The Effect of Class Size, Teachers' Workload and Parental Involvement on Students Performance in Mathematics at Senior Secondary School Level

Onabanjo, Comfort Folake. Ph.D; Iyawe, Omoruyi Jonathan Pedro & Adeyemi, Olanrewaju

Abstract

This study was designed to examine Mathematics teachers' workload vis-à-vis class- size and parental involvement as a correlation of senior secondary school students' performance in Mathematics. As a descriptive study, it consisted of three research questions. The study sample comprised of twenty public secondary schools from which thirty- two Mathematics teachers and one thousand, two hundred SS2 students were purposively selected for the study. Three instruments, a Mathematics Performance Test (MPT; r = 0.78), Mathematics Teachers' Workload Questionnaire (MTWQ; r = 0.83) and Parental Involvement Questionnaire (PIQ; r = 0.68) were used for the study. Data were analyzed using Descriptive Statistics, Pearson Product Moment correlation Coefficient (PPMC), t-test and one way ANOVA at 0.05 level of significance. Findings revealed that there was a significant relationship between class size and students performance in Mathematics (F- cal < F-ratio, df= {4, 11943; p>0.05}. It was also found out that there was a significant relationship between Mathematics teachers' workload, parental involvement in students activities and student performance in Mathematics (F- cal > F- ratio, df= {1198; p<0.05). The implication of the findings was discussed and it was suggested that Mathematics teachers should be made to teach Mathematics only. They should be excused from teaching additional subject(s), as this would give room for concentration of achievement of stated objectives.

Keywords: *Class- size, Teachers' Workload, Parental Involvement, Mathematics Teachers.*

INTRODUCTION

Mathematics is seen by society as the foundation of scientific and technological knowledge that is vital in socio-economic development of the nation. Because of this, Mathematics is a core and compulsory subject at both primary and secondary levels in Nigeria. Mathematics is also used as a basic entry requirement into any of the prestigious courses such as Medicine, Architecture and Engineering among other degree programmes. Mathematics is an indispensable subject and is accorded a premium position among school subjects. It is a subject that every student must register and pass, as in order to advance to higher levels in future.

In spite of the premium position occupied by Mathematics at the upper basic level of education, there has not been a remarkable improvement in the students' performance as corroborated by Odebunmi (2011). Poor performance has always been recorded in national examinations (Aduda, 2013). Performance in Mathematics as reflected by the analysis of result in Mathematics May/June WASSCE results from 2000- 2014 has remained poor over the years. Hence, the need to investigate factors contributing to poor performance in Mathematics at WASSCE examinations by students so that poor performance in mathematics can be reversed.

Various research conducted by different scholars indicated some factors that have contributed to this poor student performance in Mathematics. According to Olaoye (2012), Mathematics teachers' experience in handling the subject with the students was found to exert greater influence on the

academic performance of students. It was posited that the more experienced a Mathematics teacher was in teaching the course, the more they made innovations to make the subject exciting to the learners compared to new entrants into teaching profession. However, no research was found to have considered the nature of workload and its attributes inclusively, which Mathematics teachers are subjected to; especially considering the numbers of students taking the subject in most cases outnumbered all other subjects combined.

