
Gender, Interest and School Type as Predictors of Academic Achievement in Trigonometry among Secondary School Students in Kano State, Nigeria

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ABSTRACT

The study investigated and analysed students' gender, interest and school type as predictors of academic achievement in trigonometry among secondary school students in Kano State, Nigeria. To guide the study, three research questions and three hypotheses were formulated. The research design for the study was survey design of ex post facto type. The population of the study consisted of nine thousand eight hundred and seventy (9,870) SS II students from which a sample of three hundred and seventy students were selected in accordance with Krejcie and Morgan (19070). The procedure for the data collection were administration of questionnaire (Students' Trigonometry Interest Questionnaire STIQ) and an achievement test (Trigonometry students' achievement test TSPT). Descriptive statistics (frequency and percentage) and t-test were employed to analyse the hypotheses at 0.05 level of significance. The findings of the study showed that female students' performed slightly higher than the male students' in trigonometry. Students' interest in trigonometry is a predictor of achievement while the school students attended is not a predictor of achievement in trigonometry. The study recommends that teachers should endeavour to make the students courageous enough to be able to face the tasks ahead of them (learning trigonometry). The study concludes that students' gender and school type are not predictors of students' academic achievements in trigonometry in Kano State, Nigeria but interest is a predictor.

Keywords: Gender, School type, Interest, Academic Achievement, Trigonometry

INTRODUCTION

The sexual distribution between male and female which nature has dichotomized by associating certain features and characteristics as specific for each can be termed as gender. Certain tasks and some accomplishment are exclusively destined for either male or female and very few are meant to interweave across. According to Abiem and Odok (2006) one variable that has attracted significant attention from researchers in mathematics education is gender and also that girls achieved better than boys in number and numeration, while boys outperformed the girls in all the branches such as trigonometry, geometry. Köse (2001) found that girls had higher level of school achievement than boys but boys had higher level of mathematical achievement. Kaiser-

Messmer (1994) states that there have been studies conducted that show that boys performed better than girls in mathematics. A number of studies have documented that boys are more interested in mathematics than girls notably Fredricks & Eccles (2002; Jacobs et al. (2002); OECD (2004) and Watt (2004).

Research efforts of Zhang and Manon (2000); Johnson (2000) showed no significant differences in achievement between boys and girls as they start getting acquainted with mathematics. Kolawole (2007) reported that there was not too much of a gap in gender differences in mathematics achievement at the elementary school level (age 9 years) but there was a greater gap at the high school level (15 years). Kiptum, Rono, Too, Bij, and Too (2013) stated that the literature on gender differences provides evidences that gender issues impact achievement in mathematics notably that female students show less interest in mathematics and the steady decline in the girls' liking of mathematics perhaps account for the corresponding decline in their achievement in the subject over the years. Omenka, and Kurumeh (2013) concluded that there is no significant effect of gender on students' achievement in Number and Numeration when taught using Ethno mathematics approach.

Interest is the feeling of wanting to know, feel, touch, experience or learn more about something. Interest is a quality that attracts attention towards phenomena. Hence, interest in a certain subject is a feeling of wanting to know the subject or rather learn more about it. Interest is a motivational variable that is linked with educational attainment, in that, students are more likely to engage in an academic activity, pay more attention, and generate higher achievements if they are interested in the topic. Hence, interest in a certain subject is a feeling of wanting to know the subject or rather learn more about it.

Köller, Baumert, & Schnabel (2001) showed that subject-specific interest in mathematics had no significant influence on the development of achievement if the previous knowledge was controlled. Whereas, Hidi & Renninger (2006); Harackiewicz, Durik, Barron, Linnenbrink-Garcia, & Tauer (2008); and Fisher, Dobbs-Oates, Doctoroff, & Arnold (2012) reported that subject-specific interest is an important determinant for successful learning and advanced achievement. Further studies highlighted gender differences in students' interests indicating lower interests of girls compared to boys in mathematics such studies include the works of Fredricks & Eccles (2002) and Watt (2006).

