Effects of Student-Teacher Ratio on Academic Achievement of Selected Secondary School Students in Port Harcourt Metropolis, Nigeria

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Abstract
The study investigated the effects of student-teacher ratio on academic achievement of selected secondary school students in Port Harcourt metropolis, Nigeria. In carrying out the research, a descriptive survey research design was employed. Simple Random Sampling Method was used to select 3 Senior Secondary Schools in Port Harcourt Local Government Area of Rivers State where 120 students were randomly selected (40 students per school). Three research questions and hypotheses were formulated to guide the study. A researcher- designed questionnaire and Achievement Test in Mathematic were the major instruments used in collecting the data which were analysed using Pearson Product Moment Correlation coefficient statistical tool at 0.05 level of significance. Results showed that there is a significant relationship between student's perception of students-teacher ratio and academic achievement in Mathematics. The findings also suggest that teacher's years of experience and qualifications had a significant positive relationship with academic achievement of students in Mathematics. Based on these findings, Recommendations were made for government and stakeholders in education on how to tackle this ugly situation.
Keywords: Student-teacher ratio, class size and academic achievement

Introduction

Most of the governments of the world spend most of their budget on resource inputs in the Education sector. They make decisions about providing resources inputs to enhance student achievement and performance. However, not all these decisions are easy to take especially in Nigeria where mismanagement makes the problem more adverse. Resources are scarce, especially in low income countries; policy makers can ill afford errors in the choice of allocations. To reduce the scope for mistakes, the true picture of the determinants of Education outcome is desirable.

The Government has introduced Education Sector Reforms (ESR) and National Plan of Action (2001-2015) for the improvement of quality of Education through improving the states of various recourse inputs like revision of curricula, teacher training and provision of better facilities in the public sector schools.

Secondary schools not only occupy a strategic place in the educational system in Nigeria, it is also the link between the primary and the university levels of education.

According to Asikhai (2010), education at secondary school level is supposed to be the bedrock and the foundation towards higher knowledge in tertiary institutions. It is an investment as well as an instrument that can be used to achieve a more rapid economic, social, political, technological, scientific and cultural development in a country. It is rather unfortunate that the secondary schools today are not measuring up to standard expected of them. There has been public outcry over the persistently poor performance of secondary school students in public examinations.

According to Nwokocha & Amadike (2005), academic performance of students is the yardstick for testing educational quality of a nation. Hence, it is expedient to maintain a high performance in internal and mostly external examinations.

Statement of the Problem

As school population increases class sizes also increase, the performances of students become an issue. Class size has become a phenomenon often mentioned in the educational literature as an influence on student's feelings and achievement, on administration, quality and school budgets. Class size is almost an administrative decision over which teachers have little or no control. Most researchers start from the assumption that size of the class would prove a significant determinant of the degree of success of students. In fact, with the exception of a few, many studies have reported that under ideal situation, class size itself appears to be an important factor. The first issue that calls for immediate clarification is what number of students should constitute a large group and

what should be described as a small group? In describing a small group, the researcher observed that they have few teachers with small pools of talent; offer limited range of subjects and characteristically finding it hard to justify costly investment on libraries… their pupil's lack competition and interest with relatively few peers as they get stuck with same teacher for an entire school career.

Large class size on the other hand is often impersonal, having broader curricula with teachers being given wider support, while students may suffer discipline problems as teachers cannot get to know their students very easily. They find it easy to stream students according to ability while commitment to work may stand a test of time. In terms of numerical strength, the National Policy on Education (1977 revised in 1981) specified 20 in pre-primary, 30 in primary and maximum of 40 in secondary schools. These directives appear unrealistic in urban areas as a result of high population.

Therefore, considering the vitality of the problem, this study investigates the effects of student- teacher ratio on academic achievement of students in Mathematics.

Purpose of Study

The primary purpose of this study is to evaluate the effectiveness of teacher-student ratio on the academic achievement of secondary school students in Mathematics in Lagos metropolis, Nigeria. Specifically, the study examined:

- The relationship between teacher's years of experience and academic achievement of students in Mathematics
- The relationship between teacher's qualifications and academic achievement of students in Mathematics

Research Questions

Three research questions were formulated to guide the study

- Is there any significant relationship between teacher-student ratio and academic achievement of students in Mathematics?
- Will there be a significant relationship between teacher's years of experience and academic achievement of students in Mathematics?
- Is there any significant relationship between teacher's qualifications and academic achievement of students in Mathematics?

