UNIVERSITY OF CAPE COAST

# PERCEPTIONS OF ISSUES AND CHALLENGES CONTRIBUTING TO PUPILS' POOR PERFORMANCE IN MATHEMATICS IN SOME RURAL SCHOOLS IN THE NEW JUABEN MUNICIPALITY: THE PERCEPTIONS OF STAKEHOLDERS IN EDUCATION

OPOKU BAWUAH

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BY

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Thesis submitted to the Department of Basic Education of the Faculty of Education, University of Cape Coast, in partial fulfilment of the requirement for award of Master of Philosophy Degree in Basic Education

AUGUST 2013

## DECLARATION

### Candidate's Declaration

*I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.*

Candidate's Signature: ..... Date:.....

Name: Opoku Bawuah

### Supervisors' Declaration

*We hereby declare that the preparation and presentation of this thesis was supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.*

Principal Supervisor's Signature: ..... Date:.....

Name: Dr. J. A. Fletcher

Co-supervisor's Signature:..... Date:.....

Name: Dr. C. B. Duedu

## ABSTRACT

The main purpose of this study was to investigate the key issues and challenges perceived by Pupils, Mathematics teachers, Headteachers and Circuit supervisors as contributing to pupils' poor performance in mathematics in some rural schools in the New Juaben Municipality. It was to find out how stakeholders of mathematics education perceive teachers' support for the learning of mathematics. Also, the study sought to find out the perceptions of stakeholders about schools' support and motivation for the learning of mathematics. Finally, the study sought to determine whether rural mathematics teachers and pupils' perceptions toward mathematics contribute significantly to pupils' achievement in the subject.

The study used simple random, the stratified and the purposive sampling techniques. The simple random sampling was used to select 300 pupils and the stratified technique was used to put the classes into various strata, thus JHS 1, JHS 2 and JHS 3, while the purposive was used to select the 30 other respondents for the study. The instruments used to collect data for the this study were three sets of perceptions questionnaires and one interview guide. The data gathered were analysed statistically using means, frequencies and percentages. The study among other things found that the support pupils get from teachers, headteachers, and the school in general with respect to teaching and learning is inadequate. It was recommended that stakeholders in education should provide opportunities that would encourage pupils to attend school regularly and study mathematics with interest.

## ACKNOWLEDGEMENTS

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Finally, I am also grateful to my four children: Benedicta, Bright, Kenneth, and Bismark Opoku Bawah for their support and prayers. To them all, I say, thank you.

## DEDICATION

To my wife, Mrs. Gladys Opoku Bawuah.

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# CHAPTER ONE

# INTRODUCTION

## Background to the Study

One of the progressive educational programmes that has been adopted and is being pursued in the country in recent times is "functional numeracy", that is, the ability to count and use number effectively (Ministry of Education [MOE], 2002). All areas of life is based on effective knowledge of mathematics and science. Without knowledge of mathematics and science there will be no development in life. So any country which is concerned about her development puts a great deal of emphasis on the study of mathematics (Forman, 2003).

Mathematics is said to be the driving force towards technological advancement. Its usage permeates almost every field of study including physics, chemistry, geology, engineering and medicine (Roman, 2004). It is accepted universally that a strong foundation in mathematics is a pre-requisite for many careers and professions in today's rapidly growing technological society (Kakutani, 2011). The implication it claims for any country, especially a developing country like Ghana, is that progress in industrial and technological development calls for a work force that is well-grounded in mathematics.

Perhaps, mathematics is one subject that has received the greatest attention in the curriculum in our schools. All over the world, mathematics educators and

mathematicians are showing more concern about the teaching and learning of mathematics in both basic and secondary schools because mathematics is a compulsory subject of study to all students in many countries, from primary to secondary level (Lawson, 2003).

In many countries including Ghana, mathematics has the greatest number of hours per week for instruction (Curriculum Research and Development Division [CRDD], 2007). This is so because sufficient knowledge in mathematics equips the students to fit well into various scientific and technological fields in this modern world. Mathematics is regarded as the foundation and tool for the basic sciences, and in most cases, appropriate yardstick for measuring the performance of students.

Day-in and day-out, in many human endeavours, new areas where mathematics can be profitably employed are being found. It has proved indispensable for the understanding and for the technological control of the physical world and also of the social structure. In fact, mathematics is one single subject whose indispensable concepts and skills, relationships and applications permeate every study: Science, technology, commerce, economics, geography and several other fields of human endeavour. This has brought more sharply into focus, the arduous task of those whose responsibilities it is to teach mathematics. Mathematics teachers are called upon to use innovative teaching methods capable of developing mathematical understanding, inquiry, problem solving skills and interest in children (Passos, 2007).

Most changes in the structure and content of school mathematics curricula came as a result of the changing needs of citizens for effective participation in the increasing technological world and the increased volume of research knowledge about teaching and learning (Clark, 2009). In Ghana, the 2002 educational reform was based on the need for an educational system that would serve the needs of the individual, the society, and the country as a whole (MOE, 2002). To meet the needs of the individual in the changing scientific world, mathematics should not be treated as a fixed collection of facts and procedures (Anderson, 2007). Instead, it should be treated as a dynamic body of knowledge that is continually enriched through exploration, analysis, generalizing and conjecturing (Forman, 2003). This therefore demands a move from the classroom where children memorise facts and practice algorithms to a classroom where reasoning and understanding are emphasised. Plana (2007) argues that if there is to be true understanding and consequent transfer of learning to new situations, children need to reach the point where they can formulate concepts for themselves. This is because children can go through learning procedures and provide right solutions to problems without really understanding the principles underlying what has been learnt. There is, therefore, the need for a reformed vision in the teaching and learning of mathematics (Chayya, 2003).

Even though there is no ‘royal’ method for teaching every topic in mathematics, providing routine exercises and rules for practice whilst the teacher sits down, is discouraged. The reason is that learning mathematics goes beyond searching for answers (Kulbir, 2003).

The discipline of mathematics is lucidly distinguished from other teaching subjects by the fact that, in its totality, it applies to rich variety of situations than any other teaching subject (Chamey, 2002). Some organisations or associations, both international and local have been involved in various tasks for the improvement of mathematical instruction at all levels (Long, 2003). In Ghana, the Mathematical Association of Ghana [MAG] organises annually regular workshops in the country to educate mathematics teachers on the importance of mathematics in the development of the country and some ways to improve upon the teaching and learning process. It has been the wish of Mathematics teachers to inform pupils, students and the general public of the mathematics related careers. Students and any other person wishing to use mathematics to do business must read and make a career with mathematics.

There has been an unusually rapid increase in the use of advanced mathematics techniques and concepts in economics, psychology, sociology, political science, history, business management, medical research, to mention but few. Typical issues involving the use of advanced mathematics are those of economic systems, learning theory in psychology, inventory control and production scheduling in business management (Gagatsis & Shiakalli, 2004). The demand for the use of advanced mathematics is even higher for students interested in researching into cell growth and the spread of diseases in biology as well as population data handling (Wang, 2004).

Programming is one of the careers demanding mathematical knowledge. The Electronic Data Processing [EDP] is one of such careers (Hinton, Brownlow

McMurray & Cozeus, 2004). The programmer determines the steps required in the solution of a problem. The programme gives instructions in machine language to convert the problem into directions that the computer can follow. All the steps and instructional procedure require a good mathematical background.

The work of the actuary is little known by most people. The actuary is a social mathematician. The actuary uses his mathematical ability on behalf of the people in his community. He specializes in statistics related to the lives of people. From this information he determines the probability of the living or dying at each age. He can also predict the probability of a person or group of persons becoming disabled hospitalized or becoming unemployed.

The actuary uses his or her knowledge to develop insurance plans that may keep the family in or against financial eventualities. Protection against financial disasters, which might follow accident or fire destruction, requires some skills of an actuary.

Accountancy as a career should be most accessible to most people with adequate mathematical background beyond the senior secondary school level provided they are attracted to the profession. There has been an interesting demand for accountants by firms, corporations and institutions and firms, and therefore mathematicians should rise to the challenge to fill the vacancies, by enrolling for the professional courses in accounting (Ghana Audit Service, 2008).

Statistics provides an aid in physical and biological sciences, economics, sociology, psychology, agriculture, communication and industry. For example, the astronomer predicts future positions of the heavenly bodies, the pharmacist

determines the potency of drugs and a meteorologist predicts the weather conditions.

Furthermore, an electrician determines the power supply; agriculturist is interested in establishing the relationship between inputs and output. The data used by these professions have mathematics as their basic tool. The mere mention of a computer is quite satisfying. A lot of people are associated with the computer, but the secret key to grasping computer language and concepts is mathematics. The progress of the developed world is based on the advances they have chalked in the use of the computer. Young children should be given early computer training so that they can grow up with it and apply it in life for their own progress and development of society. It may not be too far when appointments to senior ranks and offices would demand a knowledge of the use of the computer (Bekpe, 2012).

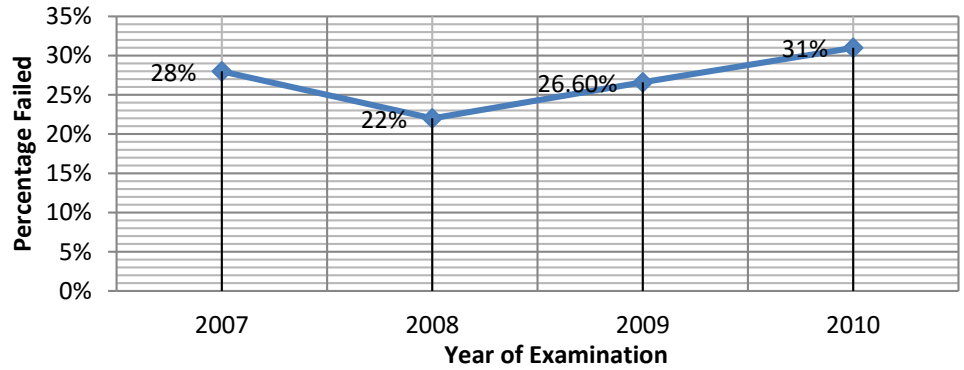
Mathematics lessons should be taken seriously at the primary, junior and senior secondary school levels to sharpen the abilities of children to understand the use of computers. The uses of electronic mathematical machines such as calculators are already serving as training exercises for children towards the use of computers.

National, regional and district planning officers day in and day out use mathematics in their routine duties of planning (Lewin & Stuart 2003). The proportional distribution of facilities to communities is made easy by the application of mathematics. Social amenities such as schools, hospitals, roads,

water systems and electricity are shared equally by the use of mathematical knowledge (Osafo-Affum, 2001).

The careers under the domain of mathematics cannot be exhausted in this write-up. But it is my hope that if educational career counsellors can expose their students to the benefits of studying mathematics in relation to the above careers discussed, mathematics will take its rightful place in the school curriculum.

In order to be prepared for potential success in the world today and in future, knowledge of mathematics and science is important (Ozdemir, 2006). But the irony is that while mathematics is becoming increasingly important, achievement in the subject at the various educational levels has been generally low over the years as compared with the achievement in other subject areas. There is evidence for a decreasing trend in average mathematics performance in rural schools (especially on the tasks that require deep understanding of mathematics), accompanied by a significant decline of students' interest in mathematics during the course of high school.




Source: WAEC 2007 – 2010

**Figure 1:** Percentage failed trend in BECE between 2009 and 2010

Figure 1 shows that, performance in Mathematics in the Municipality has to be improved. The performance improved a little in 2008 when it fell from 28% in 2007 to 22% in 2008. However, it sharply rose to 31% in 2010. This rise showed that more pupils were failing and the percentage continued to go up.

## Statement of the Problem

Despite all the efforts and other reforms that have been introduced at the various levels ( Basic, JHS and SSS ) of mathematics from 1995 up to date, there is very little improvement in the achievement of rural school pupils in mathematics (WAEC, 2012).

There is the tendency for some stakeholders to accuse mathematics teachers in the rural schools of poor performance (Kofowa, 2012). An investigation was therefore needed to delve into the background of the causes of pupils' poor performance in mathematics in the rural schools and the perceptions of mathematics education stakeholders.

It also appears that most people hold the view that pupils of urban schools performance better than their counterparts in rural schools most especially in mathematics and thus gain more admissions to first class senior secondary schools than their counterparts in the rural school (Fletcher, Asare-Inkoom, & Forkpe, 2009). It can also be argued that statements about schools in urban areas doing better may be assumptions since many people have not taken time to analyse issues and challenging factors that account for the difference. An effort to systematically work on issues and challenges contributing to the poor

performance of rural schools in mathematics through the perceptions of the stakeholders is the focus of this study.

## Purpose of the Study

The study aims at investigating the key issues and challenges perceived by pupils, mathematics teachers, and headteachers and circuit supervisors as contributing to pupils' poor mathematics performance in some rural schools in New Juaben Municipality in the Eastern Region of Ghana.

## Research Questions

The following questions guided the study:

1. How do pupils, headteachers and circuit supervisors perceive teachers' support for the learning of mathematics?
2. What is the perception of stakeholders of education about schools' support and motivation for the learning of mathematics?
3. How do mathematics education stakeholders (teachers, headteachers, and circuit supervisors) perceive pupils' efforts in learning mathematics in schools?
4. What challenges do mathematics teachers face which they perceive contribute to pupils' poor performance in mathematics?

## Significance of the Study

The study has both theoretical and educational values. Theoretically, it will contribute to the body of literature on factors that affect poor mathematics performance in the rural schools which account for the disparity between rural and urban schools. Educationally, it is hoped that the finding of this study will

provide parents, stakeholders and the public with information about some school issues and challenges which significantly contribute to pupil's poor performance in mathematics in rural schools. Teachers and headteachers can use the findings to improve the administration of their schools and improve upon their classroom delivery of mathematics lessons. Curriculum designers can also use the findings of the study as a guide in their design of junior high school mathematics syllabus and as teaching aids to support schools in the rural areas in Ghana.

## Delimitation of the Study

The study is delimited to school issues and challenges that contribute to the pupils' poor performance in mathematics in some rural schools particularly in the New Juaben Municipality in Ghana. The reason is that ever since the introduction of formal education in Ghana, various issues and challenges have contributed to rural school children's performance generally (Ankomah, 2005) and these factors need to be looked at and addressed. The study would be more representative if all the schools in all the municipality in Eastern Region had been used. However, owing to the limited time, materials, geographical locations of those schools and financial resources at the disposal of the researcher, the study was limited to only rural schools pupils, teachers, head teachers, and circuit supervisors in some selected rural schools in the New Juaben Municipality in Eastern Region of Ghana.

## Limitations of the Study

According to Best and Kahn (2006), limitations are conditions beyond the control of the researcher that will place restrictions on the conclusion of the study

and it application. The results of this research study could not be generalised due to the following set of reasons:

1 The related literature which supported the study was more foreign than local so culture variations might influence the findings to some extent.

2 It is not what people say that they always practice, hence students' favourable responses about their teachers' perceptions and attitudes may influence the results of the study.

3 Another limitation is that perceptions and attitudes can be influenced on a daily basis and a bad experience on the day of the survey could skew the pupils' response to the survey. In spite of these limitations, efforts were made to minimise the effect of the limitation on the outcome of the study.

## Organization of the Rest of the Study

Chapter one is the introduction. It also covers the background to the problem, the statement of the problem, purpose of study, research questions, delimitation, limitation, significance of study, and the organization of the study.

Chapter two deals with review of relevant literature, Chapter three contains the methodology while fourth chapter presents the results and discusses of the findings; and chapter five provides a conclusion, summary and recommendations.

# CHAPTER TWO

# REVIEW OF RELATED LITERATURE

## Introduction

This chapter presents a review and discussion of the literature related to the topic of the study. A search through the literature revealed that a considerable number of articles and studies concerning attitudes, achievement in mathematics, and factors contributing to students' poor performance in mathematics have appeared in the past decades. Some studies specifically pertaining to the mathematics achievement of pupils and or students, attitudes of teachers and students towards mathematics, achievement of pupils in mathematics and the concept of attitudes have also been found. For the purpose of this study, the review of the literature has been treated and discussed under the following sub-headings:

1. Perception
2. Pupils' perception towards mathematics and academic achievement
3. Pupils' attitudes towards mathematics
4. Relationship between pupils' attitude/perception towards mathematics and their' achievement in the subject
5. Teachers' attitudes and perceptions toward mathematics

6. Relationship between teachers' attitude/perception towards mathematics and pupils achievement in mathematics
7. Teachers' knowledge of mathematics and its impact on students' learning
8. Difficulty of Mathematics Teaching and Learning
9. Performance of pupils in basic mathematics programme
10. Classroom and school factors affecting achievement in mathematics
11. Changing students' perceptions of mathematics
12. Mathematics Assignment/Homework
13. Summary

## Perception

An important aspect of how we perceive objects or people has to do with what we think they are or should be (Morris, 2008). How mathematics is perceived depends on what students themselves think mathematics is. Because students are limited in what they can perceive, they are highly selective in what they choose to perceive and that which is relevant to them. In this process of filtering, different people will react differently even when they are from the same physical environment. They would not always have the same experiences, hence the differences in people's perceptions. Perception is therefore what results in our attitudes, and our actions in turn depend on our attitudes. Individual differences in perceptions of self have been linked in several studies to academic performance (Guay, Marsh & Boivin 2003; Spinath, Frank, Bright & Robert, 2006). How does an individual's perception of self influences academic performance?

Self-concept is broadly defined as the image or perceptions that students hold about themselves (Ahmayaara & Houston, 2007). It includes attitudes, feelings, and knowledge about abilities, skills, appearance and social acceptability (Bouche & Harter, 2005). According to Bouche and Harter, these perceptions of self are basically formed through experiences with and interpretations of one's environment. They also suggest that self-concept is a construct that becomes more multifaceted as the individual moves from infancy to adulthood. Ahmayaara and Houston found that self-concept becomes more differentiated as children develop and suggested that, with development, an increasing number of self-concept domains can be articulated as well as differentiated. As children approach adolescence, they exhibit an increased ability to make judgments about self-worth, and as adolescents, they further articulate their ideas about self-esteem (Ahmayaara & Houston 2007).

One aspect of self-concept that may be more pertinent to academic performance is culture or ethnicity. Research, mostly in Western and European cultures, has established that self-concept has a significant influence on student outcomes (Bouche, & Harter, 2005; Cokely; 2002, Spinath et al., 2006). Students' perceptions of the fit between their self -concept and academic demands are important for learning outcomes. Indeed, self- concept researchers have found a relationship between the way students describe themselves and their academic performance (Harlaar, Frank, Bright, & Robert 2006).

However, there has yet to be a significant amount of empirical investigation of whether these findings can be generalized to other cultures beside

Western European and Asian cultures. Of particular importance to note is the limited research linking self-concept, (specifically those utilizing Marsh's Self description questionnaire (SDQ) and academic performance on the continent of Africa (Marsh & Hau, 2004). Marsh and Hau's cross-cultural study of adolescents from 26 countries articulated this concern best: "In self-concept research, support for the construct's validity of major instruments and the main theoretical models has been based largely on responses by students from Western countries-particularly English speaking students in the United States, Australia, and Canada" (p. 56).

Self-concept literature supports the notion that how individuals perceive themselves can impact all phases of their lives. Perceptions in mathematics and associated anxiety have been known to plague students from all socio-economic and diverse types of backgrounds (Woodand, 2004). In today's fast paced world where individuals deal with information generated from computers and calculators to that of mental estimations of daily purchases, it is imperative that students become proficient in mathematics. Not only must learners deal with a wide range of operational skills such as computing decimals, percentages and fractions to accomplish tasks, they must also understand underlying numerical concepts in order to succeed in a variety of day-to-day commercial and work place situations. At the same time, to deal effectively with these tasks, citizens must develop self efficacy, feel positive about themselves and accept that they are accountable for their actions.

