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INFLUENCE OF SCHOOL VARIABLES ON STUDENTS' ATTITUDE IN GEOMETRY IN NASARAWA STATE, NIGERIA

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Abstract

This study determined the influence of school variables on students' attitudes in geometry in Nasarawa State, Nigeria. The study is a descriptive survey research design. The population of the study comprised all the senior secondary 2 students in Nasarawa state. This is 18,609 (8,882 male and 9,727 female) SS2 students of 428 secondary schools in Nasarawa State. The sample for the study was 392 SS II students from 18 senior secondary schools. The study adopted multi-stage random sampling technique. Three research objectives, three research questions, and three null hypotheses aided the study. Geometry Attitude Scale (GAS) was used as an instrument in this study. The instrument was validated by experts with average logical validity index of 0.80. Mean and standard deviation were used to answer the research questions, while inferential statistics of independent t-test was used to test the null hypotheses at 0.05 level of significance. The findings of the study revealed, among others, that boarding students had positive attitude towards geometry than day students, and urban students had positive attitude towards geometry than rural students. Also, single-sexschool students had positive attitude towards geometry than mixed sex school students. The study also revealed that private school students had positive attitude towards geometry than public school students. It was, however, recommended, among others, that the government should make informed educational policies and practices to better support students' attitudes and well-being across school variables; the government and school owners should provide targeted support to students in single-sex or mixed schools, addressing specific attitude-related needs of students; and educational policies and practices should be reviewed to promote equal opportunities and support for students in both public and private schools.

Keywords: School Variables, Attitude, Geometry

Introduction

Mathematics throughout the world is regarded as an essential tool in many fields, including natural science, engineering, medicine, finance and social sciences. With several branches including algebra, vector spaces, combinatory and number theory. Mathematics has shown significant importance in human education. Of particular interest to this study, geometry as a branch of mathematics is an important area in school mathematics curriculum throughout history; it has had great importance in people's lives, originating with the need of human beings to specify quantities, measure figures, and to make maps. To represent and solve topics of mathematics like trigonometry and in daily life situations, sound geometry knowledge is necessary. The National Council of Teachers of Mathematics (NCTM) in the year 2000 emphasized the importance of geometry in school mathematics by stating, "Geometry and spatial sense are fundamental components of mathematics learning. They offer ways to interpret and reflect on physical environment." The usefulness of geometry in everyday life is obvious in areas like measuring and estimating to students (Suleiman, Isma'il & Bello, 2020). Zakariyya (2016) posited that without mathematics, there will be no science, without sciences there will be no technology and without technology, there will be no modern society. Education enables science and technology with a good knowledge of mathematics to convert human skills and enterprises into material wealth and social amenities (Inweregbuh, 2018). Thus, Mathematics has therefore become an everyday phenomenon. However, in spite of all the importance accorded to mathematics in society, there exist low levels of mathematics attainment by students at every segment of the educational system in Nigeria (Olasehinde, Williams, Yahaya & Owolabi, 2018). This has given many stakeholders in education a high level of concern.

The school is a social and learning agent that provides the environment upon which a child may be formally educated in order to attain educational goals. Human beings, have an unlimited capacity to learn, but may however be limited by the behavioural patterns and facilities that the immediate environment offers. According to Oluseyi and Akpan, (2019), nature only provides the raw materials in form of potentials, but it is the environment that determines the extent of development.

Attitude can be defined as a favourable or unfavourable evaluative reaction towards something or someone exhibited in one's beliefs, feelings, or intended behaviour. It is a social orientation an underlying inclination to respond to something either favourably or unfavourably. Attitude could also be defined

as a consistent tendency to react in a particular way often positively or negatively toward any matter (Kpolovie, Joe & Okoto, 2014). According to Maio and Haddock (2016), attitude possesses both cognitive and emotional components. Maio and Haddock (2016) further stated that attitude are important to educational psychology because they influence social thought, the way an individual thinks about and how he\she processes social information.

