An Investigation of Mathematics Performance of High School Students in Lagos state, Nigeria: External Factors

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The study was conducted to investigate the external factors affecting the performance of high school students in Lagos state, Nigeria in mathematics taking the views of senior high school students. A total of 276 students (13 – 20 years old) out of the initial 287 that were randomly selected from two rural secondary schools completed the survey. Using a descriptive survey designed questionnaire, data collected were analyzed using both general linear model and Pearson correlation analysis. Findings from the study indicated among others that inappropriate spending by government, teachers' qualification, and overpopulated schools, among other factors, contributed to the poor performance of the students to a large extent. From the findings, the role of government is key to better performance of the students, it is recommended therefore that funds should be made available to create more schools and to improve teachers' productivity.

Keywords: mathematics, high school students

Mathematics according to Maliki, Ngban, and Ibu (2009) is described as a subject that "affects all aspects of human life at different degrees" (p. 131). According to The National Mathematics Advisory Panel (2008), mathematics is used throughout our daily lives. The importance of mathematics in day-to-day activities is no longer news. However, what remains news is the fact that students' performance in mathematics has not improved significantly despite its importance, not even with the introduction and use of technology in mathematics, as confirmed by Chang and colleagues (2006) when they stated that, nowadays, students make use of computer-assisted problem-solving systems to better learn and understand mathematics.

In civilized and developed countries, schooling resources which cost money, including class size reduction, higher teacher salaries, modern school buildings and equipment, are positively associated with student outcomes. Although money alone may not be the only solution, the more equitable and adequate allocation of financial inputs to schooling do provide opportunities for improving the equity and adequacy of outcomes. This notion was confirmed by Wenglinsky (1997), when he stated among other reasons, that economic resources that are spent judiciously are always associated with academic achievement. He further added that per-pupil expenditures on both instruction and administration of the school are positively related to class size, which in turn relates to student achievement.

In Nigeria, despite the fact that the government has clearly confirmed the importance of mathematics by making it a core and compulsory subject at both junior and senior secondary levels (Federal Republic of Nigeria [FRN], 2004), the invested billions of Naira in the teaching and learning of mathematics has not yielded any significant improvement due to wasteful and inadequate spending of the required resources. Numerous factors were identified by some researchers for the inconsequential performance by students, some of which included: shortage of qualified mathematics teachers, poor facilities, equipment and instructional materials for effective teaching (Odogwu, 1994; Yemi & Adeshina, 2013), and large pupil-to-teacher ratios (Alele-Williams, 1988). Another major hindrance to better improvement of government spending, is the continued use of traditional chalk and talk methods which are yet to give way to the multimedia teaching methods presently in use in schools in developing nations.

Students' performance in mathematics at both internal and external examinations has remained considerably poor (Ale, 1989). To buttress this fact, *The Sun News* reported that Nigeria recorded its worst results in mathematics in the last three years. According to *The Sun News* ("Outrage trails students' poor performance," 2014), out of 1.6 million students that took the 2014 May/June West Africa Senior School Certificate Examination (WASSCE), only a little more than half a million (31.28%) passed with the minimum requirement for admission into tertiary institutions. Based on such facts, the purpose of this study is to explore the various external factors affecting high school mathematics performance in Lagos, Nigeria.

Mathematics teachers had on several accounts been judged as the main determinant in the success or failure of students in the subject. This is true for many reasons; according to Idowu (2015), "they are the main custodians of students, the way and manner they perform this role is important" (p. 4). Because of this, mathematics teachers are expected to have the required knowledge necessary for teaching as well as the ablility to disseminate such knowledge appropriately that will result in learning. Mathematics teachers, according to Soer (2009), should be able to communicate the required knowledge in a clear, informative and precise manner to their students. This, unfortunately, according to Okafor and Anaduaka (2013), is not being done by the mathematics teachers. According to both researchers, most teachers are not ready to go the extra length in their teaching.

