

STATISTICAL ANALYSIS OF CHALLENGES FACING TEACHING OF SECONDARY SCHOOL MATHEMATICS TODAY



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Abstract

This study was aimed at studying statistically those challenges facing teaching of secondary school mathematics today. The data used in this study were collected from both secondary source obtained from Statistics Department of Aguata Education zone Ekwulobia, Anambra State, Nigeria and primary source (questionnaire). The data consisted of all the 46 secondary school mathematics teachers in the zone. 47 Government owned secondary schools in the zone were used in this study. A 25-item questionnaire was designed, validated and used to cover the 6 areas identified to be the problems facing teaching of mathematics in secondary schools. The six problems included excess workload, non-payment of mathematics allowance/incentives, insufficient new curriculum materials, student's enrolment in special centers for examination, lack of students' interest, inadequate supply of textbooks to meet the new curriculum. Chi-square test of independence was used to test the 6 hypotheses raised at $\alpha = 0.05$. The response status of the challenges/factors was analyzed using frequency table according to local government areas that make up the education zone. The result from the analysis indicated that the problems were experienced in all the LGAs of the zone. The result also showed that eleven schools have no mathematics teachers at all. Based on the findings, recommendations were made which included among others: Government should recruit and post more mathematics teachers to schools that lack teachers; the mathematics teachers should be encouraged by re-introducing special allowances as incentives etc.

Keywords: Challenge, Teacher; School mathematics, incentive, teaching.

The role of mathematics education in this era of scientific, technological and engineering advancement cannot be over emphasized. No nation can develop in human capital and social development without application of knowledge of mathematics

(Suleiman & Abdullahi, 2012). In fact, mathematics is regarded as the major tool available for formulating theories in science, engineering, economics and other fields. The mathematics teachers take the responsibility of general education of the student's mathematics. The mathematics teachers are in the best position to build positive attitude and pattern in interest and problem solving skills in the students. Kolawole and Oluwatayo (2008) opined that an effective teacher develops mathematical ideas and skills in his students that they can use for further studies, for everyday problem and for personal needs. A teacher that is facing many challenges in his work cannot function effectively and this will affect learning on the part of the students.

Many other researchers have come up with some factors that militate against teaching and learning of mathematics in our secondary schools. Alio & Nnamani (2015) in their studies reported that lack of instructional materials, overloading of mathematics teachers as a result of large class, lack of conducive learning environment, understanding of students' attitude, explosion of population of students enrolment without commensurate mathematics teachers to handle them pose a challenge on the part of the teachers. Akolo (2010) in agreement with Alio & Nnamani (2015) reported in his study that in many states, learning environments are not conducive for effective teaching and learning of mathematics. Kurumeh and Dogo (2015) study on teaching secondary school mathematics for creativity and innovation for application in the transformation of the 21st century global economy revealed that lack of incentives for mathematics teachers prevent them from putting in their very best in teaching the indispensable subject. They pointed out the negative attitude of students towards mathematics as one of the challenges of teaching and learning of secondary school mathematics.

On teacher motivation and achievement in mathematics, Ojimba (2012) also reported lack of incentives to mathematics teachers on the part of the government as one of the prominent challenges. He therefore suggested that motivation is necessary for every teacher if achievement in mathematics and science is to be realized. Accordingly Alio and Okafor (2015) emphasized that for proper dissemination of science and technology literacy among Nigerians, the teachers of mathematics must be considered and catered for. Thus, effective delivery of their job which brings about economical development will be achieved. Peter (2013) in his study also discovered that lack of special allowances and inadequate number of mathematics teachers affects the teaching of mathematics. He suggested that 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.

Ibebuike in Peter (2013) had noted that many students from 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 further posited that

this was due to the paucity of competent and adequately qualified teachers of mathematics who were invariably overloaded.

Adetunji (2012) also discovered in his study that workload of mathematics teacher constitutes a challenge to effective teaching. That is why he suggested that the workload of mathematics teachers should be such that allows for adequate content coverage and thus minimize towards passing examination alone.

From the literature reviewed, it was discovered that mathematics teaching in our secondary schools had been facing many challenges. Those problems are still persistent without adequate attention given to them. This paper therefore, analyzed statistically the challenges faced by secondary school mathematics teachers today. The result from this study would go a long way to suggest a way forward for addressing the challenges.

Purpose of the Study

The purpose of the study was to study statistically those challenges facing teaching and learning of secondary school mathematics today. Attention was specifically paid to the following:

- i. To identify the challenges facing Mathematics teaching in Aguata Education Zone.
- ii. To determine whether the challenges so identified cut across all the schools in the zone.
- iii. To compare the findings of this study with the already done works in different parts of the country.

