

Challenges of teaching mathematics in selected senior secondary schools in Kenema city, Eastern Sierra Leone

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Abstract

This study investigated the challenges of teaching mathematics in senior secondary schools in Kenema city, the Eastern region of Sierra Leone. The study made use of the survey design. The population comprised all Mathematics teachers and year four pupils in the senior secondary schools in Kenema city during the 2014/2015 academic year and a sample 165 respondents from five selected senior secondary schools made up the sample. Simple random sampling technique was used to select the five senior secondary schools. Stratified sampling was used to ensure that students from various forms and streams were equally represented in the sample. Semi structured questionnaires were developed for both teachers and pupils. The study revealed that many senior secondary schools in Kenema city needed more trained and qualified mathematics teachers than what was available. It was also found out that the necessary support to schools in terms of teaching and learning materials, incentives to mathematics teachers were grossly inadequate. Moreover, many pupils in the senior secondary schools seemed disinterested in mathematics. Some mathematics teachers had the habit of missing their teaching periods and most of those who missed their classes never compensated for the loss. Child Centered Teaching Techniques were seldom used by the mathematics teachers which might have resulted in the students' low participation during mathematics lessons. In this digital age, none of the mathematics teachers used ICT affordable to enhance learning in the sampled senior secondary schools. Furthermore many of the senior secondary schools were located in residential areas and the classrooms were generally over crowded. In order to overcome these challenges, senior secondary school authorities, NGOs, as well as government should provide teaching and learning materials, incentives and training opportunities for mathematics teachers. Mathematics teachers should encourage pupils to be more interested and committed to the learning of Mathematics.

Key-words: mathematics, performance, teaching, learning

1. Introduction

1.1 Background to the Study

Secondary school education is planned for human development. It is a preparatory ground for grooming career abilities, discovering and energizing talents of learners. Also, it is at this level that the learner is expected to build solid foundation in formal education.

Pupils need Mathematics every day for their development and advancement; hence they should see Mathematics as essential to their success or effectiveness in many other subjects. In view of the importance of Mathematics in all aspects of development and advancement, and because it is related to other subjects and disciplines, teachers should make concerted efforts to motivate pupils' interest in the subject¹.

Despite the importance of Mathematics and its place in the senior secondary school curriculum, the subject is becoming unpopular in the Sierra Leonean senior secondary schools. The performance of pupils in this all important subject at the West African Senior Secondary Certificate Examination (WASSCE) in Sierra Leone has been very poor over the past three decades. Pupil's perpetual poor performances have inhibited many of them from enrolling into science and its allied courses in the tertiary institutions. One would wonder what could be responsible for such abysmal performances. Effective Mathematics learning in senior secondary schools

could be enhanced by good quality Mathematics teaching since no educational system can rise above the quality of its teachers.

1.2 Statement of the Problem

There is lack of adequate information on the capacity of senior secondary school mathematics teachers in terms of subject matter knowledge and pedagogical content knowledge, their effective commitment to the teaching of the subject, the mathematics learning environment, teaching and learning materials and equipment, and the lack of opportunity for students to rate their mathematics teachers. It is against this background of lack of these identified challenges that this study has been tailored to respond to the following research questions.

1.3 Research Questions

1. What is the level and type of training received by Mathematics teachers?
2. What is the content and methodological capacity of Mathematics teachers?
3. What is the physical and psychological environment in which Mathematics is being taught?
4. What is the level of commitment among Mathematics teachers?

5. What is the type and degree of availability of teaching and learning materials and equipment for the teaching of Mathematics?
6. What are the types and sources of support given to Mathematics teachers?
7. Which teaching methods are used by Mathematics teachers?
8. What are the ratings of Mathematics teachers?
9. Are there imbalances between the need and availability of trained and qualified Mathematics teachers?

1.4 Significance of the Study

The usefulness of this study cannot be over emphasized as it does not only investigate the challenges of teaching mathematics but brings out solutions and plausible recommendations that will help improve the teaching of Mathematics in Sierra Leonean senior secondary schools. It is expected that Mathematics teachers can reflect on the findings of this study to know the qualities required of them as Mathematics teachers and to know their pupils impressions about their methods of teaching. These will provide a kind of mirror for the teachers and thereby facilitate a positive improvement in their methods and approach to the teaching of Mathematics.

