SCHOOL ACADEMIC CLIMATE AND SENIOR SECONDARY SCHOOL STUDENTS' ACHIEVEMENT IN MATHEMATICS IN RIVERS STATE

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ABSTRACT

This research study focused on the relationship between school academic climate and students' achievement in mathematics at the senior secondary school level in Rivers State, Nigeria. The ex-post facto research design was adopted for this study, since already conducted mathematics test scores of students were retrieved and used for the analysis. Furthermore, data were elicited through the school academic climate and students' achievement in mathematics questionnaire (SACASAMQ). This questionnaire has twelve (12) question items related to school academic climate and students' achievement in mathematics. A population of 10,120 students was involved in the study out of which 4,510 were chosen for the sample using the Yarrow Yamen's formula. The data were analysed using the Z-test statistic, means and simple percentage. The findings were that to "a high extent", school academic climate related to students achievement in mathematics. Furthermore, the hypothesis testing showed that there is a significant relationship between school academic climate and students' achievement in mathematics. Based on these findings, recommendations were made.

Keywords: School academic climate, students, mathematics achievement, senior secondary school

INTRODUCTION

This research study focused on the school academic climate and students' achievement in mathematics at the senior secondary school level in Rivers State, Nigeria. Furthermore, the interest in raising levels of achievement in mathematics has led to a focus on the role of the school academic climate in students' mathematics achievement.

In our research context, school academic climate connotes supervision of class, home task given, home task correction, preparation and utility of teaching aids, teacher regularity and commitment. Oyekan (1995) had earlier enumerated various problems related to under achievement in mathematics to include poor supervision of class by teachers, poor supervision of home task given to the students and poor preparation and utility of teaching aids by the teachers. Furthermore, an instructional variable in mathematics is whether teachers frequently check mathematics homework in class so as to assess and support full understanding (Martin et al, 2000).

Supporting the views of Martin and associates, Harris (1995) had earlier reiterated the need for emphasis to be placed on hands on experience of students in mathematics and science rather than learning terminology. Some of the instructional adaptations recommended include the following:

1. Breaking down difficult ideas into more understandable segments

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2. Pausing often enough to allow students to catch up and process the words the teacher has been using
3. Stressing the main word or idea
4. Using synonyms for important words
5. Providing a handout that students can use to follow the discussion
6. Demonstrating whenever possible in ways that supplement spoken or written instruction.

Commenting further on school academic climate Papanastasiou (2001) showed that school climate was influenced by the educational background of students and school climate in turn influences teaching, hence achievement in mathematics.

The videotape study of TIMSS (1995) from three different countries (Japan, Germany and USA) showed that outside interruption affect the flow of the lesson and detracts from instructional time. Internationally, in TIMSS 1999 for both mathematics and science, about one-fifth of the students reported that their classes were interrupted pretty often or almost always (Mullis et al 2000).

However, Betts et al (2003) had argued in their study that the percentage of days a student was absent was a strong negative predictor of each student's gain in achievement in mathematics. Perhaps the next most consistent finding was that an individual student made much more academic progress in a school year in which he or she was surrounded by peers in his or her grade who had high scores on the prior spring's test. A strong but less consistent finding was that the average initial test scores of a student's peers in his or her classroom also influenced his or her learning.

Does an aggregate of these findings connote the fact that the school academic climate plays a centre-stage role in the achievement of students especially in mathematics? What is the problem of low achievement in mathematics at the senior secondary school level in Rivers State, Nigeria?

The Problem

Ahiakwo (2006) found that the performances of various levels of students in mathematics have decelerated over the years with that of Nigerian students quite remarkable. However, mathematics is the pivot around which the whole essence of living revolves and the basis for scientific and technological takes-off. Furthermore, WAEC (2001 – 2010) chief examiners reports of results of our public examinations had shown markedly a decline in the percentage of passes in mathematics. What factor must be responsible for such poor performances especially in Nigeria and Rivers State in particular? Is there a likely relationship between school academic climate and senior secondary school achievement in mathematics? To what extent is this relationship? This research study is poised to investigate this phenomenon.

THEORETICAL BACKGROUND

Cheng (1996) had earlier conducted a study on the effect of classroom environment on students' satisfaction and achievement suggesting that classroom climate and management style contributes differently towards different aspects of achievement.

Singh and Saxena (1995) also found that school level factors of academic climate (test and feedback, homework, teachers' quality) are the prominent contributors to learning achievement in mathematics. Jain and Arora (1995) conducted a study on the effect of school-level variables on achievement and found that the continuous stay of teachers for not

more than five years in the same school, proper qualification are likely to improve the performance of primary education.