Unfortunately, many students are not confident about their ability to solve mathematical problems. A poor perception toward the discipline is thought to plague learners at every level of schooling (Tapia, 2004). A student's confidence about his or her ability is often seen as an important variable in learning and teaching processes. There is awareness in an education context that lack of confidence may lead to the learner being prevented from making the required effort to reach the goals of education processes.

Reid and Yang (2002) define confidence as one part of self concept which has to do with how sure a student is of his or her ability to learn new mathematics and to do well on mathematics tasks. They argue that confidence affects a student's willingness to approach new topics and to persist when the material become more difficult.

It is argued that confidence is an attitude or perception towards oneself and it depends heavily on experience (Oraif, 2007). Reid and Yang (2009) noted that confidence was lacking when secondary and basic school students faced a new and open-ended task but, with the completion of the first such task, confidence was observed to grow markedly when facing subsequent tasks even when the students were finding the tasks difficult. Yang (2009) also found that the growth of confidence did not necessarily seem to lead to better performance in the open-ended tasks, but it did mean that the students approached subsequent tasks more enthusiastically with more self-belief and assurance. The effects of confidence on mathematics achievement and participation have been explored in many studies (Planas & Civil, 2008; Evans, 2005) and there were significant

correlations between confidence in mathematics ability and mathematics achievement. A study presented by Evans examined grade eight pupils' attitudinal and motivational variables related to mathematics achievement in Jordan. One of the most important results reported in this study is that confidence was more strongly correlated with mathematics achievement than any other variable.

The question is how confidence might be developed in learners so that they can improve and apply these confidence skills. The key factor is that success seems to lead to confidence among those students who have been more successful in school examinations (Oraif, 2007). The essential question is how to offer success to those who are not so good at formal examinations, particularly when based on recall of information or procedures. If success depends largely on confidence, there is a real danger that the examination system will generate many students who are unsuccessful, thus reducing their confidence. This may well lead to further poor performance in examinations. Thus, the system may lead to the destruction of confidence. It does not seem to be the style of examination but the fact of success in examination which is a crucial factor for the confidence. In that examinations are seen as a key part of most learning, the difficult question is how to generate success for all (thus enhancing confidence) without losing all sense of rigour.

Individuals with poor perception toward mathematics are often reported to have a low self-concept and feelings of incompetence (Schoenfeld, 2002). These perceptions are manifested as self-deprecating remarks and a perpetual lack of

success in mathematics. Self-concept is an important feature to be considered in the realm of achievement and self-evaluation of one's abilities. In fact, Pezdek Berry and Renn (2002) found that elementary mathematics teachers' attitudes can be transmitted to their students in that perception toward mathematics is highly related to students' statements about previous mathematics teachers. Therefore, if teachers' attitudes or perceptions towards mathematics are positive, then these beliefs may enhance their own global self concept while affecting and benefitting their elementary students in the area of mathematics learning. Improving graduates and undergraduates students' perceptions toward mathematics is an important concern for university education courses. This will facilitate positive mathematics perceptions in future elementary pupils.

## Pupils' Perception towards Mathematics and their Academic Achievement

Perception of pupils can be influenced by the attitude of the teacher and his method of teaching. Studies carried out Australia have shown that the teachers' method of mathematics teaching and his personality greatly account for the students' positive perception towards mathematics and that, without interest and personal effort in learning mathematics by the students, they can hardly perform well in the subject (Bolaji, 2005; Koul & Fisher, 2006). The results of a research conducted in some schools in Nigeria showed that the pupils' perceptions towards mathematics were positive and that many of them believed that mathematics is a worthwhile and necessary subject which can help them in their future career (Olatoye, 2002). It was recommended that the teacher should

develop positive relationship with students and stress classroom activities that involve active teaching- learning process and pupils' participation in the class. The research suggested that stakeholders should organize periodic seminars and workshops for students, parents and teachers designed to promote positive perceptions towards mathematics.

Perception towards mathematics denotes interest or feeling towards studying mathematics. It is the students' disposition towards 'liking' or 'disliking' mathematics while perception in mathematics means scientific approach assumed by an individual for solving problems, assessing ideas and making decisions. Review of relevant literature depicts varying opinions and findings on the students' perception towards mathematics and their performances. According to Koul and Fisher (2006), perceptions towards mathematics are, in general, highly favoured, indicating strong support for mathematics and the learning of mathematics

Silver, Mesa, Morris, Star and Benken (2009), Muijs and Reynold (2002), and Ma and Xu (2004) in their findings on perceptions revealed that in countries like Rwanda and Australia where there were emergent thirst for students perception towards mathematics and academic achievement, there were very favourable attitudes or perception towards mathematics. However, in countries where a high level of technological and industrial development had been achieved, the findings showed that perception towards mathematics was more neutral.

Valero (2007) differs in his report to the study carried out by Gutstien (2006) when he linked higher achievement in mathematics to positive attitude on the part of the students. As mentioned earlier, Olatoye (2002) found that students perception towards mathematics have significant direct effect on their achievement in the subject, and Bolaji (2005) in a study of finding the influence of students' perceptions towards mathematics found that the teachers' method of teaching mathematics and his personality greatly accounted for the students' positive perception towards mathematics. Student beliefs and perceptions have the potential to either facilitate or inhibit learning. Nardi and Steward (2003) opined that students' perceptions about the value of learning mathematics may be considered as both an input and outcome variable because their perceptions toward the subject can be related to educational achievement in ways that reinforce higher or lower performance.

However, despite these diverse views and reports from various researchers on perception towards mathematics and student achievement, attempts have been made to improve students' perception and achievements. Researchers, including, Kyriakou and Goulding (2006), Bouche and Harter (2005) developed and evaluated some of such strategies directed at improving students' perception of science subjects includes a strong relation between mathematics contents and students everyday experiences. Orton (2004), Sullivan, Clarke and Clarke (2009) also stressed that students need to develop the attitudes and habits of mind that are considered for meaningful work in mathematics and technology.

A critical look into the above cited studies indicate that there are positive reports concerning the relationship between students' perception and academic achievement. It is against this background that the present study also investigated the relationship that exists between the students' perceived performance in mathematics and their perceptions toward mathematics in the rural schools in New Juaben Municipality.

## Pupils' Attitudes towards Mathematics

Shen and Pedulla (2002) in a study involving 957 pupils from grades 3 to 7 American elementary school reported higher scores on attitude variables. Ma and Xu (2004) conducted a study on pupils' reactions to activities and different topics in mathematics. Ma and Xu found that both basic and secondary school students considered mathematics to be useful. Cooper (2007) observed that the social differences in mathematics participation were associated with different attitudes and perceptions toward mathematics. Tricia (2001) in an attempt to determine the opinion and feelings concerning mathematics and science found that, 52 percent of males enjoyed being in the scientific field whilst 29 percent of females said they would like a career pertaining to science. Besides, 50 percent of elementary school boys against 33 percent of girls described themselves as good at mathematics (Hanmer, cited in Tricia, 2001). Available data showed that students in Glasgow at the basic school level found mathematics or regarded mathematics as one of the most popular subjects (Alhmali 2007). It also appears from many more studies that students dislike mathematics and that it becomes less favourable as students progress through Junior High School to the College level

(Hannula, 2002). This trend may be due to the fact that through the high school to the college level students begin to make career choices. The foregoing necessitated the need to determine pupils' perceptions towards mathematics at the JHS level in the New Juaben District in the Eastern Region of Ghana.

## Relationship between Pupils' Attitudes or Perceptions toward Mathematics and their Achievement in the Subject

Investigating the relationship between achievement and perceptions toward mathematics is vital. Common sense reveals that an individual may achieve higher in something that he/she delights in doing, has confidence in doing and finds it to be useful to him/her. Positive perceptions or attitudes toward mathematics need to be encouraged among JHS school pupils. The Third International Mathematics and Science Studies [TIMSS], (Smith, 2000) for 8$^{th}$ graders and Shen and Pedulla (2002) noted that in more than one - third of the countries, a positive relationship was observed between pupils' perceptions towards mathematics and their achievement in mathematics. Shen and Pedulla (2002) in the study reported that pupils' achievements in mathematics were related to their general performance. They further suggested that neither perceptions nor achievement are dependent on one another, but rather they interact with each other in complex and unpredictable ways. Also, Pezdek Berry and Renno (2002) based on 113 studies in primary schools concluded that there was relationship between perceptions toward mathematics and pupils' achievement. They added that the relationship was stronger among Asian and Black students than among Whites, but did not differ across gender. In Israel,

Nasser and Birenbaum (2004) studied the relationship between the Arabs and Jews fourth graders' perceptions toward mathematics and their achievement. The authors reported that in both groups, pupils' perception related to their achievement. The authors further reported that perception had minor and insignificant effects on mathematics achievement of the Jewish children while it had modest but significant effect on the Arabs.

Using data from the Chilean educational assessment systems [SIMCE], Ramirez (2003) found that fourth graders with more positive attitudes toward mathematics reported higher mathematics achievement than their peers with negative attitudes toward mathematics. From the reviewed literature under this section, greater findings revealed that there is a significantly positive relationship between students' achievement in mathematics and their perception or attitude toward the subject (Pezdek, Berry & Renno, 2002; Shen & Pedulla, 2002*)*. In the light of this the researcher deemed it necessary to carry out this study to investigate issues and challenges which pupils, mathematics teachers, headteachers and circuit supervisors perceived as contributing to pupils' poor performance in mathematics in some rural JHS in the New Juaben Municipality.

**Teachers' Perceptions toward Mathematics**

The way individuals develop perceptions toward objects, places, things and people is the same way they tend to develop perceptions toward mathematics. Perceptions toward mathematics to some extent determine an individual's willingness and readiness to study and benefit from the subject. The development of positive attitudes and perceptions toward mathematics in general is necessary

for all learners. Davies and Florian (2004) in a study which involved Hong Kong and Australia discovered that teachers possessed negative perceptions about mathematics. Grootenboer (2002) also reported similar findings for 31 New Zealand primary school teachers. A teacher's perceptions toward mathematics include his liking, enjoyment, enthusiasm and interest or their opposites (Kottler Zehm & Kottler 2005). Besides, the teacher's confidence in his/her own mathematical abilities, mathematical self- concept and his/her valuing of mathematics are determinants of his/her perceptions toward mathematics (Nicol, 2002). Chionidou (2007) studied primary school teachers teaching 3rd to 6$^{th}$ grade classes in Athens- Greece. Chionidou reported that male teachers prefer trying out different ways of solving problems in both arithmetic and geometry because they believe that they promote critical thinking in their children. Female teachers on the other hand prefer to stick to algebra problems and algorithms and avoid geometry. Chionidou reported that all the teachers studied agreed that successful teachers of mathematics must:

1. Himself/herself be fond of mathematics.
2. Possess some confidence in the subject.
3. Do a lot of revision work with pupils and do not proceed unless he/she ensures that his/her pupils understand what has been taught.
4. Be close to all their pupils

## Relationship between Teachers' Attitudes or Perceptions toward Mathematics and Pupils' Achievement in Mathematics

The role of the teacher in bringing about the desired change in his/her pupils is indispensable in any educational system. This could be judged from remarks parents, students, educators, stakeholders and policy makers make when pupils demonstrate poor achievement in the Performance Monitoring Test [PMT], Criteria Reference Test [CRT], Basic Education Certificate Examination [BECE], West Africa Senior Secondary Examination [WASSE] and other related assessment. Connell and Klem (2004) in a study that involved elementary school teachers found a relationship between teachers' attitudes or perceptions toward mathematics and pupils' achievement. Schoenfield (2007) in a study involving 850 4th-6th grade pupils and 48 teachers noted that higher teachers' Perceptions toward mathematics was significantly related to pupils' achievement. Reeve (2006) in a study in Australia involving 5th grade elementary school teachers noted that there was a strong correlation between teachers' perceptions toward mathematics and pupils' achievement. Reeve further stated that the relationship was found to be strongest for low achieving pupils. Research evidence suggests that teachers with low mathematics self-concepts or perceptions may undermine the potential of students to learn, appreciate and react positively to mathematics concepts (Reeve, 2006). Teachers with low self concept in mathematics are less likely to study mathematics at higher levels of education. Hence, many basic school teachers may not only possess negative perceptions toward mathematics, but may have chosen not to study mathematics in their last years of high school.

Haladyna, Oslen and Shaughnessy, cited by Tricia (2001), found significant relationship between basic school teachers' perceptions toward mathematics and pupils' achievement. Anderson (2007) also attempted to investigate the relationship between classroom process and students' achievement in mathematics. He found that teachers' attitudes and methods used were strongly related to students' achievement. Anderson further noted that teachers' perceptions toward problem- solving were strongly related to students' achievement in mathematics.

Kommer, cited in Tricia (2001) also observed in Australia that boys receive more attention from teachers than girls do. Thus, teachers may be unaware of the fact that they call on boys more than girls. Males are called more in class when complex questions are asked and by so doing the males think for themselves and try to break the problem down to discover the answer. These result in males performing better in these situations than females. Kommer again noted that sometimes teachers are found solving mathematics problems for females without any encouragement to work out the problem. Hanmer, cited in Tricia (2001) held similar view with Kommer (2006). Hanmer added that may be teachers feel that females need that extra push or maybe it is the teachers with bias against what they feel females can and cannot do. Males and females should be treated somewhat differently due to their specific need, but at the same time the opportunities should be equal (Hanmer, cited in Tricia, 2001).

Tricia (2001) noted that teachers exert enormous influence on the perceptions and achievement of pupils in mathematics. That is, if a pupil believes

that a teacher has a low expectation/opinion of him/her then it may be possible that the pupil will perform according to that expectation. Reeve, Conroy and Webber, cited by Reeve (2006) noted that gender in self-concept between male and female teachers of mathematics present inappropriate role models for students especially female teachers for their female students. Gender differences are found at the basic school level but not at Senior Secondary School level. This difference was found to be attributable to teachers' level of study of mathematics (Kommer, 2006). Thus, males were more likely to study mathematics at higher level than females and therefore register higher mathematics self-concept. Common observations show that in Ghana female teachers predominate at the basic school level many of who may not have studied mathematics as elective subject. The direct link between self-concept and achievement may be tenuous, but the evidence that teacher attitude affects student performance is stronger. Eccles and Wigfield (2002) maintained that teacher efficacy has stronger relationship with students' self-perceptions about their abilities in mathematics.

In effect, teachers' perception or attitude toward mathematics has influence on how students perceive their own abilities to deal with mathematics. This association was found to be strongest for low achieving students who are taught by a teacher with low mathematics efficacy. From the discussion so far, there appear to exist a positive relationship between teachers' perceptions or attitudes toward mathematics and pupils' achievement. Majority of the reviewed literature indicated that there is positive correlation between teachers' perception or attitudes toward mathematics and students' achievement in the subject (Connel

& Klen 2004; Reeve, 2006; Schnofield, 2007; Tricia, 2001). Besides, evidence suggests that the expectation teachers hold for students in mathematics as well as stereotyping boys and girls influence students/pupils achievement in mathematics.

## Teachers' Knowledge of Mathematics and its Impact on Student Learning

Although a large number of studies have been carried out to investigate the relationship between teachers' knowledge of mathematics and student learning Aurbrey (2006); Gay and Airasian (2003) and Ball, Hill and Bass (2005) argued that researchers had given little evidence on the direct relationship between teachers' knowledge of mathematics and student learning. Researching in teacher knowledge means more than investigating the number of mathematics courses teachers have taken or the procedural knowledge of mathematics they possess. Knowledge of mathematics teaching includes knowledge of pedagogy, as well as understanding the underlying process of the mathematical concepts, knowing the relationship between different aspects of mathematical knowledge, being able to interpret that knowledge for teaching, knowing and understanding students' thinking, and being able to assess student knowledge and to assess instructional decisions (Nicol, 2002). As explained in a later section of this thesis, effective mathematics teaching requires the teacher to possess the qualities discussed here and even more to be able to help students to learn mathematics effectively.

## Difficulty of Mathematics Teaching and Learning

Teaching mathematics is very challenging especially when one finds himself or herself teaching in a community which does not know its role in the school, does not value learning; a community which randomly prevent their children from attending school. One cannot be sure of the learners in terms of their abilities, knowledge, what they can do and what they cannot. Today, they behave like this and tomorrow they behave differently. Among the subjects in the school curriculum, common observations and general belief show that mathematics is the most difficult and feared subject especially by female students. Much of society is aware that mathematics is considered one of the most difficult and challenging academic subjects out of all core subject areas. Roman (2004) supports this when he explains that children and even parents have poor perceptions about mathematics and often complain about the needs and uses of mathematics and how it "doesn't relate to anything" (p. 16). Mesler (2004) contends that when asked to sum up views of pupils' perception about mathematics at school many students described it as difficult, dull, abstract and disliked. Pyke (2003) described the perception that adults still have about their difficulties in mathematics. Pyke maintains that most of the people's reactions described how they associated mathematics with fear and trembling, or a complete detachment. Physical symptoms of panic, cold sweat and despair were also reported. The foregoing are the physical symptoms of difficulties one encounters in solving problem in mathematics. Mathematics educators, students, parents to mention but a few are worried about mathematics teaching and learning

in our schools. This is because it is believed that students fear the subject, they lack interest in it, they see it to be difficult, boring and abstract. Besides, some students complain that mathematics is not properly taught to their understanding and that, one needs to be born as a mathematician. Thus, these beliefs and features are the manifestations of the difficulty of mathematics. Mathematics teaching and learning has been a problem for many countries all over the world and not Ghana alone. In an attempt to identify people with peculiar areas of mathematics problems, Montague (2003) outlined the following:

1. Some people are able to remember formula, but may not understand why the formula makes sense.
2. Some prefer to do paper and pencil tasks and are attentive to the details, but do not see the big picture.
3. Some see the big picture and have insight into patterns of the mathematics, but are poor at computations and have problems with remembering step-by-step procedures.
4. Some understand mathematics concepts and like to solve problems mentally and quickly yet their answers may be inaccurate.
5. Some individuals may have difficulty in verbalising and explaining their answers.

All the above may let an individual to conclude that mathematics is difficult. There is enough research evidence that the learning of mathematical concepts more than any other content area or subject is tied closely to the teacher's knowledge of mathematics and the manner in which these concepts are

taught (Evans, 2009). Therefore, individuals with mathematics problems could be a result of how their teachers are inadequately prepared in mathematical principles and how they teach them. Mathematics teachers need understanding of the mathematics curriculum, the ability to use a variety of instructional techniques that are simultaneously multisensory and which provide explicit instruction that is systematic, cumulative, diagnostic and both synthetic and analytical as well as knowledge of current research in mathematical instruction.

Other problems associated with mathematics are the language of mathematics and the concepts associated with it. These include spatial and quantitative references such as before, after, between, one more than or less than. Mathematics terms such as numerator and denominator, prime numbers and prime factors, carrying and borrowing may also be problematic. Mathematics is taught and learned in a language in an intensive manner. The US National Council of Teachers of Mathematics [NCTM] prescribed standards for mathematics education. Thus, Fennell (2006) summarizing the US NCTM guideline states that, command of mathematical language plays an important role in the development of mathematics ability.

The importance of language in mathematics instruction is often overlooked in the mistaken belief that mathematics is somehow independent of language proficiency. However, particularly with the increased emphasis placed on problem – solving, command of mathematical language plays an important role in the development of mathematical ability. Mathematics vocabulary, special syntactic structures inferring mathematics meaning and discourse patterns typical

of written text all contribute to difficulties many students for whom English is a second language (L2) have when learning mathematics in English.

