TEACHER VARIABLES AND SENIOR SECONDARY STUDENTS' ACHIEVEMENT IN MATHEMATICS IN RIVERS STATE, NIGERIA

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Abstract

This research study focused on the relationship between teacher variables and students' achievement in mathematics at a senior secondary II level in Rivers State, Nigeria. The ex-post facto research design was adopted for this study, since already conducted mathematics test scores of the students were retrieved and used for the analysis. Furthermore data were elicited through the teacher variables and students' achievement in mathematics questionnaire (TVAMQ). A population of 10,373 senior secondary II students and teachers were involved in the study, out of which 4510 students and 151 teachers were chosen for the sample using the Yarrow Yamen's formula. The data were analyzed using the Z-test statistic, means and percentages. The findings were that there is a significant relationship between teachers' method of teaching, teachers' attitude and students' achievement in mathematics. Hence recommendations were made.

Keywords: Teacher Variables, Mathematics achievement, teachers' attitude and method

Introduction

This research study focused on the teacher factor and students' achievement in mathematics at the senior secondary school level in Rivers State, Nigeria. The issue of teacher as a factor that affects students' achievement in mathematics is not yet closed or resolved. TIMSS (2002) found that trends in mathematics achievement over three decades showed a "re-occurring decimal" pointing to the teacher as a major decision variable in mathematics achievement. Earlier, Afrassa and Peeves (1999) showed that in Australia, the teacher factor cannot be undermined in questioning low achievement of students in mathematics.

In the same vein, the National Centre for Education Standard (2000) measured and found that teacher factor stands as a major pivot in students' general achievement and mathematics in particular. Furthermore, Lamb and Fullarton (2000) found that in Australia, although student background variables influenced their achievement in mathematics, classroom and school factors contributed substantially.

In the Nigerian context, Ibebuike (2006) had noted that many students, even as far back as their primary school days did not take interest in mathematics to a meaningful degree; remarking that methods of instruction were not very favorable to these students. He posited that this was due to the paucity of competent and adequately qualified mathematics teachers who were invariably over labored. Arguing further, Iwuoha (2007) identified lack of thorough grooming in mathematics concepts; unsuitable teaching environment, wrong evaluation techniques by both teachers in schools and WAEC's lack of incentives to mathematics teachers as major factors that caused low mathematics achievement. Hence, this study seeks to investigate teacher variable such as his method of teaching and attitude towards mathematics and their relationships with students' achievement in mathematics.

The Problem

The Chief Examiners' reports of results of our public examinations (WAEC, 2003-2008) had shown markedly a decline in the percentage of passes in mathematics. Ahiakwo (2006) found that the performance of various levels of students had decelerated over the years especially in mathematics achievement with that of Nigerian children quite remarkable. There is a perceived risk that the percentage of failures in secondary schools and in universities is greater in scientific matters than in others. STAN (1992) has earlier outlined a number of factors responsible for students' poor performances in science disciplines and mathematics in particular. These included the nature of science curricula, teachers' methods of teaching, the parents, the government and lack of science facilities in schools amongst others. Ojo (2004) in his paper "improving mathematics teaching in our schools" identified the teacher problems as one of the problems of teaching mathematics. Does that suggest a likely relationship between the teacher variables of method of teaching and attitude towards mathematics and students' achievement in mathematics? To what extent do these teacher variables relate to students' achievement in mathematics at the senior secondary II level in Rivers State, Nigeria? Hence, this study is poised to investigate these phenomena.

Theoretical Background

a) Teachers' method of teaching and students' achievement in mathematics

Ojoko (2001) defined teaching as the art and science of directing the learning process. According to him, teaching is often viewed narrowly as a process of imparting knowledge and skills in developing attitudes. It also entails managing instructional facilities and equipment, providing and organizing learning materials and resources and meeting students' needs. However, Gbamanja (2001) stated certain principles of teaching to include: planned teaching results in more teaching; students tend to achieve in ways they are tested; students learn more effectively if they know the objectives and are shown how to gain the ends; the teachers function in the learning process is that of guidance to reach an objective and that pupils learn from one another. He pointed out that the problem of stimulating students to be thrilled with learning and gaining the zest for education that will continue for life is an elaborate task.