The findings of this study would also provide relevant information to senior secondary school authorities about the problems affecting the teaching of Mathematics at classroom and general school level. These pointers would help education and school administrative authorities to improve on their monitoring and supervision of the teaching of Mathematics. The result might be an improvement in the teaching and achievement in Mathematics at the senior secondary school level, where much of the foundation is laid for tertiary level, education not only in mathematics but related disciplines as well.

The learners for whom the curriculum is being implemented may be the most important beneficiary of this study. If the challenges are identified and addressed the positive effect would be on the effective teaching and learning of Mathematics. The learners would therefore gain from high quality teaching of Mathematics, appreciable learning environment, better achievement or performance in Mathematics and the job market as a whole.

1.5 Delimitation of the Study

The study considered only the following senior secondary schools in Kenema city.

- Holy Rosary Senior Secondary School (HRSSS),
- Government Senior Secondary School (GSSS),
- Holy Trinity Senior Secondary School (HTSSS),
- Ansarul Islamic Senior Secondary School (AISSS),
- Methodist Senior Secondary School (MSSS)

Kenema city is both the district headquarter town of Kenema district and the provincial headquarter of the Eastern province of Sierra Leone. Kenema city was selected because it is in this town that we have high concentration of senior secondary schools in Kenema district.

2. Research Methodology

2.1 Research Design

The study is a survey design.

2.2 Population and Sample

The population comprised all Mathematics teachers and year four students in the senior secondary schools in Kenema city during the 2015/2016 academic year.

The sample comprised 165 respondents in all, out of which 15 were mathematics teachers (3 from each selected senior secondary school) and 150 SSS4 students (30 from each selected senior secondary school).

2.3 Instrumentation

Semi structured questionnaires were developed and administered to the selected senior secondary school Mathematics teachers and the 2015/2016 academic year SSS4 students.

2.4 Sampling Techniques

Simple random sampling technique was used to select the senior secondary schools and mathematics teachers. Also, proportionate stratified random sampling techniques were used to select the respondents (SSS4) from science, commercial and arts streams.

2.5 Data collection Methods

Two data collectors were recruited and trained on how to administer the questionnaires. The questionnaires were pre-tested to gauge their feasibilities. Based on the results of the pre-test, the questionnaires were re-adjusted for final administration. Questionnaires were distributed to the selected respondents (Mathematics teachers and SSS4 students) for completion in meetings summoned by data collectors in each selected senior secondary school. Completed questionnaires were collected and returned to the researcher for analysis.

2.6 Methods of data analysis

The statistical package SPSS was used to analyse the data. Descriptive analysis (percentages) was carried out on the data that were collected.

3. Results and Discussion

3.1 Research Question 1: What is the level and type of training received by Mathematics teachers?

Table 1: Level and type of training received by Mathematics teachers.

School	Specialized in Mathematics	Specialized in areas other than Mathematics	M Sc Ed/ M Ed	B Sc Ed	B Sc	B Ed	Diploma	HTC
HRSSS	2	1	0	0	1	0	0	2
GSSS	2	1	0	1	0	1	0	1
HTSSS	2	1	0	1	0	1	1	0
AISSS	0	3	1	0	2	0	0	0
MSSSS	2	1	0	0	0	3	0	0
Total	8 (53.3)	7 (46.7)	1(6.7)	2(13.3)	3(20.0)	5(33.3)	1(6.7)	3(20.0)

3.2 Research Question 2: What is the content and methodological capacity of Mathematics teachers?

Data presented in table 2 and figures 1 and 2 are used to answer research question 2.

Table 2: Teaching experience of mathematics teachers.