Some studies show that students have a relatively positive attitude towards mathematics (Ajayi, Abiola, & Adeyanju, 2017). However, some studies suggest that there is no significant difference in attitude towards mathematics among students (Nicolaidou & Philippou, 2015; Mohd, Mahmood & Ismail, 2017). Nevertheless, it is generally believed that students' attitude towards a subject determines their success in that subject (Jebson & Hena, 2015). In order words, a favourable attitude results in good achievement in a subject. A student's constant failure in mathematics particularly geometry can make the student believe that they can never do well on the subject, thus accepting defeat. On the other hand, students' successful experience can make such students develop positive attitude towards mathematics (Mensah, 2016). Against this background, the study investigated the influence of school variables on students' attitude towards geometry in Nasarawa State, Nigeria.

School structure can be characterized by boarding or day school formation. Both day and boarding schools have been a feature of educational systems in Nigeria for many years now. However, there are multiple and conflicting research reports on the attitudes and behaviour of day and boarding students in various subjects and various locations (Mensah, Okyere & Kuranchie, 2015; Ngeno, Githua & Changeiywo, 2015). While research carried out to find out the academic excellence of boarding and day students have shown that there are varying attitudinal levels among boarding and day students (Zachariah & Joshua, 2016; Binji, Sokoto & Dankal, 2020; Lin, Lin, Wang, Su & Huang, 2021), some studies showed that there is no significant difference in the attitude of boarding and day school students (Owoeye & Olatunde-Yara, 2017; Ahmed, Oliver, Afolabi & Danmole, 2018 & Inweregbuh, 2018). Nevertheless, majority of these studies have no doubt shown that school structure (boarding/day) can affect the attitudes of students.

Also, the location and availability of educational resources at the disposal of the students in terms of school variables may affect their level of attitudes. According to Omisore, Omisore, Abioye-Kuteyi, Bello and Olowookere (2018), it is highly likely that the

most excelling students will emerge from urban schools in the modern academic dispensation as compared to those from rural schools in Nigeria. This can be attributed to the lack of standard and modern school infrastructure and facilities in rural schools. Du Plessis and Mestry (2019) observed that rural schools lack adequate amenities for the development and learning of students as compared to modern schools. Both public and private schools, urban and rural schools possess more facilities as well as teachers to promote the education of students as such influencing the attitudes of students compared to that of the rural schools (Alokan & Arijesuyo, 2017). However, aside from the availability of facilities, students are believed to have similar attitudes regardless of the school location (Owoeye & Olatunde Yara, 2017). Thus, considering factors associated with schooling such as infrastructure, learning materials and staffing, it can be considered that there may be a significant difference in the attitudes of students towards geometry as regards the location of the school. Several studies assert that students from urban schools outperform students from rural schools (Akpan, Ikpeme & Utuk, 2015; Alokan & Arijesuyo, 2017; Lopes, Xavier & Silva, 2020). However, it is noticeable that there are still students in rural schools with high and positive attitudes in mathematics (Lopes, 2020). Therefore, it can be considered that students can perform well irrespective of the school location, however, the influence of school location on the attitude of students towards geometry cannot be overlooked.

Statement of the Problem

Students' academic achievement appears to be one of the key criteria for educational standards and quality. Literature is replete with statistics and assertions indicating students' general poor academic achievement in mathematics in Nigeria. This low academic achievement continues to generate much concern among students, parents, teachers and other stakeholders in the education sector. This problem, besides persisting, the rate seems to be increasing alarmingly. Therefore, it's pertinent to investigate the composition of school variables and their influence on students' attitude and academic achievement in geometry in Nasarawa State, Nigeria.