Schools differ, just like the people within them, in terms of different characteristics. The type of schools students attended has an impact of their academic and school related achievements. The different types of schools include among others the followings: - Single -sex (boys only or girls only), co-educational or mixed school (both boys and girls), day or boarding, urban or rural, grammar school or Arabic/Islamic school, private or public.

Okon, and Archibong, (2015) added that text books appear to be readily available in private secondary schools than in public ones and that every subject is taught by a trained and qualified teacher as against the public which any teacher may teach any subject which is within the same nomenclature.

Students' academic achievement can be defined as the level of accomplishment of school educational goals by students over a stipulated time. Adediwura & Taiwo (2007) defined academic achievement as the display of knowledge attained or skills developed in school subjects

designated by test and examination scores or marks assigned by the subjects' teachers. To this effect, the study investigated students' gender, interest and school type as predictors of achievement in trigonometry among secondary school students in Kano State, Nigeria.

Following the students' long years achievements in trigonometry aspect in SSCE, which shows the students inability to score high marks compared to other aspects of mathematics it can be concluded that students' lack of interest is on the increase. For instance, WAEC Chief Examiner's report of the years (2009), (2010), (2011), and (2012) has indicated that students generally performed poorly in the trigonometry questions. Students were very weak in trigonometry and as such made unnecessary errors in their approach to obtaining the correct solutions in the topic. Candidates' inability to interpret word problems and draw required diagrams correctly was observed especially bearing.

Trigonometry as an aspect of mathematics in secondary school in Nigeria faces several problems in relation to its instructional strategies and curricular content delivery by the mathematics teachers. Adepoju (2002) and Tella (2008) observed that trigonometry has been neglected by the learners and its content delivery by teachers has been slow.

In the light of the aforementioned problems relating to achievements in trigonometry, this study investigated and analysed students' gender, interest and school type as predictors of achievement in Trigonometry among secondary school students in Kano State, Nigeria.

Objectives of the Study

The objectives of the study are to ascertain the relationship between students gender, interest and school type on the academic achievement of Senior Secondary students in Trigonometry. Specifically, the objectives of this study are to establish whether:-

- 1 Students' gender is a predictor to students' academic achievement in trigonometry.
- 2 Students' interest in trigonometry is a predictor to students' academic achievement in trigonometry.
- 3 School type is a predictor to students' academic achievement in trigonometry.

Research Questions

To guide the research work the following research questions were formulated:-

- 1 Could there be gender difference in academic achievement among and female students in trigonometry?
- 2 What is the relationship between Students' interest in trigonometry and students academic achievement in trigonometry?
- 3 Could there be difference in achievement in trigonometry among students' of public and private school?

Null Hypotheses

The following hypotheses were formulated and tested at 0.05 level of significance.

- H₀₁: There is no significant gender difference in academic achievement in trigonometry between male and female students.

- H₀₁: There is no significant relationship between Students' interest in trigonometry and students' academic achievement in Trigonometry.
- H₀₃: There is no significant difference between public and private school students' academic achievement in Trigonometry.

METHODOLOGY

The research design for this study was descriptive survey of ex post facto type. The population for the study consists of all SS II students from the Senior Secondary Schools in Municipal Education zone numbering nine thousand eight hundred and seventy (9,870). The sample of the study consists of three hundred and seventy (370) students (in accordance with Krejcie and Morgan (1970) from all the sampled schools. The samples of the study were drawn from six Senior Secondary Schools namely: - Rumfa College, Kano, Murtala Muhammad Secondary School, Kano Capital Secondary School (Both boys and Girls), Shekara Girls Secondary school and Fatima Muhammad Girls Secondary school, Kano. A simple random sampling technique was used to select students from the six schools which comprises of 185 male and 185 female students. The study also has 121 mathematics teachers as part of the study. The instruments used for the study were Trigonometry Students' Achievement Test (a 40 item multiple choice type questions) and Students Trigonometry Interest Questionnaire (a 20 item questions) for the students. The data for the study were collected through the administration of the above instruments. The data collected from the instruments were analysed using descriptive statistics (Mean and standard deviation) for research questions and an inferential statistics (t-test, Spearman's Rank Order Correlation and Pearson's Correlation) for the hypotheses.