Research Hypotheses

Three corresponding null hypotheses were formulated to guide the study

- There is no significant relationship between teacher-student ratio and academic achievement of students in Mathematics
- There is no significant relationship between teacher's years of experience and academic performance of students in Mathematics
- There is no significant relationship between teacher's qualifications and academic achievement of students

Review of Related Literature

Student–teacher ratio is the number of students who attend a school or university divided by the number of teachers in the institution. For example, a student–teacher ratio of 10:1 indicates that there are 10 students for every one teacher. The term can also be reversed to create a teacher–student ratio.

Bayo (2005) opined that smaller classes benefit all pupils because of individual attention from teachers, but low-attaining pupil's benefit more at the secondary school level. Pupils in large classes drift off task because of too much instruction from the teacher to the whole class instead of individual attention, and low-attaining students are most affected. Students benefit in later grades from being in small classes during early grades. Longer periods in small classes resulted in more increases in achievement in later grades for all students. In reading and science, low achievers benefit more from being in small classes. The benefits of small class sizes reduce the student achievement gap in reading and science in later grades.

The ratio of students to teaching staff compares the number of students (in full-time equivalent) to the number of teachers (in full-time equivalent) at a given level of Education and similar types of institutions. However, this ratio does not take into account the amount of instruction time for student compared to the length of a teacher's working day, nor how much time spend teaching. It therefore cannot be interpreted in terms of class size.

Pupil-teacher ratio, primary in Nigeria was 36.03 as of 2010. Its highest value over the past 40 years was 46.09 in 2007, while its lowest value was 33.88 in 1975. Primary school pupil-teacher ratio is the number of pupils enrolled in primary school divided by the number of primary school teachers (regardless of their teaching assignment). Pupil-teacher ratio, primary in Nigeria was 36.03 as of 2010. Its highest value over the past 40 years was 46.09 in 2007, while its lowest value was 33.88 in 1975.

Primary school pupil-teacher ratio is the number of pupils enrolled in primary school divided by the number of primary school teachers (regardless of their teaching assignment).

Classes with too many students are often disrupting to education. Also, too many students in a class results in a diverse field of students, with varying degrees of learning ability. Consequently, the class will spend time for less academic students to assimilate the information, when that time could be better spent progressing through the curriculum. In this way, student–teacher ratios are compelling arguments for advanced or honors classes. Numerous sources argue that lower student to teacher ratios are better at teaching students complex subjects such as physics, mathematics and chemistry, than those with a higher ratio of students to teachers. Commonly the schools with lower student to teacher ratios are more exclusive, have a higher attendance of whites, and are in non-inner urban areas and/or fee-paying (non-government) institutions.

Many analysts have found that extra school resources play a negligible role in improving student achievement while children are in school. Yet many economists have gathered data showing that students who attend well-endowed schools grow up to enjoy better job market success than children whose education takes place in schools where resources are limited. For example, children who attend schools with a lower pupil-teacher ratio and a better educated teaching staff appear to earn higher wages as adults than children who attend poorer schools.

Longer periods in small classes resulted in more increases in achievement in later grades for all students. In reading and science, low achievers benefit more from being in small classes. The benefits of small class sizes reduce the student achievement gap in reading and science in later grades.

According to Webster Dictionary (2005), quality is the characteristics of anything regarded as determining its value, worth, rank or position. Assurance on the other hand connotes "to make sure, secure, guarantee or make certain''. Quality assurance therefore implies making sure that the value or worth of anything or service(s) is secured, guaranteed or maintained. Fergabaum in Nwagbara (2008) opines that the word quality is often used to signify excellence of a product, service or action. He asserts that quality is the totality of features and characteristics of a product or services that bear on its ability to satisfy stated or implied needs. It is therefore the ability of such products or services to meet the expectation of the recipient or users. This of course involves Quality Control", which is the regular process through which products, services and quality performance are measured. Longman (1990) defined quality assurance as all those planned and systematic actions necessary to provide adequate confidence that a product or service will satisfy given requirements for quality. This implies meeting or even surpassing the minimum standards set by appropriate authority.