From the foregoing, it seems that language sometimes contributes to mathematics difficulties. Available literature shows that learners have their best chance of success in mathematics and science if they study it through their first language (L1) (Silverton 2006). Thus mathematics and science contain a high proportion of conceptual and abstract notions. These notions cannot be internalised in a meaningful manner through the memorisation of verbal formulae. Understanding is essential and a high degree of cognitive maturity and verbal fluency is required to negotiate and acquire this understanding. It is clear from The Third International Mathematics and Science Surveys' [TIMSS] results that students and probably many teachers are not able to demonstrate a personal understanding of mathematics and science concepts in their own words. They rather rely on superficial repetition of formulaic phrases (Kunter & Baumerl, 2006). Mathematical concepts such as area, volume, slope to mention but a few need to be formed well by the learners and this will result in better understanding and higher achievement in mathematics. Mathematical literacy is conceptually abstract and difficult to understand and communicate in a meaningful way. In this vein teachers need to try as much as possible to vary methods and assist pupils to construct their own knowledge and concepts on given topics (Kunter & Baumerl, 2006). In the light of this the study was concentrated on JHS pupils, their class teachers, and headteachers and the circuit supervisors in the New Juaben

Municipality in the Eastern Region of Ghana to find out how respondents perceived mathematics in terms of it difficulty.

**Performance of Pupils in Basic Mathematics Programme**

In Ghana, mathematics can be said to enjoy a lot of recognition and respect from policy makers. Mathematics features prominently in all in-service courses for teachers. It is a core subject at the basic schools, senior secondary schools and Colleges of Education. Furthermore, mathematics is a basic requirement for entering senior secondary school, College of Education, Polytechnics and University. Despite all these, there are a lot of indicators that problems exist on the ground which must engage the attention of people who want to see progress in our educational set up especially in mathematics. In the New Juaben Municipality, Comparative Analysis of 2007–2010 B.E.C.E results showed that out of 2951 candidates who took the BECE in 2007, 1856 representing 63% passed (WAEC, 2007). In 2008, 2792 candidates were presented for the BECE in the Municipality and 1512 representing 54% passed (WAEC, 2008). In 2009, the Municipality presented 3170 candidates and 2047 representing 65% passed while in 2010, 2758 candidates were registered for the BECE and 1577 representing 57% passed (WAEC 2009 and 2010).

Thus in considering the number of candidates who failed in mathematics, 1095 candidates representing 37% failed in 2007; in 2008, 1280 candidates representing 46% failed; in 2009, 1123 pupils representing 35% failed; and in 2010, 1181 representing 43% of the pupils also failed. The comparative analysis shows that in 2009, there was still poor performance in the mathematics even

though it looked better than other years' performance (New Juaben BECE Comparative Results Analysis, 2007-2010) (See Appendices I & K).

Table 1 shows the number and the percentage pass and fail in mathematics in the urban and rural schools in 2009 and 2010 BECE in the New Juaben Municipality.

**Table1 : The West African Examination Council (WAEC) Performance of Urban and Rural Schools in New Juaben Municipality in BEC 2009 and 2010 in Mathematics**

| | Number of Schools | | Total Number of Candidates | | Year (2009) | | Year (2010) | |
|---|---|---|---|---|---|---|---|---|
| | 2009 | 2010 | 2009 | 2010 | Pass (%) | Fail (%) | Pass (%) | Fail (%) |
| Rural | 30 | 30 | 1,235 | 1,075 | 445 (36) | 790 (64) | 419 (29) | 656 (71) |
| Urban | 47 | 47 | 1,935 | 1,683 | 1,498 (77.4) | 437 (22) | 1,161 (69) | 522 (31) |

One of the factors that contribute to high dropout rate in schools among pupils is the poor uninspiring teaching, particularly in teaching of mathematics. A look at the state of mathematics at the basic and secondary levels in Ghana reveals that performance in the subjects is low. The poor performance in mathematics incensed the Ministry of Education to institute a test, designated "Criterion-Referenced Test [CRT] in 2006, to determine the extent of pupil's performance in the subject (Create 2007). The CRT results revealed that in 2006, only 1.8% of

the population reached the mastery level of 55%. That is 0.3% boys and 1.5% girls. The overall national mean score was 28.8% Further analysis revealed that majority of the pupils failed to reach the set criterion because they lacked simple manipulative skills. This weak performance is attributed to low level of teaching and learning (PREP/MOE, 1996).

Expansion in primary enrolments had come but without requisite quality. The results of the 1996-2006 national CRTs showed how serious the problem of quality schooling is at this level. The results revealed that performance was poor. Teachers of the right calibre and professional competence are needed in adequate numbers for the success of the reform. The Teacher Education Reform was thus aimed at upgrading existing training colleges to evolve an efficient system of teacher education which will produce competent professional teachers. The performance in mathematics at the primary level gives much cause for concern (MOE, 2003). There is no gainsaying that teaching of the subject is a contributory factor. For example, Darling, Holtzman, Gatlin and Heilig (2005) noted that teacher efficiency after training has been a source of major concern to educationists and parents in United Kingdom. It has been argued that standards of education in Ghana have dropped. Teachers whose depth of knowledge in mathematics in particular was not adequate could not cope with the demands of the new syllabuses. Studies conducted by the University of Cape Coast under the Centre for Research in Improving Quality of Primary Education in Ghana [CRIQPEG, 2007] in selected schools in parts of the country showed that quality

and effectiveness of teaching was low; even when the textbooks were available, they were poorly used.

Primary Education Programme [PREP] conducted a study on selected teacher trainees in Ghana using the same set of CRT test items. It was found that some of the pre-service teachers faulted in the very areas that the pupils had performed poorly. In another development, an educationist who was on a panel that interviewed teachers selected for the National Best Teacher Award in 1997 posed the question "How would you teach 1/3 +1/5 in Primary 4?" Two of the regional award winners said" Add the numerators and add the denominators" (Amissah, 2009). This partly explains the poor performance of pupils at the basic school level and this is carried over to the secondary school level.

## Classroom and School Factors Affecting Achievement in Mathematics

Work on differences in mathematics achievement has highlighted the importance of classroom, teacher and school factors (Wenglinsky, 2002). The Third International Mathematics and Science Study (TIMSS) looked at student, classroom and school factors influencing mathematics achievement in the United States (US) and Australia (Guskey, 2003). It found that classroom differences account for about one-third of the variation in student achievement in the United States and over one-quarter in Australia. Much of the classroom variation was due to composition and organisational factors. This has important implications for policy regarding the improvement of mathematics achievement in schools (Guskey, 2003).

There is widespread interest among industrialised countries to improve the levels of mathematics achievement in schools. Apart from the economic benefits this would bring, it is argued that by better preparing young people for the numeracy demands of modern workplaces and raising the overall skill levels of the workforce, there are also social benefits tied to improving access for larger numbers of young people to post-school education and training opportunities and laying stronger foundations to skills for lifelong learning (Silver, Mesa, Morris, Star & Benken, 2009). The interest in raising levels of achievement has led to a focus on identifying the range of factors that shape achievement as well as understanding how these factors operate to limit or enhance the achievement of different groups of students (Silvertorn, 2006).

A paper, using the Third International Mathematics and Science Study (TIMSS) has shown that in Australia, while student's background variables influence differences in achievement in mathematics, classroom and school variables also contribute substantially (Lamb & Fullarton, 2002).

The early literature on school effectiveness placed an emphasis on the ability and social backgrounds of students in identifying the factors that shape academic performance and suggested that schools had little direct effect on student achievement. An irony in the history of quantitative studies of schooling has been the failure of researchers' analytic models to reflect adequately the social organisation of life in classrooms and schools. The experiences that children share within school settings and the effects of these experiences on their development might be seen as the basic material of educational research; yet, until recently,

few studies had explicitly taken into account the effects of particular classrooms and schools in which students and teachers share membership (Lamb & Fullarton, 2002).

Some research on school effectiveness has used multi-level modelling techniques to account for the clustering effects of different types of data. The results of such studies show, according to the meta-analysis of school effectiveness research undertaken by Witziers, Bosker and Kruger (2003) that, school effects account for approximately eight to ten per cent of the variation in student achievement, and that the effects are greater for mathematics than for language. A later study has also shown that there are substantial variations between schools (Belsie, 2003). Kunter and Baumert concluded that classrooms as well as schools are important and that teacher and classroom variables account for more variance than school variables (Kunter & Baumert, 2006). Kunter and Baumert in their comparison of achievement across countries using TIMSS data of 2000 reported that classroom-level differences accounted for a substantial amount of variation in several countries including Australia and the United States. But are these differences due more to teachers, to classroom organization, to pupil management practices or other factors?

Work on classroom and school effects has suggested that teacher effects account for a large part of variation in mathematics achievement. In the United Kingdom, a study of 80 schools and 170 teachers measured achievement growth over the period of an academic year, using start-of-year and end-of-year attainment data (Hill & Ball 2004). Using multi-level modelling techniques, the

authors modelled the impact teachers had on achievement growth. They claimed that over 30 per cent of the variance in pupil progress was due to teachers. They concluded that teacher quality and teacher effectiveness, rather than other classroom, school and student factors, are large influences on pupil progress.

A number of Australian studies have also pointed to teachers having a major effect on student achievement. In a three-year longitudinal study of educational effectiveness known as the Victorian Quality Schools Project, Hill and his colleagues (Hill, 2002; Bass & Ball, 2005) examined student, class/teacher and school differences in mathematics and English achievement. Using multi-level modelling procedures to study the interrelationships between different factors at each level – student, classroom and school – the authors found in the first phase of the study that at the primary level, 46 percent of the variation in mathematics was due to differences between classrooms while at secondary level the rate was almost 39 per cent. Further analyses showed that between-class differences were also important in examining student growth in mathematics achievement, and that, differences in achievement progress located at the classroom level ranged from 45 to 57 per cent (Hill & Ball, 2004; Hill & Rowe, 2005).

In explaining the large classroom-level differences in student achievement in Mathematics, Hill and his colleagues highlighted the role of teacher quality and teacher effectiveness. They contended that while not fully confirmed, they had evidence of substantial differences between teachers and between schools on teacher attitudes to their work and in particular their morale (Hill, et al 2005) and

this supported the view that it is primarily through the quality of teaching that effective schools make a difference (Hill & Rowe, 2005). In further work that examined the impact of teacher professional development on achievement, they again argued that differences between teachers helped explain much of the variation in mathematics achievement (Lamb & Fullarton 2002).

However, alternative explanations for the large classroom-level differences were also provided by Hill and his team. They pointed to the possibility that classroom-level pupil management practices such as streaming and setting accounted for the class effects. This was not pursued by the authors who stated that in all of the schools they surveyed, the classes were of mixed ability (Hill, Ball & Schilling, 2002; Hill & Rowe, 2005). Another possibility was an under-adjustment for initial differences, that is, they did not control adequately for prior achievement differences. A further explanation considered was the possibility of inconsistency in teacher ratings used in the measure of student achievement in mathematics. This possibility was also deemed by Hill and his colleagues as unlikely to have had a major bearing, though its influence was not ruled out. However, the authors did not use, or argued for the use of more objective, independently assessed mathematics tests.

## Changing Students' Perception of Mathematics

Negativity towards mathematics also seems to determine pre-service teachers' areas of specialization (Swars, 2006). In Florida in America about 90 percent of the pre-service teachers choose to specialize in areas other than mathematics (Davis, 2004). Then, one would agree that one needs to address

behavioural issues before expecting learning, full participation and understanding of mathematics from pre-service teachers. A pedagogical approach -integrated, collaborative, field-based approach to teaching and learning mathematics - has emerged as a result of discussions between mathematics and education faculty (Grootenboer & Lowrie, 2002). The goal of the approach is to enhance pre-service teachers' mathematical knowledge by making positive changes on their attitude towards and perception of mathematics (Grootenboer & Lowrie, 2002). It is expected that high confidence in their ability to do mathematics will result in a positive perception and thus an increase in motivation. This will also result in advancement of students' mathematical knowledge (Southwell & Penglase, 2005). In the long term, pre-service teachers with enhanced content knowledge and higher confidence will graduate students with positive attitude toward and perception of mathematics (Evans, 2009). When children are given a little push by way of motivation, encouragement and support to study mathematics, they develop high confidence in their ability to perform well in mathematics. A number of things, including teachers developing positive attitudes towards mathematics can be done to encourage students to learn mathematics better and consequently improve their performance in the subject (Silver, Mesa, Morris, Star & Benkem, 2009). A few of these strategies and activities which are undertaken by effective mathematics teachers are discussed in the sections below.

## Mathematics Assignment/Homework

Homework, or homework assignment, refers to tasks assigned to students by their teachers to be completed mostly outside of class, and derives its name

from the fact that most students do the majority of such work at home. Common homework assignments may include a quantity or period of reading to be performed, writing or solving mathematics problems, a school project to be built (such as a diorama or display), or other skills to be practiced.

The basic objectives of assigning homework to students are the same as schooling in general - to increase the knowledge and improve the abilities and skills of the students. However, opponents of homework cite homework as rote, or grind work, designed to take up children's time, without offering tangible benefit (Ellsasser, 2007). The researcher disagrees with that view. Homework may be designed to reinforce what students have already learned, prepare them for upcoming (or complex or difficult) lessons, extend what they know by having them apply it to new situations, or to integrate their abilities by applying many different skills to a single task. Homework also provides an opportunity for parents to participate in their children's education. It therefore rests on every good mathematics teacher to give enough mathematics homework. However, homework becomes a waste of time if it does not challenge pupils to learn.

A review of over 60 research studies (Trautwein, Koller, Schnitz & Baumert, 2002) showed that, within limits, there is a positive correlation between the amount of homework done and student achievement. The research synthesis also showed that too much homework could be counterproductive (Trautwein et al, 2002). The research supports the "10-minute rule", the commonly accepted practice of assigning 10 minutes of homework per day per grade-level. For example, under this system, 1st graders would receive 10 minutes of homework

per night, while 5th graders would get 50 minutes' worth, 9th graders 90 minutes of homework, etc. Many schools exceed these recommendations or do not count assigned mathematics homework in the time limit.

In the United Kingdom, recommendations on homework quantities were outlined by the then Department for Education in 1998 (Her Majesty, 2004). These ranged from 10 minutes daily reading for 5-year-olds, to up to 2.5 hours per day for the pupils in Year 11. In Ghana, teachers give homework without considering the quantities outlined. The researcher has not come across a document recommending the quantity of assignment to be given per time frame. Most teachers give a lot of homework most especially the preparatory or private schools and the pupils perform very well.

With an enhanced emphasis on homework, parents and students are turning to customized solutions. In the United State of America, private institutions, such as Sylvan Learning Centres and Kaplan help students through individually-tailored assignments (Shirvani, 2007). Other parents find help through their community where tutoring, study groups and other resources may be made available. Many libraries provide tutors for helping students with their homework, both in-person and on-line. If it is necessary to hire a tutor to assist with a child's homework, parents also speak to the child's teacher about the amount and the appropriateness of the homework load (Shirvani, 2007).

Concerning pupils' homework, parents in Ghana do not take special part-time teachers for their wards to assist them in doing their homework per se. Parents employ part-time teachers to teach their children in the home but when

these children bring their homework from school these part-time teachers assist the children in doing the homework. Students generally benefit when their parents become involved in the homework process. However, too much parental involvement can prevent the positive effects of homework (Patall, Cooper, & Robinson, 2008).

Patall, Cooper, and Robinson (2008) observed a positive linear relationship between hours per week spent on homework (5 to 10 hours) and achievement through examining 27 studies. The assignment of appropriate homework can stimulate independent engagement in learning task. According to Blazer textbook-based homework was associated with higher achievement (Blazer, 2009). Teachers need to know what their students understand and can do independently, therefore, they often advise parents not to do the children's homework assignments for them, nor correct their children's homework assignments and have them copy the corrections. Grades, and the teachers' other feedback need to apply to the student's performance, not to the parents' performance, nor to student-parent co-performance (Hattie, 2009).

On the other hand, it is also fairly common for teachers to give assignments far beyond what students can do independently and for teachers to expect parents to go over homework and have the student make corrections before it is turned in. Practices vary. Independent learning is encouraged and improved by providing guidance (such as explaining how to look up information or find a word in a dictionary) rather than merely providing the answers to the child's homework-related questions (Hoover-Dempsey, Battiato, Walker, Reed, Dejong

& Jones, 2002). Having one's child work out mathematics problem allows the parents to see and correct, help the pupil to learn better. When parents do "homework" of their own at the same time as their children, it sets a good example and helps to foster a good attitude toward learning (Hoover-Dempsey et al, 2002). One key role for parents is to negotiate with teachers and schools should the homework burden be unmanageable or age-inappropriate for the students. This negotiation may take the form of speaking with the teacher individually, speaking to other school officials, or coordinating with other parents or with the PTA or school board to get the homework load for the entire class or school reduced.

**Homework Effectiveness**

Student learning improves when homework serves a clear purpose and is matched to both the skills of each individual student and to the current topics being taught in class. Feedback improves the effectiveness of homework, especially when given in a timely manner (within 24 hours). Effective feedback improves student learning by correcting misunderstanding, validating process, and highlighting errors in thinking (Protheroe, 2009). Embedded comments provide much better feedback than a mere grade at the top of the paper. Homework must be concentrated to be effective: mastering takes days or weeks of practice.

Another way mathematics teachers can be more effective is by alerting parents to their students' mathematics homework, giving parents a chance to become familiar with the material and their child's progress (Hoover-Dempsey et al, 2002). This also encourages parents to become involved in the homework

process. Messages tend to get lost in transit or even altered when using "pupil post" (passing verbal messages or written notes back and forth using the student as courier), and therefore direct communication is much more effective and prevents frustration all around (Ronning & Falch, 2011). Methods available for directly reporting homework assignments (to both students and their parents) include the phone, email, and centralized web-pages. The present study investigated how mathematics teachers incorporated homework in their teaching and what the perceptions of both teachers and pupils were about the effectiveness of mathematics homework.

## Summary

In this chapter, an attempt has been made to develop a framework with which to measure how the mathematics curriculum is delivered in New Juaben Municipality and also to identify the challenges mathematics teachers face, which make it difficult for them to practise effective mathematics teaching.

The review looked at students' perceptions of mathematics and how they affect their attitude and performance in mathematics as well as how teachers' perceptions of mathematics influence their practice. It also looked at teachers' knowledge of mathematics and its impact on students' learning. The review also looked at classroom and school factors affecting achievement in mathematics.

Finally, the review considered homework as means of enhancing students' performance in mathematics. The advantages and limitations of mathematics homework assignments were discussed to enable the researcher to evaluate the nature and effectiveness of home work in the New Juabeng

Municipality. The next chapter looks at the methodology aspects of the research, explaining how the study was conducted.

# CHAPTER THREE

# METHODOLOGY

## Introduction

This chapter discusses the procedures used in conducting the study. It describes the research design, study areas, population, the sample for the study and the instruments used in the data collection. It also looks at the data collection procedure and method of data analysis.

## Research Design

Descriptive survey was chosen for this study. According to Streubert and Carpenter (2010), descriptive research studies are designed to obtain information concerning the current status of phenomena. They are directed towards the nature of situation as it exists at the time of the study and they focus in determining the status of a defined population with respect to certain variables. It is concerned with conditions or relationships that exist, opinions that are held, processes that are going on, effects that are evident or trends that are developing (Best & Kahn, 2006). It is the descriptive research or survey which describes data and characteristics about the population or phenomenon being studied. It answers the questions who, what, when, where and how. It can be said that a descriptive survey has a low requirement for internal validity. This is because the relationship

observed between the variables are meaningful in their own right rather than being due to something else (Amedahe, 2002).