In a study conducted by Avong (2013), shortage of qualified mathematics was judged to be the most contributing factor to poor performance by her participants in a study conducted in a remote in Kaduna state. Teachers' attitudes had also been linked to students' poor performance in a study conducted by Osunde and Izevbigie (2006). In this study, 400 Nigerian post primary school teachers' attitudes toward the teaching profession were sorted. They discovered that issues like delay in payment of salaries and poor financial remuneration contributed to a low attitude of teachers in the teaching profession.

The school population, according to Korau (2006), today, is in the thousands compared to mere hundreds many years ago. Consequently, schools are now overcrowded with some classrooms having too large a size that may seriously compromise mathematics teaching and learning. A student-teacher ratio of 40:1 may be considered adequate, but according to Umameh (2011) some schools in Nigeria are noted to have a 100:1 ratio, a situation that will never lead to any meaningful learning of mathematics no matter how capable the mathematics teacher may be. According to Asikhai (2010), the government recommendation for student-teacher ratio was 50:1, but it is obvious that this ratio can never be met with the astronomical increase in population experiencing currently.

Also, another issue raised that equally affect students' performance is the distance from most students' homes to their schools. This adversely affects not just fatigue, but sometimes absenteeism, which, according to Duze (2005), could lead to truancy and eventual dropout by some students. Evidence from research has also showed that long distances travelled to school are among the major reasons why students performed poorly and eventually dropped out of schools (Arubayi, 2005; Onakpoma, 2008).

Rationale

The frequent drop in the performance of students in mathematics in Nigeria, as reported by *The Sun News* ("Outrage trails students' poor performance," 2014), where only 31.28% of the 1.6 million students that took the 2014 May/June WASSCE passed with the minimum requirement for admission into tertiary institutions informed the rationale for this study. This sad pronouncement has triggered various reactions as to what could be the reason behind the drop in performance in the Lagos state, Nigeria

Purpose

The purpose of this study is to investigate the various roles played by the external factors in the current position and offer solutions that will lead to improvement in mathematics in Lagos state, Nigeria. In so doing, a self-reported performance of high school students from Lagos state, Nigeria was collected.

Research Questions

Based on the background of the study and the various concerns that were identified in the gap in the literature, the following research questions were formulated to guide the study:

1. Does inappropriate spending by government as a factor affecting students' performance differ across respondents' gender?
2. Do teachers' qualifications and methods as factors affecting students' performance differ across respondents' educational status?
3. Is there a correlation between distance from home to school/ school population and students' performance in mathematics?

Method

For the purpose of data collection, the researcher employed the use of questionnaire for two major reasons. These are: (1) Due to time constraint, and little financial resources available for the study; and (2) for a study of this nature that required the collection and analysis of data from a substantial student size, the use of questionnaire seem to be the most appropriate technique to use.

Participants

Before the distribution of the questionnaire to the students, the researcher explained why he was conducting the research and also explained every detail of the questionnaire to the students. He equally gave the students the opportunities to ask any questions that are not clear to them either before or during the administration of the questionnaire. A total of 287 senior high school students from two selected rural schools from Lagos state, Nigeria participated in the study, out of which only 276 participants completed the survey and were included in the analysis. School A had a total of 143 participants (85 males and 59 females) while school B had a total number of 133 participants (56 males and 77 females). The participants' ages ranged from 13 to 20 years and their educational status is SS 1and SS 2 (10^{th} and11^{th} grades). The two selected schools were randomly picked from a total of twelve schools through a draw from a hat, with all schools having equal chances of being picked.

The overall distribution of the participants' educational status of their gender is represented in Table 1, while the distribution of participants by school is represented in Figures 1 and 2 respectively. The age distribution of the participants is represented by Table 2.

Table 1.

