



International Journal of Multidisciplinary Research and Growth Evaluation



International Journal of Multidisciplinary Research and Growth Evaluation

ISSN: 2582-7138

Received: 16-09-2021; Accepted: 05-10-2021

www.allmultidisciplinaryjournal.com

Volume 2; Issue 6; November-December 2021; Page No. 16-19

Students' academic performance in physics as a correlate of their academic performance in mathematics in Makurdi local government area, Benue State

Dr. Benjamin Akura Taangahar¹, Dr. Joseph Olaiya Fatoki², Joyce Damilola Joshua³

¹⁻³ Department of Science and Mathematics Education, Faculty of Education Benue State University, Makurdi, Nigeria

Corresponding Author: Dr. Benjamin Akura Taangahar

Abstract

This study investigated the students' academic performance in physics as a correlate of their academic performance in mathematics in Makurdi Local Government Area of Benue State. The descriptive survey design was used for the study. Three research questions and one hypothesis guided the study. Out of the population of 220 secondary schools, 5-year result from the 5 schools were selected using hat and draw method. Multistage sampling of purposive and random sampling was used. Purposive sampling was used to select only schools that offer physics at SSCE and random sampling of hat and draw was used to give equal chance for each school ownership to participate in the study. The 5 schools yielded 225 physics and mathematics WAEC results for the study. Descriptive statistics of percentage WAEC results was used to answer the first and second research questions and correlation was used to answer the third. Pearson (r) correlation was converted to t in order to test the hypothesis at a 0.05 level of significance.

Based on the adopted WAEC scale, a score of 58 % for students' performance in physics and 57.9% for students' performance in mathematics respectively indicated a Credit pass in students' performance in the subjects. The third research question which was on the correlation between students' academic performance in Physics and Mathematics showed a Correlation coefficient for $r=0.6$ across 5 years studied. The correlation coefficient (r) converted to t -value yielded a t -cal. of 5.08 and a t -crit. of 2.02. This showed that the correlation was significant. Based on the findings of the study the research recommends that teachers should improve physics students' performance in the subject by exposing them to mathematical problems involving formulae and calculations. Also just like mathematics is learnt at lower basic education, physics should also be taught at the elementary level of education.

Keywords: Students, Academic Performance, Physics, Mathematics

Introduction

Science and mathematics have been regarded as the bedrock on which modern day technological breakthrough is built. This is the reason why nations the world, especially the developing ones like Nigeria, are striving to keep abreast technologically and scientifically. This is because the world is advancing more scientific and the functioning in every endeavour of human race depend greatly on science. The understanding of the workings of the world through science and mathematics helps man to know more about the universe. Without the application of physical science; astronomy, rocket science and satellites, it would have been difficult for man to explore the other planets of the universe.

In Nigeria, Secondary school science comprises disciplines such as physics, chemistry and biology (Federal Republic of Nigeria, 2004) [6]. Secondary school physics is organised into three themes of conservation of energy, energy quantisation and duality of matter as well as physics in technology. Traditional topics taught comprise; mechanics and general physics, heat, waves, optics and current electricity. Abah, Ada and Taangahar (2016) [1] Physics, remains one of the most difficult subjects in the school curriculum. Although it is a core science subject, it makes immense demands on science students. It is aimed at describing the things that make up the universe. This includes the things that are in it and the properties those things possess and the changes they undergo. Physics is used in medicine, agriculture, engineering and space science. This knowledge helps engineers select the appropriate materials.

Mathematics consists topics such as quantity (number theory), structure (algebra), space (geometry) and change (analysis). Mathematics is essential in many fields including natural science, engineering, medicine, finance and social sciences. The objective of senior secondary mathematics is to help students know and demonstrate understanding of concepts from the branches of mathematics

(Number, algebra, geometry and trigonometry, statistics as well as probability), it also helps students to use appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts (Okafor & Anaduaka, 2013) ^[9].

Several concepts that could involve the use of mathematics include weighing, understanding chemical formulas, analysing marketing data, measuring and calculating statistics. Some applications of mathematics in everyday life could be in the form of balancing of accounts, umpiring sports, cooking, sewing, figuring out time, distance and cost of travel and landscaping. Applications of mathematics among senior secondary school subjects is useful to subjects like economics, commerce, agriculture, chemistry, biology and physics. It means that a student who fails mathematics might end up performing poorly in other subjects.