Descriptive research can be either quantitative or qualitative. It can involve collections of quantitative information that can be tabulated along a continuum in numerical form such as scores on test or the number of times a person chooses to use a certain feature of a multimedia programme or it can describe categories of information such as gender or pattern of interaction when using technology in a group situation.

The qualitative field study or research concentrates on words and observations to express reality and attempts to describe people or attributes in natural situation. Most qualitative research falls into two areas: studies that describe events and studies aimed at discovering inferences or causal relationships.

In quantitative research, the researcher is ideally an objective observer who neither participates in nor influences what is being studied. Furthermore, the quantitative field studies also limit the research problem to a particular context. (Creswell, 2002). Qualitative research on the other hand is conducted through an intense and prolonged contact with a field or life situation. These situations are typically "band" or normal reflective of the everyday life of individuals (Holliday, 2007).

This study employed both qualitative and quantitative approaches for data collection. Though differences exist, the two methods do not belong to separate paradigms because it utilises elements of both quantitative and qualitative often

within the same study and thus can sensibly be used within the same investigation (Mahoney & Goerty, 2006). The research was mainly an exploratory undertaking. It explored and analysed the issues and challenges perceived by mathematics stakeholders as contributing to pupils' poor performance in mathematics, most especially in the B.E.C.E. It was intended to be the basis for further research on the need for review of the topic.

## Population

For the purposes of research, the term population can be taken to mean all members of the target of the study. Amedahe (2002) maintains that the population is the aggregation of cases that meet a designated set of criteria. Therefore, for the purpose of this study, the target population includes all Junior High School pupils, all mathematics teachers, all headteachers and all circuit supervisors in the New Juaben Municipality in the Eastern Region of Ghana.

The accessible population included all Junior High School 1, 2 and 3 pupils, their mathematics teachers, headteachers and circuit supervisors in the selected schools in the municipality in the Eastern Region in Ghana. The Junior High School pupils were selected because the pupils can give better description of their perceptions toward mathematics and also a vivid description of their school climate and their educators' perceptions and attitudes toward mathematics. Junior High School 1, 2 and 3 were considered because they are potential candidates and have knowledge about the B.E.C.E.

## Sample and Sampling Procedure

In all, a sample of 300 pupils from the ten rural schools in the New Juaben Municipality which ranked ten from bottom on the league table of the B.E.C.E results in the Municipality were used for the study. Samples of 300 Junior High School pupils were used for the study. This figure consisted of 154 boys and 146 girls. This sample of 300 pupils represented 10% of 3000 pupils in Junior High School 1, 2 and 3 in both public and private rural schools in the New Juaben Municipality. The ages of the pupils ranged between 14 - 18.

Besides, 10 mathematics teachers, 10 headteachers and 10 circuit supervisors were also included in the study. This sample of 10 mathematics teachers, 10 headteachers and the 10 circuit supervisors represented hundred-percent (100%) each respectively of the teachers, headteachers and circuit supervisor's respondents of the population. The sample of 300 pupils representing 10% of the 3000 pupils of the target population, the 10 mathematics teachers ,10 headteachers and the 10 circuit supervisors each representing 100% of the respondents from the ten schools and the education office were representative of the population. Commenting on the sample size Rundblad (2006) suggests that if the population is a few thousands, then, a sample of about 10% will do. Charles (2005) also suggests that for credible results a minimum of 20 percent size of sample for population of a thousand could be ideal. Furthermore, according to Alan and Hew (2005) for descriptive studies, a sample with a minimum number of 100 is essential.

The simple random sampling was used in selecting the pupil respondents. The simple random sampling is a probability sampling procedure that gives every element in the target population and each possible sample of a given size an equal chance of being selected. This type of sampling gave all the pupils equal chance of being selected (Thompson, 2002).

In this study the simple random sampling technique used was the table of random numbers .The numbers in a table of random numbers are not arranged in any particular pattern. They may be read in any manner that can be horizontal, vertical, diagonal, forward or backward. In using a table of random numbers, the researcher blindly selected a starting point and systematically proceeded down the column of the numbers in the table. The number of digits that were used corresponded to the total size of the target population. Each member of the class was assigned a number using alphabetical order. Every element or child whose assigned numbers matched a number the researcher came across is selected for the sample. When the researcher came across the numbers which did not match the number assigned, the element in the target population was ignored.

The stratified sampling technique is a probability sampling procedure in which the target population is first separated into mutually exclusive, homogeneous segments (strata) and then a simple random sample is used to select from each segment (stratum).This technique was used to put the classes into JHS One, JHS Two and JHS Three. In using the stratified sampling technique, the researcher first defined the target population and then identified the stratification variables. The number of strata was then determined, which in this case three

strata were automatically in place; that is JHS 1, JHS 2 and JHS 3. After identifying the various strata and knowing the number to select from each stratum, the researcher employed the simple random sampling as described under the simple random sampling using the table of random numbers to select the required number of respondents .That is within each class, the simple random technique was used to select ten pupils.

Purposive sampling is a non- probability sampling where respondents who fit specific purpose or description are selected. Mathematics teachers, headteachers and the circuit supervisors were also selected using the purposive sampling technique. This method of selecting the mathematics teachers and the headteachers was appropriate because the nature of the work of the headteachers and that of the mathematics teachers put them in the position of being included in the study. The ten circuit supervisors were the only people who were by then supervising the schools in the municipality when the study was being carried out so they were automatically selected. The other circuit supervisors were either on causal leave or maternity leave.

## Research Instruments

Questionnaire and structured interview guide were the main instruments for data collection in this study. The questionnaire and the interview scheme have items that answered the research questions. For the interview, the researcher focused on group interview so that he could get all the three hundred respondents or pupils involved.

The challenges contributing to rural school pupils' poor performance in mathematics were broken down into sub-units like poor teacher method (abstract teaching), lack of relevant learning materials/facilities, misuse of learning hours, incompetent supervision, pupils' perceptions toward mathematics, lack of homework and assignment, lack of mathematics teachers' supports etc. The questionnaire dealt with pupils' perceptions of mathematics, the rural mathematics teachers' perceptions/attitudes toward mathematics teaching, the supports from the school towards the teaching of mathematics and some challenges encountered by both pupils and mathematics teachers in the rural schools with respect to the teaching of mathematics in the rural schools. In all four instruments were prepared with one each for each respondent; thus the pupils, the mathematics teacher, the headteacher, and the circuit supervisor. (See appendices E, F, G, and H).

The instruments had sub-scales and therefore were multidimensional in nature. Likert-type items which allowed respondents to indicate their responses to select statements on a continuum from strongly agree to strongly disagree (Jacobs & Razavich, 2002) were used for the study. In this scale, each response given by a respondent is associated with a point value. The questionnaire was considered to be suitable method by which valid and reliable data could be collected in a study of this kind where the variable under investigation required statement of facts and personal concerns (See Appendices E, F, G and H).

Items for the questionnaire for the teachers on the school issues and challenges perceived contributing to the poor mathematics performance of rural

school pupils included punctuality, number of homework/assignment/exercises, learning aids used, teachers' methods of teaching, school supports. All the above constituted teachers' perceptions; pupils' perceptions included pupils' regularity to classes, regularity in presenting assignment and exercises, pupils interest in mathematics etc. Majority of the questions were in Likert form. In all, the items were 18. In addition to the above, bio-data was also sought. This included gender, age, professional qualifications, current ranks and years of teaching mathematics.

Questionnaire for Headteachers on the perceived issues and challenges was also in two sections. The nature of the questions was like that of the teachers. The items were on gender, current qualification, current rank, years of heading the school, etc. The section B of their questionnaire covered supervision, (regularity and punctuality of teachers to class, amount of exercises and homework given, teaching methods etc), facilities to promote effective mathematics teaching, challenges of pupils, pupils' attitudes ,teachers' attitude, challenges of his mathematics teacher etc. The questionnaire contained 19 items.

The questionnaire to the circuit officers was also in two sections, The A part was on bio-data and the B on the main content or issues under investigation. Questions on gender, qualification, current rank were in A part. The section B was almost the same as that of the headteacher and the mathematics teachers.

It covered mathematics teachers regularity to class, pupils exercises/assignment/homework, TLMS used, teaching environment , support to mathematics teaching in the rural school, challenge of mathematics teachers in the rural schools, reasons why most children in the rural schools are performing

poorly in mathematics, attitude of pupils towards mathematics etc. Majority of the items were in the form of Likert. Questions ranging from 1 to 18 items were employed to elicit the needed information (See Appendix F).

Besides the questionnaires, a structured interview schedule for the pupils was also used (See Appendix H). This strategy was very essential to gather data from participants. The pupils used structured interviewed schedule because some of them could not read well to answer the questions in the interview guide appropriately. This was suitable for the study because each participant got the opportunity to voice out the issues and challenges that impeded the teaching and learning of mathematics. The pupils were in groups of three in each school. In all thirty groups from ten different rural schools were interviewed. However, the last two questions of the interview schedule were opened questions which allowed pupils to provide their own responses. These two questions sought to get information like: challenges pupils face in studying mathematics, and causes of pupils poor performance in mathematics in the Basic Education Certificate Examination.

## Validity and Reliability

Validity refers to the extent to which the research conclusions are authentic (Martyn, 2008). It is a demonstration that a particular research instrument in fact measures what it purports to measure (Martyn, 2008). Validity is a measure of the extent to which research conclusions effectively represent empirical reality or whether constructs devised by researchers accurately represent or measure categories of human experience (Patton, 2002). The validity

measures taken in this study were based on these conceptions of the notion of validity.

The content validity of the instruments was ensured, for the drafted questionnaire and interview scheme were given to the mathematics education experts to assess their validity. Based on their suggestions and comments, the instruments were directed to achieve the purpose of the study. In order to find out the suitability of the two instruments, they were pre-tested in some rural J.H.S in the Fanteakwa District. The responses of the respondents in the pre-test helped to refine and check the clarity and suitability of both the questionnaires and the interview scheme. The needed alterations and redesigning were done.

The reliability co-efficient of the sets of the perceptions questionnaires of the teachers', headteachers' and the circuit supervisors' were computed using the Cronbanch Alpha formula and these were found to be 0.75, 0.63 and 0.58 respectively. A Chronbach's Alpha value of 0.71 was found in the pupils' interview schedule which indicates that the instrument was reliable (Creswell, 2008), (See Appendix H). Nahid (2003) also remarks that reliability in research can only be a matter of degree since it is not possible to get a perfect score. So reliability coefficients ranging between 0.58 to 0.75 were found acceptable for the present study. Based on the pilot testing results, suggestions from experts and supervisors were incorporated to refine and modify the contents of the instruments in order to make them more relevant and valid for the purposes of the study. The final instruments for the study therefore included all important issues which gave all the necessary answers to the formulated questions.

## Data Collection Procedure

### Pilot Study

A pilot study using a proportional stratified random sample of 30 students from five basic schools in Fanteakwa District preceded the main study. This sample was made up of 12 male and 18 female pupils. These pupils were randomly selected from all the three level classes in the schools. The responses of these were analysed using the planned statistical procedures as discussed under the section captioned Data Analysis. The findings provided valuable ideas, approaches and clues not foreseen prior to the study. For example, a few of the items in the interview guide were reframed and the time allocated for the interview was reviewed.

In all, 30 students, 6 mathematics teachers, 5 headteachers and 6 circuit supervisors responded to the questions in the questionnaires and the interview schedule in the pilot study. The purpose of the pilot study was to validate the instrument and to find out the possible problems to be encountered during the main study. The questionnaire for students contained 18 items classified under two main sections, namely: personal information and views about the issues and challenges perceived as contributing to pupils' poor performance in mathematics. The 18 items contained in the Mathematics teachers' questionnaire covered personal information, attitudes towards mathematics, exercises/assignment/ homework given etc. The rest of the questionnaires to both headteachers and circuit supervisors almost covered the same information as above.

Analysis of the pilot study took the form of evaluation of individual items. From the analysis, the strengths and weaknesses of some of the items were brought to the fore. For example, some of the questionnaire items had to be recast and others removed for their inappropriateness and some others had to be added. The pilot study helped to achieve the reliability coefficient reported earlier in the chapter. The revised questionnaires for the main study were made up of 16 items for pupils and 18 items for mathematics teachers. The headteachers had 19 items questionnaire while the circuit supervisors also had 18 items in their questionnaire. On the whole, the pilot helped to redesign the main study.

The researcher went to introduce himself and explain the purpose of the study to the District Directors of Education for New Juaben and Fanteakwa Districts without any introductory letter. The Fanteakwa District Director requested for an introductory letter from the researcher's place of work of which he did (See Appendix A). At the New Juaben District Education Office, the director asked the researcher to apply officially (See Appendix B). These letters were personally handed over to them and approval given to carry out the pilot study and the actual study in their respective districts. Copies of the approval letters were distributed to the various schools personally by the researcher. The headteachers, mathematics teachers, circuit supervisors and the pupils were briefed about the purpose and the implications of the study. They were also assured that any information they gave were going to be kept confidential. In each school a day and convenient times were set for the administration of questionnaire and the interview. The questionnaire and the interview were done in the same day

in each school. The questionnaires were administered first to the mathematics teachers and the headteachers, followed by the interview of the pupils. To ensure the choice of appropriate responses by the pupils, the researcher explained the responses: Strongly agree, (SA), Agree (A), Uncertain (UN), Disagree (D), and Strongly disagree (SD). Each question in the interview schedule was read to the respondents first and the pupils were asked to reason and tick the appropriate option as their response to the statement. This practice was carried out in all the selected schools. It was observed that in some schools, pupils could not even write the name of their schools. This was why the researcher read the statement first to the pupils or respondents personally. The data collection process lasted for ten days. The process was successful. Headteachers of the selected schools, the staff and respondents co-operated with the researcher except on few instances where some mathematics teachers requested for some compensation for their time used to complete their questionnaires.

**Data Analysis Procedures**

The data from the two sources were studied for consistency. Tables were produced to show the variety of responses of each item as well as the number of respondents. Both quantitative and qualitative methods were used in analysing the data collected .Some of the open –ended items were analysed using qualitative methods while the remaining items were analysed quantitatively . Frequencies, (percentages) and means were used to analyse the quantitative data from the various sources. Statistical operations were done to set the frequencies, (percentages) and averages. In each frequency, tables were compiled. The

Statistical Package for Social Science (SPSS) was also used to analyse the quantitative data and check the accuracy of the researcher's manipulation of the frequencies (percentages). Durrheim (1999) asserts that "statistical procedures are used to analyse quantitative data".

The analysis and discussion of the data was done according to the research questions. Each research question was first stated and then the findings were presented. The responses from research question one was analysed with the help of means that were calculated using the SPSS programme.

Responses for question two were analysed with the help of frequencies, percentages and means that were calculated using the SPSS programmes. Other questions were also analysed using the same appropriate statistical measures. The frequencies (percentages) and means were used to analyse the data to determine whether or not the variables – perceptions of teachers in rural schools of teaching mathematics influence pupils' performance in mathematics, whether the perceptions of pupils in rural schools of learning mathematics have impact on their performance in mathematics and whether learning facilities and teachers' output of work; class – exercise, assignment/homework and others do influence performance of pupils in mathematics.

# CHAPTER FOUR

# RESULTS AND DISCUSSION

## Overview

The study investigated the issues and challenges that mathematics education stakeholders perceived as contributing to pupils' poor performance in mathematics in some rural schools in the New Juaben Municipality in the Eastern Region of Ghana. This chapter is focused primarily on findings made and discussion of the findings on the data. Findings from the study are discussed in relation to the research questions. Discussion of these research questions are based on quantitative and qualitative analysis of the data collected from the questionnaire and the interviews. Some of the responses to the open-ended items were analysed using qualitative methods while the responses on the remaining items were analysed quantitatively as said earlier on. The discussion is focused on the following areas: (i) demographic information about sampled pupils, mathematics teachers, headteachers and circuit officers. (ii) finding related to research questions.

The following research questions were formulated to guide the study

1. How do stakeholders of mathematics education (pupils, headteachers, and circuit officers) perceive teachers' support for learning mathematics?

2. What is the perception of stakeholders of education about the school support and motivation for learning mathematics?
3. How do education stakeholders perceive pupils effort in learning mathematics in school?
4. What challenges do mathematics teachers perceive which contribute to pupils' poor performance in mathematics?

## Demographic Information about Pupils, Teachers, Headteacher and Circuit Supervisors

Information about the demographic background of the pupils who were sampled for the study covered a wide range of characteristics such as gender, age, and class. With regards to mathematics teachers' demographic data, it focused on gender, age, qualification, rank and years of teaching mathematics in the school. The headteachers' demographic information was similar to that of the teachers. It was also on gender, age, qualification, rank and year of heading the school. However, that of the circuit supervisors was on gender, qualification and rank. The coverage of these areas was to ascertain if it contributed to the support or mitigated against pupils performance in mathematics in the sampled schools. Tables 2 to 5 show the demographic data of the respondents with respect to gender.

**Table 2: Pupils' Gender**

| Gender | No. | % |
|---|---|---|
| Male | 154 | 52 |
| Female | 142 | 48 |
| **Total** | **296** | **100** |

Table 2 shows the number of male and female pupil respondents who participated in the study. Out of the total of 296 pupils, 154 representing 52% were males while 142 representing 48% were females. Although the researcher had in mind to select equal number of males and females, this could not be possible. These situations suggest low female enrolment in rural schools.

**Table 3: Headteachers' Gender**

| Gender | No. | % |
|---|---|---|
| Male | 5 | 50 |
| Female | 5 | 50 |
| **Total** | **10** | **100** |

Table 3 shows the gender distribution of Headteachers (HT). The table portrays equal number of males and females. Five representing 50% of the respondents were male headteachers while 5 representing 50% of the respondents were also female headteachers.

**Table 4: Mathematics Teachers' Gender**

| Gender | No. | % |
|---|---|---|
| Male | 7 | 70 |
| Female | 3 | 30 |
| **Total** | **10** | **100** |

Table 4 portrays the gender distribution of the mathematics' teachers. From the table, the male population of the respondents were more than the females. With respect to the teacher respondents, 7 representing 70% were males while only 3 representing 30% were females.

**Table 5: Circuit Supervisors' Gender**

| Gender | No. | % |
|---|---|---|
| Male | 6 | 60 |
| Female | 4 | 40 |
| **Total** | **10** | **100** |

Table 5 also shows the gender distribution of circuit supervisors. The table showed that the male population of the respondents were more than the females. Six representing 60% were males while 4 representing 40% were female. The male domination was an indication that more males hold high position in the municipality and schools where the study was conducted. However, the distribution of the headteachers' gender on Table 3 portrayed equal number of males and females. This was different from the situation with regards to mathematics teachers and circuit supervisors.

Table 6 shows the percentage distribution of the ages, gender and classes of pupils involved in the study. Data in Table 6 indicates that in JHS1, the modal age of the male was 12 years representing 23.8%. Out of the total male population of 42 recorded in JHS1, 10 representing 23.8% were of age 12, while nine represent 21.4% and 21.4% respectively were 13 and 15 years old. There were age differentials between the females and that of the males.