Distribution of Participants' Educational Status by Gender

Edu. Status	Male	%	Female	%	Total	Total %
SSS1 (10^{th})	56	42.11	77	57.89	133	100
SSS2(11^{th})	85	59.44	58	40.56	143	100
TOTAL	141	51.11	135	48.91	276	100

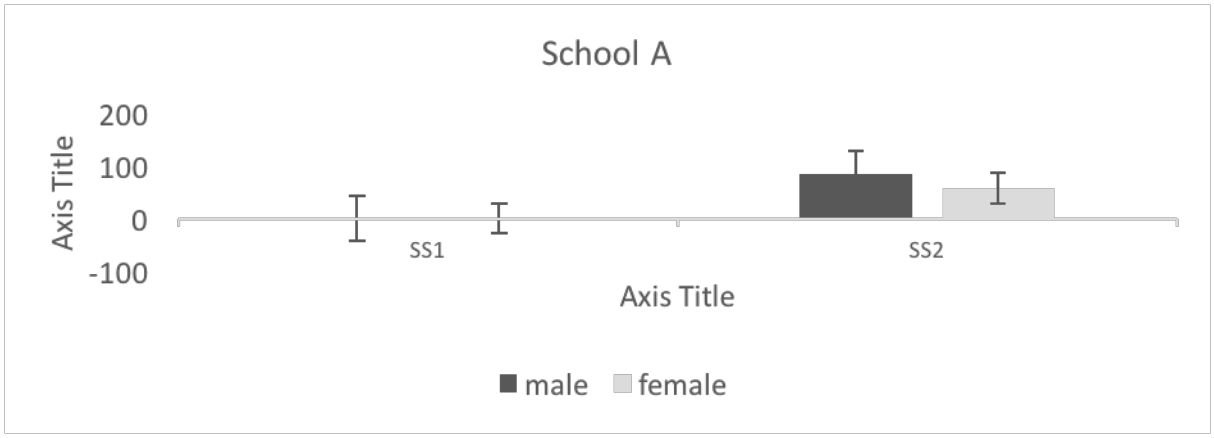

Figure 1.

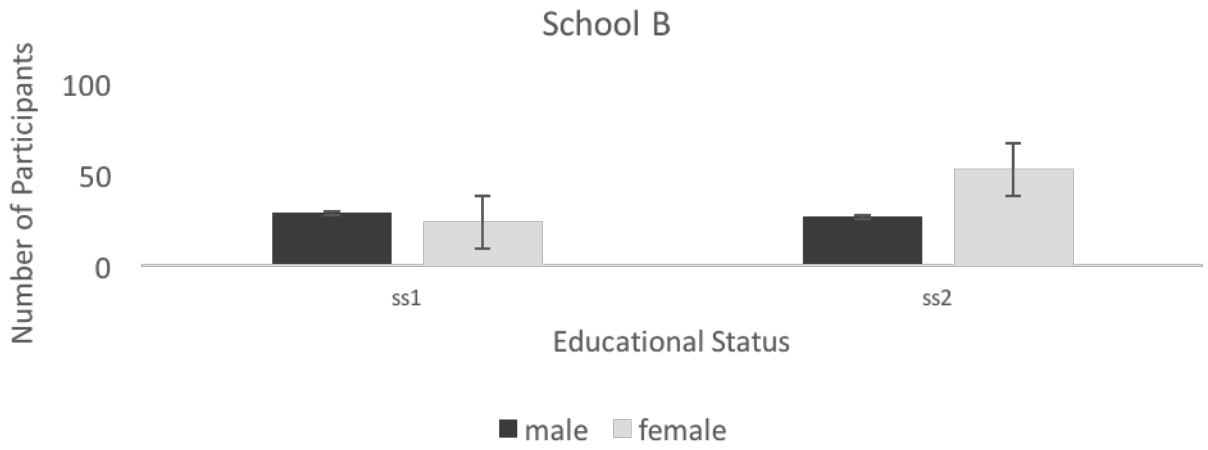

Figure 2.

Table 2.

Age Distribution

	Male	%	Female	%	Total	Total %
13—14	22	62.86	13	37.14	35	12.68
15—16	83	49.70	84	50.30	167	60.50
17—18	30	44.88	37	55.22	67	24.28
19—20	4	57.14	3	42.86	7	2.54
Total	139	50.36	137	49.64	276	100.00

Instrumentation

For the researcher was more interested in the views of the students with reference to issues affecting their performance in mathematics, this survey was designed as such, to gather responses from the students that can be analyzed to better understand their position with regards to factors affecting their performance in mathematics.