Quality assurance is regarded as a process and practice primarily concerned with conformance to mission specification and goal achievement within the publicly accepted standards of excellence (Okereke, 2008). It is a strategy for ensuring quality in the school system (Ololobou, 2008). According to Vlasceanu, Grunbery and Parlea (2004), quality assurance refers to an aggregate of actions and measures taken regularly to assure the quality of education products, services, or processes, with an emphasis on assuring that a prescribed threshold of quality is met. Quality assurance means putting in place appropriate structures, legislations, supervision of personnel and materials in order to ensure that set minimum standards are attained, sustained and seen to have meaningful impact on society. Quality assurance is important because it ensures that goods and services produced in a country are of the highest possible standard, as well as protecting buyers from purchasing sub-standard products (Uya, 2008). According to Oriaife in Maduewesi (2005), quality assurance is a baseline standard in education which can be measured on a scale of reference. It is an expression of standard or a means by which a certain set standard in education can be achieved.

It could easily be deduced therefore that quality assurance in education is a totality of the combination of such indispensable variables as quality teachers, quality instructional materials and quality infrastructure (classrooms, seats, tables, chalkboards etc). Others include; favourable teacher/pupils ratio, favourable pupils/classroom ratio and quality instructional supervision. All these and more surely results to quality product (student) who is exposed to a balanced and result oriented education, especially secondary education. He is well prepared to face not just the challenges of tertiary education, but the challenge of providing middle level technical and administrative service in any sector of the Nigerian economy.

STAR project in Tennessee was conducted on the class size effect. It was a longitudinal study (1985-1989) of math and reading achievement. The study included 6,829 K-3 students as the sample of the study. Students and teachers were randomly assigned to the classes of different sizes from Kindergarten to Class III. Then students were randomly assigned to smaller and larger classes (Word et al., 1990). STAR recommended the positive achievement effect of small class size during the lower classes or early school years. However, there was no evidence about the class size effects in the later or higher classes.

Many other studies analyzed the STAR data and drew conclusions. According to Mosteller (1995), the effect of class size on student achievement is very large in the STAR project experiment.

Likewise, students out performed in the small classes in the regular and the regular with aid classes by a great margin. However, the students carried out and continued their better performance after returning to the

regular classes. Their performance was better than those students who remained in a regular class size with or without a teacher's aid. Similarly, Krueger (1999) analyzed the STAR project experiment and found that smaller class size positively affected the standardized test scores. With the passage of time, this effect increased. However, this effect was larger for the beneficiaries of the free lunch

program and the minority students. Similarly, Nye, Hedges, & Konstantopoulos (1999) concluded that the benefits of small classes remained significant for at least five years after the students enter regular classrooms.

Mitchell and Davidson (1989) developed six models and six theories of how class size affects student achievement. Three of them emphasize on a direct correlation between larger class size and declining achievement test scores. Furthermore, these theories are "Greater Instructional Overhead," "Increased Student Interaction Time" and "Decreased Access to Fixed Instructional". These theories suggest that addition of more students to a class lessens the teacher effectiveness. However, the other three theories emphasize that the correlation between more students and the altered classroom performance is indirect.

These theories are "Class Heterogeneity," "Instructional pacing" and "Student Grouping or Achievement Modeling". There are some other factors rather than the number of students; those are the causes for effects. These factors are associated with the student assigning to large and small class sizes.

Furthermore, Angrist and Lavy (1999) used a regression discontinuity design to analyze the effect of class size on student achievement. The class sizes was determined by the "Maimonides' rule" in Israel. According to that rule, the maximum class size is 40. Two classes are automatically created if the total enrollment is greater than 40. Likewise, there will be three classes if the numbers of students are greater than 80 and so on. The researchers exploited these irregular changes. This study found that class size has a positive and significant effect on student achievement in Reading comprehension and mathematics. Some researchers exposed that students in the large classes desired to spend less time on class assignments (Blatchford & Mortimore, 1994; Klein, 1985). However, students in smaller classes desired to participate more time in addition to spending more time on schoolwork.