Several studies have been conducted on the factors responsible for students' low academic achievement in mathematics as regards teachers' factors, parental support, the background of students, the interest of students, environmental factors and instructional materials, yet there is no conclusive report to their effects. There has not been enough study on the influence of school variables on mathematics students' achievement and attitude. Much as the

situation described here causes concern, it is not yet known why some students fail to attain the standards expected of them. The study therefore, determined influence of school variables such as school structure, school type, school location and ownership on students' attitude and achievement in Geometry in Nasarawa State, Nigeria.

Objectives of the Study

The main purpose of this study is to investigate the influence of school variables on students' attitude towards geometry in Nasarawa State, Nigeria. The specific objectives of this study are to determined influence of:

1. day and boarding schools on students' attitudes towards geometry in Nasarawa State.
2. urban and rural schools on students' attitudes towards geometry in Nasarawa State.
3. public and private schools on students' attitudes towards geometry in Nasarawa State.

Research Questions

The following research questions were raised to guide the study.

1. What are the mean attitude ratings of students in day and boarding school students towards geometry in Nasarawa State?
2. What are the mean attitude ratings of students in urban and rural school students towards geometry in Nasarawa State?
3. What are the mean attitude ratings of students in public and private school students towards geometry in Nasarawa State?

Statement of Hypotheses

The following hypotheses guided the study and were tested at α=0.05 level of significance.

H_{01}. There is no significant difference in the mean attitude ratings of day and boarding school students towards geometry in Nasarawa State

H_{02}. There is no significant difference in the mean attitude ratings of urban and rural school students towards geometry in Nasarawa State

H_{03}. There is no significant difference in the mean attitude ratings of public and private school students towards geometry in Nasarawa State

Methodology

This study adopted a descriptive survey research design. This is because the design helped to explore and describe a phenomenon, capture real world context, collect data. These characteristics in the population sample was identified, observed and measured to guide decision (McCombes,

2025). The population of the study consisted of all the senior secondary 2 students studying mathematics in Nasarawa state. The population of this study consisted of 18,609 (8,882 male and 9727 female) SS2 students of 428 secondary schools in Nasarawa State (Nasarawa State Ministry of Education, 2025). These secondary schools comprised boarding and day schools, rural and urban schools and public and private schools. The sample for the study consists of 392 (193 male and 199 female) SS II students from six senior secondary schools. The study adopted multi-stage random sampling technique. Stratified sampling to categorize schools into boarding/day schools, urban/rural and public/private groups; Simple random sampling technique was used to select schools from each category. Two schools each from an inspectorate office was randomly selected using the ballot technique, the selection of schools were based on "day, boarding, rural, urban and public, private schools". one instrument was used for data collection: Geometry Attitude Scale (GAS). Geometry Attitude Scale (GAS) was designed to determine students' attitudes in geometry. GAS is made up of 20 worded items, 10 positive while the other 10 negative covering students' attitudes in Geometry. GAS was rated using a four-point scale. The options are; strongly Agreed (SA) = 4 points, Agree (A) = 3 points, Disagree (D) = 2 points and Strongly Disagreed (SD) = 1 point for positive items. The negative items were rated in the reverse order. Geometry Attitude Scale (GAS) was validated by experts. Construct validity was ensured in terms of comprehensiveness of the instruments, relevance of the items to the purpose of the research, adequacy of the instrument for eliciting responses from the respondents. In a bid to ascertain the reliability and consistency of the instrument designed for the study; Geometry Attitude Scale (GAS) underwent face and construct validity. The reliability of the instruments was determined using Cronbach's Alpha with the coefficients of internal consistency 0.72 index. Inferential statistic of mean and standard deviation were used to answer research questions while inferential statistics of independent t-test was used to test the null hypotheses at 0.05 level of significance.

Results

Research Question One: What are the mean attitude ratings of students in day and boarding school students towards geometry in Nasarawa State?

Table 1: Mean Attitude Ratings and Standard Deviation of Students of Boarding and Day Schools in Geometry

	School Structure	N	Mean	Std. Deviation	Std. Error Mean
Attitude	**Boarding**	**182**	**56.23**	**9.30**	**.6893**
	Day	**210**	**45.38**	**10.48**	**.7235**

Table 1 shows that the mean attitude ratings of students in geometry in boarding and day schools was (56.23, 45.38) and standard deviation of students in geometry in boarding and day schools was (9.30, 10.48) respectively.

