which is 6.135 significant at $P=0.000 < \alpha=0.05$. The null hypothesis is therefore rejected. This means that

WASSCE Physics grades significantly predict the class of degree of Physics Education students in State Universities in North Central Zone of Nigeria. Furthermore, the linear regression model as indicated on Table 2 above is $\text{Class of degree} = 0.619 (\text{WASSCE Phy. Grade}) + 0.938$. From the model, the class of degree as a dependent variable in the equation has a coefficient of Beta value of 0.619 for WASSCE Physics grade and a constant of 0.938 respectively. This implies that for each increase in the class of degree, there is 0.619 increase in WASSCE Physics grade and a constant value of 0.938 associated with it. This is the implication of the linear regression model of hypothesis one of this study.

Research Question Two: What is the relationship between Physics Education students' West African Secondary School Certificate Physics grades and their class of degree in Federal Universities in North Central Zone of Nigeria?

Table 3: Relationship between Students' West African Secondary School Certificate Physics Grades and their Class of Degrees in Physics Education in Federal Universities in North Central Zone of Nigeria

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.402 ^a	0.161	0.159	0.640

a. Predictors: (Constant), WAEC

Table 3 reveals the correlation coefficient of the relationship between students' West African Secondary School Certificate Physics grades and their class of degree in Physics Education in Federal Universities in North Central Zone of Nigeria. The correlation coefficient of the relationship between the students' WASSCE Physics grades and their class of degrees in Physics Education in Federal Universities in North Central Zone of Nigeria as indicated on Table 3 is 0.402 with standard error of estimate of 0.640. The correlation coefficient value of 0.402 indicates a moderate correlation between the WASSCE Physics grades and their class of degrees in Physics Education in Federal Universities in North Central Zone of Nigeria.

Hypothesis Two: WASSCE Physics grades do not significantly predict the class of degree of Physics Education students in Federal Universities in North Central Zone of Nigeria.

Table 4: Regression Analysis of WASSCE Physics Grades and the Class of Degree of Physics Education Students in Federal Universities in North Central Zone of Nigeria

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.517	0.266		1.941	0.053
	WAEC	0.746	0.084	0.402	8.841	0.000

a. Dependent Variable: DegreeFed

Table 4 reveals the calculated linear regression's t-value of students' WASSCE Physics grades as predictor of the class of degrees of Physics Education students in Federal Universities in North Central Zone of Nigeria which is 8.841 significant at $P=0.000 < \alpha=0.05$. The null hypothesis is therefore rejected. This means that WASSCE Physics grades significantly predict the class of degree of Physics Education students

in Federal Universities in North Central Zone of Nigeria. Furthermore, the linear regression model as indicated on Table 4 above is $\text{Class of degree} = 0.746 (\text{WASSCE PHY. GRADE}) + 0.517$. From the model, the class of degree as a dependent variable in the equation has a coefficient of Beta value of 0.746 for WASSCE Physics grade and a constant of 0.517 respectively. This implies that for each increase in the class of degree, there is 0.746 increase in WASSCE Physics grade and a constant value of 0.938 associated with it. This is the implication of the linear regression model of hypothesis two of this study.

Discussion of findings

On West African Secondary School Certificate Examination (WASSCE) Physics grades as predictors of the class of degrees of Physics Education students in State Universities in North Central Zone of Nigeria, the study reveals that West African Secondary School Certificate Examination (WASSCE) Physics grades significantly predict the class of degrees of Physics Education students in State Universities in North Central Zone of Nigeria, thus the null hypothesis is rejected. The linear regression's t-test analysis shown on Table 2 shows that the probability associated with the calculated value of t (6.135) is 0.000 and since the probability value is 0.000 less than 0.05 level of significance. The null hypothesis is rejected. This indicates that there is a significant relationship between WASSCE Physics grades and the class of degrees of Physics Education students in State Universities in North Central Zone of Nigeria. This means that the WASSCE Physics grades can predict the class of degrees of Physics Education students in State Universities in North Central Zone of Nigeria.

The finding of this study contradicts the finding of Nweze (2019) who found that University Tertiary Matriculation Examination Chemistry does not significantly predict students' CGPA in their 100 level in Industrial Chemistry, Biochemistry, Medicine and Surgery in State Universities in Nigeria.

On West African Secondary School Certificate Examination (WASSCE) Physics grades as predictors of the class of degrees of Physics Education students in Federal Universities in North Central Zone of Nigeria, the study reveals that West African Secondary School Certificate Examination (WASSCE) Physics grades significantly predict the class of degrees of Physics Education students in Federal Universities in North Central Zone of Nigeria, thus the null hypothesis is rejected. The linear regression's t-test analysis shown on Table 4 shows that the probability associated with the calculated value of t (8.841) is 0.000 and since the probability value of 0.000 is less than 0.05 level of significance. The null hypothesis is rejected. This indicates there is a significant relationship between WASSCE Physics grades and the class of degrees of Physics Education students in Federal Universities in North Central Zone of Nigeria. This means that the WASSCE Physics grades can predict the class of degrees of Physics Education students in Federal Universities in North Central Zone of Nigeria.

The finding of this study agrees with the finding of Nweze (2019) who found that UTME Chemistry significantly predicted students' CGPA in Industrial Chemistry of 100 level students in Federal Universities, Nigeria. Contrary to the findings of this study, Nweze (2019) found out that UTME Chemistry does not significantly predict students' CGPA in Biochemistry, Medicine and Surgery for 100 level students in Federal Universities in Nigeria.

CONCLUSION

Based on the findings of the study, it was concluded that West African Secondary School Certificate Examination (WASSCE) Physics grades can predict the class of degrees of Physics Education students in State Universities in North Central Zone of Nigeria, and WASSCE Physics grades can predict the class of degrees of Physics Education students in Federal Universities in North Central Zone of Nigeria.

RECOMMENDATIONS

Based on the conclusion of this study, the following recommendations were made that:

1. Tertiary institutions should admit students based on merits to enhance students' achievement in Physics education at the Universities.
2. The government should provide adequate funds for the purchase of teaching resources and Physics laboratory equipment for effective teaching of Physics at both secondary and tertiary institutions to enhance students' performance.
3. Curriculum Planners should review secondary school Physics curriculum from time to time so that secondary school Physics contents will be in line with that of the University to help enhance students' achievement.

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