Significance of the Study

The findings from this study would be useful to the mathematics teachers, school administrators, government and curriculum developers and reviewers as it would expose the challenges facing mathematics teaching today, so as to attract attention and solution. It would also be a reference material to researchers who may be interested in future to further research on the challenges facing teaching of mathematics.

Methodology

Population and Sample

The population for the study comprised of all the mathematics teachers in the forty-seven (47) government owned secondary schools in Aguata Zone, Anambra State, Nigeria.. There were 46 of them. Aguata Education Zone is made up of three Local Government Areas: Aguata, Orumba North and Orumba South.

Data Collection

Data used for this study were collected from secondary and primary sources. The list of schools containing number of mathematics teachers and numerical strength

of each school in the three local government areas of the zone was collected from the statistics department of the zonal office. A 25-item questionnaire was designed to cover the areas identified to be the problems facing mathematics teaching in secondary schools. The following factors affecting the teaching of mathematics were gotten from the responses of teachers to items in the questionnaire:

- Excess workload
- Non-payment of mathematics allowance/incentives
- New curriculum materials
- Lack of textbooks to meet the new curriculum.
- Special/miracle centers
- Lack of interest on the part of students

List of schools containing the number of mathematics teacher and total number of students are given tables 1, 2, and 3.

Table 1: Number of Mathematics Teachers in Aguata Local Government Area of the Zone and Students' Population

S/N	Name of School	No. of Maths Teachers	Students' Population
1.	Umar Gali High S.S. Shomolu	2	50
2.	Gali Sec. S.S. Agwata	2	43
3.	Gali High S.S. Ujo	1	207
4.	Community Sec. S.S. Achin	2	130
5.	Agwata High S.S. Agwata	1	152
6.	Ujo Boy's Sec. S.S. Ujo	2	230
7.	Government Tech. College, Umacha	2	30
8.	Community Sec. School, Enafie	1	1020
9.	Peace Sec. School, Umacha	1	54
10.	Community Sec. School, Umacha	2	138
11.	St. Peter's Sec. School, Achin	-	480
12.	Community Sec. S.S. Mpelegwa	1	212
13.	Community Sec. S.S. Olat	1	228
14.	Community Sec. S.S. Agwata/achin	2	260
15.	Community Sec. S.S. Aljo	1	165
16.	Christ Redeemer College, Anani	1	258
17.	Community Sec. S.S. Ighwato	1	166
18.	Umacha High School, Umacha	1	43
19.	Community Sec. School, Ujo	1	235
20.	Enafie High School, Enafie	2	296
21.	Community Sec. School, Enafie	-	20
	Total	27	6,383

Source: Statistics Department, Aguata Zone, 2015.

Table 2: Number of Mathematics Teachers in Orumba North and Students' Population

S/No	Name of School	No. of Maths Teachers	Students' Population
1.	Community High Sch., Nanka	1	550
2.	Community Sec. School, Oko	1	1010
3.	Community Sec. Sch. Nanka	1	155
4.	Community Sec. Sch. Ndiike	1	145
5.	Community Sec. Sch. Ndiowu	1	296
6.	Community Sec. Sch. Enugu-Abor Ufuma	1	342
7.	Community Sec. Sch. Awgbu	1	300
8.	Awgbu Grammar Sch. Awgbu	-	130
9.	Community High Sch. Awgbu	-	93
10.	Com Sec. Sch. Ufuma	-	103
11.	Community Sec. Sch. Ajalli	1	258
12.	Community Sec. Sch Omogho	-	141
13.	Community Sec. Sch., Awa	1	142
Total		9	3,692

Source: Statistics Department, Aguata Zone, 2015.

Table 3: Number of Mathematics Teachers in Orumba South and Students' Population

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Method of Data Analysis

Descriptive statistics of percentages was used to present the response status of the challenges using frequency table. Chi-square test statistic was employed in this analysis to test the null hypotheses of independence of the challenges on the Local Government to which the teacher belongs at 5% level.

Hypotheses of Interest were formulated from the six challenges of Mathematics teaching as given below:

Ho 1: Excess workload is independent of the local government to which the teacher belongs.

Ho 2: Lack of Mathematics allowance/incentive is independent of the local government area.

Ho 3: New curriculum material problem is independent of Local government area.