School	Number of teachers sampled	Teaching Experience (years)				
		<1	1-3	4-6	7-9	≥10
HRSSS	3	1	0	2	0	0
GSSS	3	1	0	1	0	1
HTSSS	3	0	0	0	0	3
AISSS	3	0	2	1	0	0
MSSSS	3	0	2	0	0	1
Total	15	2(13.3)	4(26.7)	4(26.7)	0(0.0)	5(33.3)

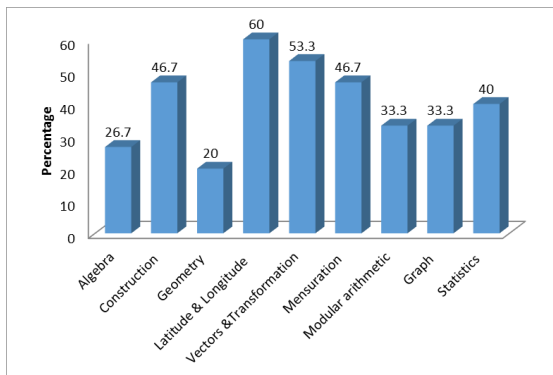


Fig 1: Topics Mathematics teachers find difficult to teach at the senior secondary level.

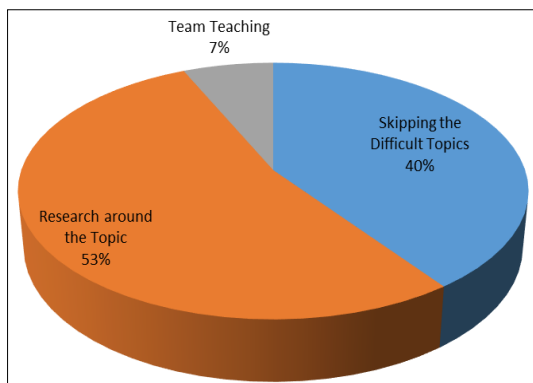


Fig 2: Methods used to overcome the difficulty of teaching certain topics in mathematics.

3.3 Research Question 3: What is the physical and psychological environment in which Mathematics is being taught? Data presented in figures 3, 4 and 5 are used to answer research question 3.

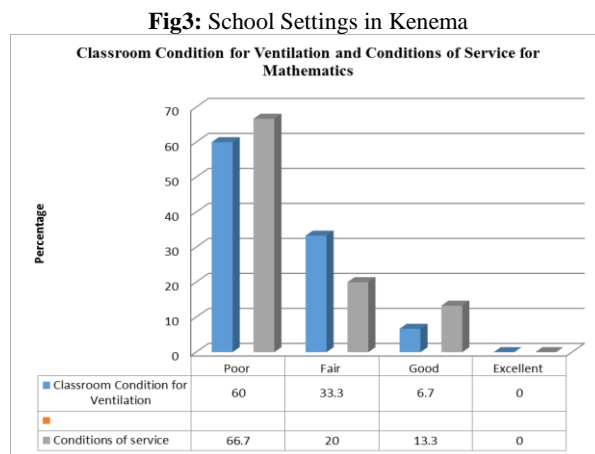
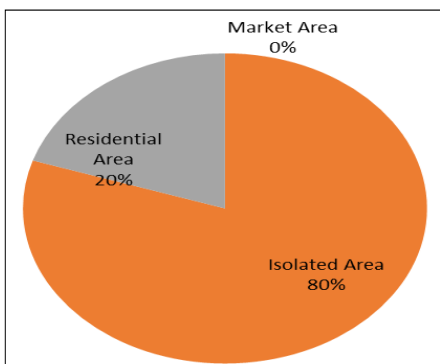


Fig 3: School Settings in Kenema

Fig 4: Classroom Condition for Ventilation and Conditions of Service for Mathematics Teachers

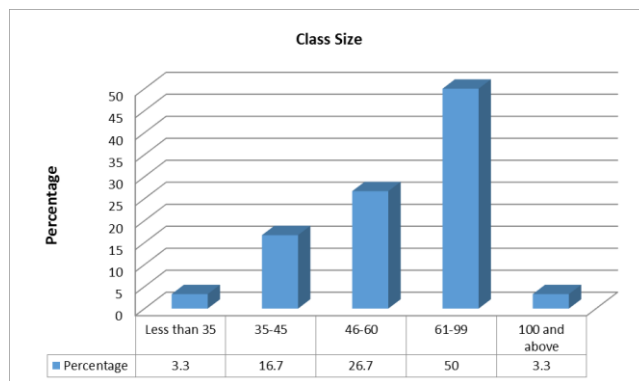


Fig 5: Average Class Size

3.4 Research Question 4: What is the level of commitment among Mathematics teachers?

Data presented in figures 6, 7, 8 and 9 are used to answer research question 4.

