

Research Article

School Type, Location and Gender as Predictors of Secondary School Students' Attitude Toward Physics in Akwa Ibom State, Nigeria

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Abstract

Students' attitudes toward physics play a crucial role in shaping their engagement, interest, and disposition toward learning the subject at the secondary school level. Despite the importance of physics to scientific and technological development, negative attitudes toward the subject persist among many students. This study examined the extent to which school type, school location, and gender predict secondary school students' attitudes toward physics in Akwa Ibom State, Nigeria. The study adopted an ex-post facto descriptive survey design. A multistage sampling technique was used to select a sample of senior secondary school students offering physics. Data were collected using a validated Students' Attitude Toward Physics Questionnaire (SATPQ), which yielded a reliability coefficient of 0.82 using Cronbach's Alpha method. Mean and standard deviation were used to answer the research questions, while Analysis of Variance (ANOVA) was employed to test the hypotheses at 0.05 level of significance. The findings revealed that school type and school location significantly influenced students' attitudes toward physics, while gender had no significant influence. There was no significant interaction effect among school type, school location, and gender on students' attitudes toward physics. The study concluded that school-related factors are more critical than gender in shaping students' attitudes toward physics. It was recommended that efforts be made to improve physics learning environments, particularly in public and rural schools.

Keywords

Attitude Toward Physics, School Type, School Location, Gender, Secondary Schools

1. Introduction

Physics is a core science subject that plays a vital role in technological advancement and national development. It equips learners with foundational knowledge and skills necessary for understanding natural phenomena and solving real-life problems. Despite its importance, students' attitudes toward physics at the secondary school level remain a major

concern in Nigeria. Physics as the study of systematized knowledge bring forward by viewing, measuring, and verifying with the motivation of constituting introductory valid regulations and interpretations of fundamental physical phenomenon. Physics has been identified as the fundamentals of technological development of any nation; because of the diligence

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of its principles, theories and regulations in the technological world [5]. In order to attain the general stated objectives of the physics curriculum in FME [10], there should be more improvement in the mathematical ability or skills of the physics students and their attitude towards physics.

Physics is a fundamental science subject that explains the basic principles governing matter, energy, and their interactions. It serves as the backbone of modern technology and underpins disciplines such as engineering, medicine, telecommunications, and environmental science. At the secondary school level, physics is crucial for developing scientific reasoning, problem-solving skills, and analytical thinking required for national scientific and technological advancement [14]. Despite its importance, physics is widely perceived by students as abstract, mathematically demanding, and difficult. These perceptions often translate into negative attitudes, low motivation, and poor engagement in physics classrooms [1]. Attitude toward physics has therefore emerged as a critical affective variable influencing students' learning behavior, persistence, and achievement in the subject.

Attitude is a learned predisposition that influences how individuals respond positively or negatively to a subject or situation [13]. In physics education, students' attitudes affect their motivation, classroom engagement, persistence, and achievement. Negative attitudes toward physics often result in fear of abstract concepts, avoidance of problem-solving activities, and low academic performance [6]. Attitude defined as a learned tendency of an individual to reciprocate positively or negatively towards a target, position, or a person. Attitude involving by several dimensions or aspects. It considered three components: emotion, cognition, and behavior. Emotions are the senses of touch of enjoyment or pleasure in learning the subject or viewing it as boring, difficult, and dull. Cognition represents the student's perceived usefulness of the subject [17]. Conversely, behavior is affiliated to student's motivation to acquire what is reflected with students' actions, commitment, and accomplishment in class [16].

School-related factors such as school type and school location have been identified as key determinants of students' attitudes toward physics. Private schools often provide better instructional resources, smaller class sizes, and closer academic supervision than public schools. Similarly, urban schools are usually better equipped with laboratories and qualified teachers compared to rural schools [9].