Performance, according to Odogwu and Babajide (2018) ^[8], is a measure of the output of learning. It is expressed in terms of change in knowledge, skills and attitudes of individuals as a result of their experiences within the school system. Academic performance is commonly measured through assessments and examinations. Even though there is no general agreement on how it is best measured, it is regarded as students' performance in an examination based on their Cumulative Grade Point Average (CGPA) (Boakye, Ashainmarh, Addo, Boateng, & Konadu, 2016) ^[2]. The CGPA is commonly used at the tertiary level of education in most countries. At basic and senior secondary schools in Nigeria, academic performance could be described as student grades obtained in a subject or group of subjects at an end-of-term or certificate examination. Thus, poor academic performance is judged by the examiner as falling below an expected standard. The standard for WAEC pass and fail grades are in the order of Excellent (A1) 75%-100%, Very Good (B2) 70%-74%, Good (B3) 65%-69%, Credit (C4) 60%-64%, Credit (C5) 55%-59%, Credit (C6) 50%-54%. Pass grades not acceptable for tertiary admission. Pass (D7) 45%-49%, Pass (E8) 40%-44% and Failing grade (F9) 0%-39%.

Physics and mathematics result in West African Examination Council (WAEC) appear to be far from been satisfactory, in spite of the vital role they play in everyday life and for national development. This suspected poor performance at Senior Secondary Certificate Examinations is believed could jeopardize students' career in science related fields except there is a way of teaching physics such that their performance could be enhanced. It is believed that if there is a correlation between physics and mathematics, students' pass in mathematics could produce a corresponding pass in physics. According to Taangahar and Ameh (2019) there is a low students' academic performance in physics which is as a result of their belief that physics is a difficult subject for students. This is especially when the concepts taught are related to mathematical calculation. Ogunleye and Adekoya (2014); Charles, Ibibo and Okey (2017); Odogwu and Babajide (2018); Fatoki and Taangahar (2021) ^[10, 8, 5] revealed a relationship between achievement in Mathematics and Physics and advocated for the grooming of Physics students in mathematics' problem-solving schedules before they commence treatment of similar numerical problems in Physics.

Even though studies have shown a relationship between the comprehension of Mathematics concept and the ability to solve Physics problems, it is still suspected that some

students may pass physics but not mathematics. Based on this assertion, this study tends to find out whether students' academic performance in physics correlate with their academic performance in mathematics.

Research Questions

The following research questions guided the study.

1. What is the academic performance scores of physics students in physics at Senior Secondary Certificate Examination?
2. What is the academic performance scores of physics students in mathematics at Senior Secondary Certificate Examination?
3. Do students' academic performance scores in physics correlate with their academic performance scores in mathematics?

Hypothesis

The null hypothesis was tested at 0.05 alpha level.

HO: Students' academic performance scores in physics does not significantly correlate with their academic performance scores in mathematics.

Research Methods

This study adopted a descriptive survey research design to investigate the correlation of students' academic performance in physics and their academic performance in mathematics in Makurdi Local Government Area. The population of the study consisted 220 secondary schools across the twelve districts from all ownership. Source: Data of secondary schools from Ministry of Education in Benue State. Multistage sampling of purposive and random sampling was used. Purposive sampling was used to select only schools that offer physics at SSCE and simple random sampling of hat and draw was used to give equal chance for each school ownership to participate in the study. The names of all the sampled schools were written, squeezed and put in a container. The container was then shaken and the schools picked. The first 5 schools picked had one science class each, which provided the 225 physics and mathematics WAEC results used for the study.

The study adopted WAEC results and grades for secondary schools therefore, there was no need for validation of instrument and reliability test. WAEC grades used are in the order of Excellent (A1) 75%-100%, Very Good (B2) 70%-74%, Good (B3) 65%-69%, Credit (C4) 60%-64%, Credit (C5) 55%-59%, Credit (C6) 50%-54%, Pass (D7) 45%-49%, Pass (E8) 40%-44% and Fail (F9) 0%-39%. Data to answer the research questions were analysed using percentages. To test the null hypothesis at 0.05 alpha level of significance, Correlation (r) coefficient was converted into a t-test to test for Significance.