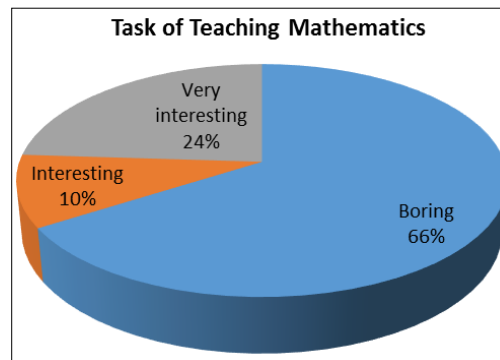


Fig 6: Task of Teaching Mathematics

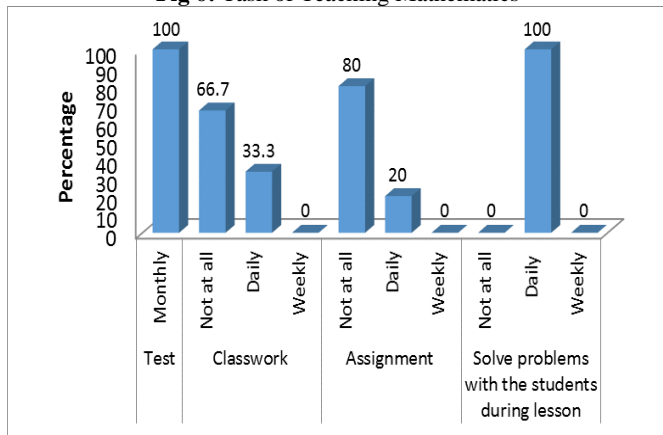


Fig 7: Frequency of giving Test/ Class work/ Assignments/Only solve problems with the students during lesson to students in the 2014/2015 academic year.

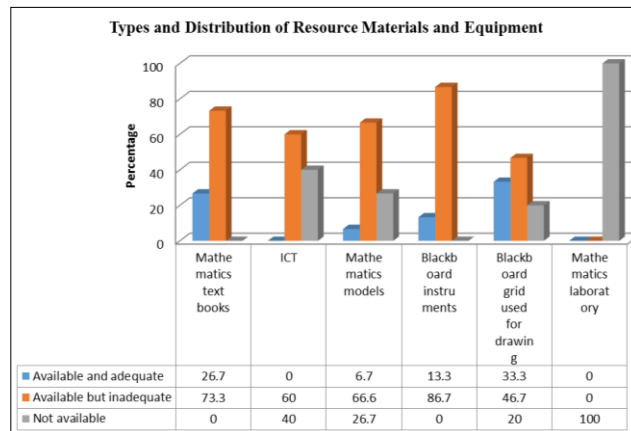


Fig 10: Types and Distribution of Resource, Materials and Equipment in Senior Secondary schools

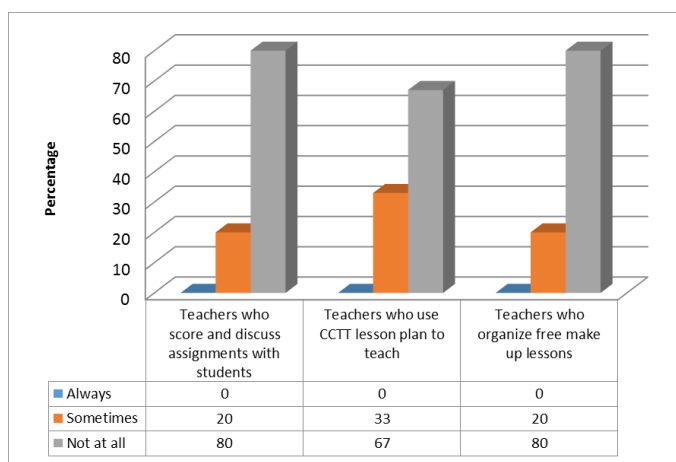


Fig 8: Mathematics Teachers who mark, Grade, discuss Class work/Assignment, use CCTT Lesson Plan and Organize free make up lessons