Oliver & Said-Moshiro (2007) described that large class size is an inevitable feature of the developing countries.

Furthermore, Finn (2003) concluded that the students became occupied in the small class size, both academically and socially. Therefore, their strong engagement caused academic achievement improved. Similarly, Lindahl (2005) found the significant effects of smaller class sizes on student achievement. The study examined the effect of class size in natural variation by using longitudinal approach. The teaching and learning process in the developing countries is substandard; this is the key and real issue.

However, this process can be improved by enhancing the capability of teachers and school leaders to handle this setting and identifying ways for students to be successful (Benbow, Mizrachi, Oliver & Said-Moshiro (2007).

Methodology
The study adopted a descriptive a descriptive survey design using simple random sampling technique to select Port Harcourt Local Government Area of Rivers State, Nigeria as the study locale. The sample consisted of 120 students selected from 3 schools where 40 were selected from each school.

A 20-item researcher designed questionnaire titled Teacher-Student Ratio Perception Questionnaire (TSRP) and a 20 item multiple choice questions in Mathematics was also developed to assess students' academic performance. The researcher personally administered the questionnaire and the achievement test in Mathematics to the students in their various schools. The content and face validity of the data collection instrument were determined by expert opinion whiles their reliability were empirically ascertained by the test retest procedure using an eight week time lag which yielded coefficient of 0.68 and 0.72 respectively. Descriptive and Inferential statistics were employed to analyze the hypotheses generated.

Results

Table 1: Demographic data of the Respondents

Variable	Frequency	Percentage
Sex of Students		
Male	60	50.00
Female	60	50.00
Total	100	100
Age of Students		
10-14	44	36.67
15-19	70	58.33
>20yrs	6	5.00
Total	120	100
Years of Experience of Teachers		
<5	10	8.33
6-10	23	19.17
11-15	50	41.66
>16	37	30.83
Total	120	100
Qualifications of Teachers		
O.N.D/N.C.E	25	20.83
B.Sc/B.Ed/B.A	75	62.50
M.Sc/M.Ed/MBA	20	16.67
Ph.d	-	-
Total	120	100

Evidence given in table 1 above shows that 60(50%) of the respondents were males while 60(50%) were female students. Further look at the table shows that equal selection was made between the male and female respondents in this study.

The above table indicates that 44(36.67%) of the respondents were within the age bracket of (10-14) years; 70(58.33%) of them belong to the age bracket of (15-19) years while those who were 20 years and above were 6(5%). This shows further that the respondents selected were mostly from the age bracket of (15-19) years.

In terms of years of experience of teachers, 8.33% were less than 5years on the job, 19.17% were between 6-10years on the job, 41.66% were 11-15 years and 30.83% were more than 16 years on the job respectively.

In terms of Academic qualification, Majority of the teachers 62.50% had first degrees in their respective fields.

Table 2: Pearson Product Moment Correlation between Teacher-Student Ratio and Academic   Achievement of Students in Mathematics

Variable	N	x	sd	df	r-cal	r-crit
Teacher-student Ratio	120	12.34	3.64	118	0.42	0.195
Achievement test in Mathematics	120	16.36	4.20			

Significant at 0.05, df= 198

The result from table 2 shows a significant correlation between teacher-student ratio and academic achievement of students in Mathematics. This was based on the result of the analysis which shows a calculated r-value of 0.42 as against a theoretical value of 0.195 at 0.05 alpha level.

Table 3: Relationship between Teacher's years of Experience and Academic Achievement of Students in Mathematics

Variable	N	x	sd	df	r-cal	r-crit
Teacher's years of Experience	120	10.28	2.29	118	0.67	0.195
Achievement test in Mathematics	120	16.36	4.20			

Significant at 0.05, df= 198

From the result presented in table 3, it was evident that the calculated r-value of 0.67 is greater the critical r-value of 0.195 given degrees of freedom 198 at 0.05 level of significance. This shows that there is a significant relationship between teacher's years of experience and academic achievement of students in Mathematics.

Table 4: Relationship between Teacher's Qualifications and Academic Achievement of Students in Mathematics.