Furthermore, he pointed out that the teaching profession is concerned fundamentally with the attainment of maximum beneficial learning for the individual. It is the teachers' task to ensure that learning is efficient and effective in order for students to discover their human potential. Having examined the basic principles of teaching, we proceed to establish the relevance of the teachers' method of teaching on student achievement with reference to mathematics teaching. Etukudo (2002) had pointed out that the inadequacy or otherwise of a facilitator, instructor or a teacher as the case may be definitely produces a conspicuous effect on both the learner and what is learned. Furthermore, two teachers can teach the same group but the average learning outcome may vary. This shows that what is learned is a function of what is taught.

Sometimes, two schools located in the same community have significant variation in their mean performance in standardized achievement test. The reason may not be far-fetched. It may be attributable to anaemic pedagogical approach of teachers. In the same vein, Manouchetri (2002) pointed out that good subject matter knowledge alone is not enough for a teacher to teach well; they (teachers) need adequate knowledge of how to teach to enable them perform well and give out a rich harvest.

Iwuoha (2001) observed that it was teachers' lack of effective methods of teaching mathematics that scared the students away from mathematics. Other studies such as Iwuoha (2000) and Ibebuike (1999) had earlier revealed that lack of thorough grooming in mathematics

concepts; unsuitable teaching environment; wrong evaluation technique by both teachers in schools and WAEC; and lack of incentives to mathematics teachers were responsible for the low achievement in mathematics.

Invariably, methods of teaching are derived from four modes of teaching as postulated by Gbamanja (2001). These four modes of teaching are didactic mode, heuristic mode, philetic mode and the guristic mode. He further explained that the didactic is the telling mode of teaching. Activities of this mode include: lectures, assignments, recitations and examinations. The content of this mode of teaching is traditional subject matter.

The heuristic mode involves the inquiry and discovery methods. Here, the teacher acts as an arranger, organizing inquiry/discovery activities to facilitate meaningful learning. Activities of this mode include organizing learners, giving criteria, holding conferences and checking progress of students. However, the philetic mode of teaching is the affective style and it involves the arousal of students' feelings or opinions. A philetic teacher is a friend, counselor and a 'parent'. The teacher who operates in this mode creates moods and a performer of things for the enjoyment of students. All these activities are focused on the ego of the learner.

The guristic mode of instruction involves the teacher explaining his experiences or feelings. There is no motive to teach per se; no desire to impart any of the above three modes. From the teacher's information about his own view of life, students pick out what their lines of interest are. The guristic teacher is a good interpreter of the future. He sees the future and imagines for the learner. His major activity involves reflective thinking.

However, various methods of teaching include lecture method, discussion method, demonstration method, project method, field trips, discovery/inquiry method, laboratory methods, the process approach, individualized learning methods and questioning methods. These methods of teaching are embedded in the mode of teaching enumerated above. While method is a way of doing something or an approach adopted by a teacher to explain a subject matter to a group of students or learners; methodology means the study and practice of various methods of teaching and it involves all the things a teacher would do to enhance teaching and learning. These include different teaching methods, clear statements of instructional objectives; learning resources, presentation skills, writing and following a good lesson plan.

Furthermore, Aina (1982) had earlier demonstrated the importance of appropriate method in teaching and learning when she referred to the "triangle of teaching". Constituting the triangle

are the teacher, the learner and the subject matter with the method in the middle of the triangle as the determinant factor in teaching and learning. Each of the factors at the apexes of the triangle is very important to the selection and development of a method. Therefore, there is no one method that could be referred as the most effective. Rather, a good teacher considers the age of the learners and their assimilation potentials/objective of the lesson in the selection of his method. Ojoko (2001) identified several methods that science teachers could use in presenting scientific information, principles and skills to the learners. These include, discovery or inquiry method, field trip, discussion method, demonstration method and the laboratory method. He opined that the success of these methods of teaching depends largely on two factors – the use of teaching aids by the teacher and the use of motivation by the teacher.

Alamina (2001) had defined teaching aids as all materials and devices that a teacher would need for optimum teaching. She emphasized that teaching aids are materials and devices that enhance teaching and learning; in some cases serve as substitutes to reality. However, teaching aids should fit into the work of the class in a logical and sequential manner. The use of teaching aids for a particular topic is generally determined at the lesson planning stage.