Null Hypothesis One: There is no significant difference in the mean attitude ratings of day and boarding school students towards geometry in Nasarawa State

The result of the test hypothesis one is presented in Table 2.

Table 2: Results of t-test on Attitude Ratings of Day and Boarding Schools Students in Geometry

	School Structure	N	Mean	Std. Deviation	t-test for Equality of Means t	df	Sig. (2-tailed)
Attitude	**Boarding**	**182**	**56.23**	**9.30**			
	Day	**210**	**45.38**	**10.48**	**0.092**	**390**	**0.000**

Table 2 reveals a significant difference in the mean attitude ratings in boarding and day students. The value t = 0.092 was obtained with associated exact probability value of 0.000. Since the associated probability (0.000) is less than 0.05 set as level of significance, the null hypothesis was rejected. Hence, there was a significant difference in the mean attitude rating between boarding and day school students. This means that school structure influence students' attitude towards geometry

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Research Question Two: 2. What are the mean attitude ratings of students in urban and rural school students towards geometry in Nasarawa State?

Table 3: Mean Attitude Ratings and Standard Deviation of Rural and Urban School Students' towards Geometry

	SchLocation	N	Mean	Std. Deviation	Std. Error Mean
Attitude	Rural	219	56.82	9.03	.6100
	Urban	173	45.54	10.85	.8250

Table 3 shows that the mean attitude ratings of students towards geometry in rural and urban schools was (56.82, 45.54) and standard deviation of students in geometry in rural and urban schools was (9.03, 10.85) respectively

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Null Hypothesis Two: There is no significant difference in the mean attitude ratings of urban and rural school students towards geometry in Nasarawa State

The result of the test hypothesis one is presented in Table 4.

Table 4: Results of t-test on Attitude Ratings of Urban and Rural School Students in Geometry

	School Location	N	Mean	Std. Deviation	t-test for Equality of Means t	df	Sig. (2-tailed)
Attitude	Urban	219	56.82	9.03			
	Rural	173	45.54	10.85	0.238	390	.000

Table 4 reveals a significant difference in the mean attitude ratings of students in urban and rural schools. The value t = 0.238 was obtained with associated exact probability value of 0.000. Since the associated probability (0.000) is less than 0.05 set as level of significance, the null hypothesis was rejected. Hence, there was a significant difference in the mean attitude rating between urban and rural school students. This means that school location influence students' attitude towards geometry

.

Research Question Three: 3. What are the mean attitude ratings of students in public and private school students towards geometry in Nasarawa State?

Table 5: Mean Attitude Ratings and Standard Deviation of Public and Private School Students towards Geometry

	School Ownership	N	Mean	Std. Deviation	Std. Error Mean
Attitude	Public	214	45.59	10.65	.7277
	Private	178	56.58	9.10	.6823

Table 5 shows that the mean attitude ratings of students towards geometry in public and private schools was (45.59, 56.58) and standard deviation of students in geometry in public and Private schools was (10.65, 9.10) respectively.

Null Hypothesis Three: There is no significant difference in the mean attitude ratings of public and private school students towards geometry in Nasarawa State

The result of the test hypothesis one is presented in Table 6.

Table 6: Results of t-test on Attitude Ratings of Public and Private School Students towards Geometry

	School Ownership	N	Mean	Std. Deviation	t-test for Equality of Means		
					t	df	Sig. (2-tailed)
Attitude	Public	214	45.59	10.65			
	Private	178	56.58	9.10	-21.89	390	0.000

Table 6 reveals a significant difference in the mean attitude ratings of students in public and private schools. The value t = -21.89 was obtained with associated exact probability value of 0.000 Since the associated probability (0.000) is less than 0.05 set as level of significance, the null hypothesis was rejected. Hence, there was a significant difference in the mean attitude rating between public and private school students. This means that school ownership influence students' attitude towards geometry.