Variable	N	x	sd	df	r-cal	r-crit
Teacher's Qualification	120	4.68	0.78	118	0.21	0.195
Achievement test in Mathematics	120	16.36	4.20			

Significant at 0.05, df= 198

Table 4 shows that r-calculated of 0.21 is greater than r-critical of 0.195 given 198 degrees of freedom at 0.05 level of significance. This shows that there is significant relationship between Teacher's qualifications and academic achievement of students in Mathematics.

Discussion of Findings

Findings from hypothesis one shows that there is significant relationship between teacher- student ratio and academic achievement of students in Mathematics. This findings was supported by Bayo (2005) who opined that smaller classes benefit all pupils because of individual attention from teachers, but low-attaining pupil's benefit more at the secondary school level. Pupils in large classes drift off task because of too much instruction from the teacher to the whole class instead of individual attention, and low-attaining students are most affected. Students benefit in later grades from being in small classes during early grades. Longer periods in small classes resulted in more increases in achievement in later grades for all students. In reading and science, low achievers benefit more from being in small classes. The benefits of small class sizes reduce the student achievement gap in reading and science in later grades.

The ratio of students to teaching staff compares the number of students (in full-time equivalent) to the number of teachers (in full-time equivalent) at a given level of Education and similar types of institutions.

However, this ratio does not take into account the amount of instruction time for student compared to the length of a teacher's working day, nor how much time spend teaching. It therefore cannot be interpreted in terms of class size.

Furthermore, Finn (2003) concluded that the students became occupied in the small class size, both academically and socially. Therefore, their strong engagement caused academic achievement improvement.

Findings from hypothesis 2 revealed that there is a significant relationship between teacher's years of experience and academic achievement of students in Mathematics. This findings was supported according to Oriaife in Maduewesi (2005), quality assurance is a baseline standard in education which can be measured on a scale of reference. It is an expression of standard or a means by which a certain set standard in education can be achieved.

It could easily be deduced therefore that quality assurance in education is a totality of the combination of such indispensable variables as quality teachers, teacher's years of experience, quality instructional materials and quality infrastructure (classrooms, seats, tables, chalkboards etc.). Others include; favourable teacher/pupils ratio, favourable pupils/classroom ratio and quality instructional supervision. All these and more surely results to quality product (student) who is exposed to a balanced and result oriented education, especially secondary education. He is well prepared to face not just the challenges of tertiary education, but the challenge of providing middle level technical and administrative service in any sector of the Nigerian economy.

This finding collaborates with NPE (2007) that no educational system can rise beyond the quality of its teachers. There is also a significant relationship in quantity and quality of teachers and students' academic performance. Therefore, in order to find solution to the problems hindering effective functioning of secondary education, a look must be taken at the quality of teacher interaction and delivery. Situations where some teachers are not masters of the subject they teach, cannot communicate effectively, show dedication and commitment to duty do not augur well for education. Some teachers are unqualified in terms of not having the required teacher training or in extreme cases teaching a subject for which one is not trained. Nothing has changed as teachers still present themselves as the repertoire of knowledge and the students the dormant recipients with the rote method continuing. The response of students to good classroom instruction is in itself gratifying to the teacher.

Findings of hypothesis 3 also show that there is a significant relationship between teacher's qualifications and academic achievement of students in Mathematics. The findings support

the assertion of Fergabaum in Nwagbara (2008) who opines that the word quality is often used to signify excellence of a product, service or action. He asserts that quality is the totality of features and characteristics of a product or services that bear on its ability to satisfy stated or implied needs. ''It is therefore the ability of such products or services to meet the expectation of the recipient or users. This of course involves Quality Control'', which is the regular process through which products, services and quality performance are measured.

Recommendations

The study recommends to the following:

- **School Authorities:** There is also the need to keep enlightening the parents of the importance of the student -teacher ratio on the academic attainment of their children. This is necessary so that parents can understand the implications and consequences of overcrowded classes and thus mobilize all resources to curtail the problems arising from the situation.
- **Parents:** Appropriate parental counseling programmes needs to be organized for parents that will educate them on how to motivate their children to cultivate good maintenance culture in order to

enhance their academic performance

- **Government:** Employment should be strictly for those that study education and competent in the field. More so, there should be pre service training and in-service training for every staff at an interval period of time

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