Furthermore, Sahoo (1998) and Probhan (1999) conducted a study on the effects of school – related factors and found that regularity in home task giving and correction have positive effects on enhancing learning achievement. On teacher regularity to class and commitment in the teaching process, Nwosu (2002) posited that;

> *…a number of reasons have been advanced by researchers on why available resources for mathematics teaching have not been effective. They include: in-competence of mathematics teachers, lack of commitment of mathematics teachers, defective training given to mathematics teachers, high teacher/student ratio (p. 247).*

He further explained that there is lack of commitment caused mainly by the mathematics teachers' negative attitude to their work. All these speak nothing but students' under-achievement in the subject. The pattern of training of mathematics teachers has remained predominantly traditional for too long and there is no opportunity to retrain and update the teachers'' knowledge to function to expectation. Worse still, our training institutions are concerned with the covering of the prescribed syllabus or curriculum rather than train them to satisfy their professional career. Earlier in his study, Nwosu (2000) found that there was little or non-use of resources by teachers of mathematics which made it difficult for students to achieve more in mathematics. He further stated that non-use of classroom resources have been attributed to teachers' lack of knowledge and skills required putting such resources into productive use. This, he stressed, has caused poor performance of students in mathematics.

The third international mathematics and science study (TIMSS) represents the most comprehensive international comparism of students' achievement yet conducted. The TIMSS assessment was conducted to study the effects of different factors on students' achievement, including instructional activities, classroom environment, confidence in mathematics and science ability.

Following the findings of Coleman (2006) suggesting that "school made no difference"; extensive research has been carried out on – in and out – of school variables affecting students' achievement. Researchers have suggested that achievement in mathematics and science in secondary school is a function of many international variables such as school-related variables.

An earlier empirical study on school academic climate and students' achievement in mathematics was carried by TIMSS (2002). This was sponsored by the International Association for the Evaluation of Educational Achievement (IEA). It set out to measure across 45 countries, mathematics and science achievement among students at different ages and grades. In total, over half a million students from more than 30,000 classes in approximately 15,000 schools provided data. Not only were comprehensive mathematics and science tests developed for the study, there were questionnaires developed for students, their teachers and their school principals. Prior to the development of the tests, an extensive analysis of textbooks and curriculum documents was carried out. Mathematics and science curriculum developers from each country also completed questionnaire about the placement of an emphasis on a wide range of mathematics and science topics in their country's curricula. Together, the data provided a unique opportunity to examine an extensive range of contextual variables that influence mathematics and science achievement.

Consequently, results showed that not only do schools make a difference in mathematics and science achievement but classroom as well. There are strong classroom effects and modest school effects on mathematics achievement.

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Having considered these international and empirical studies, we can now ask the question – to what extent does school academic climate relate to student's achievement in mathematics in Nigeria and Rivers State in particular. This study is poised to carry out empirically, this phenomenon using a different statistical tool for the research analysis. This is with the view to filling the gap in literature and contributes to requisite knowledge in mathematics education.

THE METHOD

The ex-post facto research design was adopted for this study because it seeks to investigate an existing phenomenon regarding students' achievement in mathematics. The population of the study consisted of 10,120 senior secondary II students in Rivers State, Nigeria. However, the sample size of 4,510 for the study was selected by using the Yarrow Yamen's formula. The research instrument is the school academic climate and students' achievement in mathematics questionnaire (SACASAMQ). To elicit data from the respondents, the instrument was constructed using the following scale:

1. Very High Extent (VHE) = 4
2. High Extent (HE) = 3
3. Low Extent (LE) = 2
4. Very Low Extent (VLE) = 1

The respondents were free to indicate (√) in the column against each of the items as it applied to them. A decision cut off point of 2.50 was adopted. Any item or component in which the respondents have a mean score below 2.50 was regarded as a low extent.

Descriptive and inferential statistics were adopted for this study. In the descriptive statistics mean ($\bar{X}$), variance $(\delta)^2$ and standard deviations (δ) were computed and tables constructed. Deductions made from results on these tables formed the answers to the research question. To test the hypothesis the Z-test statistics was applied to compare the means of the school academic climate and achievement in mathematics. The 0.05 level of significance was adopted with the degree of freedom as $df = N_1 + N^2 - 2$.

Table 1. Distribution of Population of 10,120 senior secondary II students in Rivers State

S.No	*Local Govt. Area*	*No. of Schools*	*Population of Students (SS2)*	*Sample of Students (SS2)*
1.	Abua/Odual	11	440	209
2.	Ahoada – East	12	480	218
3.	Ahoada – West	13	520	226
4.	Akuku-Toru	8	320	177
5.	Andoni	10	400	200
6.	Asari-Toru	8	320	177
7.	Bonny	13	520	226
8.	Degema	12	480	218
9.	Eleme	6	240	150
10.	Emohua	19	760	262

11.	Etche	19	760	262
12.	Gokana	12	480	218
13.	Ikwerre	13	520	226
14.	Khana	22	880	275
15.	Obio/Akpor	16	640	246
16.	Ogu/Bolo	3	120	92
17.	Okrika	6	240	150
18.	Omuma	3	120	92
19.	Ogba/Egbema/Ndoni	15	600	240
20.	Opobo/Nkoro	3	120	92
21.	Oyigbo	4	160	114
22.	Port Harcourt	15	600	240
23.	Tai	10	400	200
	Total	*253*	*10,120*	*4,510*

RESULTS AND DISCUSSION

Research question: To what extent does school academic climate relate to students' achievement in mathematics?