**Table 6: Percentage of Age, Gender and Class Distribution of Pupils' Respondents**

| | | Gender | | | | | |
|---|---|---|---|---|---|---|---|
| | | Male | | Female | | Total | |
| Class | Age (yrs) | No. | % | No. | % | No. | % |
| JHS 1 | 12 | 10 | 23.8 | 7 | 16.3 | 17 | 20 |
| | 13 | 9 | 21.4 | 2 | 4.7 | 11 | 12.8 |
| | 14 | 5 | 11.9 | 9 | 20.9 | 14 | 16.5 |
| | 15 | 9 | 21.4 | 16 | 37.2 | 25 | 29.4 |
| | 16 | 6 | 14.3 | 5 | 11.6 | 11 | 12.9 |
| | 17 | 2 | 4.8 | 1 | 2.3 | 3 | 3.5 |
| | 18 | 1 | 2.4 | 3 | 7 | 4 | 4.7 |
| | Above 18 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | | 42 | 100 | 43 | 100 | 85 | 100 |
| JHS 2 | 12 | 3 | 4.5 | 5 | 11.4 | 8 | 7.3 |
| | 13 | 11 | 16.7 | 8 | 18.2 | 19 | 17.3 |
| | 14 | 9 | 13.6 | 13 | 29.5 | 22 | 20 |
| | 15 | 11 | 16.7 | 7 | 15.9 | 18 | 16.4 |
| | 16 | 14 | 21.2 | 6 | 13.6 | 20 | 18.2 |
| | 18 | 7 | 10.6 | 1 | 2.3 | 8 | 7.3 |
| | Above 18 | 2 | 3 | 0 | 0 | 2 | 1.8 |
| **Total** | | **66** | **100** | **44** | **100** | **110** | **100** |

**Table 6: Cont'd**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| JHS 3 | 12 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 13 | 1 | 2.2 | 0 | 0 | 1 | 1 |
| | 14 | 7 | 15.2 | 10 | 18.2 | 17 | 16.8 |
| | 15 | 8 | 17.4 | 14 | 25.5 | 22 | 21.8 |
| | 16 | 11 | 23.9 | 17 | 30.9 | 28 | 27.7 |
| | 17 | 15 | 32.6 | 6 | 10.9 | 21 | 20.8 |
| | 18 | 2 | 4.3 | 8 | 14.5 | 10 | 9.9 |
| | Above 18 | 2 | 4.3 | 0 | 0 | 2 | 2 |
| | **Total** | **46** | **100** | **55** | **100** | **101** | **100** |

Out of the 43 girls, 16 representing 37.2% were of age 16 years. Three were 18 years old while the least age of the group was 13 years. Taking the total percentage of JHS 1 the modal age was 15 years with a total number of 25 pupils which was made up of 9 males and 16 females representing 29.4%. In JHS 2 the male modal age was 16 years with 14 pupils representing 21.2% of the population of pupils. The modal age of the female respondents in JHS 2, was 14 years with a total number of 13 representing 29.5% of JHS 2 pupils population. In JHS 2, the age which had the maximum number of respondents in the study was 14 years. The total males in JHS 3 involved in the study were 46 while the female numbered 55. Female distribution of respondents in JHS 3 in the Table 6 indicated that 17 representing 30.9% were of 16 years of age. Table 6 further shows that, all the female pupils in JHS 3 in the study were above 12 years.

From Table 6, the year with the maximum number of pupils was 15 years where a total of 28 representing 27.7% were recorded. The result from Table 6 was an indication that most of the pupils investigated were adolescents. This suggests that, a problem of learning difficulties is bound to come as some psychologists stated in their theories about the characteristics of adolescent (Rice & Dolgin, 2002). They stated that 40 to 60 percent of adolescent school children are chronically disengaged. And this is exhibited by inattentiveness, lack of efforts or unwillingness to compete in educational tasks and assignment and self-reported level of boredom.

According to Piaget's stage of development, these ages are within the formal operational stage, that is 12 years upwards where children can think in abstract (Piaget, 1972). There is therefore the possibility of the mathematics teachers teaching in abstract which would make it difficult for most of the pupils to understand the lessons. Hence, pupils' inabilities to comprehend most topics in mathematics.

**Table 7: Distribution of Headteacher and Teacher Respondents: Gender and Ages**

| Ages (years) | Gender | | | | | |
|---|---|---|---|---|---|---|
| | Males | | Females | | Total | |
| | No. | % | No. | % | No. | % |
| 20 – 24 | 1 | 8.33 | 0 | 0 | 1 | 5 |
| 25 – 29 | 0 | 0 | 1 | 12.5 | 1 | 5 |
| 30 – 34 | 3 | 25 | 1 | 12.5 | 4 | 20 |
| 35 – 39 | 1 | 8.33 | 2 | 25 | 3 | 15 |
| 40 – 44 | 3 | 25 | 0 | 0 | 3 | 15 |

**Table 7: Cont'd**

| | | | | | | |
|---|---|---|---|---|---|---|
| 45 – 49 | 0 | 0 | 1 | 12.5 | 1 | 5 |
| 50 – 54 | 2 | 16.66 | 0 | 0 | 2 | 10 |
| 55 – 59 | 0 | 0 | 3 | 37.5 | 3 | 15 |
| 60 – 64 | 2 | 16.66 | 0 | 0 | 2 | 10 |
| **Total** | **12** | **100** | **8** | **100** | **20** | **100** |

As shown in the Table 7, teachers and headteachers' age ranged from 20 to 64 years. The age range showed that 25% of the male respondents were below 30-44 years. However, 37.5% of the females were between 55-59 years.

**Table 8: Qualification of Mathematics Teachers**

| Qualification | No. | % |
|---|---|---|
| WASSCE | 2 | 20 |
| Post-Secondary | 6 | 60 |
| Diploma | 1 | 10 |
| Degree (B'Ed.) | 1 | 10 |
| **Total** | **10** | **100** |

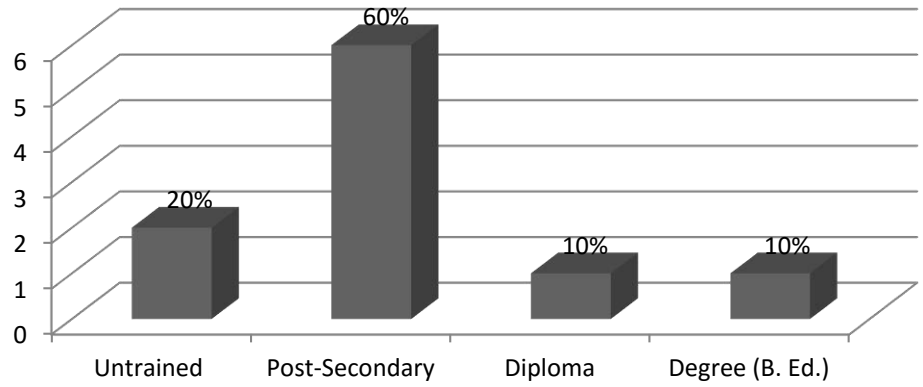



**Figure 2.** Qualification of mathematics teachers

Table 8 indicates the data on Mathematics teachers' level of qualification. Table 8 revealed that 6 participants representing 60% of the respondents were Post Secondary Certificated teachers and 2 also representing 20% were West African Senior Secondary School Certificate Examination (WASSCE) holders. This implies that, 2 of the teachers who handled pupils in the selected survey schools were pupil-teachers. The two untrained teachers may have some challenges of handling the subject due to lack of further training and studies in the area of mathematics. No wonder during the interview with pupils, about 80% of them pointed out that their teacher's method of teaching and their attitudes towards them were a problem, when pupils were asked to mention some of the challenges they faced in studying mathematics.

**Research Question 1: How do mathematics education stakeholders perceive teacher support for the learning of mathematics?**

Research question one sought to find out from the school pupils, headteachers and circuit supervisors their perceptions of teacher's support for pupils to study mathematics. Question 4 of the pupils' questionnaire tried to find out pupils' knowledge about teachers' attendance to the school to assist them to study mathematics. Out of 296 pupils, 133 representing 44.9% were of the view that teachers were always ready to assist them to learn mathematics. Eighty of the pupils representing 27% also agreed to teachers' regular attendance to school to support them. However 52 representing 17.6% did not agree to teacher's attendance to school or class to support them in learning mathematics.

Figure 3 indicates that 133 (44.9%) of the pupils supported the position of the teachers that they come to school regularly to assist pupils learn mathematics. When the same question was put to the teachers themselves almost all of them supported their regularity to school to assist the pupils to learn mathematics.

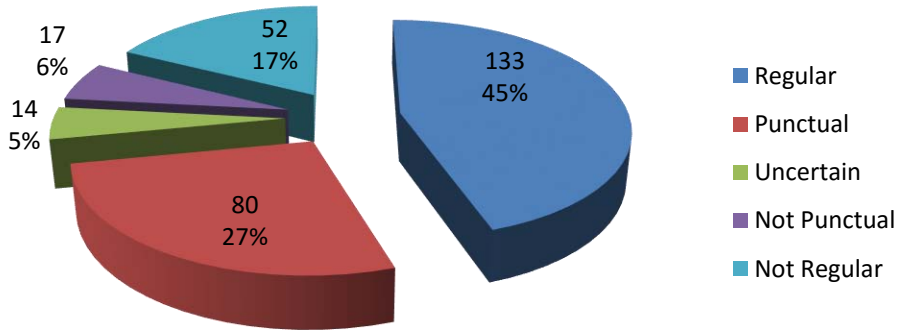



**Figure 3.** Attendance of teachers

Further questions were asked based on research question one to find out the support teachers gave to pupils in their study of mathematics. Answers to questions like "did your mathematics teachers make effective use of the mathematics periods?, "were mathematics class exercises enough to aid you to understand concepts taught"? and the likes were found out from the pupils. Table 9 which is on descriptive statistic highlights the responses of the mathematics education stakeholders to the question regarding the level of support teachers give to students in the mathematics classroom to enable them learn the subject more effectively.

Table 9 presents the views of pupils, headteachers and circuit supervisors on the support of the teacher to pupils' learning of mathematics. A scale of one to

five was assigned to the responses as Strongly Disagree (SD = 1) Disagree (D = 2) Uncertain (Un = 3), Agree (A = 4) Strongly agree (SA = 5) (See appendix H). Any variable that receives a mean score of more than 3 is regarded as a viable area that encourages participation and promotion but a score of 3 or less is regarded as not viable. The maximum score is 5 while the minimum score is 1.

**Table 9: Descriptive Statistics on Teacher Support of Pupils' Learning of Mathematics (Item) From Different Stakeholders Viewpoints Mean rating of Respondents**

| Statements | Pupils | | Headteachers | Circuit Officer |
|---|---|---|---|---|
| Mathematics teachers make effective use of the mathematics periods | 2.7 | _ | 4.8 | _ |
| Mathematics class exercises given to pupils after lessons are enough to aid the consolidation of concept | 2.6 | | 1.7 | 2.9 |
| Homework given to pupils aid them to do further research on mathematics concepts taught | 2.6 | - | 2.1 | 2.7 |
| Mathematics teachers mark assignment promptly and discuss weaknesses | 2.5 | - | 4.3 | 3.0 |
| The teaching methods of teachers are effective for pupils' understanding of mathematics concept | 3.6 | - | 3.7 | 3.1 |

The mean scores ranged between 1.4 and 4.8. A closer look at the table 9 reveals that only headteachers agreed that mathematics teachers make effective use of the mathematics periods. They had a mean of 4.8. The pupil respondents

however, disagreed with that statement. They also had a mean of 2.7. This behaviour of the teachers might be that most of the mathematics contact periods had been wasted by other school activities which the pupils were not in agreement with. This could lead to loss of contact hours which would automatically affect pupils' performance in mathematics.

Regarding class exercises given to pupils after every mathematics lesson, all the respondents pointed out that they were not enough to aid in the consolidation of concepts taught. The means of 2.59, 1.90, 1.70, 2.90, suggest that pupils could not consolidate concepts taught with the help of the few class exercises given to them after teaching. This condition may be due to the small duration assigned for mathematics teachers to use to teach and do exercises simultaneously. Inadequate number of exercises would contribute to pupils' poor performance in mathematics both in school and out of school.

Table 9 further revealed that the picture of the class exercises reflected on the homework mathematics teachers give to pupils. Statistics gathered in table 9 indicated that all stakeholders were of the view that homework given to pupils did not aid pupils to do further research on the concepts taught. The mean with respect to the nature of homework were all less than the neutral averages of 3. This implies that the impact of homework in pupils' learning and further research about mathematics concepts were ineffective.

Besides, the pupils with a mean of 2.54 did not agree that assignments were marked and discussed promptly. The Headteachers strongly supported the fact that really, teachers gave assignments, marked and discussed promptly with

pupils. On methodology issues, all the three categories of respondents agreed that mathematics teachers in their schools used good and effective methods to teach mathematics. The pupils had a mean of 3.64, head teacher 3.7 and circuit supervisors 3.1. These responses indicated perceived strong teaching methods support for pupils' learning which meant mathematics teachers' approaches were not perceived as a contributory factor to low performance of pupils. On the other hand, on the issue of marking of class exercises, pupils had an opposing view to other stakeholders and this could account for some reasons of pupils poor performance in mathematics. In other words, if the claim by pupils those teachers were not promptly marking their exercise/homework, then how could they make out their mistakes and correct them? It means the same mistakes could be made in subsequent work and hence affects their performance in mathematics.

**Research Question 2**: **How do mathematics education stakeholders (pupils, teachers, headteachers and circuit supervisors) perceive school support for and motivation of pupils in the learning of mathematics?**

Basically, the study as already stated in the introductory paragraph of this chapter was to investigate the key issues and challenges perceived by stakeholders in education as contributing to pupils' poor mathematics performance in some rural schools in the New Juaben Municipality in the Eastern Region of Ghana. Research question two was to help the researcher find out how the school supports pupils' learning of mathematics. The question was about pupils' motivation to learn mathematics. Views on this question were sought from all the four stakeholders, that is, the pupils, the teachers, the headteachers and circuit

supervisors. The Table 10 below gives the summary of their responses to the two relevant items in the questionnaire.

Responses from the headteacher as in Table 10 indicate that the school supports the pupils in various forms to study mathematics. The mean of the head teachers was 3.5 which was above the neutral point of three, an indication of the support from the school. A mean of 2.1 implied that the pupils were of a different view as to the support the school gave to them in terms of facilities and conducive environment for learning mathematics and their teachers' seriousness to help them pass their mathematics examination. The pupils' responses were backed by the responses of the circuit supervisors. A mean of 2.8 for the circuit supervisors was an indication that the support the school and the teachers gave to the children was not enough to assist the pupils to pass their mathematics examination well. This was again reflected in the pupils' views during the interview. About 109 representing 36.8% indicated inadequate relevant TLMs, textbooks and other facilities for learning mathematics as some of their challenges (See appendix H). Low level of school support in terms of facilities and environment might have accounted for pupils' poor performance in mathematics in the Basic Education Certificate Examination.

**Table 10**: **Mathematics Education Stakeholders' Perceptions of School Support and Motivation of Pupils in the Learning of Mathematics**

| Statement | Pupils | Teachers | Headteachers | Circuit Supervisors |
|---|---|---|---|---|
| The school supports mathematics teachers with adequate TLMs to teach mathematics | 2.1 | 3.1 | 3.5 | 2.8 |
| The school motivates pupils enough to study mathematics | 2.27 | 2.1 | 4.1 | 2.2 |
| The facilities in the school aid the learning of mathematics | 2.89 | 2.00 | 4.50 | 2.70 |

With respect to the pupils' motivation to learn mathematics, all the respondents except the headteachers saw it as negative (See table 10).Their means which are below the neutral point of three implied that the school did little or nothing to motivate pupils to study mathematics. This could be considered also as a contributing factor to pupils' poor performance and achievement in mathematics. Aremu and Oluwole (2001) submit that some of the factors of poor academic achievement in mathematics are motivational orientations.

Another item which was used to answer research question 2 was on the facilities and the environment of the school (See table 10). Unfortunately, three of the stakeholders, disagreed with the suggestion that the facilities of the school support the learning of mathematics. Their responses indicated means between 2.00 to 2.88. For research question 2 where the pupils, the mathematics teachers

and the circuit supervisors disagree on the influence of the school facilities and environment on academic performance in mathematics :this may be because they perceive other factors as more influential to pupils' poor academic performance in mathematics than school facilities and environment. However, headteachers with a mean of 4.5 showed that facilities in their schools facilitated the studying of mathematics. Further information on the situation through the interview data revealed that facilities were not enough in the school to support learning generally, and specifically the learning of mathematics. Glen (2002) agrees that pupils who receive instruction in buildings with good facilities and environmental conditions can earn test scores that are 5- 17 percent higher than scores for pupils in substandard buildings.

**Research Question 3**: **How do mathematics education stakeholders (Teachers, Headteachers, and Circuit Supervisors) perceive pupils effort in the learning of mathematics?**

To answer the research question three on pupils' effort by way of attendance to school and class, the teachers and headteachers were asked to respond to the questionnaires.

From Table 11, it was revealed that 7 of the teachers representing 70% and 6 of the headteachers representing 60% stated that pupils in their schools did not attend school regularly. This negative behaviour of the pupils is a strong factor to account for pupils' poor performance in mathematics. Absenting themselves from school and class indiscriminately could also be a factor that contributes to pupils' poor performance in mathematics.

**Table 11: Pupils Attendance to School/Class Regularly**

| | Teachers | | Headteachers | |
|---|---|---|---|---|
| Item | No. | % | No. | % |
| Agree | 2 | 20 | 3 | 30 |
| Uncertain | 1 | 10 | 1 | 10 |
| Disagree | 5 | 50 | 6 | 60 |
| Strong Disagree | 2 | 20 | 0 | 0 |
| **Total** | **10** | **100** | **10** | **100** |

**Table 12: Presentation of Submission of Pupils' of Assignment**

| Items | No. | % |
|---|---|---|
| Agree | 5 | 50 |
| Uncertain | 2 | 20 |
| Disagree | 3 | 30 |
| **Total** | **10** | **100** |

In terms of how regular pupils present assignments, headteachers and mathematics teachers agreed that pupils had not been submitting their assignment regularly. Five representing 50% of the respondents agreed to this item. The evidence could be seen on Table 12. Similarly, 6, representing 60% of the headteacher respondents testified that really pupils are not regular to schools and class. To emphasize the results emanating from research question 3, analysis of findings of data collected from different sources revealed the means presented in Table 13.

**Table 13: Rating Perceived effort made by Pupils in the Study of Mathematics**

| Statements | Teachers | Headteacher | Circuit Supervisors |
|---|---|---|---|
| Pupils in your school do not study mathematics seriously | 2.9 | 2.9 | 2.0 |
| Pupils are afraid of learning mathematics | 3.5 | 3.9 | 3.2 |

The mean rating on teachers, head teachers and circuit supervisors in Table 13 revealed that pupils in the rural schools in the New Juaben District did not study mathematics seriously. This implies that pupils put little effort in the studying of mathematics which may account for their poor performance in the BECE. Furthermore, some responses from the interviews with pupils on some possible causes of the decline in their performance in mathematics in BECE also revealed that pupils' lack of seriousness could be associated with poor performance and achievement in mathematics. On the phobia of pupils with respect to mathematics, the means from Table 13 revealed that pupils were not afraid of mathematics. Mean ranging from 3.0 to 3.9 indicated that pupils were not afraid of mathematics. Why then are they not taking it serious in their study?

**Research Question 4**: **What challenges do mathematics teachers face which they perceive contribute to pupils' poor performance in mathematics?**

Research question four was asked to elicit from the teachers themselves, headteachers, pupils and circuit supervisors challenges that mathematics teachers face in performing their duties. Among the challenges that the three categories of respondents put across were: (i) pupils' refusal to do homework/exercises (ii)

pupils refusal to learn mathematics at home (iii), lack of practice after new concepts had been taught (iv) lack of relevant textbooks, TLMs and other items. (v) large class sizes (vi) pupils with weak mathematics backgrounds, (vii) pupils' dislike for the subjects, and (viii) lack of in-service training among others. Analyzing some of these challenges, the researcher conceived the idea that these factors contribute to learners' poor achievement in mathematics. Apart from the teachers' knowledge of mathematics content, mathematics teachers feel these are other factors that contribute to the learner's poor performance in B.E.C.E especially in mathematics.