Research Question 1

What is the academic performance scores of physics students at Senior Secondary Certification Examination?

These results are shown in Table 1.

Table 1: Academic Performance Scores of Physics students at Senior Secondary Certification Examination from 2015 to 2019

Year	Physics Scores (%)	Remarks
2015	57.6	Credit
2016	63.7	Very Good
2017	63.9	Very Good
2018	50.9	Credit
2019	53.9	Credit
Percentage	58.0	

N = 225

Table 1 shows a rise in physics academic performance scores of physics students in the year 2015, 2016 and 2017 with corresponding percentages of 57.6%, 63.7% and 63.9% respectively. However, there was a decline in the academic performance scores from 63.9% to 50.9% and 53.9% in 2018 and 2019 respectively. From the analysis, students' academic performance scores in physics was highest in 2017 and lowest in 2018. With respect to WAEC grading, the percentage of 58.0 represents a Credit pass in students' academic performance in physics. Therefore, students' academic performance in physics at Senior Secondary Certification Examination was high.

Research Question 2

What is the academic performance scores of physics student in Mathematics at Senior Secondary Certification Examination? These results are shown in Table 2

Table 2: Academic Performance Scores of Physics students in Mathematics in Senior Secondary Certificate Examination from 2015 to 2019

Year	Mathematics Scores%	Remarks
2015	64.0	Very Good
2016	59.5	Credit
2017	55.4	Credit
2018	49.4	Pass
2019	61.3	Very Good
Percentage	57.9	

N= 225

Table 2 shows that the performance of physics students in mathematics in 2015 was Very Good with 64.0%. It however started declining from 2016 with 59.5%, 2017 with 55.4% to 49.4% in 2018. It again began to experience a rise 2019 with Very Good grade of 61.4%. From the analysis, students' academic performance scores in mathematics was highest in 2015 and lowest in 2018. Based on WAEC grading, the percentage of 57.9 % represents a Credit pass in students' academic performance in mathematics.

Research Question 3

Do students' academic performance scores in physics correlate with their academic performance scores in mathematics?

Result for this research question is shown in Table 3

Table 3: Result for Correlation between Students' Academic Performance in Physics and Mathematics from 2015 to 2019

Year	Mathematics Scores (%)	Physics Scores (%)	Correlation Coefficient (r)	Remark
2015	64.0	57.6	0.72	Correlated
2016	59.5	63.7	0.57	Correlated
2017	55.4	63.9	0.68	Correlated
2018	49.4	50.9	0.47	Correlated
2019	61.3	53.9	0.56	Correlated
Correlation coefficient (r)			0.60	

N=225

The table shows the correlation between physics and mathematics students' academic performance scores in 2015. 2016, 2017, 2018 and 2019 with corresponding Correlation coefficient of $r=0.72$, 0.72 , 0.57 , 0.68 , 0.47 and 0.56 respectively. The highest correlation between the students' academic performance in physics and mathematics was in

2015 with $r=0.72$ and the lowest in 2017 with $r=0.47$. Thus there was a correlation between the two subjects for the 5 years studied yielded the coefficient of 0.6. This shows a high positive correlation between the two subjects.

Hypothesis

Students' academic performance scores in physics does not significantly correlate with their academic performance scores in mathematics.

The result for the test of this hypothesis is shown in Table 4.

Table 4: Result for Significance Correlation of Students' Academic Performance in Physics and their Performance in Mathematics

Year	R	t-Cal.	t-Crit.	level of Sig (0.05)
2015	0.72	6.85	2.02	Significant
2016	0.57	4.53	2.02	Significant
2017	0.68	6.11	2.02	Significant
2018	0.47	3.50	2.02	Significant
2019	0.56	4.42	2.02	Significant
Cal. t-value		5.07		

df =223

Table 4 shows a correlation between students' academic performance in physics and their performance mathematics. The t-cal. between students' academic performance in physics and academic performance in mathematics of 6.85, 4.53, 6.11, 3.50 and 4.42 for 2015, 2016, 2017, 2018 and 2019 respectively was significant in all the years. This was because the t-cal. for each year was greater than the t-crit. Since t cal. 5.07 is greater than 2.02 for all the years, the hypothesis which states that there Students' academic performance scores in physics does not significantly correlate with their academic performance scores in mathematics is rejected. Thus there is a significant correlation between students' academic performance scores in physics and their academic performance scores in mathematics.