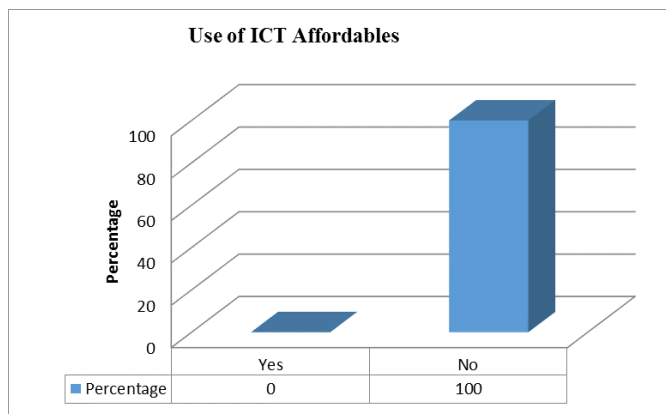


Fig 11: Use of ICT Affordable by Mathematics Teachers

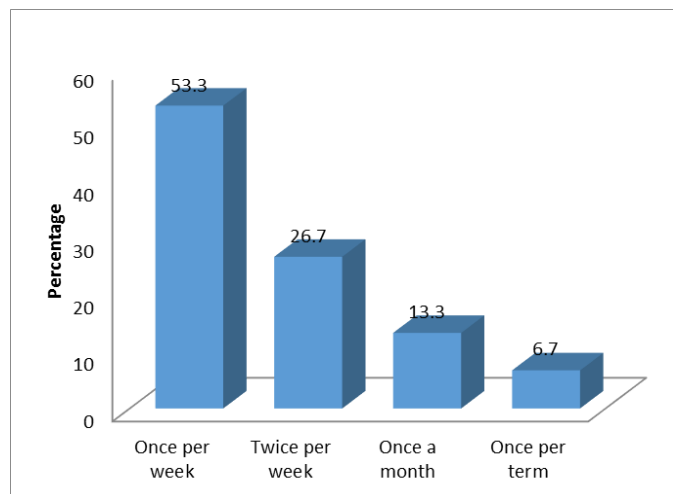


Fig 9: Mathematics teachers' habit of missing classes

Research Question 5: What are the degrees of availabilities of Teaching and Learning Materials and Equipment?
Data presented in Figures 10 and 11 are used to answer research question 5.

Research Question 6: What types of supports are given to Mathematics teachers?

Data presented in figure 12 is used to answer research question 6.

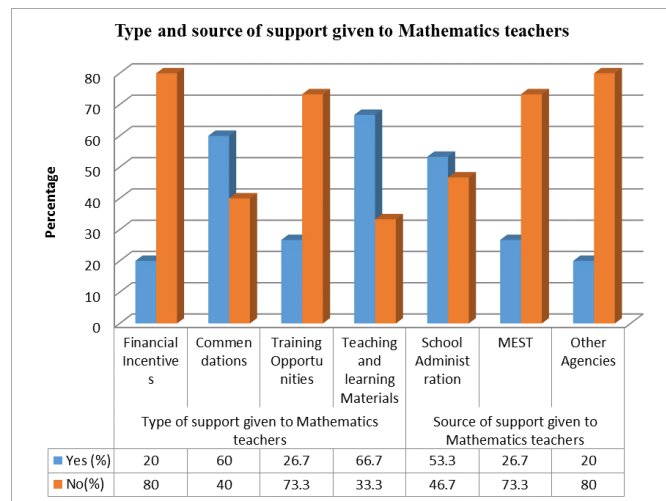


Fig 12: Type and Source of support given to Mathematics teachers

Research Question 7: Which Teaching Methods are used by Mathematics Teachers?