Earlier studies had revealed the importance of teaching aids in the achievement of students in mathematics. Scopes (1973) remarked that textbook provides something of a prop, giving the requisite mathematical content at least to presentation and providing the necessary materials for students to be involved in doing mathematics for themselves. Explaining that mathematics is for all, he further contended that every normal student is capable of good mathematical reasoning if attention is directed to the activities of his interest. In his own view, Butler (1960) stressed that multisensory aids and laboratory/field experiences in mathematics are often regarded as means of motivation. They are indeed avenues through which important learning can and should take place. Chapman (1973) also stressed the importance of teaching aids when he said “I hear and I forget, I see and remember, I do and understand”. With this, he has emphasized the use of instructional materials by both teachers and students of mathematics for better understanding of its concepts.

In his contributions to the approaches of teaching mathematics, Salau (2002) posited that by its very nature mathematics is abstract and extra effort is required to bring students to understand its underlying concepts, principles and applications. Specifically, many principles and concepts in mathematics are not easily explained with common sense deduction. This

obviously adds to the difficulty students encounter in the comprehension of mathematics generally. Notably, examples of these concepts are symmetry, place value, additions, subtraction, number system, geometry, probability as well as longitude and latitude to mention but a few. The abstractness of these concepts requires so much recourse to using concrete instructional aids.

Considering the ambit of motivation by the teacher in pedagogy, Blair (1962), Siann and Ugwugbu (1980) found that motivation and achievement are learned early in life as this becomes a stable characteristic of an individual if appropriate circumstances are given. Atkinson (1958) on his earlier study discovered that objects with high achievement motivation or need for achievement perform well on tasks involving individual, initiative but not on routine tasks.

Similarly, Sill (1968) carried out a study and discovered that when the motivation to succeed (Ms) is greater than the motivation to avoid failure (Maf) that is Ms > Maf, there will be the strong tendency to achieve, but when on the other hand, motivation to avoid failure is greater, which happens when achievement need is weak all interest – oriented activity is inhibited and the child may indulge in any crooked business as a cheap way towards success. Kiamanesh (2005) in an international study found that motivation was correlated with achievement and academic performance. Harping on the study by Kiamanesh; Banks, McQuarter and Hubbard (2006) found that motivation leads to engagement in academic tasks which is related to achievement. They asserted that generally in Iran, several factors such as self-concept, attitudes toward subject, home background, external motivation and attribution were significantly related to students' mathematics achievement. The correlation coefficient between motivation and achievement of the students under study was 0.79.

On teacher motivation and achievement in mathematics Gbamanja (2002), Alamina (2001) and Ahiakwo (2006) had argued that motivation is necessary for every teacher if achievement in mathematics and science is to be realized. Consequently, an overview of these literatures on motivation and achievement suggest that enduring motivation for learning mathematics comes from the genuine understanding of the subject itself. The more students understand mathematics, the more they want to learn about it. Lack of understanding consequently leads to continued foundation and negative attitudes towards the subject. The literature revealed that the disabling effect produced in the pupil by emotional reactions such as fear or dislike of the subject taught and loss of confidence through lack of success calls for effective motivation by these teachers of mathematics. The question now comes – is there any

likely relationship between teachers' method of teaching and students' achievement in mathematics at the senior secondary II level in Rivers State, Nigeria? If there is, to what extent is this relationship? This research study is poised to investigate this phenomenon.

b) Teachers' attitude and students' achievement in mathematics

Hill and Rowe (1996) carried out a study on teacher attitude to their work and students' achievement in mathematics and found that substantial difference existed between teachers who had a better attitude towards the subject and those who did not. They found out that it is primarily through the quality of teaching that effective schools make a difference.

Harping on teachers' attitude towards mathematics, Emenalo (2000) remarked that since the teaching is carried out by the teacher while the achievement in mathematics concerns the student (learner), it then becomes obvious that the attitude posed by the teacher in the teaching-learning process would likely impact the achievement of the student. He noted that the attitude of teachers in the classroom could cause fear of the subject, which had claimed many casualties over the years in internal and external examinations in Nigeria. He ex-rayed some responses from students when he asked the question'; Do you like mathematics?