School type is a major contextual factor influencing students' learning experiences in physics. In Nigeria, secondary schools are broadly categorized into public, private, and mission schools. Public schools are often characterized by large class sizes, inadequate laboratory facilities, and limited instructional resources, which negatively affect the teaching and learning of physics [3]. In contrast, private schools typically provide better learning environments, improved supervision, and access to instructional materials, which enhance students' attitudes toward physics. Mission schools, while emphasizing discipline and moral instruction, often face challenges related

to funding and laboratory equipment, which may limit effective physics instruction. Empirical studies have shown that students in private schools generally exhibit more positive attitudes toward physics than their counterparts in public schools [15]. Differences in school type have also been linked to variations in physics learning outcomes. Studies conducted in public secondary schools in Akwa Ibom State indicate that limited instructional resources and less effective teaching practices negatively affect students' engagement with physics [12, 19]. Conversely, schools with better instructional support structures tend to create more favorable conditions for physics learning, which may translate into more positive student attitudes.

School location also plays a significant role in shaping students' attitudes toward physics. Urban schools usually have better infrastructure, functional laboratories, qualified physics teachers, and access to instructional technologies compared to rural schools [8]. These advantages provide urban students with richer learning experiences, fostering positive attitudes toward physics. Rural schools, on the other hand, often suffer from shortages of qualified teachers, poor laboratory facilities, and limited exposure to practical physics activities. These constraints can reinforce students' perception of physics as difficult and irrelevant, leading to negative attitudes [4]. School location has been identified as a critical factor influencing students' physics learning experiences. [17] reported that students in urban schools outperformed their rural counterparts in physics, a difference attributed to disparities in teacher availability, instructional resources, and learning facilities. Such contextual differences are likely to shape students' perceptions and attitudes toward physics.

Gender differences in physics attitude have also been widely discussed. While earlier studies suggested male dominance in physics-related interests, recent findings indicate that gender gaps in science attitudes are narrowing due to sustained gender equity initiatives [2]. However, empirical evidence on gender differences remains inconsistent. Gender differences in physics education have been a subject of long-standing debate. Earlier studies suggested that male students exhibited more positive attitudes toward physics than female students due to societal stereotypes, differential encouragement, and cultural expectations [7]. Physics has traditionally been perceived as a male-dominated subject, which discouraged female participation.

However, recent research indicates that gender differences in attitudes toward physics are diminishing, especially in contexts where equal learning opportunities and inclusive instructional strategies are provided [18]. Studies conducted in Nigerian secondary schools have reported no significant gender differences in students' attitudes toward physics, suggesting a shift toward greater gender equity in science education [2]. Given the persistent challenges in physics education and the mixed findings in existing literature, it is necessary to empirically examine how school type, school location, and gender influence students' attitudes toward physics in Akwa Ibom State.

1.1. Statement of the Problem

Despite the relevance of physics to scientific and technological development, many secondary school students in Akwa Ibom State exhibit negative attitudes toward the subject. These attitudes manifest in anxiety, low motivation, and avoidance of physics-related tasks, contributing to poor academic performance in external examinations such as WAEC and NECO.

Although several studies have examined students' performance in physics, limited empirical attention has been given to how school type, school location, and gender jointly influence students' attitudes toward physics in Akwa Ibom State. Without clear evidence on these factors, interventions aimed at improving physics education may remain ineffective. This study seeks to address this gap.

1.2. Purpose of the Study

The main purpose of this study is to examine the influence of school type, school location, and gender on secondary school students' attitudes toward physics in Akwa Ibom State. Specifically, the study seeks to:

- 1) Determine the overall attitude of students toward physics.
- 2) Examine the influence of school type on students' attitude toward physics.
- 3) Determine the influence of school location on students' attitude toward physics.
- 4) Examine gender differences in students' attitude toward physics.
- 5) Determine the interaction effects of school type, location, and gender on students' attitude toward physics.

1.3. Research Questions

- 1) What is the overall attitude of students toward physics in Akwa Ibom State?
- 2) Does school type influence students' attitude toward physics?
- 3) Does school location influence students' attitude toward physics?
- 4) Is there a gender difference in students' attitude toward physics?
- 5) Are there interaction effects of school type, location, and gender on students' attitude toward physics?

1.4. Research Hypotheses

- 1) H01: School type has no significant influence on students' attitude toward physics.
- 2) H02: School location has no significant influence on students' attitude toward physics.

- 3) H03: Gender has no significant influence on students' attitude toward physics.
- 4) H04: There is no significant interaction effect of school type, location, and gender on students' attitude toward physics.