Data presented in figures 13 and 14 are used to answer research question 7.

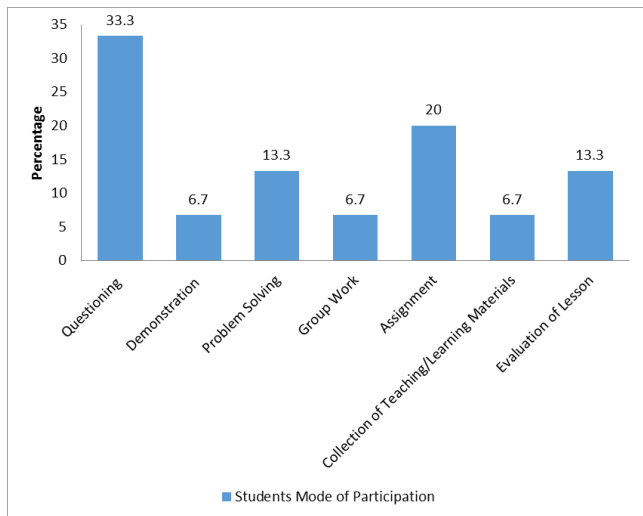


Fig 13: Students Mode of Participation in Mathematics Lessons

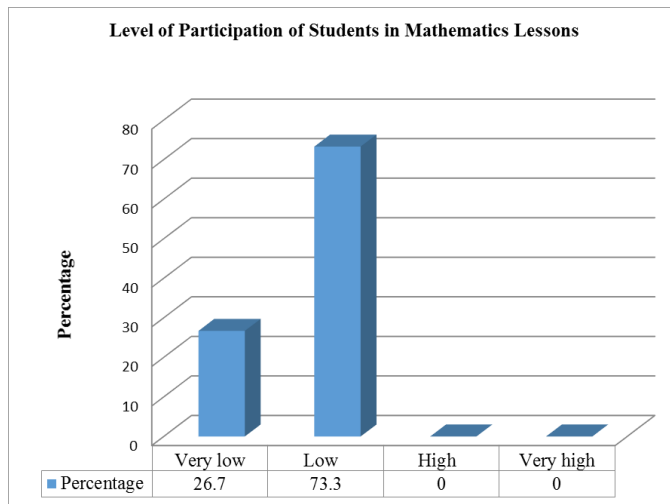


Fig 14: Level of Participation of Students in Mathematics Lessons

Research Question 8: What are the ratings of Mathematics teachers?
 Data presented in figures 15 is used to answer research question 8.

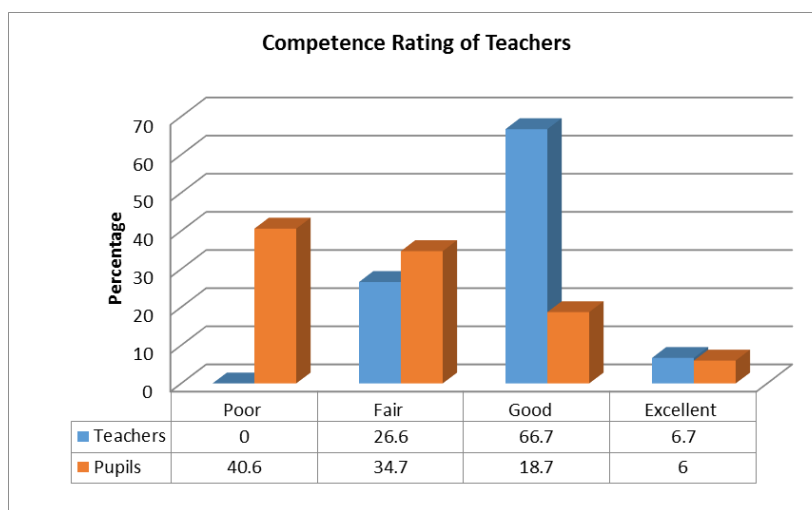


Fig 15: Competence Rating of Mathematics Teachers

Research Question 9: Is there any Significant Imbalance between the Need and Availability of Trained and Qualified Mathematics Teachers?
 Data presented in table 3 is used to answer research question 9.