> I hate it; I fear it; if I had a free choice I would never do it again. I try to do my best, but I just cannot understand it. I do but our class teacher makes me to fear it. No, I do not want to run mad (p.18).

These responses indicated that teachers' attitude has a role to play in students' achievement in mathematics. This reiterates the fact one of the most important factors adversely affecting the teaching and learning of mathematics was the psychological barrier of fear of the subject on the part of students. The attitude of teachers in the classroom could cause fear of the subject thereby resulting in low achievement or abysmal failure of the learner.

Furthermore, Chima (2002) had hinted that there was no denying the fact that mathematics as a subject has acquired the infamous status of students' enemy number one. It has become such a terrible nightmare and monster to most students that they not only fear but also hate it. He contended that hatred for mathematics was so much that teachers of this unpopular subject were oftentimes victims of misplaced aggression from students who extended their morbid fear and hatred for mathematics to this embattled group of teachers. He advised teachers that if they wish to inculcate the love of mathematics, they must attend to three things:

a) The experience of others – by continual study of books, reports and discussion. They should not confine themselves to their own country alone nor their own types of schools.

b) The intelligent and sensitive teaching of the daily common task – unless they cope with this, they are bound to feel uncertain and harassed; but for this work they must continually seek inspiration, material and spiritual from the wider cultural, historical and recreational aspects of his subject.

c) The emotional response of his pupils – to win a faithful response from his students may call for a real adjustment of attitudes on the part of the teacher.

From the statements above, it may be argued that many children are easily disturbed by their early experience of mathematics and that loss of confidence, bewilderment, or repeated failure gives rise to a distaste for mathematics. Do these statements point to the fact that teachers' attitude has a role to play in students' achievement especially in mathematics at the senior secondary school level in Rivers State, Nigeria? This research study is posed to investigate this phenomenon.

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 10,373 senior secondary II students and mathematics teachers in Rivers State, Nigeria. However, the sample size of 4510 was selected for the students and 151 selected for the teachers using the Yarrow Yamen's formula. The research instrument is the teacher variables and students' achievement in mathematics questionnaire (TVASAMQ) divided into five sections. To illicit 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 (V) in the column against each of the items as it applied to them (see appendix). A decision cut off point of 2.50 was adopted. Any item or component in which the respondents have a mean score of 2.50 and above was regarded as "a high extent",; while 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, means $(\overline{X})$, variance $(\delta)^2$ and standard deviation (δ) were computed and tables constructed. Deductions made from results on these tables formed the answers to the research questions (1, 2). To test the hypotheses (1 and 2), the Z-test statistic was applied to compare the means of the various variables and those of 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 and 253 mathematics teachers

S/N	Local Govt. Area	No. of schools	Population of students	Sample of students	Teachers	
					Pop	Sample
1	Abua/Odual	11	440	209	11	7
2	Ahoada-East	12	480	218	12	7
3	Ahoada-West	13	520	226	13	8
4	Akuku-Toru	8	320	177	8	5
5	Andoni	10	400	200	10	6
6	Asari-Toru	8	320	177	8	5
7	Bony	13	520	226	13	8
8	Degema	12	480	218	12	7
9	Eleme	6	240	150	6	3
10	Emohua	19	760	262	19	11
11	Etche	19	760	262	19	11
12	Gokana	12	480	218	12	7
13	Ikwerre	13	520	262	13	8
14	Khana	22	880	275	22	15
15	Obio/Akpor	16	640	246	16	10
16	Ogu/Bolo	3	120	92	3	2
17	Okrika	6	240	150	6	3
18	Omuma	3	120	92	3	2
19	Ogba/Egbema/Ndoni	15	600	240	15	9
20	Opobo/Nkoro	3	120	92	3	2
21	Oyigbo	4	160	114	4	2
22	Port Harcourt	15	600	240	15	9
23	Tai	10	400	200	10	6
	Total	253	10,120	4510	253	151

Results and Discussion

Research Question 1

To what extent does teachers' method of teaching relate to students' achievement in mathematics?

