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## Student's Academic Performance in Physics and Mathematics among Senior Secondary Schools in Maradun Local Government Area, Zamfara State, Nigeria.

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### Abstract

*The purpose of this research is to investigate Student's Academic Performance in Physics and Mathematics Among Senior Secondary School Students in Maradun Local Government Area, Zamfara State, Nigeria. Three objectives with corresponding research questions and null hypotheses guided the study. The study employed Descriptive survey design. The population of the study consisted of all senior secondary school SS2 Physics and Mathematics students from eight (8) public senior secondary schools in the local government area. A convenience sampling approach was used in selecting two schools one male and one female. The sample size of the study consisted of 232 SS2 students. The instruments for data collection were Secondary School II Physics Performance test (SSII PPT) and Secondary School II Mathematics Performance Test (SSII MPT), with determined reliability indexes of 0.79 and 0.78 respectively, each comprised of 30 objective items with options A-D, which were administered to ascertain students' academic performance in Physics and Mathematics. Descriptive statistics of mean, standard deviation, and mean difference were used in answering research questions, while T-test statistics was used in testing the null hypotheses at 0.05 level of significance. The key findings of the study revealed no statistical significant difference between students' academic performance in Physics and Mathematics regardless of gender. These results suggest a unique educational landscape in the study area where traditional, academic disparities often observed in other contexts are not statistically evident. The study concludes with recommendations for educators and policymakers to enhance teaching methodologies that highlight the interconnectedness of subjects, with the aim to promote science education and maintain gender-neutral learning environments to sustain these equitable outcomes in the state.*

**Keywords:** Academic Performance, Physics, Mathematics.

## Introduction

Physics is a foundation of science and technology education, providing the foundational principles that are necessary for understanding natural phenomena and their applications in daily life. It employs quantitative of measurement, experimental observation and mathematical modeling to explain the behavior of the physical world (Eren&Gurdal, 2010). Although a wide conceptual difference exists between Physics and Mathematics and it is no longer history that mathematical knowledge are required to tackle numerical problems in physics, leaving much to be done in order to change students attitude towards mathematics and science. Physics is one of the basic subjects of physical sciences through which this world and its complexities, necessary technological advancement can be understood (Erinosho, 2013). 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. Abah, Ada and Taangahar (2016).

Physics has become one of the subjects associated with scientific concepts. Physics is studied by students in junior and senior high school. As a science, Physics has an important role in the knowledge of phenomena in the universe, and physics education continues to change and develop in accordance with the world condition (Kaya & Boyuk, 2011). The majority of students believed that physics is a demanding subject in high school, and that it became even more difficult in college and graduate school (Ryan 2013) Physics is a science that focuses on the physical characteristics of matter and how it interacts with energy. It is a systematic study of knowledge that is the result of careful observation, measurement and experimentation with the goal of establishing fundamental laws and providing verifiable scientific justification for natural phenomena. Veloo, Nor, and Khalid (2015) found that optimistic attitudes toward mathematics are linked with improved physics outcomes, while negative perceptions reduce performance in both subjects. Gender differences have also been identified in attitudes toward mathematics. Therefore, physics is the one of the major branch of pure science in addition to chemistry and biology which are compulsory by the national policy on education (Nwuba and Osuafor, 2021) and it is concern with finding out things and understanding what lies behind every day phenomena.

General Mathematics, which is compulsory for all students regardless of specialization, and Further Mathematics, an elective subject for those interested in advanced studies (Dehipawala, Shekoyan, & Yao, 2014; Baskan, Alev, & Karal, 2010). General Mathematics is not only a requirement for university admission but also provides the intellectual foundation for the growth of science and technology (Ahmed, Mohamed, & Fahar, 2015). Without mathematics, scientific knowledge, technological advancement, and innovation are severely limited, underscoring its role as the gateway to modern development (Awodun & Ojo, 2014). The role played by Mathematics in the day to day activities of human endeavors is suggestive of the fact that Mathematics is needed by all, not only for scientific and technological development but for all forms of development. Isma'il, Bello, Bashir and Sodangi (2019). Academic achievement in mathematics, therefore, becomes

a critical index of students' future prospects in today's competitive world. It encompasses ability, performance, and growth across cognitive, emotional, social, and physical domains (Mohamed & Aron, 2017). Mathematics provides the intellectual foundation for technological advancement and innovation. Without mathematics, there would be no meaningful scientific knowledge, no advanced technology, and by extension, no innovative society. It has thus been described as the gateway to science and technology and an indispensable element in modern development (Awodun & Ojo, 2014). Psychologists define attitude as a leaned tendency to evaluate things in a certain way. This can include evaluation of people, issues, objects or events. Such evaluations are often positive or negative, but they can be uncertain at times (Kendra, 2013). Attitudes are frequently influenced by experiences or upbringing. They can significantly affect how learners behave and react in various situations. Although views are enduring, they can change. A person's learned inclination to react favorably or unfavorably to an item, circumstance, idea or other person is referred to as their attitude (Sarmah & Puri, 2014). 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. A performance level is a measure of learning in and outside academics. Its history in academics goes as far back as learning itself (Oluwatusin& Dele-Rotimi, 2017).

