

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

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ABSTRACT

This research study focused on the relationship between teacher quality 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 teacher quality and students' achievement in mathematics questionnaire (TQASAMQ). This questionnaire has twelve (12) question items related to teacher quality and students' achievement in mathematics. A population of 253 principals were involved in the study out of which 151 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", teacher quality related to students' achievement in mathematics. Furthermore, the hypothesis testing showed that there is a significant relationship between teacher quality and students' achievement in mathematics. Based on these findings, conclusions and recommendations were made.

Keywords: Teacher quality, mathematics achievement, senior secondary school, students

INTRODUCTION

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

In our research context, teacher quality connotes the teacher qualification, teaching experience, training before joining and the in-service training attained. However, Greenberg, I, Genshak, W, Hamachek, K. (2004), in their study on the relationship between the teacher quality and students' achievement in mathematics found that teacher certification and teacher experience were strongly associated with higher students' achievement in mathematics. There were also significant associations between higher degrees of education or teaching experience with achievement in mathematics.

Furthermore, certified teachers were defined as teachers holding a professional regular certificate to teach their subject field. All other teachers with temporary or provisional licenses were defined as uncertified since they did not possess the certification standards.

Lee and Fradd (1996) had earlier posited that the teacher is the primary factor in school and much depends on him to promote students' higher order thinking skills which are required for academic success. Grandall (1994) had earlier reiterated the importance of teacher training when he said teachers can provide an insight into linguistic and communicative activities. In his views, Ibebuike (1986) noted that many students, even as far back as their primary school

time, do not take interest in mathematics to a meaningful degree. He remarked that the methods of instruction were not very favourable to these students partly because of the fewness of mathematics teachers who are over labored and because of the degree of thoroughness of the knowledge of the subject by some teachers.

Does an aggregate of these findings connote the fact that teacher quality 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

Mathematics is the pivot around which the whole essence of living revolves and the basis for scientific and technological take-off. Ahiakwo (2006) had earlier found that the performances of various levels of students in mathematics have decelerated over the years with that of Nigerian students quite remarkable. 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 teacher quality and senior secondary school achievement in mathematics? To what extent is this relationship? This research study is poised to investigate this phenomenon.

THEORETICAL BACKGROUND

Kentu (1986) had earlier harped on the percentage of teachers qualifying as mathematics teachers yearly. He noted that such percentage had not exceeded one percentage of the graduates. In essence, the quality and quantity of teachers are seen as the determining factors to the advancement of the subject. Ayotunde (1989) saw lack of qualified teachers as the most prevalent constraint to the teaching of mathematics in Nigerian secondary schools. In his survey, 41.2 percent of schools indicated, “lack of qualified teachers as very serious; while 27.5 percent see it as “serious” and 31.3 percent see it as “not serious”.

Furthermore, in his studies on the qualifications of teachers in science, mathematics and technical education, he remarked that “it seems therefore that the most problematic areas in respect to qualified teachers are mathematics and Agricultural Science. Ojo (1986) in his paper: “improving mathematics teaching in our schools”, identified the teacher problem as one of the problems of teaching mathematics. He contended that the teacher based problems in mathematics instructions are primarily of two types – quantity and quality.

On the quality, he asserted that qualified teachers in mathematics are in short supply. The dearth is world-wide, but it is more acute in countries which are in a hurry like Nigeria. While on the quantity, he asserted that most grade II teachers in the primary schools failed mathematics while most secondary school mathematics teachers, especially in recent times are graduates of subjects other than mathematics. The calibre consist of people with H.N.D. (Photogrametry), HND (textile technology), OND (town planning, B.Sc (Econs), B. A. (Sociology) etc.

It is no wonder then that the states of the teaching profession in our society is low as the majority entering it do so because they failed to obtain employment in positions for which they are better qualified. He posited that these groups of teachers are “birds of passage” lacking in the necessary motivation for teaching and contributing to the high rate of attrition and instability in the profession.