In large class sizes for example, teachers found it difficult to pay attention to individuals. In a class of 50 to 60 learners for instance, definitely many pupils will lag behind. When the circuit supervisors of the various schools were asked to respond to the same statement, 7 representing 70% of the respondents agreed. According to the government policy on promotion requirement, a learner who fails twice in a class must be automatically promoted to the next grade or class (UNICEF, 2003). As a result of this automatic promotion employed in our educational system, majority of learners, most especially those from rural schools had problems achieving basic literacy and numeracy skills and as a result, their performance in mathematics is very poor because they did not achieve all the basic competencies from previous grades/class. In addition to this, lack of relevant textbooks, TLMs and other resources make it difficult for teachers to teach mathematics in a constructive manner. It is said that practice makes a man

perfect, and if the pupils are not practising how can they make any better grades in mathematics?

Furthermore, reasons which needed to be considered and addressed if we wanted to help the rural pupils come out of the mathematical saga or canker were given by teachers as follows: (i) difficult level of the subject making understanding very difficult (ii) fear when studying mathematics problems, (iii) no serious learning is done to pass the basic education certificate examination in mathematics. Also mentioned by headteachers were laziness on the part of the pupils, lack of practice or revision, lack of interest, lack of determination, confidence and concentration, teachers abstract methods, incompetent mathematics teachers, lack of relevant textbooks, and B.E.C.E question above pupils' standard and poor mathematics foundation of pupils.

**Table 14: Reasons why pupils do not do well in the B.E.C.E in Mathematics**

| Teacher Response | No. | % |
|---|---|---|
| Questions above pupils standard | 1 | 10 |
| Lack of practice/revision | 4 | 40 |
| Lack of interest of pupils | 1 | 10 |
| Fear, and difficult level of mathematics | 2 | 20 |
| Lack of good foundation in mathematics | 1 | 10 |
| Poor mathematics text books | 1 | 10 |
| **Total** | **10** | **100** |

Computing these responses statistically, 4 teachers representing 40% said pupils do not study or practise solving mathematics problems, 2, representing

20% of the teachers were of the notion that pupils fear, or are afraid of answering mathematics questions and that mathematics is difficult for most children. Lack of interest and good foundation took 10% each respectively (See Table 14).

From the Table 15, it was shown that the headteachers saw the problem in a different way. Three, representing 30% of them, indicated that pupils lack interest and that their poor attitude towards mathematics was the main cause. Two, representing 20% said the questions at times were outside of the syllabus. Lack of in-service training for mathematics teachers, lack of foundation for pupils, pupils poor attitudes towards mathematics, incompetent mathematics teachers, poor and inadequate textbooks contributed very minutely to pupils' problem. They were all indicated by 1 respectively representing 10% of the headteacher respondents.

**Table 15: Headteachers Reasons why Pupils do not do well in B.E.C.E Mathematics**

| Item (Headteacher) | Frequency | Percentage |
|---|---|---|
| Question outside the syllabus | 2 | 20 |
| Lack of in-service for teachers | 1 | 10 |
| Lack of good foundation of pupils | 1 | 10 |
| Lack of interest of pupils and | 3 | 30 |
| Pupils poor attitude towards mathematics | 1 | 10 |
| Incompetent mathematics teachers | 1 | 10 |
| Poor and inadequate text books | 1 | 10 |
| **Total** | **10** | **100** |

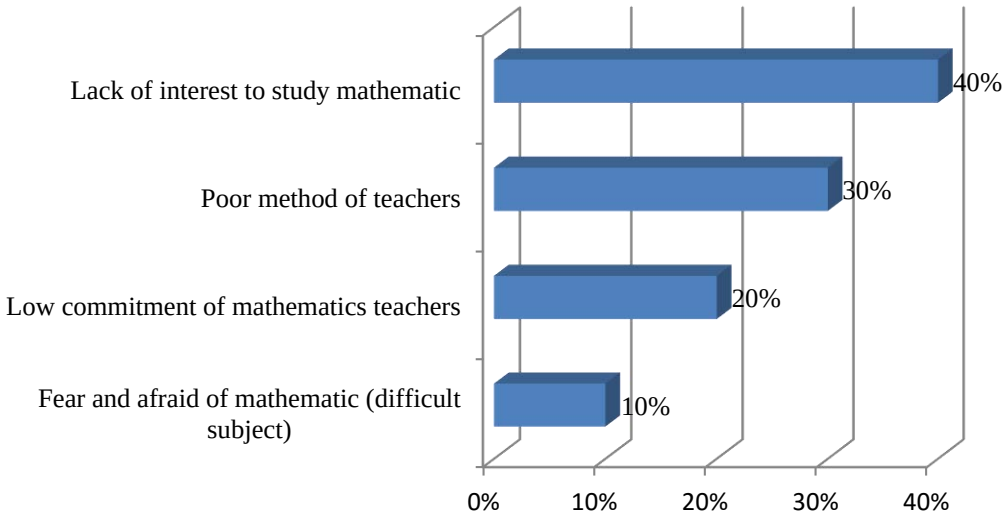



**Figure 4.** Reasons why pupils do not do well in maths in the B.E.C.E.

On Pupils' views about why they do not do well in mathematics in the B.E.C.E analysis in fig. 6 shows that 40 out of 100 respondents mentioned lack of interest to study mathematics and only 10 out of 100 respondents attributed to fear of mathematics. This is an interesting finding because the students can learn mathematics if the right environment is provided since they do not fear the subject.

The next section presents a qualitative analysis of the data collected for the study. The data is mainly interview data generated through the researcher's interaction with the pupils' participants and the responses of the open-ended questions from the other respondents. It is important to point out that the interview data was used to investigate and to elicit more answers to the research question four.

## Qualitative Data Analysis

The purpose of the interviews with the pupils was to identify some issues and challenges they encounter which hinder or impede their learning of mathematics. It was done to find out from the pupils some of the causes which they perceived to have contributed to the poor performances in mathematics in the B.E.C.E.

The interviews were focus group interviews which were done with groups of pupils from classes selected randomly from each stratum (i.e. J H S 1, 2, and 3). Two hundred and ninety six constituted the groups were interviewed. Two major questions were raised to guide the pupils' interviews. These were: Q15→ "What are some of the challenges you face in studying mathematics?" and Q16→ "What was the cause of pupils' poor performance in mathematics in BECE?" (See appendix H Items 15and 16).

Q15.What are some of the challenges you face in studying mathematics?

The following were challenges the pupils mentioned: teachers' poor attitudes towards them (pupils), lack of commitment of teachers, poor teaching methods of teachers, teachers irregular attendance, lack of pupils' interest in mathematics, inadequate and irrelevant textbooks, poor home and school conditions and complex procedure or steps involved in mathematics which led to methods or rules being easily forgotten and others . See pupils' direct responses in appendix J

During the interviews, the researcher established that pupils were not comfortable with their teachers' behaviours towards them during mathematics

lessons. It came to light that some mathematics teachers had no patience for slow learners and some had been insulting the weak pupils before the class. This condition embarrassed pupils and made them feel inferior as they were not able to cope with the lessons (See appendix J). Approaching their teacher to address their problems was impossible. This attitude may be a major factor which may account for pupils not being interested in mathematics. This lack of interest in mathematics may result in poor performance in the Basic Education Certificate Examination.

Q16. What was the cause of pupils' poor performance in mathematics in B.E.C.E.?

In responding to this question, most of the pupils indicated the following among others: the difficult nature of mathematics, fear, laziness, lack of practice and revision, lack of interest on pupils' part, lack of confidence and determination, poor teaching methods of teachers, incompetent mathematics teachers, lack of good textbooks and other resources and lack of committed mathematics teachers.

Among the causes, the most frequent ones that most of them mentioned were the incompetent mathematics teacher and lack of good text books. As already stated under the teacher qualification, teachers' status in terms of content knowledge is a contributory factor to pupils' poor performance in mathematics. The incompetent teachers had been confirmed as one of the main causes of pupils' poor achievement in mathematics. Irrelevant and inadequate mathematics textbooks were also seen by the pupils as an issue contributing to their poor

performance in mathematics. Teachers were asked the following questions (thus questions 3and 4):

Q3. What are some of the challenges you face in teaching mathematics?

When the teachers were asked to respond to the above question, common factors as challenges ran through their answers. These were:

i. Lack of relevant textbook and other facilities
ii. Large class sizes
iii. Lack of practice of concept taught
iv. Pupils weak background knowledge of the subject
v. Frequent truancy of pupils.

The mention of lack of relevant textbooks by the teachers goes to support the pupils' claim of not having adequate and good textbook to study the mathematics. Part of the problem of pupils not being able to study hard and hence put-up good performance in mathematics examination may also stem from this issue of irrelevant textbooks. Almost all the challenges raised in one way or the other affect pupils' performance in mathematics.

Q4. What are some of the reasons why pupils do not do well in mathematics in the B.E.C.E.?

In response to this questions, the teachers mentioned the following reasons as some of the causes of pupils not doing well in mathematics in B.E.C.E: fear of the subject, low commitment of the mathematics teachers, lack of interest of pupils to study it, lack or poor mathematics textbook, lack of good foundation of

pupils in mathematics, incompetence of some mathematics teachers and lack of confidence and motivation.

Lack of interest and poor foundation of pupils could also be contributory factors to pupils' poor performance in mathematics in the BECE. In the rural areas, most of the teachers are untrained, most especially in the lower classes. This might have affected pupils' foundation in mathematics and hence their poor achievement in mathematics in the BECE.

## Discussion of Findings

On the composition of the sample for the study, it was observed that 52% of the pupils' respondents were male as against 48% who were female. Further observation of the other respondents put the percentage at 60% for males as against 40% for the females. The low percentage of females in the teacher, headteacher, circuit Supervisor sample could be attributed to the observation that mathematics still appears to be male dominated subject (Fletcher et. al, 2009); therefore, more mathematics teachers and headteachers were males. With regard to the pupils' sample, the few female respondents could also be attributed to the assertion by Koul and Fisher (2006) that female participation and interest in mathematics and science diminishes as they move up in the educational ladder towards the university level. This may be due to a variety of factors that are primarily rooted in their cultural belief surrounding the role of women in the society.

Statistics gathered in the study revealed that about 98% of the pupils were adolescents. It has been observed that homework and class – exercises contribute

tremendously to pupils' learning of mathematics (Rothschild,2005). According to Rothschild, pupils' learning improves when homework serves a clear purpose. Also feedbacks from homework and class exercises improve the effective need of homework (Needlmen, 2001). Yet this study shows that teachers did not make any good use of homework to aid the learning of mathematics.

Furthermore, it has been pointed out by a number of researchers that teachers' attitudes towards the children play a vital role in pupils learning. Enthusiasm, respect for pupils and personality traits influence pupils in studying mathematics as well as other subjects (Koul & Fisher, 2006). Yet, again in this study, pupils did not think their teachers respected them. Instead, some weaker pupils were always ridiculed in class and this could contribute to such pupils' poor performance in mathematics. The findings of the study revealed that bad methods of the teachers were contributory factors to pupils' poor performance in mathematics. Bolajie (2005) agreed that teachers' reception, methods of mathematics teaching and personality greatly accounted for the pupils' positive perception of mathematics.

It also came out in the study that some of the pupils failed mathematics because of fear. Swars, Daane and Giesen (2006) and Martinez (2006), all confirmed that fear of both answering mathematical questions in class and for taking mathematical test could be escalated to a level termed mathematics anxiety which leads to negative learning of mathematics. Individuals with poor attitude or perception towards mathematics are often reported to have a low self-concept and feeling of incompetence (Hannula & Markku, 2002).

In addition to the above findings, it was revealed that motivation from both the school and the home account for pupils' seriousness in learning mathematics. According to Murdock and Miller (2003), motivations towards mathematics are developed early to greatly influence attitude and perception of learning a subject. The lack of motivation on the part of the pupils could contribute to their poor performance in mathematics. ( See appendix J)

One cannot ignore the school environment with regards to pupils learning of mathematics. In schools with conducive and favourable atmosphere where school authorities co-operate and work cordially with pupils, the pupils achieve high in mathematics. Protheroe (2009) proposed that classrooms that promote learning mathematics with understanding for all pupils involve a necessary complex set of interaction and engagement of the teachers and pupils with richly situated mathematical content. Such classrooms never existed in any of the schools in the sample.

Other grey areas that were identified to have influenced pupils' performance of mathematics were lack of relevant textbooks and TLMS which pupils would study to consolidate concepts taught. This finding is consistent with observation made in the 2008 TIMSS report by Anamuah-Mensah, Mereku & Ghartey-Ampiah (2008) that, in Ghana, teaching was largely by exposition with little opportunities for learners to engage in practical and problem solving activities. Kami and Rummelsburg (2008) had stated thirty years before the above observation that all scholars recognise the need of sensory materials in learning. Among the materials they listed were counters, multi-base blocks,

clocks, abacus and so on. The idea of Kami and Rummelsburg was supported by Clausen May (2005). According to him TLMs are necessary for mathematics teaching. Swan, Marshall, and White (2007) also commented that children must be given the opportunity to work with manipulative materials in mathematics lessons. Dochy, Segers, Bosssche, and Gijbels (2003) stress that for effective work in mathematics teaching, teachers need to draw upon a variety of resources for their lessons. These observations are still relevant today but teachers studied did not use adequate TLMS.

Education has undergone a significant shift in thinking about the nature of human learning and the conditions that best promote the varied dimensions of human learning (Cooper, 2007). In psychology, there has been a paradigm shift in designing instruction from behaviourism to cognitivism and now to constructivism. Constructivism has been widely embraced by mathematics teachers as well as science teachers. Since constructivist epistemology is entirely consistent with problem – based learning, its principles manifest through theories of teaching and learning, cooperative learning and variety of hands – on experiments combined with expert scaffolding (Ambrose, 2004).

Although constructivism is a theory about learning than a description of teaching, some important strides toward defining the relationship between theory and practice in settings such as problem – based learning have been made. The following pedagogical recommendations, while general in nature, have derived from fundamental constructivist principles of learning (Fosnot, 2005). These were as follows:

1. Pupils should be encouraged to raise questions, generate hypotheses and test their validity.
2. Pupils should be given time to use and learn mathematics through practice, homework and exercises.
3. The learning environment should provide ample opportunities for dialogue or rapport. The classroom should be seen as a community of discourse engaged in child friendly activity and conversation.
4. In a community of learners, it is the pupils themselves who must communicate their ideas to others, and defend and justify them.

These assertions by Fosnot (2005) about constructivism above are in line with how teachers should teach mathematics and how pupils should seriously study mathematics in their schools. The present study did not record the use of constructivist approaches to the teaching of mathematics.

Furthermore, Hmelo-Silver and Barrows (2006) point out that teachers using constructivist theory of learning use at least two different approaches in mathematics teaching .These are.

1. Problem- Solving Approach: focus on development of mathematical thinking.
2. Investigative Approach: a focus on understanding meaningful memorization of facts, rules, formulas, and procedures and thinking necessary to contact mathematical inquiry.

Yet teachers in the study in the New Juaben Municipality did not use these methods. It is therefore not surprising that pupils in the study said their teachers did not use the appropriate methods to teach them. The use of inappropriate

methods of teaching mathematics contributes in no mean way to pupils' poor performance in mathematics.

**Interpretation of the Findings in Reference to Literature/Previous Findings**

**General Comment**

In this century, there is tremendous need for a change in the way teachers teach and learners learn. This need is mandated by the shift in knowledge and skills requirement that are necessary for full functional products of the global village we live in today. It is through the overhaul or shift in instruction and learning strategies that such change can be achieved. The quest for learners who have knowledge base that can help them be critical thinkers, decision makers and problem solvers is every nation's cry. In aligning curriculum with activities and the environment of the classroom, teachers and pupils have a critical role to play. The teachers need to know how to mimic the real world to develop the holistic being of every learner. The need to change the educational experience for all learners is central to the issue of developing critical thinkers. The individual instruction and other techniques of learning that go with this require a lot of creativity on the side of the teachers. The changes in the roles of both teacher and learner lie with the teacher as a facilitator of learning. The importance of the teachers' strategies to assist learners or pupils in the quest of learning mathematics can therefore not be over-emphasised. All mathematics teachers must understand that what they do is of paramount importance.

**Learning Difficulties due to Adolescence Age**

By observation and perusal of the result, it was possible to deduce that mathematics learning difficulties occurred due to the age of the pupils. Statistics of the pupils ages showed that all the pupils were adolescents. Psychologist Steinberg, and Sill, (2002), Pritchard (2005) had proposed that, at this age, the adolescents had developed the capacity of abstract thought processes. This ability to conceptualise abstract and hypothetical concepts made some mathematics teachers teach these pupils without any supportive learning aids which actually makes it difficult for pupils to understand the lesson. Constructivism approach to the learning of mathematics has shown that children are more successful in their learning of mathematics if they are taught in ways that are responsive by using different learning materials, assigning different tasks and using other practices such as co-operative learning (Fletcher, 2003).

Secondly, Mesler (2004) writing on difficulties in learning mathematics agreed that many pupils lack interest in mathematics because it is difficult and boring; that, it is not taught well for them to understand; that, it is abstract and takes their time and energy when solving mathematics problem. All these beliefs are manifestation of the difficulty of mathematics learning. It is not surprising that mathematics learning has been a problem to many adolescents, most especially those in the schools under the survey. Contemporary belief in mathematics education is that learners need to be active rather than passive recipients of mathematical concepts to be learnt meaningfully (Kwang, 2002).

**In–depth Knowledge in Content and Pedagogy**

The findings of this study with regards to the poor mathematics performance of pupils in the ten rural schools in the New Juaben Municipality used have confirmed the findings of earlier studies of (Ronning & Falch, (2011). The finding revealed that 176 of the pupils representing 76.9% of the respondents reported that most of their inability to perform in mathematics especially in the BECE was due to low in-depth knowledge of their teachers in content and pedagogy. This was confirmed with 10% and 20% of the headteacher and circuit supervisor respondents respectively. This goes to confirm the earlier finding of Protheroe (2009). His research testified that teachers with shallow knowledge are bound not to teach to cover the whole scope of the topics and also likely to select only topics he/she would be able to teach from the curriculum. To teach all pupils according to today's standards, teachers need to understand subject matter deeply and flexibly so they can help students create useful cognitive maps, relate one idea to everyday life. This kind of understanding provides foundations for pedagogical content knowledge that enables teachers to make ideas accessible to others (Protheroe, 2009).

The National Commission on Teaching and America Future (2003) stated that in order to teach mathematics effectively, one must combine a profound understanding of mathematics with knowledge of students as learners and to skilfully pick from and use a variety of pedagogical strategies.

To complement this, the Texas StateWide Systemic Initiative (TSSI) in their document guideline for the Mathematical Preparation of Prospective

Elementary Teachers states that, the teaching of mathematics not only requires knowledge of content and pedagogy, but also requires an understanding of the "relationship and interdependence between the two (Hill,Rowan & Ball, 2005). Kyriakou and Goulding (2006) found that future teachers need to develop both extensive subject matter background and pedagogical concepts and skills. According to Clarke and Clarke (2009), good mathematics teachers must master a repertoire of instructional methods and strategies. Accomplished mathematics teachers have a thorough understanding of the subject(s) they teach and appreciate how knowledge in their subject is created, organised, linked to other disciplines, and applied to real – world settings. Effective mathematics teachers master pedagogical knowledge used to convey and reveal subject matter to pupils. They are aware of the preconceptions and background knowledge that student typically bring to the subject and of strategies and instructional materials that can be of assistance. In addition, they understand and solve the possible difficulties likely to arise in the classroom and modify their practice accordingly. Their instructional repertoire allows them to create multiple paths to knowledge in general and to the subject they teach, in particular. Therefore, effective mathematics teachers must command a wide range of generic instructional techniques and use them appropriately.