Within an age of increasing accountability and limited educational funding, finding the right ratio of teachers to students is critical for the academic achievement of students and the success of schools. Finding and engaging highly qualified teachers to instruct and teach Mathematics in a classroom is simply not enough; the number of students assigned to a teacher is also important. Class size has potentials to affect classroom management, classroom instruction, and the academic achievement of the students (Blatchford, Russell, Basset, Brown, & Martin, 2010; Deutsch, 2010; Finn, Pannozzo, & Achilles, 2010; Smith, Molnar, & Zahorik, 2010). Dilution of the instructional potency could occur if the student to teacher ratio is high, yet many schools would cite that the current lack of, or inadequate educational funding mandates larger class sizes. Determining the most effective class size is a debate fueled by necessity; with limited available funds, school administrators and policy makers must decide which interventions are the most effective while deciding where costs can be decreased without sacrificing the educational attainment of the students (Kennedy, 2012). Many researchers worldwide are now showing a growing interest into the investigation of large class size as it affects learning and achievement. Coleman (2009) contends that there is a growing need to study the large class phenomenon as it affects teaching and learning. Consequently, the present researchers have the need to investigate effect of class size on Senior Secondary School Students' Performance in Mathematics. In Nigeria, the average class size varies from one level of education to another and at the tertiary level from one discipline to the other. The National Policy on Education (NPE) recommends a class size of 20 for the pre-primary level, and 30 for the primary level. The policy was silent on secondary education, but the practice has been to have a class size of 40. It then follows that anything in excess of the recommended number is abnormal, and if the excess is more than 10, the class can be regarded as large. Harmar (2011) considers a class of 40 as large since according to her, most of the students cannot get the chance of participating effectively in calculation activities. Virginia Locastro (2013) reports that in Japan, the average largest class size is 45 and the normal one is 38, while small class size falls between 4 and 7. The International Labour Organization (ILO) and the United Nations Education Scientific and Cultural Organization (UNESCO) recommend 1:30; 1:35 teacher/pupil ratio for primary and secondary schools respectively. From the present researchers' perspective, a class in which the teacher is not able to give enough individual attention to students due to the size of the class can be considered as large. Learners' perceptions of difficulties in a large class reveal that their main problem is the ineffective management of the class-noise, lack of individual attention to learners, teachers' feedback on class assignment often is not forthcoming. All these are problems of management.

The involvement of parents in their children's education has been suspected to influence pupils' performance and adjustment. While parental engagement is widely understood to be vital for the academic performance of students, it is also acknowledged, that we need to know much about effective means of engaging parents in learning, particularly those parents who are 'hard to reach'. Some research results have evidence that families have a major influence on their children's achievement in school and through life. When schools, families and community work together to support learning, children tend to do better in school, stay in school longer and like school more. One of the chief aims in studying Mathematics is to express one's thoughts and make decisions effectively

. In the light of the above, the researchers intend to investigate the effect of class size on Senior Secondary School ŝ students.

Senior Secondary education is an arm of Post-Basic Education and Career Development which children receive after a successful completion of ten years of Basic Education and passing the Basic Education Certificate Examination (BECE) as enunciated in the 6th Edition of the National Policy on Education (FRN, 2013). The expectation is that at the end of secondary education, beneficiaries would have been prepared for meaningful living and self-reliance within the society as well as being prepared for the next level, that is, the tertiary education level. Senior Secondary Education is an important sub-sector in national and individual development. It plays a vital role in creating a country ŝ human resource base at a level higher than basic education (Achoka, Odebero, Maiyo & Mualuko, 2013). Yusuf and Adigun (2010), Lydiah and Nasongo (2009) noted that the performance of students in any academic task has always been of special interest to the government, educators, parents and the society at large.

Statement of the Problem

It is observed that previous studies have centered attention mainly on investigating the difference or relationship between individual teacher ' s variables and students ' academic achievement. Apparently further studies are required to investigate the combined contribution of Mathematics class size, teachers ' workload (TW), and parental involvement towards students ' academic performance at the senior secondary school level. Therefore, this study sought to investigate how well academic performance in Mathematics at the SSCE level could be explained by the combined influence of class size, teachers ' workload, and parental involvement. In addressing this situation, the following research questions were generated to guide the study.

Research Questions

This sought to answer to the following research questions;

* What relationship exists between Mathematics student class size and academic performance of students?
* What relationship exists between Mathematics teachers ' workload and academic performance of student?
* What relationship exists between Parental involvement and academic performance of students?

Methodology

The research design for the study was descriptive as the research was not intended to manipulate the independent variables like Mathematics teachers ' class size, workload and parental involvement. Rather, it tried to assess the effect of these variables on the dependent variable of students ' performance in Mathematics at senior secondary school.

Population

The population for this study involved all senior secondary school Mathematics teachers, parents and students in Abeokuta South local government area of Ogun State, with focus on Senior Secondary School 2 Students.