On teacher training, Fagbemi (1987) and WAEC (2002) earlier found that decline in teacher performance could be traced to low esteem and shortage of trained teachers, irregular inspection and supervision of instruction, massive admission of secondary school dropouts into teachers' training colleges, and lack of formal training in education by most teachers. Furthermore, the presence of fake and unqualified teachers with forged certificates and degrees might have worsened the matter. There is the likelihood that such deficient teachers would resort to stodgy teaching skills, become resistant to accept changes in the mathematics curriculum and exhibit capricious complacency towards pupils' academic progress. They cannot after all display maximal competence and dexterity associated with tangible mathematics instruction. Hence, their insipid performance may continually act as a catalyst towards students' underachievement and hatred for mathematics.

In the United Kingdom, a recent study of 80 schools and 170 teachers measured achievement growth over the period of an academic year when using start-of-year and end-of-year achievement data. Using multi-level modeling techniques, the study modeled the impact teachers had on achievement growth. The report on the work claimed that over 30 percent of the variance in pupil progress was due to teachers. It concluded that teacher quality and teacher effectiveness, rather than other classroom, school and student factors are large influences on pupil progress.

Several Australian studies had pointed to teachers having a major effect on student achievement. Hill and Rowe (1996) carried out a three-year longitudinal study of educational effectiveness known as the Victorian quality schools project. They examined student, class/teacher and school differences in mathematics and English achievement. Using multi-level modeling procedures to study relationships between different factors of each level—student, classroom and the school, they found in the first phase of the study that at the primary level, 46 percent of the variation in mathematics was due to difference between classrooms whereas at the secondary school level the rate was almost 39%. They contended that there were evidences of substantial differences between teachers and between schools on teacher attitudes to their work in particular. This finding supported the view that it is primarily through the quality of teaching that effective schools made a difference. Other empirical studies included Laczko and Berliner (2001).

Having considered these international and empirical studies, we can now ask the question – to what extent does teacher quality relate to students' 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 contribute to requisite knowledge in mathematics education.

THE METHOD

The ex-post fact 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 253 principals of senior secondary schools in Rivers State, Nigeria. However, the sample size of 151 principals was selected for the study by using the Yarrow Yamen's formula. The research instrument is the teacher quality and students' achievement in mathematics questionnaire (TQASAMQ). 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 questions. To test the hypothesis the z-test statistics was applied to compare the means of the teacher quality 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 253 principals in Rivers State, Nigeria.

<i>s/no</i>	<i>Local Govt. Area</i>	<i>No. of schools</i>	<i>Population of principals</i>	<i>Sample of principals</i>
1.	Abua/Odual	11	11	7
2.	Ahoada-East	12	12	7
3.	Ahoada-West	13	13	8
4.	Akuku-Toru	8	8	5
5.	Andoni	10	10	6
6.	Asari-Toru	8	8	5
7.	Degema	12	12	7
8.	Eleme	6	6	3
9.	Emohua	19	19	11
10.	Etche	19	19	11
11.	Gokana	12	12	7
12.	Ikwerre	13	13	8
13.	Khana	22	22	13
14.	Obio/Akpor	16	16	10
15.	Ogu/Bolo	3	3	2
16.	Okrika	6	6	3
17.	Omuma	3	3	2
18.	Ogba/Egbema/Ndoni	15	15	9
19.	Opobo/Nkoro	3	3	2
20.	Oyigbo	4	4	2
21.	Port Harcourt	15	15	9
22.	Tai	10	10	6
23.	Bonny	13	13	8
	Total	253	253	151

RESULTS AND DISCUSSION

Research Question: To what extent does teacher quality relate to students' achievement in mathematics?

Table 2. Opinions of principles on teacher quality and students' achievement in mathematics