## Statement of the Problem

Student's academic performance in Physics and Mathematics among senior secondary schools Maradun local Government area of Zamfara State, Nigeria has remained consistently poor in recent years. Reports from the West African Examinations Council (WAEC) Chief Examiners between 2020 and 2023 emphasize persistent challenges, such as: students' failure to relate mathematical knowledge in solving physics problems, difficulties in interpreting graphs, lack of accuracy in measurements, and regular misinterpretation of mathematics related physics questions, which often lead to wrong solutions. Parents and communities in the in the area have also expressed displeasure with the low performance of their children in both internal and external examinations, while government efforts have yielded limited development. on the other hand, many students identify physics as a complicated and male dominated subject, which lead to poor enrollment and gender disparities in science education. A significant factor contributing to these challenges is students' negative attitude toward mathematics, which extends to physics due to the subject's heavy reliance on mathematical concepts. as a result, poor mathematical competence not only affects students' performance in physics but also develop fear and disinterest in the subject. Alongside therefore, this study would examine students' academic performance in mathematics and physics among senior secondary school in Maradun local Government Area, Zamfara State, Nigeria

## Objectives of the Study

The objectives of the study are to:

1. Determine the difference between the academic performance of students in mathematics and physics among senior secondary schools in Maradun Local Government Area, Zamfara State, Nigeria.

- Find out whether there is difference between male and female students' academic performance in mathematics among senior secondary school in Maradun Local Government Area, Zamfara State, Nigeria.
- Find out whether there is difference between male and female students' academic performance in Physics among senior secondary school in Maradun Local Government Area, Zamfara State, Nigeria.

### Research Questions

The following research questions were used to guide the study:

- Is there any difference between the academic performance of students in mathematics and physics among senior secondary schools in Maradun Local Government Area, Zamfara State, Nigeria?
- Is there any difference between male and female students' academic performance in mathematics among senior secondary school in Maradun Local Government Area, Zamfara State, Nigeria?
- Is there any difference between male and female students' academic performance in Physics among senior secondary school in Maradun Local Government Area, Zamfara State, Nigeria?

### Null Hypotheses

Three Null Hypotheses were formulated and tested at 0.05 levels of significance.

- H<sub>01</sub>:** There is no significance difference between the academic performance of students in mathematics and physics among senior secondary schools in Maradun Local Government Area, Zamfara State, Nigeria.
- H<sub>02</sub>:** There is no significance difference between male and female students' academic performance in mathematics among senior secondary school in Maradun Local Government Area, Zamfara State, Nigeria.
- H<sub>03</sub>:** There is no significance difference between male and female students' academic performance in Physics among senior secondary school in Maradun Local Government Area, Zamfara State, Nigeria.

## Methodology

This study adopted a descriptive survey research design to investigate the students' academic performance in physics and mathematics among senior secondary schools in Maradun Local Government Area.

**Table 2:** Summary of the descriptive analysis of the difference between the academic performance of students in Physics and Mathematics among senior secondary schools in maradun Local Government Area, Zamfara State, Nigeria.

Variables	N	$\bar{X}$	SD	S.E. Mean	Mean Difference
Physics	233	15.1588	3.51544	0.23030	
					0.3786
Mathematics	232	14.7802	3.44517	0.22619	

Table 2 presents a descriptive analysis of difference in academic performance of 233 senior secondary school students in Physics and 232 in Mathematics in Maradun Local Government Area. The mean score for Physics was 15.1588, with a standard deviation (SD) of 3.51544, while Mathematics had a mean score of 14.7802 and an SD of 3.44517. The relatively small standard deviations for

The population of the study consisted all senior secondary schools across the local government area. Simple random sampling technique was used to select four schools GDSS Maradun, GGDSS Maradun and MASS Maradun across the area. With a sample of 232 students. Purposive sampling was used to select only classes that offer physics and mathematics.

The sample for the study is described in table 1.