DATA PRESENTATION AND ANALYSIS

The data collected from the sample of the study were presented in subsequent tables.

Research Question One: Could there be gender difference in students' academic achievement in trigonometry?

Table 1: Means and Standard Deviations of Male and Female Students' Academic Achievement in Trigonometry

Gender	N	Mean	Mean Difference	SD
Male Achievement	185	13.87	-1.61	3.432
Female Achievement	185	15.48		3.876

Table 1 presented the mean and standard deviation scores of male and female students' academic achievement in trigonometry. From Table 1, the mean and standard deviation scores of male students are 13.87 (SD=3.432) while that of the female students are 15.48 (SD=3.876) respectively. Table 1 further shows that the mean academic achievement score 13.87 (SD=3.432) for male is lower than 15.48 (SD=3.876) for female. The mean difference was -1.61 in favour of female students'. Therefore, there is a difference between male and female students' academic

achievement in Trigonometry. In order to establish whether the difference is statistically significant, an independent sample t-test was used at $p=0.05$ level of significance.

Table 2: Summary of Independent Samples t-test of Male and Female Students' Academic Achievement in Trigonometry

Gender	N	Mean	Mean Difference	SD	t	df	p
Male Achievement	185	13.87	-1.605	3.432	-4.218	368	.000
Female Achievement	185	15.48		3.876			

Table 2 presented the independent samples t-test of male and female students' academic achievement in trigonometry. The mean academic achievement score 13.87 (SD=3.432) for male is lower than 15.48 (SD=3.876) for female. The mean difference was -0.605 in favour of female students'. This is supported by $t(368) = -4.218$, $p < 0.05$; the null hypothesis which stated no significant difference was rejected. Therefore, there is a significant difference between male and female students' academic achievement in trigonometry

Research Question Two: What is the relationship if any between Students' interest in trigonometry and students' academic achievement in trigonometry?

The data required to answer the research question are the students' achievement in trigonometry and the students' interest in trigonometry. The data is contained in Table 3.

Table 3: Means and Standard Deviations of Students' Interest in relation to Academic Achievement in Trigonometry

	N	Mean	Mean difference	SD
Students Achievement	370	14.67	-44.31	3.743
Students Interest	370	59.08		12.080

Table 3, presented the means and standard deviations of students' academic achievement in trigonometry and students' interest in trigonometry. From Table 3, the mean academic achievement in trigonometry is 14.67 (SD=3.743) while that of students' interest in trigonometry is 59.08 (SD=12.080). The mean difference -44.31 shows a wide gap between the students' interest in trigonometry and students' academic achievement in trigonometry. This further shows that there is a wide difference between interest in trigonometry and academic achievement in trigonometry. To establish whether the difference is statistically significant, paired sample t-test was used at 0.05 level of significance.

Table 4: Summary of Spearman's Rank Correlation of Students' Interest in relation to Students' Academic Achievement in Trigonometry.

Variables	N	Mean	SD	df	r	rcrit	p	Decision
Students' Achievement	370	14.67	3.743	369	0.106	0.1966	0.041	$P < \alpha$
Students' Interest	370	59.08	12.080					

Table 4 presented a Spearman's Rank Correlation on students' academic achievement in trigonometry in relation to students' interest in trigonometry. There was a difference in the mean academic achievement scores in trigonometry ($M=14.67$, $SD=3.743$) and students' interest scores in trigonometry ($M=59.08$, $SD=12.080$) which is in favour of students' interest scores in trigonometry and was further supported by $r(369) = 0.106$, $p=0.041$ and $r\text{-crit}(369) = 0.1966$. The relationship between students' academic achievement and interest in trigonometry was $r = 0.106$. The relationship was positive but weak, this is an indication that there was a relationship between students' academic achievement and interest in trigonometry. Since $0.041 < 0.05$, therefore, the null hypothesis which states that there is no significant relationship between students' interest in trigonometry and students' academic achievement in Trigonometry was rejected.