Ho 4: Lack of textbooks is independent of Local government area

Ho 5: Lack of students' interest is independent of Local government area

Ho 6: Miracle centre/special centre is independent of Local government area

Data Presentation

Table 4: Shows Response Status of challenges facing Teaching of Mathematics According to LGAs

Challenges/Factors	Aguata		Orumba North		Orumba South	
	Yes	No	Yes	No	Yes	No
Excess workload	10(37%)	17(63%)	7(78%)	2(22%)	6(60%)	4(40%)
Nonpayment of Maths allowance incentives	27(100%)	0(0%)	9(100%)	0(0%)	10(100%)	0(0%)
New curriculum materials	18(67%)	9(33%)	6(67%)	3(33%)	5(50%)	5(50%)
Lack of textbooks	13(48%)	14(52%)	7(78%)	2(22%)	5(50%)	5(50%)
Lack of students interest	15(56%)	12(44%)	5(56%)	4(44%)	7(70%)	3(30%)
Special/Miracle centre	16(59%)	11(41%)	4(44%)	5(56%)	6(60%)	4(40%)

Interpretation of Result in tables 1 – 4.

Table 1 indicated that some schools with large population of students have only one or no mathematics teacher all. Such schools like Community Secondary School Isuofia with 1,020 students; Pioneer Secondary School Umuchu (561); whereas St.

Peters' Secondary School, Achina (480) and Community Secondary School, Ezinifite (209) have no mathematics teachers at all. Also, some of the less populated schools were observed to have up to two mathematics teachers; like Community Secondary School, Achina with population of 135 students and Community Secondary School, Umuchu (138).

Table 2 showed that schools with large population and small population respectively have only one mathematics teacher. Schools such as Community Secondary School, Nanka (550); Community Secondary, Oko (1010) and CSS Enugu-Abor Ufuma (342). Four schools in table 2 have no mathematics teachers at all.

Table 3 revealed that 8 out of 10 schools in Orumba South have only one mathematics teacher each irrespective of the population while 4 schools have no teacher at all.

Table 4 revealed the percentage of response status of the teachers to each challenge or factor, Local Government by Local Government. For excess workload, 37% indicated Yes while 63% said No in Aguata LGA, 78% of teachers in Orumba North indicated Yes while 22% indicated No and 60% indicated Yes while 40% indicated No. All the teachers in each of the Local Government Areas responded 100% to non-payment of mathematics allowance/incentive. This implied that no allowances or incentives were being paid to them as mathematics teachers.

Data Analysis

Chi-square (χ^2) test of independence of Excess Workload on LGA.

Table 5: Shows Response Status on Excess Workload

Workload LGA	Yes	No	Total
Aguata	10(12.9)	17(14.1)	27
Orumba North	7 (4.3)	2 (4.7)	9
Orumba South	5 (4.5)	5 (5.2)	10
Total	22	24	46

Note: Expected frequencies for each response status is given in the bracket

$$\chi^2_{cal} = \sum_{i=1}^r \sum_{j=1}^c (o_{ij} - e_{ij})^2 / e_{ij}$$

$$\chi^2_{cal} = 3.56$$

$$\chi^2_{(1, 0.05)} = 5.99$$

Decision: Since $\chi^2_{cal} = 3.56 < \chi^2_{(2, 0.05)} = 5.99$, we accept the null hypothesis H_{01} and conclude that excess workload is independent of the LGA to which the teacher belongs.

H₀ 2: Non-payment of mathematics allowance/incentive is independent of LGA

Table 6: Response Status on Non-payment of Maths Allowance/Incentive

Workload LGA	Yes	No	Total
Aguata	20 (21.8)	7 (5.3)	27
Orumbu North	8 (7.2)	1 (1.8)	9
Orumbu South	9 (8.04)	1 (1.95)	10
Total	22	24	46

$$\chi^2_{cal} = 1.72, \chi^2_{(2, 0.05)} = 5.99$$

Decision: Since $\chi^2_{cal} = 1.72 < \chi^2_{(2, 0.05)} = 5.99$, we accept Ho₂ and conclude that nonpayment of mathematics allowance/incentive is independent of the LGA to which the teacher belongs.

Ho 3: Insufficient New Curriculum Materials Problem is independent of LGA

Table 7: Response status on New Curriculum Materials

New Curriculum LGA	Yes	No	Total
Aguata	18 (17.02)	9 (9.98)	27
Orumbu North	6 (5.7)	3 (3.3)	9
Orumbu South	5 (6.3)	5 (3.7)	10
Total	22	24	46

$$\chi^2_{cal} = 0.921, \chi^2_{(2, 0.05)} = 5.99$$

Decision: Since $\chi^2_{cal} = 0.921 < \chi^2_{(2, 0.05)} = 5.99$, we accept the null hypothesis Ho₃ and conclude that insufficient new curriculum material problem is independent of LGA to which the teacher belongs.

Ho 4: Lack of textbooks to meet the new curriculum is independent of the LGA.