**Teachers' Attendance and Punctuality to School/Class**

The finding also revealed that most mathematics teachers in the rural schools where the survey took place were not punctual and regular to school and class. Only about 27% of the respondents confirmed that teachers were punctual.

Even so, this good attitude of a number of mathematics teachers did not reflect strongly on the pupils' mathematics performance. The researcher strongly believes that if the teachers' activities in the school with regard to mathematics teaching are monitored carefully, it will go a long way to assist the pupils to develop interest in mathematics studying and hence improve their performance in the discipline. Researchers such as Rutter and Maughan (2002) found that pupils' classroom behaviour was much better when the teacher arrived on time to class, had prepared the lesson thorough and planned the teaching strategies thoughtfully (Rutter & Maughan 2002). On the other hand if a teacher is not punctual, wasted time in organising or sorting out things at the last minute there would to be confusion resulting in the misbehaviour of pupils (Sztain, 2003).

Research findings also suggest that a teacher who is not regular and punctual to school and class distract pupils' interest and attention and spoils the teaching learning atmosphere (Lloyd, 2005).

**Mathematics Contact Periods**

The study further revealed that in most schools in the rural areas, contact periods have gone wasted by the school authorities. The means of 2.7, 1.5 and 1.4 of pupils, teachers and circuit supervisors confirmed that mathematics contact periods were most of the time affected by other school activities like worship, carrying of stones, firewood and water among other things. These problems of the mathematics teachers and pupils contributed immensely to pupils' poor performance in mathematics. This finding agreed with the finding of Lamb and Fullarton (2002). According to Lamb and Fullarton, classroom and school

variables contribute substantially to pupils' achievement in mathematics. In a school where schedules or routine on the time-tables are strictly adhered to, teaching and learning goes on effectively and there is orderliness in such school. Rutter and Manghan (2002) cast no doubt on the possibility of improving the school achievement in mathematics. Indeed, work on difference in mathematics achievement has highlighted the importance of effective use of the mathematics periods in our schools (Smith, 2000).

**Mathematics Exercise and Homework/Assignment**

Another area the survey reveals as a factor that contributed to pupils inability to perform well in mathematics was the amount of exercises and assignments given to pupils after concepts have been taught and the regularity of presenting assignment. It is believed that the amount of exercises mathematics teachers give to pupils for practice after concept and skills have been taught assists pupils to learn or practice mathematics. Since practice makes man perfect few, inadequate exercises give pupils little opportunity to practise and become perfect. Regarding class exercises given, all the respondents pointed out that they were not enough to aid in the consolidation of concepts and skills taught. This was reflected with means of 2.59, 1.90, 1.70 and 2.90 respectively. This outcome or finding supports what Brown McNamara, Olwen and Jones (2003) came out with. Classroom exercise is nearly a universal activity designed to help pupils to learn. It is the process that brings the curriculum into contact with pupils. The quality of classroom exercise is a key to improving pupils learning (Brown et. al, 2003). Findings of research suggested that several classroom exercises were

associated with achievement and the ways in which exercises are presented in classroom context affects pupils achievement (Ludtke & Trautwein, 2009; Guskey, 2003).

With regards to pupils' assignment presentation, it was realised that 50% of the respondent did not regularly present their homework or assignment for marking and discussion. Since homework is an avenue for pupils to learn concepts outside class, it will reinforce what pupils have already learned and prepare them for upcoming lesson. Homework also provides an opportunity for parents to participate in their children's education. The amount of mathematics homework pupils received from their teachers actually assist pupils to learn and improve upon their performance. This had been confirmed with some earlier researchers like Cooper, Blazer, Baumer etc. According to Ludtke and Trautwein, (2009), homework is a contribution towards pupils' learning and serves as extension of the curriculum beyond the classroom. To them homework can be conceived as one facet of opportunity to learn and continue to learn or work after regular school hours.

Research has indicated that the amount of homework given by a teacher was found to have a strong positive effect on achievement. For instance, Baumer showed that the frequency of homework has a positive effect on achievement gains (Baumer 2002). Blazer echoed that assignment of appropriate homework can stimulate independent engagement in learning tasks. That, home work was associated with higher achievement (Blazer 2009). A review of over 60 research studies showed that, with limits, there is a positive correlation between the

amount of homework done and pupils achievement. It therefore rests on every good mathematics teacher to give enough mathematics homework, encourage pupils to submit them early, and mark and discuss promptly with pupils.

**School Supports to Pupils to Learn Mathematics and Pupils' Motivation to Learn Mathematics**

Among the most important findings the survey came out with were **p**upils lack of motivation to learn and the poor school environment. It was found that these two factors (lack of motivation and poor school environment) have contributed to pupils' poor mathematics performance. For example, 172 pupils representing 58% stated that the school did not support or motivate them. This finding regarding school environment goes to confirm the ideas highlighted by Chayya (2003) that for a teacher to be good and effective a school should have a clear organization; characterised by stated mission, goals, values and standards of performance. With regard to motivation, 17.5% representing 59 of the respondent confirmed that they were not motivated enough to learn to pass their mathematics examinations. Sixteen of the respondents representing 5.4% indicated uncertainty. The circuit supervisors among the respondents also confirmed that the school gave little or no motivation to pupils with regards to the learning of mathematics. About 50% disagreed with the facilities and the school environment being supportive to the learning of mathematics. Chayya (2003) also said that the school has to strive to create a professional environment for teachers that will facilitate the accomplishment of their work. The findings were also in line with what Protheroe said concerning classroom atmosphere. Classrooms that promote

learning of mathematics with understanding for all pupils involve a necessarily complex set of interactions and engagement of teacher and pupils with richly situated mathematical content (Protheroe, 2003). With that richly situated learning environment, teachers must be able to build on students' prior idea and promote student thinking and reasoning about mathematics concepts in order to build understanding (Silver, Mesa, Morris, Star & Benken, 2009).

**Teachers' Attitude and Behaviour towards Pupils**

The result of this study also revealed that mathematics teacher's attitude and behaviour added up to the factors that put pupils off the learning of mathematics. Assessing the comments the pupils raised during the interview and the circuit supervisors responses to the questionnaire it was discovered that, most of the teachers looked down on pupils during mathematics lessons, the use of insults dampens pupils' spirits or confidence to do the subject. This goes to support what Farrington found. Pupils or even adults often try to live up (or down) to what is expected of them Youth who were publicly labelled as delinquents tended to become more delinquent as a result (Farrington & Welsh, 2007). If a teacher labels a pupil as "dull or stupid" this would in all probability upset his/her sense of self – worth and confidence. Conversely, a teacher's appreciation and praise will go a long way in boosting the confidence and the morals of pupils. Pupils are seen to perform better in schools where the teachers desist from "labelling" and desist from using such other negative measures. The pupils are likely to work better in an atmosphere of confidence where they believe they will succeed (Daniels, 2010).

**Teachers' Commitment**

This can be described as the efforts or energy and interest teachers put in the teaching and learning of a particular subject. This study found out that some mathematics teachers are not committed to their work. This came out when five Circuit Supervisors, representing 50% testified that some mathematics teachers in their schools are not committed to their work. Two headteacher represent 20% of the headteacher respondents also confirmed this. This confirmed what Fennell (2006) said and what the National Research Council (2003) came out with. Fennell said, teaching context is established through preconceptions held by the teacher about the process of learning and how that might be facilitated. Committed mathematics teachers should be able to guide their students from their current understanding to further learning and prepare them for future courses (National Research Council, 2003). A committed teacher is dedicated to making knowledge accessible to all students based on his or her belief that all students can learn. Thus he/she treats learners equitably by acknowledging individual difference among pupils.

**Teachers' Methods and Lack of TLMs**

Factors which directly affected the performance of pupils in mathematics which the study revealed were teachers' poor methods of teaching and lack of 'TLMs. The research revealed that teachers' methods of teaching contributed to pupils poor performance in the discipline. The study revealed that about 194 representing 65.5% of the pupil respondents disagreed that teachers methods were so effective to aid them to understand topics taught in mathematics. Another 80%

and 40% representing 8 of the headteacher and 4 of the circuit supervisors (C.S) respondents respectively confirmed this finding. This finding also goes to confirm what Osafo- Affum (2001) echoed in her presentation to an NGO under the topic "Improving Teaching and Learning of Mathematics". According to her, many teachers lecture instead of teach. They give definitions. They don't use concrete materials and practical ways to explain mathematics concepts. Pupils at the JHS level learn through discovery method but some teachers at this level give even notes on mathematics just as they do on history topics (Osafo-Affum, 2001). On the pedagogical knowledge of the teacher, Australian Association of Research in Education states that pedagogical knowledge of the teacher is one factor that affects performance. It is not the knowledge of any kind of mathematics but instead the knowledge of how to teach (Hill & Ball, 2004). Teachers who are trained in education as well as their subject matter have a larger arsenal of teaching techniques as well as the psychological understanding of what it means to be student.

Beside these methods, teachers make little use of appropriate TLMs in their teaching. Pupils learn step by step, that is, from concrete to abstract. But because teachers do not use TLMs, only a few exceptionally good pupils (mathematically endowed) participate in mathematics lessons with some measure of understanding (Osafo-Affum, 2001).

**Truancy of Pupils**

The study revealed that the behaviour of pupils in terms of the school attendance (regularity and punctuality) was questionable. It was observed that

most of the pupils took “French leave”, on market days and special farming days. This negative behaviour of pupils affected them academically most especially in mathematics. Seven of the headteachers and teachers respondents pointed out that, because of truancy, pupils have not been submitting their assignments promptly for marking. It was also discovered that some of these pupils did not take any exercises or homework due to the on and off nature of their school attendance. This confirms the findings of Wilson, Valeria, Heather, Sheila and Julia (2008) that truancy is a typical problem of adolescent children. It is also consistent with Education Commission of the State (2007) findings that as the level of absence increased the level of standard grade award decreased. The idea that truancy is linked with low academic achievement was addressed by Balfanz, Robert, Rachel and Stephen (2008) who identified a “strong association” between high truancy level and poor academic result. Balfanz (2002) and his team were careful to point out that low academic achievement could just as well cause truancy as one of its effects. In short, one of the most important effects of truancy was that it hindered learning; pupils achieve less at school. The finding of the present study confirmed or supported all the above researchers’ findings about truancy.

**Poor Background Knowledge of Learner**

According to the Ghana Education Service rule on promotion requirement, a learner who fails twice in a phase must be automatically promoted to the next grade (USAID, 2007) As a result of this automatic promotion employed in our education system, the majority of learners had problem achieving basic literacy and numeracy skills This affected performance in mathematics in most schools in

Ghana because pupils did not achieve all the background competencies from previous grade(s). Pupils with weak background knowledge about mathematics cannot change and improve over night. Numerous studies have confirmed the relationship between background knowledge and achievement (Hill, Bill, & Schilling, 2008; Moreira & David, 2008, and Rowe, 2004). Academic background knowledge affects more than just "school learning". Studies have also shown its relation to student's academic achievement in school and on their life after school. The researcher can therefore say that this poor background knowledge issues will affect pupils' interest to study mathematics.

This among other factors were the causes of pupil refusal to learn in the home or put little effort in the learning of mathematics to enable them to pass mathematics in B.E.C.E.

**Lack and Irrelevant Textbooks**

The textbook situation in mathematics in basis schools is not helping matters in any way. In the rural schools in the New Juaben Municipality for instance, many pupils do not have access to good textbooks. One hundred and nine representing 36.8% of the pupils' respondents indicated that they did not have access to good textbooks. However, the study further revealed that 12.5% of the respondents blamed lack of textbooks as a contributing factor to their poor performance in mathematics in the B.E.C.E. A further 6 representing 60% headteacher respondents indicated lack of and relevant textbooks as some of the factors that contributed to pupils' refusal to learn mathematics. With regards to the challenges mathematics teachers encounter when teaching, 6 representing

60% of the teacher respondents indicated lack of adequate textbooks. This finding confirms Abadzi's findings which stated that textbooks give pupils opportunity to study particular topic or learn how to solve a particular type of problem (Abadzi, 2006). Furthermore, DeStefano, Schuh, Moore, Harwell and Balwanz (2006) established that mathematics textbooks used in classroom have their own influence on pupils' opportunities to learn mathematics. Text books also have their own effects on the instruction given in classroom, it is meaningful to supplement the curriculum with potential implemented curriculum (textbooks and other written materials used in the classroom) (DeStefano et al, 2006).

**Class Size**

Education planners and measurement experts have argued that class space and the number of students in the class have a correlation with teacher and pupils outputs. There is also a direct relationship between class -size and motivation, teaching methods, classroom management and assessment. Large class -sizes induce stress on teachers. For effective teacher delivery, a normal class size should not exceed 35 or 40 in JHS. Where the number exceeds these figures, the class should be broken into 2 and an additional teacher or assistant teachers hired to support the substantive teacher (Ministry of Education, Science and Sports, Ghana, 2005).

The astronomical increases in school enrolment arising from government's campaign for all school going children to be in school coupled with introduction of the capitation grant and school feeding programme have had huge impact on teachers' work life. Many teachers have to struggle with classes which are not less

than 80. The finding of the survey established that pupils performed poorly in mathematics because of large class size or overcrowding of classrooms. This was so because teachers found it difficult to pay individual attention to a class of 50 to 60 learners.

The survey confirmed the finding of ADEA (2007) and USAID (2007). The payment of school fees and other direct educational related costs to households becomes a major obstacle to enrolment especially among poor and vulnerable households (USAID, 2007). Abolition of school fee has therefore made it easier and less costly for children with these challenging backgrounds to enrol in schools and eventually help in achieving some of the educational related goal within countries.

As a result of abolishing school fees in Ghana enrolment rates is reported to have increased dramatically at both the basic and the secondary levels (ADEA 2007). Secondly, Ankomah (2006) stated that in addition to large class sizes many teachers who operate in schools which have less than the required teaching staff are forced to handle two classes in the basic schools (Ankomah, 2006 ).

**Lack of In-service Teacher Training and Continuing Professional Development**

While pre-service teacher training is important to prepare teachers for the reality of the classroom, evidence shows that this is not currently effective in some districts in Ghana. Even where it is effective, the agenda of primary education is changing from an elite system to a mass system requiring different skills and competencies from existing and new teachers. Thus it is critical that

both existing teachers and new teachers are given ongoing support and Continuing Professional Development (CPD) to enable them to provide good quality teaching to primary school children (Lewin and Stuart, 2003). The MUSTER project found that teacher trainees received little formal induction or CPD and that the main focus was on pre-service teacher training (Lewin and Stuart, 2003). In Rwanda (Obura, 2003) commented that in-service teacher training provided by the Ministry of Education was virtually non-existent with no formal system being in place for the ongoing professional development of teachers which is in agreement with the findings of the study in question. Stakeholders remarked that after new teachers are deployed to schools, there is little follow-up and these teachers often recycle the same materials for years without making any adjustments. In basic schools there was a concern that some teachers lack sufficient subject knowledge required to teach the core subjects in the curriculum, yet they are not given any additional support by the government in the classroom to remedy this situation.

# CHAPTER FIVE

# SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

## Overview

This chapter presents a summary of the study and highlights the key findings. It further outlines recommendations and avenues for further research.

## Summary of the Study

The primary purpose of the study was to investigate some issues and challenges perceived by mathematics education stakeholders (the pupils, mathematics teachers, headteachers and circuit supervisors) as contributing to pupils' poor performance in mathematics in some rural schools in the New Juaben Municipality in the Eastern Region of Ghana. Also the study sought to identify some of the challenges mitigating against the learning of mathematics of pupils in their schools and explored ways of encouraging them to study and pass the B.E.C.E mathematics examination very well. The research design was descriptive survey. The classes formed the stratum from which the simple random sampling was used to select the pupils, while purposive sampling method was used to select the mathematics teachers and headteachers. All the circuit supervisors in the municipality were also selected.

The Basic Schools (Junior High School) used in the study were 10. The schools were the last ten schools in the New Juaben Municipality graded from the

B.E.C.E of 2009, 2010 and 2011 respectively. The administration of the questionnaire to mathematics teachers, headteachers, circuit supervisors and the interview of the pupils respondents were supervised by the researcher.

A five–point Likert scale was used to assess the perceptions of two hundred and ninety six (296) pupils in JHS 1, 2, and 3 and thirty other education stakeholders –Mathematics teachers, Headteachers and Circuit Supervisors of mathematics. The variables used in the study were regular attendance to school/class, homework and class exercises given, assignments on mathematics, contact periods, pupils difficulty and fear of mathematics, pupils perceptions, teachers perceptions, teachers supports, school supports among others. The questionnaire and the interview schedule were developed by the researcher, pre-tested and revised before administering them to the subjects. The reliability coefficient of the questionnaire with respect to pupils and other education stakeholders were 0.71, 0.58, 0.68 and 0.75 perceptively.

The influence of the perceptions of the respondents and the pupils' performance and achievement in mathematics were examined using frequencies, percentages and means of the responses. The data collected were analysed using both qualitative and quantitative methods. The major findings are summarised below.

**Summary of the Key Findings**

The investigation gave a number of findings which have been listed below.

1. Though some teachers were regular and punctual to school, it did not reflect in pupil's performance in mathematics.

2. It was discovered that exercises given to children were not enough to consolidate concepts taught.
3. It was perceived by stakeholders that homework or assignment did not aid pupils to do further research on concepts taught.
4. Pupils indicated that assignment and homework were not marked and discussed promptly.
5. Appropriate teaching methods were not used to support pupils' learning.
6. The schools did not support the pupils enough to learn mathematics.
7. Poor, inadequate and irrelevant TLMs and textbooks were challenges mathematics teachers were facing.
8. It was perceived by the mathematics education stakeholders that teachers had poor attitudes towards pupils.
9. It was also perceived that pupils were not motivated enough to learn mathematics.
10. Pupils had not been presenting assignment regularly for marking and discussion.
11. The stakeholders also perceived that pupils were afraid of mathematics.
12. Pupils were playing truancy and this affected their performance in mathematics.
13. It was also perceived by the stakeholders that pupils had weak mathematics background.
14. It was perceived that pupils did not have enough practice after learning new concepts taught by teachers in the classroom.

15. The stakeholders of mathematics education also perceived that pupils did not have much interest in mathematics.

## Conclusions

This study was aimed at studying the issues and challenges contributing to pupils' poor performance in mathematics in Junior Secondary Schools in the rural area in New Juaben Municipality. The findings led to the conclusion that mathematics teachers have an important role to play in their pupils' learning of mathematics. Failure to play this role leads to pupils' poor performance in mathematics. The findings also lead to the conclusion that it is important for pupils to develop positive perceptions of mathematics. Teachers' personality, relations and interactions with pupils' during classroom activities, rewards, assignments and pupils work are all directly related to pupils' performance in mathematics. The findings from this study suggest that there is the need for the schools to create good climate for learning mathematics; the need to support both the teacher and their pupils to overcome their mathematics problems. The result from the study also suggests the need for the teacher to stress classroom activities which involve in-depth knowledge in content and pedagogy, and pupil's participation in mathematics. The findings also suggest that no matter how long teachers have been teaching mathematics in JHS, lack of periodic update of their methods and knowledge by attending workshops and seminars affect pupils' performance adversely.