The survey, originally developed by the researcher, was a two-page instrument containing two sections. The first section consisted of 27 easy-to-answer questions on various factors affecting performance in mathematics at the high school level. Some of the questions presented in the survey included: (1) Inappropriate textbooks provided by government are not stimulating learning; (2) Delay in teachers' salaries is affecting students' performance in mathematics; (3) The majority of our teachers does not have the necessary qualification to teach the subject; (4) Teaching methods used by mathematics teachers do not encourage easy learning; (5) Distance from my home to school is affecting my learning; and (6) Over population of students in mathematics class is affecting students' learning.

Using a 4-Likert-type scale ranging from Strongly Disagree to Strongly Agree, the participants were expected to respond by selecting any of the four options as appropriate to each question asked. The second section consisted of three demographic questions about their gender, age and educational status.

Procedures

For necessary revisions, the survey instrument was first pilot-tested using peer review, after which the necessary changes were made. The two school principals were notified in advance and appropriate dates were agreed upon for the administration of the questionnaires. At each of the schools, the purpose of the study was explained to the participants. All students present participated in the survey and the entire procedure took about 15 minutes.

Data Analysis

In answering the research questions (RQ), general linear model (univariate) and Pearson correlation analysis were used to analyze and examine the effect of multiple variables (inappropriate government spending, teachers' qualifications/methods of teaching, school distance and overpopulation).

For the first two research questions, a two-way analysis of variance (ANOVA) was employed for the data analysis. For RQ 1, ANOVA was used to determine if respondents differed by gender on inappropriate spending by government as a factor affecting students' performance in mathematics. The mean scores of all the identified questions in the survey were used as the dependent variable, while the gender of the students was used as the fixed factor.

For RQ 2, ANOVA was also used to determine if respondents differed by their educational status on teachers' qualifications/methods as factors affecting students' performance in mathematics. Finally, in order to determine if there was a correlation between distance from home to school/school population and students' performance in mathematics (RQ 3), a Pearson correlation analysis was computed.

Results

In this section, results from the data analysis are presented.

1. **Inappropriate government spending and students' performance.**

Inappropriate government spending like buying unattractive textbooks, not paying teachers good salaries, and delay in payments are presumed to have an effect on students' performance in mathematics, but the type of effect might differ across respondents' gender. A two-way analysis of variance was used to examine whether inappropriate government spending had an effect on student performance in mathematics. Data indicate that government procurement of unattractive textbooks, bad and inappropriate teaching aids, and delay in teachers' salaries, among others, affect students' performance and do not have an appreciable difference across gender (F (1, 259) = 2.93, p = .088, η^2 = .008) with observed power to be .293 even though it shows a trivial effect size.

As can be seen in Table 3, the mean and the standard deviation for both male and female participants' responses were almost the same, meaning that there is no significant difference between their responses, which also confirmed with result above.

Table 3.

Calculated Mean and Standard Deviation Results for both Policies and School Issues

Sex	Mean	Standard Deviation
Male	2.43	.358
Female	2.36	.350

2. Teachers' qualification/methods and students' performance.

Both teacher's qualifications and their teaching methods were also examined to measure the effect on students' performance in mathematics in relation to respondents' educational status. In order to determine this effect, a two-way analysis of variance was also used to test the presumed performance of the students with respect to their teachers' qualification/ methods. It was discovered that the effect of teachers' qualifications, style, approach, experience and methods used by mathematics teachers were not statistically significant across respondents' educational status, (F (1, 267) = 1.144, p = .286, η^2 = .005) with the observed power of .183. The effect size is also trivial.

From this result, it can be seen that the responses of the participants in terms of whether the teacher's qualification/ methods affect students' performance are almost the same across their educational status. These results can also be seen in Table 4, in which both the mean difference and standard deviations between SS 1 and SS 2 students are almost equal.

Table 4.