Table 8: Response Status on Lack of Textbooks

Lack of Textbook LGA	Yes	No	Total
Aguata	16 (15.3)	11 (11.7)	27
Orumbu North	4 (5.1)	5 (3.9)	9
Orumbu South	6 (5.7)	4 (4.3)	10
Total	22	24	46

$$\chi^2_{cal} = 0.63$$

$$\chi^2_{(2, 0.05)} = 5.99$$

Decision: Since $\chi^2_{cal} = 0.63 < \chi^2_{(2, 0.05)} = 5.99$, we accept Ho₄ and conclude that lack of textbooks to meet the new curriculum is independent of LGA to which the teacher belongs.

Ho5: Lack of students' interest/concentration in Mathematics is independent of the LGA

Table 9: Response Status of Lack of Students' Interest

Lack of Students' Interest LGA	Response		Total
	Yes	No	
Agata	15 (15.0)	12 (12.0)	27
Orumba North	5 (5.0)	4 (4.0)	9
Orumba South	7 (7.0)	3 (3.0)	10
Total	27	19	46

$$\chi^2_{cal} = 1.576, \chi^2_{(2, 0.05)} = 5.99$$

Decision: Since $\chi^2_{cal} = 1.576 < \chi^2_{(2, 0.05)} = 5.99$, we accept Ho₅ and conclude that lack of students interest in mathematics is independent of LGA to which the student belongs.

Ho 6: Special centre issue is independent of the LGA

Table 10: Response Status on the Issue of Special Centre

Special Centre LGA	Response		Total
	Yes	No	
Agata	13 (14.7)	14 (12.3)	27
Orumba North	7 (4.9)	2 (4.1)	9
Orumba South	5 (5.4)	5 (4.6)	10
Total	25	19	44

$$\chi^2_{cal} = 2.473, \chi^2_{(2, 0.05)} = 5.99$$

Decision: Since $\chi^2_{cal} = 2.473 < \chi^2_{(2, 0.05)} = 5.99$, we accept Ho₆ and conclude that the problem of special centre is independent of LGA to which the student belongs.

Discussion of Findings

The result of the test of null Hypothesis H₀₁ using χ^2 test of independence showed that Ho₁ was accepted. This implies that excess workload problem cut across all the schools in the LGA. This showed that the problem of excess workload still persists. This was in line with the findings of Alio & Nnamani (2015), Ibebuike (2006) and Adetunji (2012).

Acceptance of Ho₂, that non-payment of Mathematics allowance constitutes a challenge to all the mathematics teachers in the LGA to which they belong. This supported the findings of Kurumeh & Dogo (2015), Ojimba (2012), Alio & Okafor (2015) that motivation is necessary for every mathematics teacher if achievement in mathematics and science is to be realized. Also the acceptance of the Ho₂ was in

support of the finding of Peter (2013). This implies that the problem has not been addressed.

The finding from the test of hypothesis H_{03} on the problem of insufficient new curriculum materials indicated that H_{03} was accepted. The implication was that the problem is experienced by the mathematics teacher across the local government area supporting what Alio & Nnamani (2015). That is, government contributed to the mathematics low performance by the secondary school students through inadequate supply of textbooks and other materials.

Acceptance of hypotheses H_{04} , H_{05} and H_{06} respectively indicated that the challenges posed by lack of textbooks to meet the new curriculum, lack of students' interest and issue of special centers cut across all the Local Government Areas that are in the Zone. The implication of the analysis was that all the challenges identified had not gotten adequate attention, if at all, from the appropriate body.

Conclusion

The result of this study had revealed the persistence occurrence of the challenges faced by mathematics teachers. The workloads of the mathematics teachers need to be reduced to give room for effective teaching and learning. The mathematics teachers need to be encouraged by payment of special allowances, sponsoring them to workshops, seminars and conferences. These would make them to put in their very best thereby changing their attitudes to teaching as well as student's attitude to learning mathematics.

Recommendations

Based on the findings of the study, the following suggestions were made:

1. Government should recruit qualified mathematics teachers and post them to the schools that lack teachers, especially to those schools without any mathematics teachers at all. The posting should be done according to the numerical strength of each school to reduce excess work load of teachers, thereby giving room for adequate content coverage.
2. Government and cooperate organizations should also encourage and sponsor teacher education by offering scholarship, sponsoring the teachers to conferences, seminar and re-introducing mathematics allowances. This would motivate the mathematics teachers; thereby enabling them to motivate students to learn mathematics.
3. Appropriate and adequate textbooks should be supplied to all schools to meet the new curriculum by the Ministry of Education/appropriate body.
4. The issue of miracle centers should be taken seriously by setting up monitoring team, otherwise the centers should be closed down.

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