Table 2. Analysis of the opinions of students on school academic climate and achievement in mathematics

S/N	*Question Items*	*VHE (4)*	*HE (3)*	*LE (2)*	*VLE (1)*	*Total*	*Mean* $\overline{X}$	*Percentage rating (%)*
1.	To what extent is the maths class always properly supervised by the teachers?	981 (3924)	1184 (3552)	1579 (3158)	766 (766)	4510 (11,400)	2.53	63.25
2.	To what extent does the maths teacher give home assignments after each lesson?	1161 (4644)	1454 (4362)	1691 (3382)	204 (204)	4510 (12592)	2.79	69.75
3.	To what extent does the maths teacher correct home assignment?	1004 (4016)	1015 (3045)	1860 (3720)	631 (631)	4510 (11412)	2.53	63.25
4.	To what extent does the maths teacher prepare teaching aids for maths lessons?	767 (3068)	936 (2808)	2356 (4712)	451 (451)	4510 (11039)	2.45	61.25
5.	To what extent does the maths teacher use the teaching aids for maths?	733 (2932)	981 (2943)	2300 (4600)	496 (496)	4510 (10971)	2.43	60.75
6.	To what extent does the maths teachers punish	1015 (4060)	1409 (4227)	1635 (3290)	451 (451)	4510 (12028)	2.66	66.50

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	behavioural disturbances in the maths class?							
7.	To what extent is your maths teacher regular in class?	1150 (4600)	1466 (4398)	1669 (3338)	225 (225)	4510 (12561)	2.79	69.75
8.	To what extent is your maths teacher committed to the teaching of the lesson?	823 (3293)	851 (2571)	1725 (3450)	1105 (1105)	4510 (10418)	2.31	57.75
9.	To what extent does your home background influence your school activities?	1071 (4284)	958 (2874)	1522 (3044)	959 (959)	4510 (11161)	2.47	61.75
10.	To what extent does the culture of the school location influence your school academic environment?	1184 (4736)	1522 (4566)	1311 (3022)	293 (293)	4510 (12617)	2.79	69.75
11.	To what extent does the percentage of days you spend in the class a week influence your maths achiever?	1353 (5412)	1759 (5277)	1094 (2188)	304 (304)	4510 (13181)	2.92	73.00
12.	To what extent does the size of your class influence your achievement in maths?	744 (2976)	970 (2937)	2075 (4150)	712 (712)	4510 (10775)	2.38	59.5
		Group mean rating (x) =					*2.59*	*64.75*

Table 2 revealed that the summary result of the total opinions of students on the relationship between school academic climate and students' achievement in mathematics was 2.59 indicating a percentage of 64.75. Furthermore, the decision rule says that the mean of the scale used is 2.50; hence any score above 2.5 showed that "to a high extent" school academic climate is related to students' achievement in mathematics. However, any score below 2.5 indicates that "to a low extent" school academic climate is related to students' achievement in mathematics. Therefore, the score above showed that "to a high extent" school academic climate is related to students' achievement in mathematics.

Hypothesis Testing

Ho: There is no significant relationship between school academic climate and students' achievement in mathematics.

Table 3. Z-ratio test of significant relationship between school academic climate and student's achievement in mathematics

Variables	$\overline{X}$	*Sd*	*N*	*df*	*P*	*S. Error*	*Z-cal*	*Z-Crit*	*Decision*
School academic climate	64.75	6.29	4510	9018	0.05	0.093	43.38	Z>1.96 Or Z<-1.96	Reject H_o
Students' achievement in mathematics	54.09	14.79	4510			0.228			

The result of table 3 showed that the calculated value of Z is 43.38, which is greater than the critical value of 1.96 at the degree of freedom 9,018 at the 0.05 level of significance. Since the calculated Z-value is greater than the critical value, the null hypothesis that there is no significant relationship between school academic climate and students' achievement in mathematics is rejected. Hence, there is a significant relationship between school academic climate and students' achievement in mathematics.

CONCLUSION:

From the analysis of data and the discussion of findings, the following conclusions were made:

1. There is a significant relationship between school academic climate and students' achievement in mathematics.
2. Absence of proper supervision of the mathematics classes, home-task given, home-task correction, preparation and utility of teaching aids and teacher regularity and commitment can impede achievement of better grades in mathematics.
3. Hence, senior secondary II students in Rivers State, whose mathematics teachers do not effectively implement these school academic climate characteristics will likely find themselves achieving less grades in mathematics.

RECOMMENDATIONS

Considering the findings, discussions and conclusions of this study, the following recommendations were made:

1. The search light of blame on poor performance in mathematics should be re-focused on areas such as supervision of mathematics classes, home task given and preparation/utility of teaching aids by the mathematics teachers.
2. The pedagogical training of teachers should be re-emphasized especially in mathematics and those without adequate training sent for refresher courses.
3. School administrators should endeavour within their reach to create a conducive environment at school in order to facilitate learning.

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