Table 3: The Need and availability of Trained and Qualified Teachers

School	The Need and availability of Trained and Qualified Mathematics Teachers		
	Number of current Mathematics Teachers	Number of Currently Trained and Qualified Mathematics Teachers Available	Number of trained and Qualified Mathematics Teachers needed
HRSS	4	2	5
GSSS	5	3	6
HTSS	4	3	5
AISS	5	2	5
MSSS	5	2	6
Total	23	12	27

4. Discussion

The researchers found out that some of the Mathematics teachers in the senior secondary schools in Kenema city have the professional training and qualification to teach. However, among the professionally trained and qualified teachers, there were several teachers teaching Mathematics who specialized in science related courses other than mathematics.

Some mathematics teachers in the sampled schools had long years of teaching experience but a substantial percentage were yet to get on the job experience because they had taught mathematics for less than five years. Although some of the teachers admitted facing difficulties in teaching certain topics, a range of topics they had difficulty in teaching was identified from the school syllabus. Also, while a greater percentage of

mathematics teachers used acceptable strategies to overcome their challenges, 40.0 percent admitted skipping the topics they considered difficult to teach which has the potential to create gaps in the mathematics learning process.

Majority (80.0%) of the sampled senior secondary schools in Kenema city were found to be located in residential areas. Noise interferes with learning may be crucial and gender specific (girls being more affected than boys); this has a negative effect on pupils^{2a}. The average class size in most of the senior secondary schools was too large. Increased density leads to increased aggression that can be counteracted by pedagogy, layout and programs. Students need a degree of privacy and ownership to feel a sense of belonging^{2b}. Ventilation in the classrooms was largely poor (60.0%). Ventilation and air flow is an occupational health and safety issue because children require more air in proportion to their body weight than adults. Studies indicate that ventilation is often inadequate in schools. Ventilation removes or prevents the build-up of carbon dioxide, poor air flow which apparently leads to poor performance of tasks (21st Century School Fund (ibid p2). All these can affect the effective teaching and learning of mathematics.

Teacher motivation is a very crucial factor in the teaching and learning process. In most developing countries studies have revealed that poor emoluments and lack of encouragement of teachers greatly affect their general performances. The conditions of service for most mathematics teachers were unsatisfactory which apparently influence their psychological teaching environments.

The study also revealed that majority of the mathematics teachers found the task of teaching mathematics boring. In addition, very few of the teachers gave class work or assignments to their pupils. Those who gave assignments did not provide timely feedback to their pupils. A culmination of these will have a negative effect on both teaching and learning of mathematics in senior secondary schools.

Furthermore, only 33 percent of the teachers prepared Child Centered Teaching Techniques (CCTT) lesson notes before the delivery of their lessons, another indicator of poor commitment of the mathematics teachers to the teaching of mathematics in the sampled schools.

Teaching/learning materials like geometrical models, blackboard grids, blackboard instruments and internet facilities were not available in most of the schools. For the few schools that had some of these facilities, their quantities and qualities were grossly inadequate.

Furthermore, although we are in the digital age, none of the mathematics teachers admitted using ICT affordable to enhance learning in the sampled senior secondary schools, a further evidence of poor teaching methods and delivery incapability.

Although mathematics teachers admitted receiving kind of support for the teaching of mathematics they lamented that these emoluments and support were not significant enough. According to them, these supports came in the form of text books and commendations, which came from school authorities, NGOs, and the Ministry of education Science and Technology (MEST).

The mathematics teachers' ratings of themselves seem quite encouraging. However, the pupils' rating of their mathematics teachers was comparatively lower. These ratings by both parties are evidenced in the pupil's poor performances in the

past the West African Senior Secondary Certificate Examination (WASSCE).

Another reason for the poor of pupil performances identified was the inappropriate teaching methods used by the mathematics teachers. Findings revealed that the mathematics teachers did not consistently employ the different modes of participation (problem solving, assignment, questioning, etc.) during their lesson delivery which further contributed to poor pupil participation during the lessons, and apparently, their poor performances.