Calculated Mean and Standard Deviation Results for Teachers' Related Issues

Educational Status	Mean	Standard Deviation
SS 1	2.39	.450
SS 2	2.32	.424

3. School distance/population and students' performance

In order to determine if there is a correlation the between distances from students' home to school / school populations and students' performance, mean of the identified questions (e.g. distance from my home to school is affecting my learning, over population of students in mathematics class is affecting student' learning) were used as variables against students' mean in a Pearson correlation analysis. As expected, it was discovered that there was a positive correlation between distance from students' home to the school/ overpopulation of school with students' performance in mathematics. $r = .504$, n = 241, $p \leq 0.0001$. This result clearly indicates that there is a significant effect on students' having to travel a long distance to school as well as overpopulated classes in terms of their performance in mathematics.

Discussion

This study was conducted to investigate students' performance in mathematics at the high school level in Lagos state, Nigeria. External factors and beneficial results were identified and reported from the analysis of the collected data. Given the results, the following conclusions were reached.

Firstly, results may suggest that the effect of inappropriate or wasteful spending by government does not differ across participants' gender. An indication that both male and female participants agreed that improper spending by government significantly affects students' performance in some ways, though no statistically significant difference existed between genders. These facts seem to be in agreement with Odogwu, (1994), Osunde and Izevbigie (2006), and Yemi and Adeshina (2013). While Odogwu, and Yemi and Adeshina, all identified to a large extent lack of supplied of qualified and experienced mathematics teachers to the schools, Osunde and Izevbigie identified the delay in paying teachers' salaries as well as the poor remuneration as the main reasons for poor performance in mathematics by students.

Secondly, results may suggest that the teacher's qualifications and methods or ill-prepared teachers, teachers' poor attitudes, and/or their lack of readiness to teach appropriately might affect students' performance in mathematics. This is an indication that the participants' responses do not differ by their educational status as both (SS 1 and SS 2) classes agreed. This is also in agreement with Avong (2013), Okafor and Anaduaka (2013), and Osunde and Izeubugie (2006).

Lastly, the results may indicate that distance from home to school as well as the over populated classes/school sizes can greatly affect students' performance in mathematics. From the results, it was discovered that there was a correlation between these two variables and students' performance. This seems to be in agreement with previous results from other researchers (Alele-Williams, 1988; Arubayi; 2005, Duze, 2005; Korau, 2006; Umameh, 2011), as all the researchers identified large pupil-to-teacher ratios (Alele-Williams, 1998; Umameh, 2011), school population (Korau, 2006), and distance from home to school (Arubayi, 2005; Duze, 2005).

Recommendations

Since improving mathematics performance at the high school level is an ongoing process, the findings in this study on mathematics performance at the high school level in Lagos state, Nigeria have identified some external factors that are affecting students' performance. In view of all these, it is recommended that:

1. Government should as a first step ensure that provisions are made to fund schools appropriately and also ensured that proper measures are put in place to reduce to a mere minimum, if not completely eliminate, wasteful and unnecessary spending. This, also, includes prompt payment of their remuneration.

2. Greater effort should be made to improve the quality of teachers at the high school level, this also includes more professional development programs for the teachers so as to ensure they are up-to-date in their profession.
3. Government should also ensure that more schools are built to reduce the distance students has to travel to get to school as well as reducing class sizes.
4. Lastly, it will not be out of place to suggest that the government should start considering providing school buses for the students.

Limitations

This research was only conducted in only two rural senior secondary schools in one local government area in Lagos state. However, since almost all senior high schools in the rural areas in the state shared almost, if not all issues identified in this study (e.g. No school buses, inadequate textbooks, lack quality teachers, over populated schools, among others), therefore, it is possible for the generalization of this study to cover all rural senior high schools in Lagos state as well as in other states in the country.

The principal limitation of this study, however, was that it was only conducted in schools located in the rural area of one state in Nigeria, which may imply that the generalization of this study's findings to urban schools might not be appropriate. In addition to this, since this study only focuses entirely on the perceptions of students, more study of this nature can also be carried out to include the teachers as well as the parents.

An ancillary limitation was that the instrument used did not have established reliability or validity coefficients. Consequently, further research is needed to investigate more senior high schools in urban areas of the state. Moreover, in future studies, the instrumentation could be improved.

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