**Table 1:** Sample for the study

S/N	Name of School	Sample
1	Government Day Sec School, Maradun	53
2	Government Girl Day Sec School, Maradun	129
3	Mu'alledi Arabic Sec School, Maradun	50
<b>TOTAL</b>		<b>232</b>

**Sources:** *Zamfara State Ministry of Education, Science and Technology (2025)*

### Instrumentation

Two instruments were used in this study, these are: Secondary School II Physics Performance Test (SSII PPT) and Secondary School II Mathematics Performance Test (SSII MPT), adopted from West African examination council WAEC and National examination council NECO. The performance tests comprised (30) multiple-choice questions each, the instruments contain options letter A-D with only one correct answer while others were used as distractors.

The study processed and analyzed the obtained data using statistical tools, presenting the results in tables. Descriptive statistics of (mean, standard deviation and mean difference) addressed all three research questions, summarizing the collected data's key features. To test the formulated null hypotheses T-test was employed, all the test was conducted at a significance level of 0.05. These choices align with the aims of testing for significant differences between variables in the study.

## Results and Discussion

**Research Question One:** Is there any difference between the academic performance of students in mathematics and physics among senior secondary schools in Maradun Local Government Area, Zamfara State, Nigeria?

both subjects indicate that student scores tend to be clustered closely around their respective means, suggesting a generally consistent level of performance within each subject. The mean difference between Physics and Mathematics scores is 0.3786, with Physics showing a slightly higher average performance. However, given the minimal difference in means and the similar standard deviations, this suggests that the academic performance of students

in Physics and Mathematics is quite comparable across the sampled senior secondary schools in the study area, with neither subject demonstrating a significantly superior or inferior average outcome.

**Research Question Two:** Is there any difference between male and female students' academic performance in mathematics among senior secondary school in Maradun local Government Area, Zamfara State, Nigeria?

**Table 3:** Summary of the descriptive analysis of the difference between male and female students' academic performance in mathematics among senior secondary school in Maradun local Government Area, Zamfara State, Nigeria

Variables	N	$\bar{X}$	SD	S.E. Mean	Mean Difference
FEMALE	129	14.7984	3.61287	0.31810	0.04117
MALE	103	14.7573	3.24027	0.31927	

Table 3 presents a descriptive analysis of difference academic performance in Mathematics between male and female senior secondary school students in the study area. With 129 female students and 103 male students, both groups show similar mean academic performances, as evidenced by their respective means of 14.7984 for females and 14.7573 for males. The minimal mean difference of 0.04117 suggests a negligible practical difference in performance between the genders. Furthermore, the standard deviations (3.61287 for females and 3.24027 for males) indicate a relatively consistent spread of scores within each group, with male

scores being slightly more clustered around their mean. The small standard errors of the mean (0.31810 for females and 0.31927 for males) suggest that the sample means are good estimates of the population means, reinforcing the observed similarity in academic performance in Mathematics between male and female students in this study.

**Research Question Three:** Is there any difference between male and female students' academic performance in Physics among senior secondary school in Maradun local Government Area, Zamfara State, Nigeria?

**Table 4:** Summary of the descriptive analysis of the difference between male and female students' academic performance in Physics among senior secondary school in Maradun Local Government Area, Zamfara State, Nigeria.

Variables	N	$\bar{X}$	SD	S.E. Mean	Mean Difference
FEMALE	129	15.2636	3.45172	.30391	0.2348
MALE	103	15.0288	3.60543	.35354	

Table 4 presents the descriptive statistics for the academic performance in Physics among male and female senior secondary school students in the study area. With 129 female students, their average performance (mean) was 15.26, showing a standard deviation of 3.45. For the 103 male students, the average performance was slightly lower at 15.03, with a standard deviation of 3.61. The mean difference between female and male students' performance is a negligible 0.23, indicating a very minimal difference in their average Physics scores. The standard deviations suggest that both groups have similar levels of variability in their

scores, meaning that the spread of performance within female students is comparable to that within male students. Overall, while female students recorded a marginally higher mean score, the very small mean difference suggests that there is no substantial practical distinction in the academic performance of male and female students in Physics within this sample.

**Null Hypothesis ( $H_{01}$ ):** There is no significance difference between the academic performance of students in Physics and Mathematics among senior secondary schools in Maradun Local Government Area, Zamfara State, Nigeria.

**Table 5:** Summary of the t-test analysis of the significance difference between the academic performance of students in Physics and Mathematics among senior secondary schools in Maradun Local Government Area, Zamfara State, Nigeria.