Discussion of Findings

The findings revealed that school structure influence students' attitude towards geometry. In terms of school structure, the boarding school students have positive attitude towards geometry than the day school students. This result is in disagreement with Joseph and Emmanuel (2017) whose study revealed there was no significant difference in the mean attitude ratings between boarding and day school

students with positive attitude towards mathematics. This might probably be that Boarding school students are provided with accommodation to live in school hostel and are regimented to movement within and outside the schools where it provide them with the atmosphere to focus in their studies while day school students go for studies and return to their homes after schools of every day. This may cause boredom, lateness to school, and stress among students where little or no attention may be given to their studies there by influencing their attitude and achievement in geometry.

Another findings revealed that urban school students have positive attitude towards geometry than rural school students. This result is in agreement with the study of Alordiah, Akpadaka and Oviogbodu (2015), Ochoche and Oguche (2022) whose result showed that urban students achieved better than rural students; also in disagreement with Joseph and Emmanuel (2017) whose study revealed that there was no significant difference in the mean attitude ratings between urban and rural school students with positive attitude towards mathematics. Urban schools are characterized by their proximity to modern educational resources, offer students an environment conducive to mathematical comprehension. The presence of well-equipped libraries, standard laboratories, and digital learning tools cultivates an academic milieu that enhances problem-solving abilities and conceptual grasp in mathematics. Learners in metropolitan areas benefit from reduced travel time, enabling them to engage in extended academic activities and supplementary learning programs that reinforce classroom instruction. Furthermore, urban schools are more likely to attract qualified mathematics instructors who employ diverse pedagogical approaches tailored to contemporary educational demands. The confluence of these factors explains why urban students tend to exhibit superior mathematical proficiency compared to their rural counterparts.

Furthermore, findings revealed that school ownership also influenced students' attitudes towards geometry. The result showed that private school students have positive attitude towards geometry than public school students. This result is in agreement with the study of Adeyemi and Okonkwo (2021), Uche and Danjuma (2022), Olatunji (2023), Afolabi and Dike (2023) and Nwankwo and Etuk (2024) whose findings indicated that private school students have more positive attitude towards mathematics than their public school counterparts. Public schools are predominantly managed by governmental agencies, often grapple with resource constraints that impede mathematical proficiency. The bureaucratic processes

involved in funding allocation result in delayed infrastructural development, leading to inadequately equipped classrooms and a paucity of instructional materials. Many government-owned schools lack functional mathematics laboratories, depriving students of opportunities to engage in practical applications of theoretical mathematical concepts. This infrastructural inadequacy restricts the effectiveness of mathematics instruction, thereby contributing to suboptimal academic outcomes. Additionally, the relatively high student-teacher ratio in public schools limits personalized attention, further exacerbating difficulties in mathematical comprehension.

The level of improved attitude by the students could be as a result of carefully planned instructions, enabling learning environment provided where students worked together, explaining and encouraging one another to learn. Another reason for the better and an improved attitude by students in private schools, Boarding school, and urban could be because the students were more focused, attentive and interested in what they were doing, regular assessment practices and learning facilities were at their disposals. The environment allowed the learners to take charge of their learning and offered opportunities to develop cognition. As augured by Vygotsky 1978 that knowledge is co-construct and that individual learn from one another. Vygotsky also stated that learner must be engaged in the learning process.

Recommendations

The following recommendations were made based on the findings of this study.

1. Government should make inform educational policies and practices to better support students' attitudes and well-being in both boarding and day school settings.
2. Equitable educational resource distribution between urban and rural schools should be done to support students' attitude and academic success and also provide teachers with training to address diverse students' needs, considering urban-rural difference.
3. Educational policies and practices should be review to promote equal opportunities and support for students in both public and private schools.

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