Discussion of Findings

The discussion of findings of investigation the level of students' academic performance scores in physics and mathematics and their correlation between the two subjects.

1. Students' performance in physics from the year 2015-2019 was 59.32% which is not in the Good grade for WAEC. It is a Credit pass above the lowest WAEC pass mark of 40%. This finding agrees with the findings of Abdurrahman and Madugu (2014) who stated that students' academic performance in physics was low. The cause of low performance is attributable to students' consideration of physics as a difficult subject, especially when the materials taught are related to mathematical calculation.
2. Students' academic performance in mathematics from the year 2015-2019 had a percentage of 57.9% which is a Credit pass above the lowest WAEC pass mark of 40%. This agrees with the findings of Charles, Ibibo and Okey (2007) who showed that students of high mathematical ability have greater mean percentage gain in physics while those of low mathematical ability have lower gain in the subject.
3. Students' academic performance scores in physics had a positive correlation with their academic performance scores in mathematics. There is a significant correlation between students' academic performance scores in

physics and their academic performance scores in mathematics. Students who performed well in physics also did perform well in mathematics and students who performed poorly in physics also performed poorly in mathematics. This agrees with the findings of Odogwu and Babajide (2018)^[8] which revealed that there was a significant relationship between achievement in Mathematics and Physics.

Conclusion

The study concluded that students' academic performance in physics correlates with their academic performance in mathematics even though both subjects showed only a Credit pass in academic performance for the years considered.

Recommendations

Based on the findings, the following recommendations were made

1. Even though the results showed a Credit performance both in physics and mathematics, schools are encouraged to introduce physics concepts early in the curriculum, at the basic level of education so that students can have more exposure to physics concepts at that level before their entry into senior secondary schools.
2. Teachers should sustain the practical teaching mathematics and continue to use innovations in mathematics teaching so as to further increase students' performance in the subject.
3. Since there was significant correlation between student's performance in physics and their academic performance in mathematics, physics students should cultivate the habit

References

1. Abah CO, Ada NA, Taangahar BA. Effect of teacher-improvised equipment on secondary school students' achievement in physics in Makurdi metropolis. *Journal of Science, Technology, Mathematics and Entrepreneurial Education*. 2016; 1(1):90-97
2. Boakye E, Ashainmarh E, Addo L, Boateng F, Konadu S. Investigating factors influencing poor performance of senior high school students in physics: A case study in Kea District, Central Region. Unpublished Thesis of University of Cape Coast, 2016.
3. Charles-Ogan GI, Okey IF. Effects of mathematics knowledge on physics Students' performance in electromagnetism, *International Journal of Theoretical and Mathematical Physics*. 2017; 7(4):61-67.
4. Abdurrahman MS, Madugu A. Interrelationship between students' performance in mathematics and physics in senior secondary schools of Birnin-Kebbi Local Government Area of Kebbi State. *International Journal of Scientific and Engineering Research*. 2014; 5(11):2-13.
5. Fatoki JO, Taangahar BA. The male and female students mean achievement scores of technical schools in electricity concepts using e-learning teaching activity and lecture method. *International Journal of Research and Scientific Innovation (IJRSI)*. 2021; 8(7):77-80.
6. Federal Republic of Nigeria. National policy on education (4th Ed.) Lagos: Federal Government Press, 2004.
7. Ministry of Education. Students' population. Makurdi: Benue State government, 2019.
8. Odogwu HN, Babajide VF. Effect of knowledge of

mathematics on achievement of students in physics. Unpublished Thesis, University of Lagos, 2018

9. Okafor CF, Anaduaka US. Nigerian school children and mathematics phobia: How the mathematics teacher can help? *American Journal of Educational Research*. 2013; 1(7):247-251.
10. Ogunleye A, Adekoya EA. Effect of students' background knowledge of mathematics on senior secondary school students' achievement in physics. Lagos: University of Lagos, 2014.