<i>S No.</i>	<i>Question items</i>	<i>VHE (4)</i>	<i>HE (3)</i>	<i>LE (2)</i>	<i>VLE (1)</i>	<i>Total</i>	<i>Mean x</i>	<i>Percentage rating (%)</i>
1.	To what extent do you have qualified teachers in mathematics?	20 (8)	23 (69)	75 (150)	33 (33)	151 (332)	2.20	55.00
2.	To what extent do you have teachers with cognate experiences?	30 (120)	45 (135)	56 (112)	20 (20)	151 (387)	2.56	64.00
3.	To what extent were your teachers properly trained before joining the school?	17 (68)	26 (52)	73 (146)	35 (35)	151 (301)	1.99	49.75
4.	To what extent do your teachers possess in-service training?	22 (88)	21 (63)	78 (156)	30 (30)	151 (337)	2.23	55.75
5.	To what extent were mathematics teachers in your school interviewed before employment	45 (180)	56 (168)	40 (80)	10 (10)	151 (438)	2.90	72.50
6.	To what extent do your mathematics teachers attend seminars and work-shops in mathematics?	42 (168)	58 (174)	40 (80)	11 (11)	151 (433)	2.86	71.50
7.	To what extent were unqualified teachers in your school sent for pedagogical training?	50 (200)	58 (174)	36 (72)	7 (7)	151 (453)	300	75.00
8.	To what extent do your mathematics teachers communicate effectively?	46 (184)	58 (168)	35 (70)	12 (12)	151 (443)	2.93	73.25
9.	To what extent does the certification of your teachers influence your achievement in mathematics?	53 (212)	56 (168)	35 (70)	7 (7)	151 (457)	3.03	75.75
10.	To what extent does the relationship between mathematics teachers and the class influence students achievement in mathematics?	25 (100)	50 (150)	53 (106)	23 (23)	151 (397)	2.51	62.75
11.	To what extent does mathematics teachers ability to set examination questions influence your achievement in mathematics?	43 (172)	56 (168)	40 (80)	12 (12)	151 (432)	2.86	71.50
12.	To what extent does the mathematics teachers ability to evaluate the answers to mathematics questions influence your achievement in mathematics?	48 (192)	53 (159)	41 (82)	9 (9)	151 (442)	2.93	73.25
<i>Group mean Rating (x) =</i>							2.67	66.75

Table 2 revealed that the summary result of the total opinion of principals in the relationship between teacher quality and achievement in mathematics was 2.67 indicating a percentage of 66.75. Furthermore, the decision rule says that the mean of the scale is 2.50 making any score above 2.50 to show a “high extent” teacher quality is related to students’ achievement in mathematics. Therefore the score above shows that to a “higher extent” teacher quality is related to students’ achievement in mathematics.

Hypothesis testing

Ho: There is no significant relationship between teacher quality and student’s achievement in mathematics.

Table 3. Z-ratio test of significant relationship between teacher quality and students’ achievement in mathematics

<i>Variable</i>	<i>X</i>	<i>Sd</i>	<i>N</i>	<i>Df</i>	<i>P</i>	<i>S. Error</i>	<i>Z-cal</i>	<i>Z-orit</i>	<i>Decision</i>
Teacher quality:	66.75	8.16	151		0.05	0.60		Z>-1.96	
Students’ achievement in mathematics.	54.09	14.79	4510	46.59		0.228	18.46	or Z<-1.96	Reject H ₀

The result on table 3 showed that the calculated value of Z is 18.46, which is greater than the critical value of 1.96 at the degree of freedom 4659 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 teacher quality and student’s achievement in mathematics is rejected. Hence, there is a significant relationship between teacher quality and students’ achievement in mathematics.

CONCLUSION

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

- (i) There is a significant relationship between teacher quality and students’ achievement in mathematics.
- (ii) The teacher is a major role player in the teaching and learning process.
- (iii) There can be no much learning without better teachers’ quality. Hence, senior secondary II students in Rivers State will likely achieve less in mathematics grades if the quality of teachers in these schools are left in doubt.

RECOMMENDATIONS

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

- (i) Since teacher quality was significantly related to students’ achievement in mathematics, teachers of mathematics at the secondary II level in Rivers State Nigeria should possess the requisite qualification before being recruited to teach.
- (ii) Since the problem of study was the poor performance of students in mathematics at the senior secondary school level in Rivers State,

Nigeria, parents should not blame governments and WAEC alone, but look at the daily mathematical assignments, textbooks and workbooks in mathematics as presented by their children from school.

- (iii) Parents/guardians should create an environment at home that lends support for mathematics learning by providing mathematical kits to enhance students' achievement in mathematics.

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