## Recommendations

On the basis of the conclusions drawn from this study, which tend to address the issues and challenges contributing to pupils' poor performance in mathematics in rural areas as reflected in pupils perceptions, teachers perceptions, and school supports towards mathematics, the following recommendations are made:

1. The teaching and learning of mathematics depend greatly on the teacher's competence in the subject. It is imperative that mathematics teachers be better equipped with current trends in mathematics teaching and learning. Mathematics classes should be made more interesting and relevant to everyday life activities. The Ghana Education Service should therefore organise periodic in-service training courses for all mathematics teachers in the basic schools This will equip them with modern trends of teaching mathematics and also help them to update their skills. The institutions responsible for the training of teachers should seriously address the issue of pupils performing poorly in mathematics most especially in the rural areas.
2. More relevant materials, textbooks and learning aids in mathematics are needed in the basic schools. Encouragement should be given to agencies or individuals to write more relevant textbooks in mathematics for the basic schools and the public instead on relying on Ghana Education Service.
3. In order to attract more pupils, especially the basic school children into studying mathematics at higher levels, mathematics clubs in schools should be given urgent attention. These clubs can arrange or organise quizzes in

mathematics among classes and schools. Prizes should be awarded to deserving pupils to motivate them learn more mathematics.

4. Mathematics clinics, seminars and workshop could also be used to entice more pupils into mathematics and mathematics related jobs. It is gratifying to note that GES has started in this direction by organizing clinics, workshops for pupils (especially the girl child) during long vacations. However, the scope should be widened to include more children. More pupils could be reached if the programme could be rotated among the regional capitals instead of concentrating in Accra and Kumasi.
5. Public education is also needed for parents and guardians to draw the link between attendance and performance. GES should therefore provide mobile cinema vans which will go to the towns and villages in the districts to educate their children to study more courses in mathematics. This could form part of the literacy programme which is currently going on in the country. In addition, television and radio programmes to be known as “Mathematics for Children” should be broadcast at least once a week. These programmes should include interviews, activities of children in mathematics and career guidance. It is hoped that when these programmes are instituted, more children would be attracted into the learning of more courses in mathematics at the tertiary level.
6. Since the attitude of the teacher towards mathematics teaching influences pupils mathematics achievement, pre-service and in-service basic school teachers should be made aware of the impact of their perceptions of mathematics on pupils’ achievement in mathematics. Pupils also should be

made aware of the impact of their perceptions of mathematics on their achievement in mathematics.

8. Mathematics teachers need to be patient and tolerant towards pupils since pupils depend more on their teachers to learn more and better.
9. The school needs to motivate pupils and encourage them to study mathematics to higher level. The schools can do this by creating a conducive atmosphere, give praises, and award good learning habit. Provide good and relevant facilities to promote studying of mathematics. This will go a long way to assist pupils to develop interest in studying mathematics.
10. Teachers need to be called upon periodically for workshop, refreshable courses or in-service training to develop their professional competencies and pedagogical skills.
11. Teachers must mark pupils exercises and homework promptly and discuss the strength and weakness with pupils.
12. Finally schools, which were experiencing large class size due to free school fees and capitation grants should be assisted with additional mathematics or assistant mathematics teachers to support the substantive mathematics teacher.

## Recommendations for Further Research

Some of the findings and conclusions of the study suggest possible directions for further research. Some suggestions regarding such directions are given below.

1. The study should be replicated for basic schools in the other regions of Ghana. This should include schools in both urban and rural areas so as to enable inter-regional comparison in order to provide a basis for general conclusion.
2. A more detailed study is recommended to explore other variables such as ethnicity and area of upbringing (locality) as contributing factors to the perceptions of pupils in their participation and achievement in mathematics at the basic school level.

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# APPENDICES

## APPENDIX A

### Letter for Pilot Research

SEVENTH-DAY ADVERTIST COLLEGE OF EDUCATION
P.O. BOX 18
Asokore-Kofridua
Your Ref. No Ghana West Africa

Tel:03420-21281

My Ref. No. ER/SDACOE/NTCE/DIP/Vol.24 9th July, 2012

THE DISTRICT DIRCETOR
GHANA EDUCATION SERVICE
BEGORO E/R

Dear Sir/Madam

**PILOT RESEACRH-OPOKU BAWUAH**

The above name mention is a tutor in SDA College of Education. He is the Head of Mathematics Department. It is officially recognized that he is pursuing M.Phil programme in Mathematics at the University of Cape Coast.

He is now undertaking the research component of the programme. He has chosen to do some pilot studies in your district.

Pleased it will be much appreciated if he is granted the needed help.

Thank you for your kind attention.

Yours faithfully

Pastor A. Kwame Adjei
(AG. PRINCIPAL)

## APPENDIX B

### Letter of Permission for Data Collection

S.D.A. COLLEGE OF EDUCATION
P.O.BOX 18
ASOKORE – KOFORIDUA

24/11 /2011

THE MINICIPAL DIRECTOR
MINICIPAL EDUCATION OFFICE
P.O.BOX 203
KOFORIDUA

Dear Sir/Madam,

**PERMISSION FOR DATA COLLECTION**

I wish to write for permission to collect data from the last ten schools in the B.E.C.E of 2011/2012. I am an M.Phil. Student from University of Cape Coast undertaking a project on "Schools issues and challenges contributing to pupils' poor performance in mathematics" in some schools in the New Juabeng Municipality.

Of late, pupils' performances in mathematics have not been encouraging, in all areas of examination. I therefore, deem it necessary to research and come out with possible causes and solution that will help to rectify or reduce this canker.

I therefore need your support in the form of permission to enable me to contact these respondents in your municipality; ten Circuit Officers, fifteens Mathematics teachers and ten head teachers from selected schools. I will be grateful if permission will be granted to enable me to undertake this project in these schools.

Thank you and God richly bless you.

Yours faithfully

Opoku Bawauh

## APPENDIX C

### Letter of Response to Permission for Data Collection

**PERMISSION FOR DATA COLLECTION**

Permission has been granted for you to collect data from the schools your choice. You are not to link out the information to anybody without our knowledge.

Thank you.

CHARLOTTE ASANTE (MRS)
D/D-HRMD
for: MUNICIPAL DIRECTOR

MR. OPOKU BAWAUH
S. D. A. COLLEGE OF EDUCATION
P.O.BOX 18
ASOKORE-KOFORIDUA

## APPENDIX D

**Names of Basic Schools for Basic Education Certificate Examination (BECE)**

1. ADA KYEREMANTEN M/A JHS
2. NANA OWERE AGYEPONG JHS
3. KWAME NKURMAH MEMORIAL JHS
4. JUMAPO M/A JHS
5. MAHD-DEEN ISLAMIC JHS
6. FREEDOM PREPARATORY JHS
7. ASIKASU M/A JHS
8. AKWADUM M/A JHS ‘B’
9. AKWADUM M/A JHS ‘A’
10. NYREDE R/C JHS

## APPENDIX E

### Questionnaire for Mathematics Teachers

This questionnaire is designed to collect data on mathematics teachers' views on issues and challenges contributing to pupils' poor performance in mathematics. You are kindly requested to provide frank answers to the items of this questionnaire. The information provided will be regarded confidently and your identity will be protected.

Thank you.

**Bio Data**

School……..... Location……

(1) Gender: Male [ ] Female [ ]

(2) Current Qualifications…….....

(3) Current Rank…….....

In your view, to what extent do you Strongly Agree (SA), Agree (A), Uncertain (UN), Disagree (D), Strongly Disagree (SD), about the altitude of teachers in the teaching of mathematics in the following aspects.

| | Statement | SA | A | UN | D | SD |
|---|---|---|---|---|---|---|
| 4 | Mathematics teachers in this school are regular to school/class? | | | | | |
| 5 | Mathematics class exercises given to pupils' after lessons are enough to aid them to consolidate concept taught? | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 6 | Home work given to pupils' aid them to do further research on mathematics concepts taught. | | | | | |
| 7 | The school support mathematics teachers with adequate TLMS to teach mathematics | | | | | |
| 8 | The teaching methods used by mathematics teachers are effective enough for you to understand mathematics concepts easily/once? | | | | | |
| 9 | The school does not motivate pupils' enough to study mathematics. | | | | | |
| | In your view, to what extent do you Strongly Agree, Agree, Uncertain, Disagree, Strongly disagree about the attitude of pupils' in the learning of mathematics. | | | | | |
| 10 | Pupils in the school are regular to school/class. | | | | | |
| 11 | Pupils do not regularly present assignment for marking and discussion. | | | | | |
| 12 | The teaching environment for pupils' are conducive for learning mathematics. | | | | | |
| 13 | Pupils' in the school showed strong interest in the learning of mathematics. | | | | | |

(14) How long have you been teaching mathematics in this school?

…….....

(15) What some of the challenges you face in teaching mathematics?

.....

(16) How many times do you come to school and make judicious use of the contact periods?.....

(17) How often do you discuss the class exercises/homework with pupils after marking?.....

It is noted that for some time now pupils do not do well in mathematics in the BECE (Chief Examiners Report 2009 and 2010)

(18) What do you think have been the causes of these?

.....

## APPENDIX F

### Questionnaire for Circuit Supervisors

The researcher is undertaking a study on issues and challenges contributing to pupils' poor mathematics performances in the rural schools in the New Juaben Municipality. This will help identify the assistance to give. Kindly complete this questionnaire as honestly and objectively as possible. You are ensured that all information provided will be treated with the greatest confidentiality. Thank you for your co-operation.

Please tick (√) against the appropriate box and write your answers in the space provided.

**Bio Data**

School……..... Location…….....

(1) Gender; Male [ ] Female [ ]

(2) Academic Qualification……

(3) Current Rank ……...

In your view to what extent do you Strongly Agree (SA), Agree (A), Uncertain (UN), Disagree(D), Strongly Disagree (SD), about the altitude of teachers in the teaching of mathematics in the following aspects.

| | Statement | SA | A | UN | D | SD |
|---|---|---|---|---|---|---|
| 4 | Mathematics teachers in your school are regular to school/class? | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 5 | Mathematics class exercises given to pupil' are enough to aid them to consolidate concept taught? | | | | | |
| 6 | Home work given to pupils' aid them to do further research on mathematics concepts taught. | | | | | |
| 7 | Mathematics teachers mark assignments given to pupils' promptly and discuss their weaknesses with them? | | | | | |
| 8 | The school support mathematics teachers with adequate TLMS to teach mathematics. | | | | | |
| 9 | The teaching methods of teachers are effective for pupils' understanding of mathematics concepts. | | | | | |
| 10 | The school does not motivate pupils' enough to study mathematics. | | | | | |
| 11 | Mathematics teachers have not been given pupils' enough exercises/homework for practice. | | | | | |
| 12 | Pupils in your school are regular to school/class? | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 13 | Pupils do not regularly present assignment for marking and discussion. | | | | | |
| 14 | The teaching environment for pupils are conducive for learning. | | | | | |
| 15 | Pupils' regularly present their exercise for marking and discussion. | | | | | |

(16) Have the mathematics teacher been given enough homework to pupils'?.....

(17) What are some of the challenges the mathematics teachers face in your school……

…….....

It is noted that for some time now pupils' do not do well in mathematics in the B.EC.E (Chief Examiners Report 2009 and 2010).

(18) What do you think have been the cause of these?

.....

## APPENDIX G

### Head Teachers Questionnaire

The researcher is undertaking a study on issues and challenges contributing to pupils' poor mathematics performance in the rural schools in the New Juabeng Municipality. This will help identify the support to give to arrest the situation. Kindly complete this questionnaire as honestly and objectively as possible. You are assured that all information provided will be treated with the greatest confidentiality.

Thank you,

Please tick (√) against the appropriate box and write four answers in the space provided.

School…….....

Location…….....

(1) Gender: Male [ ] Female [ ]

(2) Age …….....

(3) Current Qualification ……....

(4) Current Rank……..

(5) How long have been heading this school?

…….....

In your view, to what extent do you Strongly Agree (SA), Agree (A), Uncertain (UN), Disagree (D), Strongly Disagree (SD), about the altitude of teachers in the teaching of mathematics in the following aspects.

| HEADTEACHER'S VIEWS ABOUT TEACHERS ON THE LEARNING AND TEACHING OF MATHEMATICS | | SA | A | UN | D | SD |
|---|---|---|---|---|---|---|
| 6 | Mathematics teachers make effective use of the maths periods. | | | | | |
| 7 | Mathematics class exercises given after lessons are enough to aid pupils to consolidate concept taught? | | | | | |
| 8 | Home work given to pupils aid them to do further research on mathematics concepts taught. | | | | | |
| 9 | The school support mathematics teachers with adequate TLMS to teach mathematics | | | | | |
| 10 | The school motivates pupils enough to study mathematics. | | | | | |
| 11 | Mathematics teachers mark assignment given to pupils promptly and discuss their weaknesses with them? | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 12 | The teaching methods of the mathematics are effective for pupils' understanding of concepts. | | | | | |
| HEADTEACHER'S VIEW ON PUPILS ABOUT THE LEARNING OF MATHEMATICS | | | | | | |
| 13 | Pupils in your school do not study maths seriously. | | | | | |
| 14 | Pupils are afraid of learning mathematics | | | | | |
| 15 | Pupils in the school shows strong interest in the learning of mathematics by attending classes regularly. | | | | | |
| 16 | The facilities in the school aid the learning for maths. | | | | | |

**Challenges of Teaching Learning Mathematics**

(17) What are some of the challenges your mathematics teachers face in the cause of teaching of mathematics…….....

.....

(18) It is noted that for some time now pupils do not do well in mathematics in the B.E.C.E.[Chief Examiners report 2009 and 2010] what do you think have been the causes of these?

……

……

(19) What role can the school play to improve the teaching and learning of mathematics in your school?

.....

.....

## APPENDIX H

### Interview Guide for School Pupil

This interview guide is designed to collect data on issues and challenges contributing to pupils poor performance in mathematics, especially in the BECE.

You are kindly requested to provide frank answers to the items of this interview. The information provided will be regarded confidentially and your identity will be protected.

Thank you,

**Bio Data**

School……. Location……

(1) Gender; Male [ ] Female [ ]

(2) Age…….

(3) In which class are you?

J.H.S ONE [ ] J.H.S TWO [ ] J.H.S THREE [ ]

In your view, to what extent do you Strongly Agree (SA), Agree (A), Uncertain (UN), Disagree (D), Strongly Disagree (SD), about the altitude of teachers in the teaching of mathematics in the following aspects.

| | | SA | A | UN | D | SD |
|---|---|---|---|---|---|---|
| 4 | Mathematics teachers in your school are regular to school/class? | | | | | |
| 5 | Mathematics class exercises given after lessons are enough to aid you to consolidate concept taught | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 6 | Home work given to you aid you to do further research on mathematics concepts taught. | | | | | |
| 7 | Mathematics teachers mark assignment given to you promptly and discuss your weaknesses with you. | | | | | |
| 8 | The teaching methods used by mathematics teachers are effective enough for you to understand mathematics concepts easily. | | | | | |
| 9 | Mathematics teachers make effective use of the mathematics period. | | | | | |
| 10 | The school support mathematics teachers with adequate TLMS to teach mathematics | | | | | |
| 11 | The school motivates pupils enough to study mathematics. | | | | | |
| 12 | Pupils' in your school do not study mathematics seriously. | | | | | |
| 13 | Pupils' are afraid of learning mathematics. | | | | | |
| 14 | The facilities in the school aid the learning of mathematics. | | | | | |

(15) What are some of your challenges in learning mathematics?

……

…….....

(16) It is noted that for some time now pupils do not do well in mathematics in the BECE(Chief Examiners Report 2009 and 2010).What do you think have been the causes of these?

.....

.....

## APPENDIX I

## Chief Examiner's Reports on Mathematics and General Overview of the Performance in Mathematics of Schools in the New Juaben Municipality in 2009 and 2010

The standard of the paper according to the chief examiner compared favourably with that of previous years. Most candidates in 2009 performed relatively well as compared to that of previous years. The literature reviewed that most candidates displayed skills and understanding of concepts involved in:

i. Operating with fractions
ii. Venn diagrams for two sets
iii. Factorising an expression with four terms
iv. Multiplication of two monomials
v. Using the simple interest formula and handling percentages
vi. Constructing of angles (90 and 30)
vii. Drawing frequency table for a given data
viii. Finding the mode of a distribution
ix. Calculating the mean of a distribution.

Besides candidates showing this strength, the report showed some weaknesses of candidates in using mathematical facts and concepts to :

i. Solve worded problems; they are unable to translate statement into mathematical language.

ii. Most candidates could not solve problems on circles. The correct formula of circumference of a circle according to the report could not be quoted in most cases by most of the candidates.

iii. Other areas the report emphasised were that pupils showed weakness in drawing coordinates axis for none negative values only, reading from a graph, simplifying an algebraic expression after expanding the product of two binomials an constructing a perpendicular from given point unto a given line.

The report recommended remedies for basic school mathematics teachers to embark on. It suggested that pains should be taken to renounce the practice of skills involved in solving problems listed as weaknesses of candidates. Mathematics teachers in the basic level should endeavour to assist people to identify the unknown quantities in worded problem and write expression involving the unknown quantities. Mathematics teachers should give more exercises on the topics mentioned in the weaknesses of candidates (WAEC, 2009).

The 2010 examiners report also reviewed that the standard of the paper compared favourably with that of previous years. Candidates showed strength as quoted by the report on:

i. Correct statement and application of formula for simple interest in terms of principal, rate, and time.

ii. Determination of probability of a given event.

iii. Factorisation of an algebraic expression, mapping and filling in missing numbers in a given relation.

iv. Determining the angles of a given data for the purpose of drawing a pie chart.

The report further pointed out pupil's weakness. Pupils weaknesses were evident in the following areas:

i. Application of percentages in determined units, cost and selling price of a number of articles and profit percentages.

ii. Application of ratio to given situation.

iii. Geometrical construction of a given triangle.

iv. Determining gradient of a given line from graphs.

v. Evaluating expression involving mixed fractions.

vi. Understanding worded question; this could be due to poor understanding in English Language and

vii. Accuracy in measurement.

The report suggested that effective teaching should be done on the topic mentioned as weakness of candidates. Mathematics teachers should ensure understanding of concepts introduced to pupils through questioning and exercises. Exercise must be marked and feedback given pupils on time (WAEC, 2010).

## APPENDIX J

### Pupils Responses to Interview Guide

**Teachers' Commitment**

Pupil 1: "Commitement of teachers' together poor"

Pupil 2: "No commit teacher"

Pupil 3: "Poor commitment"

**Attitude of Teacher**

Pupil 1: "Poor attitude toward itoms pupil"

Pupil 2: "Teach insalt me"

Pupil 3: "You can not ask him"

**Teachers' Regularly to Class**

Pupil 1: "Melate of teacher"

Pupil 2: "Teacher irregularly"

Pupil 3: "Always late"

**Interest of Pupils**

Pupil 1: "Interet on part of pepils"

Pupil 2: "Pupil come no interest"

Pupil 3: "Pupil do n't like math"

**Lack of confidence of Pupils**

Pupil 1: “Lack of confidence and determen

Pupil 2: “Maths afrade”

Pupil 3: “Do math but don’t know it”

**Lack of Text book**

Pupil 1: “No books”

Pupil 2: “Good books not in”

Pupil 3: “One good books”

**Teachers’ Method of Teaching**

Pupil 1: “Poor teacher metod”

Pupil 2: “do not in comples method”

Pupil 3: “Method not understand”

## APPENDIX K

## Comparative Results Analysis in Mathematics of New Juaben Municipality

## 2007 – 2010

| Subject | Year | № Passed | % Passed | № Failed | % Failed |
|---|---|---|---|---|---|
| **Mathematics** | 2007 | 1856 | 63% | 1095 | 37% |
| **„** | 2008 | 1512 | 54% | 1280 | 46% |
| **„** | 2009 | 2047 | 65% | 1123 | 35% |
| **„** | 2010 | 1577 | 57% | 1181 | 43% |