Several mathematics teachers missed some of their mathematics classes at least once per week. Those mathematics teachers affected unfortunately reported that they did not organize free make up lesson for their pupils. Thus gaps created by such teacher absenteeism greatly contributed to pupils' poor performances as well.

The findings also revealed that the need for trained and qualified mathematics teachers was greater than what was available in the senior secondary schools. Out of the 23 mathematics teachers in the sampled senior secondary schools only twelve were trained and qualified mathematics teachers. The study revealed that twenty seven trained and qualified mathematics teachers were needed. The available number of trained and qualified mathematics teachers was inadequate in each sampled senior secondary school. Most schools had resorted to the use of other subject specialists to teach mathematics in the senior secondary schools in order to fill the existing gaps.

Because of the employment of unqualified teachers to teach mathematics, several challenging topics were skipped. Also the lack of understanding of the mathematics methodology posed serious challenges to the largely unqualified teachers who taught mathematics. Teaching tasks were therefore uninteresting and unaccomplished.

5. Conclusions

From the study the following conclusions have been drawn:-

- The lack of adequate professionally trained and experienced mathematics teachers greatly affected their teaching capabilities and, concomitantly, the performances of the pupils.
- The largely overcrowded classrooms did not create any ideal teaching and learning environments, thus further aggravating the poor performances of the pupils
- Teacher emoluments were grossly inadequate. Mathematics teacher's dissatisfaction about their conditions of service did not provide the required motivation to teach. Thus absenteeism was common. This further greatly affected the pupils and apparently their poor performances.
- The lack of commitment of some mathematics teachers as a result of their incapability greatly affected their abilities to teach which further greatly affected the pupils' performances.
- The non-availability and inadequacy of much needed resource materials and equipment greatly affected lesson deliveries, hence pupils' performances.
- The lack of adequate support for mathematics teachers greatly undermined their capabilities to teach which also greatly affected the performances of pupils.
- Most Mathematics teachers still use teacher centered teaching techniques instead the MEST recommended child

centered teaching techniques (CCTT).

- Most Mathematics teachers do not compensate for missed lessons through free make-up lessons thus pupils miss out on vital topics which further greatly affects their performances.
- There are existing imbalances between the needs and availabilities of trained and qualified Mathematics teachers in most of the sampled senior secondary schools. This further puts pressure on the few mathematics teachers available. In many cases teaching periods are unsustainable which further greatly affects the performances of pupils.

6. Recommendations

From the study the following recommendations have been made:-

- MEST and donor agencies should increase training opportunities for Mathematics teachers wishing to pursue higher qualifications in mathematics education.
- Regular in-service training should be provided for mathematics teachers on both content and methodology.
- Government and school authorities and donor agencies should take proactive measures such as the construction of more school buildings and the employment of more Mathematics teachers. This will minimize overburden of mathematics teachers on one hand and reduce overcrowding of classroom on the other.
- Government, NGOs and donor agencies should provide incentives and other forms of support exclusively for Mathematics teachers. This will motivate the mathematics teachers and hence increase their commitment to the task of teaching Mathematics.
- Government, NGOs and donor agencies should provide adequate resource materials and equipment to senior secondary schools in order to improve the teaching and learning of Mathematics.
- Teachers must organize free make up lesson for each class that they fail to teach.
- Mathematics teachers should be trained on how to infuse ICT into the teaching of mathematics and the regular and consistent use of ICT affordable/tools.
- The Ministry of Education, Science and Technology (MEST), local councils and senior secondary school authorities should intensify the supervision of mathematics teachers in order to make sure that they prepare their lesson notes regularly and should not allow them teach without it. The authorities should also ensure that they minimize mathematics teachers' habit of missing classes and compensate for classes missed to ensure their effectiveness.
- Mathematics teachers must put emphasis on the learning outcomes of each topic, including the relevance, usefulness and importance of mathematics to the pupils during their mathematics lessons.

7. References

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