Sample and sampling techniques

Twenty public secondary schools in Abeokuta South local government area of Ogun State were selected based on the availability of qualified and adequate Mathematics teachers at their senior secondary school 2 level. Hence, a sample of thirty- two Mathematics teachers and one thousand two

hundred senior secondary school 2 students were purposively chosen, based on the criteria that the teachers were the same teachers that taught the set of students in first term, when they were in Senior Secondary School 1.

Instrumentation

Three instruments were used for the study. They are Mathematics Performance Test (MPT), Mathematics Teachers Workload Questionnaire (MTWQ) and Parental Involvement Questionnaire (PIQ) '. They contain bio data and relevant statements and other items that could help elicit information on class size, workload of teachers and also how parents get involved in their child/children s' learning.

Validation of Instruments

The adapted performance test was given to five Mathematics teachers outside the scope of the study to ascertain that it paralleled to National Examination Council (NECO) standards and to make necessary corrections. The draft copy was administered to twenty- five SS2 students over a period of three weeks. A final draft was drawn after incorporating all suggestions made by the Mathematics teachers involved. This reduced the performance test items to forty multiple choice objectives questions from the original fifty questions, due to the deletion of ambiguous and bad items. In a similar manner the draft copy of the Mathematics Teachers ' Workload Questionnaire was administered on ten Mathematics teachers, who were not included in the final selection for the study while the Parental Involvement Questionnaire was also pilot-tested in the same manner. The reliability of the instruments was obtained at 0.78, 0.83 and 0.68 respectively.

Data collection

Direct mode of collection was used in retrieving the instruments from the Mathematics teachers, who in turn assisted in collecting the administered achievement test and the Parental Involvement Questionnaires from the students. This was carried out on a specified day by different teachers with all tests and instruments collected.

Data scoring

The Performance test was scored and coded to identify the Mathematics teacher for each test collected to ensure proper alignment. Analysis was carried out using simple percentages, Pearson correlation, t-test and one way ANOVA. Pearson Product Moment Correlation Coefficient was used to show the extent of relationship between the identified Mathematics teacher 's attributes and students 'performance; and ANOVA was used for more than two variables under consideration.

Results and Discussion

Table 1

Academic Performance of Student in Mathematics

Interval Performance	0- 39	40- 44	45-49	50-54	55-59	60-64	65-69	70&above	Missing	Total
Students	440	48	71	54	76	62	64	384	1	1200
Percentages	36.7	4.0	5.9	4.5	6.3	5.2	5.3	32.0	0.1	100

Table 1 describes the academic performance of students in the administered performance test in Mathematics. It found that almost half of the entire student sample (440 students representing 36.7%)

had scores between (0-39) percent which is considered as failure based on NECO 's criterion standards and the WASSCE guidelines. Though quite appreciable number of students (384 students representing 32%) had scores between (70 & above) percent; still higher performance in education is ascertained as when in most cases failure is so minimal.

Table 2.

Teachers 'Workload per week with corresponding Number of Students.

Teachers 'Workload	6-12	13-18	18-24	25-30	17-22	23-28	29-34	35-40	Total
Subject(s) Taught	**Mathematics Only**				**Mathematics with Other(s)**				
Number of Students	66	75	81	67	107	237	206	361	1200
Percentages	5.5	6.3	6.8	5.6	8.9	19.8	17.2	30.1	100

Table 2 describes the workload of Mathematics teachers in a week along with the numbers of students. Those handling Mathematics alone (15 teachers) had the least and highest workload of 6 and 30 periods in a week respectively, and total students in these categories numbered 289 represent 24%. On the other hand those handling Mathematics with other subject(s) (17 teachers) had the least and highest workload of 17 and 40 periods in a week respectively, and total student in these categories totaled 911 representing 76%. One would see that the numbers of students under those handling Mathematics with either science and/or social science was too extreme to bring about meaningful performance on one hand and not in conformity to the international standard ratio of one teacher to thirty students in a classroom.

RQ 1: What relationship exists between Mathematics class size and students 'performance in Mathematics?