Table 2: Analysis of the opinions of students on teachers' method of teaching and students' 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 does your teachers' method	969 (3876)	1353 (4059)	1669 (3338)	519 (519)	4510 (11792)	2.62	65.50

	of teaching mathematics help you recall a wide range of materials taught?							
2	To what extent does your teachers method of teaching help you to translate words into numbers?	936 (3744)	981 (2943)	1668 (3336)	925 (925)	4510 (10938)	2.43	60.75
3	To what extent does your teachers method of teaching help you use learned materials in new and concrete situations?	733 (2932)	969 (2907)	2311 (4622)	497 (497)	4510 (10958)	2.43	60.75
4	To what extent does your teachers method of teaching mathematics help you have the ability to break down mathematics?	677 (2708)	1353 (4059)	1669 (3338)	811 (811)	4510 (10916)	2.42	60.50
5	To what extent does your teachers method of teaching help build up new materials?	767 (3068)	1387 (4161)	1510 (3020)	846 (846)	4510 (11095)	2.46	61.50
6	To what extent does your teachers method of evaluation help you achieve better grades?	947 (3788)	1049 (3147)	1905 (3810)	609 (609)	4510 (11354)	2.52	63.00
7	To what extent does your teachers' attendance to mathematics class help you achieve better grades?	812 (3248)	880 (2640)	1714 (3428)	1104 (1104)	4510 (10420)	2.31	57.75
8	To what extent does your teachers' use of lecture method help you achieve better grades?	1015 (4060)	733 (2199)	1579 (3158)	1183 (1183)	4510 (10600)	2.35	58.75
9	To what extent does your teachers' use of discussion method help you achieve better grades?	992 (3968)	1026 (3205)	1001 (3205)	891 (891)	4510 (11139)	2.47	61.75
10	To what extent does your teacher's use of demonstration method help you achieve better grades in mathematics?	1015 (4060)	1353 (4059)	1736 (3472)	406 (406)	4510 (11997)	2.66	66.50
11	To what extent does your teachers' use of discovery method help you achieve better grades?	1128 (4512)	1488 (4464)	1691 (3392)	2023 (2023)	4510 (12561)	2.79	69.75
12	To what extent does your teachers' use of	1082 (4328)	1376 (4128)	1037 (2074)	1015 (1015)	4510 (11545)	2.56	64.00

	questioning method help you achieve better grades in mathematics?							
	Group Mean Rating $(\overline{X})$ =						2.50	62.50

Table 2 revealed that summary result of the total opinion of students on the relationship between teacher's method of teaching and students' achievement in mathematics was 2.50 indicating a percentage of 62.50. Furthermore, the decision rule says that the meaning of the scale used is 2.50, hence any score above 2.50 shows that "to a high extent" teachers' method of teaching is related to students' achievement in mathematics. However, any score below 2.5 indicates that "to a low extent" teacher's method of teaching is related to students' achievement in mathematics. Therefore, the score above shows that to a high extent teachers' method of teaching is related to students' achievement in mathematics.

Research Question 2

To what extent does teachers' attitude in the classroom relate to students' achievement in mathematics?

Table 3: Analysis of the opinions of teachers on their attitude towards mathematics and students' 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 do you have interest in studying mathematics?	35 (140)	45 (135)	56 (112)	15 (15)	152 (402)	2.66	66.50
2	To what extent do you have interest in teaching mathematics?	30 (120)	42 (126)	59 (118)	20 (20)	151 (384)	2.54	63.50
3	To what extent do you hate teaching mathematics?	18 (72	25 (75	72 (144)	36 (36)	151 (327)	2.17	54.25
4	To what extent does the way you teach mathematics make students to be afraid of mathematics?	28 (112)	38 (114)	62 (124)	23 (23)	151 (373)	2.47	61.75
5	To what extent does your method of teaching maths affect students' behaviour towards maths?	40 (160)	48 (144)	48 (96)	15 (15)	151 (415)	2.75	68.75
6	To what extent do you feel good when you enter the classroom to teach mathematics?	38 (152)	50 (150)	52 (104)	11 (11)	151 (417)	2.76	69.00
7	To what extent does your class attendance in maths influence students' achievement in maths?	36 (144)	52 (156)	49 (98)	14 (14)	151 (412)	2.73	68.25