Variables	N	$\bar{X}$	SD	df	t-Cal	P-value	Decision
Physics	232	15.1588	3.51544	462	1.173	0.241	Retained
Mathematics	232	14.7802	3.44517				

$\alpha = 0.05$  level of significance

Table 5 presents the results of independent samples t-test conducted to assess if there's a significant difference in academic performance between Physics and Mathematics among senior secondary school students in the study area. With a sample of 232 students for Physics and 232 for Mathematics, the mean performance in Physics was approximately 15.16 (SD = 3.52), while in Mathematics, it was around 14.78 (SD = 3.45). The analysis, with 462 degrees of freedom, yielded a calculated t-value of 1.173 and a p-value of 0.241. Since this p-value (0.241) is

greater than the pre-determined significance level of 0.05 ( $\alpha = 0.05$ ), the null hypothesis, which posits no significant difference, is retained. This indicates that there is no statistically significant difference in the academic performance of senior secondary school students in Physics compared to Mathematics in Zamfara State.

**Null Hypothesis ( $H_{02}$ ):** There is no significance difference between male and female students' academic performance in

**Table 6:** Summary of the t-test analysis of the significance difference between male and female students' academic performance in mathematics among senior secondary school in Maradun Local Government Area, Zamfara State

Variables	N	$\bar{X}$	SD	Df	t-Cal	P-value	Decision
Female	129	14.7984	3.61287				
				230	0.090	0.928	Retained
Male	103	14.7573	3.24027				

$\alpha = 0.05$  level of significance

The t-test analysis summarized in Table 6 investigates whether a significant difference exists between male and female students' academic performance in Mathematics among senior secondary school students in Maradun Local Government Area, Zamfara State. With 129 female students having a mean score of 14.7984 (SD = 3.61287) and 103 male students having a mean score of 14.7573 (SD = 3.24027), the raw scores appear very similar. The analysis, conducted with 230 degrees of freedom (df), yielded a calculated t-value (t-Cal) of 0.090. Crucially, the p-value was 0.928. Since this p-value (0.928) is greater than the pre-determined significance level ( $\alpha$ ) of 0.05, the null hypothesis is retained. This

indicates that there is no statistically significant difference in the academic performance in Mathematics between male and female senior secondary school students in Zamfara State. In simpler terms, despite slight variations in their average scores, the evidence suggests that gender does not play a significant role in their Mathematics performance

**Null Hypothesis ( $H_{03}$ ):** There is no significance difference between male and female students' academic performance in Physics among senior secondary school in Maradun Local Government Area, Zamfara State, Nigeria

**Table 7:** Summary of the t-test analysis of the significance difference between male and female students' academic performance in Physics among senior secondary school in Maradun Local Government Area, Zamfara State, Nigeria

Variables	N	$\bar{X}$	SD	Df	t-Cal	P-value	Decision
Female	129	15.2636	3.45172				
				230	0.506	0.613	Retained
Male	103	15.0288	3.60543				

The t-test analysis in Table 7, conducted to determine if a significant difference exists in Physics academic performance between male and female senior secondary school students in maradun Zamfara State, revealed no statistically significant difference. With a p-value of 0.613, which is greater than the set alpha level of 0.05, the null hypothesis is retained. This indicates that the observed difference in mean scores between female students (Mean = 15.2636, SD = 3.45172, N = 129) and male students (Mean = 15.0288, SD = 3.60543, N = 104) is likely due to chance rather than a true difference in their Physics performance. The t-calculated value of 0.506 with 230 degrees of freedom further supports this conclusion, suggesting that both male and female students perform comparably in Physics within the study's scope.

## Conclusion

This study concluded that, there is no statistically significant difference between senior secondary school students' academic performance in Mathematics and Physics, nor are there significant differences in academic performance between these two subjects or between male and female students in either subject. Crucially, the findings also indicated no statistically significant gender differences in Mathematics and Physics among senior secondary schools in Maradun Local Government Zamfara State, Nigeria. This underscores the subject-specific nature of learning outcomes in education in the state. These consistent results suggest a unique educational landscape in the State where, contrary to some broader research findings, academic performance in Mathematics and

Physics are not significantly influenced by subject interrelation or gender.

## Recommendations

Based on the findings of this study recommends among others that:

1. Schools should consider approach to science and mathematics education, potentially integrating curriculum development to leverage common foundational skills and address any underlying learning challenges that affect both subjects equally.
2. Educators and policymakers should continue to promote gender-neutral learning environments and teaching strategies in mathematics, ensuring sustained equitable outcomes and avoiding the introduction of gender biases in instruction or expectations.
3. Schools should leverage this attitudinal parity by developing integrated extracurricular activities, projects, and career awareness programs that equally showcase the relevance and excitement of both mathematics and physics.

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