Table 3

Relationship between Students 'Class Size and Students 'Performance

Variations	Correlation coefficient	Significant
Students' Class Size	-0.221	Negative relationship
Performance of Students		

Table 3 describes the relationship between Mathematics class size and the academic performance of students, and it was found to be negative with a correlation coefficient of -0.0221. This is to say there is no relationship between the academic performance of students in Mathematics and the number of student sitting for Mathematics in the class. However, the over-population of student in the class might lead to student not being supervised or carried along during classroom teaching and as a result students might have cheated to perform well since they are less likely to participate in class activities when teaching and learning takes place. Another reason that may cause this can be as a result of teachers not being able to mark assignments given to students since they are many and there are many contents to cover in the syllabus.

RQ 2: What relationship exists between Mathematics teachers ' academic workload and Students Performance in Mathematics?

Table 4

Variations		
Teachers' Workload	Correlation coefficient	Significant
Performance of Students	-0.235	Negative relationship

Table 4 describes the relationship between teachers 'workload and the academic performance of students and it showed a very sharp negative coefficient of -0.235. There is contrast relationship between the academic performance of students in Mathematics and Mathematics teachers 'workload. This might be connected to improper teaching and inadequate coverage of contents areas in Mathematics that emanated from the additional responsibilities of the teachers.

RQ 3: What relationship exists between Mathematics Parental Involvement and Students ' Performance in Mathematics?

Table 5

Relationship between Parental Involvement and Students 'Performance in Mathematics.

Variations		
Parental Involvement	Correlation coefficient	Significant
Performance of Students	-0.035	Negative relationship

Table 5 describes the relationship between parental involvement and the performance of students. It was found to have a negative correlation coefficient (-0.035). There is contrast relationship between the academic performance of students in Mathematics and the involvement of parent in their children 's studies. This may not be unconnected to illiteracy among most parents with less knowledge of content areas in Mathematics as a result of greater responsibility at home where we have some parents who have to put food on the table and as a result have no time for their children. Meanwhile, it may be inferred that parents need to be carried along with what their children do in the school so as to know areas and aspect to help/assist them.

Conclusion

Findings have shown that dismal performance of students and attainment of quality of Mathematics curriculum depends on quite a number of factors. In view of these, it is suggested that the teaching of Mathematics should be given more attention, as its unique position in the contemporary period cannot be overemphasized. More teachers and professional hands should be encouraged to engage in teaching of large class while the ratio of teachers should be reduced to 1:30 as UNESCO standard for secondary education in other to avert the perennial dismal performance of students. Furthermore, Mathematics teachers 'workload should be such that it allows for adequate

content coverage, and thus minimizes teaching towards passing the examination alone. Meanwhile, it is recommended that schools implement team-teaching of Mathematics, so that they may pool knowledge of different Mathematics topics to maximize students 'understanding. Still this (team-teaching) should not compromise addressing the need to establish equitable and effective workloads to attain a high standard of quality assurance in Mathematics education. Also, parents should be carried along in the school activities so as to assist teachers in necessary areas and also to monitor students in their homework and other necessary areas.

Recommendations

Based on the findings of this study, the following recommendations are made:

1.) More attention needs to be given to other salient factor that might have direct and indirect impact on the academic performance of students in Mathematics. Since Mathematics is often regarded as the language of technology, the need for performance improvement in it is imperative otherwise the pace of national development might continue to be retrogressive.

2.) Mathematics teachers should be allowed to teach Mathematics only. They should be excused from teaching additional subject(s). Moreover, it points to an increased attrition rate of leaving the teaching profession to others, when teachers find their job too demanding. By implications, qualified hands might be lost to other area of human endeavours, which may turn the education sector to mediocre quality.

3.) A minimum number of 1:35 teacher-student ratio should be observed in order to ensure a good standard regarding students 'performance. As a result, emphasis should be placed on the transfer of Mathematics teachers to schools with larger population and recruitment of qualified and professional teachers to make the learning of Mathematics reach and optimal level of quality assurance.

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