8	To what extent do you desire to remain a mathematics teacher?	17 (68)	26 (78)	75 (150)	33 (33)	151 (329)	2.18	54.50
9	To what extent does your neatness of dressing and personal comportment affect your students' grades in mathematics	29 (116)	36 (108)	63 (126)	23 (23)	151 (373)	2.47	61.75
10	To what extent does your voice projection and diction influence students' achievement in mathematics?	39 (156)	48 (144)	50 (100)	14 (14)	151 (414)	2.74	68.54
11	To what extent does your control of anger influence your students' grade in mathematics?	43 (172)	50 (150)	45 (90)	13 (13)	151 (425)	2.81	70.36
12	To what extent does your attitude towards mathematics make students hate the subject?	29 (116)	37 (111)	60 (120)	25 (25)	151 (372)	2.46	61.59
	Group Mean Rating $(\overline{X})$ =						2.56	64.04

Table 3 revealed that the summary result of the total opinion of teachers on the relationship between teachers' attitude towards mathematics and students' achievement in mathematics was 2.56 indicating a percentage of 64.04. Furthermore, the decision rule says that the meaning of the scale used is 2.50, hence any score above 2.5 shows that "to a high extent" teachers' attitude towards mathematics is related to students' achievement in mathematics. However, any score below 2.50 indicates that "to a low extent" teachers' attitude towards mathematics is related to students' achievement in mathematics. Therefore, the score above showed that "to a high extent" teachers' attitude towards mathematics is related to students' achievement in mathematics.

Hypothesis Testing

Hypothesis 1

Ho_1: There is no significant relationship between teachers' method of teaching and students' achievement in mathematics.

Table 4: Z-ratio test of significant relationship between teachers' method of teaching and students' achievement in mathematics.

Variable	$\overline{X}$	Sd	N	df	P	S. Error	Z-cal	Z-crit	Decision
Teachers' method of teaching	62.50	3.20	4510	9,018	0.05	0.048	36.86	Z> 1.96 Or Z> -1.96	Reject Ho_1
Students' achievement in mathematics	54.09	14.79	4510			0.228			

The result on table 4 showed that the calculated value of Z is 36.86, which is greater than the critical value of 1.96 at the degree of freedom 9,018 at 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 teachers' method of teaching and students' achievement in mathematics is rejected. Hence, there is a significant relationship between teachers' method of teaching and students' achievement in mathematics.

Hypothesis 2

Ho_2: There is no significant relationship between teachers' attitude in the classroom and students' achievement in mathematics.

Table 5: Z-ratio test of significant relationship between teachers' attitude in the classroom and students' achievement in mathematics.

Variable	$\overline{X}$	Sd	N	df	P	S. Error	Z-cal	Z-crit	Decision
Teachers' attitude	64.04	5.14	151	4659	0.05	0.419	20.25	Z> 1.96 Or Z< -1.96	Reject Ho_2
Students' achievement in mathematics	54.09	14.75	4510			0.228			

The result on table 5 showed that the calculated value of Z is 20.25, which is greater than the critical value of 1.96 at the degree of freedom 4659 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 teachers' attitude in the classroom and students' achievement in mathematics is rejected. Hence, there is a significant relationship between teachers' attitude in the classroom and students' achievement in mathematics (see appendix for detailed calculations).

Conclusion

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

1. There is a significant relationship between teachers' method of teaching and students' achievement in mathematics at the senior secondary II level in Rivers State, Nigeria.
2. There is a significant relationship between teachers' attitude and students' achievement in mathematics at the senior secondary II level in Rivers State, Nigeria.

Recommendations

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

i) That the teacher is a major factor in the teaching of mathematics at the senior secondary school level and therefore should be qualified before being engaged in the teaching and learning processes.

ii) The perennial failure experienced by students in the SSCE examinations concerning mathematics as a subject could be reduced by organizing workshops and seminars for teachers especially towards pedagogical training

iii) Government should endeavor to set up mathematics laboratories where teaching aids could be properly utilized in the teaching-learning process.

iv) Attitudinal training workshops and seminars should be organized for teachers of mathematics to properly inculcate into them, the right attitudes to be exhibited in mathematics lessons. This will enable mathematics teachers eliminate some negative attitudes that hinder good mathematics achievement by the students.

v) Finally, government and corporate organizations should encourage and sponsor teacher education by offering scholarship, in-service training and other laudable incentives to motivate teachers of mathematics to enable them motivate students to learn mathematics. With increased number of teachers of mathematics in our secondary schools and proper motivation through special allowances, the commitment to teaching will be enhanced hence achieving better results in mathematics.