Research Question Three: What relationship exists if any between school type and students' academic achievement in trigonometry?

Table 5: Means and Standard Deviations of the Students' Academic Achievement in Trigonometry for Public and Private Secondary Schools

Variables	N	Mean	Mean Difference	Std. Deviation	Std. Error Mean
Public	250	14.8640	0.1794	3.92059	.24796
Private	130	14.6846		3.56563	.31273

Table 5, presented means and standard deviations of the students' academic achievement in trigonometry for public and private secondary schools. From Table 5, the mean and standard deviation of the students' academic achievement in trigonometry for public secondary schools are 14.8640 ($SD=3.92059$) respectively while the mean and standard deviation of the students' academic achievement in trigonometry for private secondary schools are 14.6846 ($SD=3.56563$) respectively. The mean difference between the public and private secondary schools is 0.18 in favour of the private secondary schools.

Null Hypothesis Three: There is no significant relationship between Public and private schools students' academic achievement in Trigonometry. The data necessary for the analysis is contained in Table 6.

Table 6: Pearson's Correlation of the Students' Academic Achievements in Trigonometry for Public and Private schools.

Variables	N	Mean	Std. Deviation	r	p-value	Decision	Significance
Public School Academic Achievement	250	14.86	3.92	0.02	0.81	0.81 > 0.05	Not Significant
Private School Academic achievement	130	14.68	3.57				

Significant at $p < 0.05$

Table 6, presents the Pearson's correlation of the students' academic achievements in trigonometry for public and private schools. From Table 6, an r value of 0.02 and a p -value of 0.81 were calculated and the calculated p -value (0.81) is greater than the research designated p -value (0.05). The calculated p -value being greater than the research designated p -value indicates no relationship between the two variables. The hypothesis that there is no significant relationship between public and private school students' academic achievement in Trigonometry fails to be rejected.

FINDINGS

The main objectives of the study are to investigate and analyse students' gender, interest and school type as predictors of achievement in trigonometry among secondary students in Kano Metropolis. The findings from the study showed that:-

- 1 Students' gender is not a predictor of students' academic achievement
- 2 Students interest is a predictor of academic achievement in trigonometry
- 3 The school students attended is not a predictor of academic achievement in Trigonometry.

DISCUSSION

The study presents the full explanation of the findings as obtained from the hypotheses tested and acknowledges (as part of backing) some of the published works of other authors in related studies.

There was no significant gender relationship between male and female students academic achievement in trigonometry. The findings of this study supports Zhang and Manon (2000) and Johnson (2000) who showed that no significant differences in achievement between male and female students. The study opposes (Köse, 2001) and (Wilson & Hart (2001) who found significant difference and that girls had higher level of school achievement than boys.

There was a significant relationship between students' interest in trigonometry and academic achievement in trigonometry. The findings of this study opposes (Köller, Baumert, &

Schnabel, 2001) who showed that subject- specific interest in mathematics had no significant influence on the development of achievement if the previous knowledge was controlled.

There was no significant relationship between students' school type (public and private) and students' academic achievement in trigonometry. The findings agree with (Ajayi, 2006), (Alimi, Ehinola, and Alabi, 2012) who concluded that there is no significant difference in the academic achievement of students in public and private senior secondary schools. The study is at disharmony with Mburu (2013) who maintained that the type of schools, (single sex or mixed, private or public) has effect on the academic achievement of students in Mathematics.

CONCLUSION

The study concludes that gender and the school attended are not predictors of academic achievement among students; but interest is.

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