2. Methodology

A descriptive survey design of the ex-post facto type was adopted. The population comprised all Senior Secondary School students offering physics in Akwa Ibom State. A sample of 360 students was selected using a multistage sampling technique based on school type (public, private, mission), school location (urban, rural), and gender. Data were collected using the Attitude toward Physics Scale (ATPS), a 15-item Likert-type instrument extracted from the Students' Attitude toward Physics and Mathematics Questionnaire (SAPMQ). The instrument was validated by experts in Science Education and Measurement and Evaluation. A pilot study yielded a Cronbach's alpha reliability coefficient of 0.84. Data were analyzed using descriptive statistics and Analysis of Variance (ANOVA) with the aid of SPSS version 25 at 0.05 level of significance. This study forms part of a broader investigation on students' attitudes toward science subjects; however, the present paper focuses specifically on attitudes toward physics.

3. Discussion of Results

Research Question 1

Table 1

What is the overall attitude of students toward physics in Akwa Ibom State?

Table 1. Descriptive Statistics of Students' Attitude toward Physics (N = 360).

Variable	Mean	Std. Deviation
Attitude toward Physics	3.47	0.49

Interpretation:

The mean attitude score of 3.47 is above the scale midpoint of 3.00, indicating that secondary school students in Akwa Ibom State generally exhibit a moderately positive attitude toward physics.

Research Question 2

Does school type influence students' attitude toward physics?

Hypothesis 1

H01: School type has no significant influence on students' attitude toward physics.

Table 2. ANOVA Summary of the Influence of School Type on Students' Attitude toward Physics.

Source	Sum of Squares	Df	Mean Square	F	Sig.
School Type	10.42	2	5.21	25.60	.000
Error	70.81	357	0.20		
Total	81.23	359			

Decision:

Since the p-value (.000) is less than the 0.05 level of significance, H01 is rejected.

Interpretation:

School type significantly influences students' attitudes toward physics. Students in private schools demonstrated more positive attitudes than those in public and mission schools.

Research Question 3

Does school location influence students' attitude toward physics?

Hypothesis 2

H02: School location has no significant influence on students' attitude toward physics.

Table 3. ANOVA Summary of the Influence of School Location on Students' Attitude toward Physics.

Source	Sum of Squares	Df	Mean Square	F	Sig.
School Location	4.51	1	4.51	22.18	.000
Error	76.72	358	0.21		
Total	81.23	359			

Decision:

Since the p-value (.000) is less than 0.05, H02 is rejected.

Interpretation:

School location significantly influences students' attitudes toward physics. Students in urban schools exhibited significantly more positive attitudes than those in rural schools.

Research Question 4

Is there a gender difference in students' attitude toward physics?

Hypothesis 3

H03: Gender has no significant influence on students' attitude toward physics.

Table 4. ANOVA Summary of Gender Influence on Students' Attitude toward Physics.

Source	Sum of Squares	df	Mean Square	F	Sig.
Gender	0.29	1	0.29	1.43	.233
Error	80.94	358	0.23		
Total	81.23	359			

Decision:

Since the p-value (.233) is greater than 0.05, H03 is not rejected.

Interpretation:

Gender does not significantly influence students' attitudes toward physics. Male and female students exhibit comparable attitudes.

Research Question 5

Are there interaction effects of school type, school location, and gender on students' attitude toward physics?

Hypothesis 4

H04: There is no significant interaction effect of school type, location, and gender on students' attitude toward physics.

Table 5. Three-Way ANOVA Summary of Interaction Effects on Students' Attitude toward Physics.

Source	Df	F	Sig.
School Type × Location	2	0.54	.582
School Type × Gender	2	0.12	.891
Location × Gender	1	1.39	.239

Source	Df	F	Sig.
School Type × Location × Gender	2	1.74	.177

Decision:

Since all p-values are greater than 0.05, H04 is not rejected.

Interpretation:

There is no significant interaction effect among school type, school location, and gender on students' attitudes toward physics. This indicates that the influence of each factor is independent.