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APPENDIX 1

Testing Hypothesis 1

Computation of Z-calculated using the group means (U_1 and U_2)

Variables: Teachers' method of teaching and students' achievement in mathematics

H_o: $U_1 = U_2$

H_A: $U_1 \neq U_2$

Where:

$U_1 = 62.50$

$U_2 = 54.09$

$N_1 = 4510$

$N_2 = 4510$

$\delta_1^2 = 3.2^2$

$\delta_2^2 = 14.79^2$

But $Z_{u1-u2} = \dfrac{U_1 - U_2}{\sqrt{\dfrac{\delta_1^2}{N_1} + \dfrac{\delta_2^2}{N_2}}}$

$= \dfrac{62.50 - 54.09}{\sqrt{\dfrac{3.2^2}{4510} + \dfrac{14.79^2}{4510}}}$

$= 36.86$

:. Z-cal = 36.86

Rejection Region: Two-tailed test, thus: Z>1.96 or Z<-1.96.

Level of Significance: $\alpha = 0.05$

Decision: We reject the null hypothesis. Hence, there is a significant relationship between teachers' method of teaching and students' achievement in mathematics.

APPENDIX 2

Testing Hypothesis 2

Computation of Z-calculated using the group means (U_1 and U_2)

Variables: Teachers' attitude in the classroom and students' achievement in mathematics

H_o: $U_1 = U_2$

H_A: $U_1 \neq U_2$

Where:

$U_1 = 64.04$

$U_2 = 54.09$

$N_1 = 151$

$N_2 = 4510$

$\delta_1^2 = 5.14^2$

$\delta_2^2 = 14.79^2$

But $Z_{u1-u2} = \dfrac{U_1 - U_2}{\sqrt{\dfrac{\delta_1^2}{N_1} + \dfrac{\delta_2^2}{N_2}}}$

$= \dfrac{64.04 - 54.09}{\sqrt{\dfrac{5.14^2}{151} + \dfrac{14.79^2}{4510}}}$

$= 20.25$

:. Z-cal = 20.25

Rejection Region: Two-tailed test, thus: Z>1.96 or Z<-1.96.

Level of Significance: $\alpha = 0.05$

Decision: We reject the null hypothesis. Hence, there is a significant relationship between teachers' attitude towards mathematics and students' achievement in mathematics.

APPENDIX 3

COMPUTATION OF MEAN, VARIANCE AND STANDARD DEVIATION USING STUDENTS' RAW SCORES IN MATHEMATICS

Class Interval	Frequency (f)	Class mark ($\bar{x}$)	Fx	$(x-\bar{x})$	$(x-\bar{x})^2$	$f(x-\bar{x})^2$
21-30	428	25.5	10914	-28.598	817.845	350037.66
31-40	508	35.5	18034	-18.598	345.885	175709.58
41-50	631	45.5	28710.5	-8.598	73.925	46646.675
51-60	1173	55.5	65101.5	1.402	1.965	2304.945
61-70	1285	65.5	84167.5	11.402	130.01	167062.85
71-80	440	75.5	33220.0	21.402	458.04	201537.60
81-90	45	85.5	3847.5	31.402	986.08	44373.60
	$\sum f = 4510$		$\sum f = 243{,}995$			$\sum f(x-\bar{x})^2 = 987{,}672.91$

Mean $\bar{X} = \dfrac{\sum fx}{\sum f} = \dfrac{243{,}995}{4510} = 54.09$

$\delta 2 = \dfrac{\sum f(x-\bar{x})^2}{\sum f} = \dfrac{987{,}672.91}{4510} = 218.99 \quad \therefore \sqrt{218.99} = 14.79$

$\therefore \delta = 14.79$