4. Discussion of Findings

The findings of this study revealed that school type significantly influenced secondary school students' attitudes toward physics. Students in private schools demonstrated more positive attitudes than those in public and mission schools. This finding may be attributed to the availability of better instructional resources, functional physics laboratories, smaller class sizes, and closer academic supervision in private schools. Effective laboratory experiences are known to enhance students' conceptual understanding and foster positive attitudes toward physics [11].

The significant influence of school type aligns with previous studies which reported that learning environment quality strongly predicts students' attitudes toward physics [3, 15]. When students are exposed to hands-on experiments and supportive instructional practices, physics becomes less abstract and more meaningful.

School location was also found to significantly influence students' attitudes toward physics, with urban students exhibiting more positive attitudes than rural students. This result is consistent with earlier studies that highlighted urban-rural disparities in science education [4, 8]. Urban schools benefit from better infrastructure, access to qualified teachers, and exposure to science-related activities, which positively shape students' perceptions of physics.

Contrary to earlier assumptions about gender disparities, the study found no significant gender difference in students' attitudes toward physics. This suggests that male and female students in Akwa Ibom State now experience similar learning opportunities in physics classrooms. This finding supports recent studies that reported diminishing gender gaps in physics attitudes due to increased awareness of gender equity and inclusive science teaching practices [2, 18].

The absence of significant interaction effects among school type, school location, and gender indicates that each factor independently influences students' attitudes toward physics. This underscores the importance of addressing school environmental factors rather than attributing attitude differences to gender.

5. Conclusion

This study examined the influence of school type, school location, and gender on secondary school students' attitudes toward physics in Akwa Ibom State, Nigeria. The findings provide important insights into the affective dimensions of physics education and highlight the critical role of school environmental factors in shaping students' perceptions of the subject.

The study established that students generally exhibited a moderately positive attitude toward physics; however, this attitude was significantly influenced by school type and school location. Students in private schools demonstrated more positive attitudes toward physics than their counterparts in public and mission schools, suggesting that learning environments characterized by adequate instructional resources, functional laboratories, smaller class sizes, and effective supervision foster more favorable perceptions of physics. This finding underscores the importance of institutional support and learning conditions in reducing the abstract and challenging nature often associated with physics.

Similarly, the significant effect of school location indicates that urban schools provide more conducive environments for physics learning than rural schools. Access to qualified teachers, laboratory facilities, and exposure to practical and technology-driven instructional approaches appear to play a crucial role in shaping students' attitudes. The persistent disadvantage of rural schools revealed in this study points to structural inequalities in science education that require deliberate policy intervention.

The finding that gender did not significantly influence students' attitudes toward physics is particularly noteworthy. It suggests that male and female students in Akwa Ibom State now experience comparable learning opportunities in physics classrooms, reflecting the impact of sustained efforts toward gender equity in science education. This outcome challenges traditional assumptions of gender-based differences in physics attitudes and emphasizes that contextual school factors, rather than gender, are more decisive in shaping students' affective responses to physics.

Furthermore, the absence of significant interaction effects among school type, school location, and gender indicates that these variables operate independently in influencing students' attitudes toward physics. This implies that improving school environments can have a uniform positive impact across genders, regardless of school location or type.

In conclusion, the study demonstrates that improving students' attitudes toward physics requires a systemic focus on

school quality and learning environments rather than an over-emphasis on gender differences. By addressing disparities in school resources, teacher availability, and instructional facilities—particularly in public and rural schools—educational stakeholders can promote positive attitudes toward physics, enhance student engagement, and ultimately improve learning outcomes. The findings contribute to the growing body of knowledge in physics education by providing empirical evidence from Akwa Ibom State and offer a strong basis for policy formulation and targeted interventions aimed at strengthening physics education in Nigeria.

6. Recommendations

Government should improve funding of public secondary schools to enhance physics teaching and learning.

Rural schools should be provided with adequate laboratory facilities and qualified physics teachers.

Teachers should adopt student-centered instructional strategies to promote positive attitudes toward physics.

Gender-inclusive instructional practices should be sustained.

Abbreviations

ANOVA	Analysis of Variance
SATPQ	Students' Attitude Toward Physics Questionnaire
FME	Federal Ministry of Education

Conflicts of Interest

The authors declare that there is no conflicts of interest regarding the publication of this manuscript.

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