

UNIVERSITY OF CAPE COAST

FACTORS TEACHERS, STUDENTS AND PARENTS PERCEIVE AS  
INFLUENCE JUNIOR HIGH SCHOOL STUDENTS' MATHEMATICS  
LEARNING

SOLOMON KOFI OTUO SEREBOUR

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BY

SOLOMON KOFI OTUO SEREBOUR

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

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## 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: Solomon Kofi Otuo Serebour

### Supervisors' Declaration

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

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

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

Name: Dr. Charles B. Duedu

## **ABSTRACT**

The aim of this study was to find out the factors that are perceived to facilitate students' mathematics learning and their performance at the J.H.S. level. The study was conducted in the Cape Coast Metropolis in the Central Region of Ghana.

Five research questions were raised to guide the study and a descriptive survey design was used. Simple random sampling and purposive sampling were used to select 311 participants for the study comprising 225 students, 30 teachers and 56 parents. Questionnaires were the instruments used for data collection. Frequencies, percentages and correlation were employed in the data analysis.

The findings revealed that, best teachers classroom practices such as assigning more mathematics homework and reviewing the given homework, adequate lesson preparation, encouraging students to work in groups, use of interactive approach in teaching mathematics and use of mathematics textbooks and other electronic devices influence students performance in mathematics at the J.H.S level. It was therefore, recommended that mathematics teachers should be equipped with current trend in teaching mathematics to make classes more interesting and relevant to everyday life activities.

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## **DEDICATION**

To Mrs. Priscilla Otuo Serebour, Papa Adjei Mensah and in memory of my  
mother.

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## **CHAPTER ONE**

### **INTRODUCTION**

#### **Background to the Study**

The school as a social unit deals with the most exciting facet of human existence. It is essentially charged with the responsibility of providing wholesome experience and opportunities for social intervention, self expression, self-development and to shape attitudes, opinions and values of students. The basic school is known to be the foundation of all levels of education. Many countries have invested much time, financial and human resource in the development and study of mathematics at the basic level.

Development in almost all areas of life is based on effective knowledge of science and mathematics. There simply cannot be any meaningful development in virtually any area of life without knowledge of science and mathematics. It is for this reason that the education systems of countries that are concerned about their development put great emphases on the study of mathematics.

The main rationale for teaching mathematics is focused on attaining one crucial goal to enable all Ghanaian young person's to acquire the mathematical skills, insights, attitudes and values that they will need to be successful in their chosen careers and daily lives. It is vital to note that, the role mathematics plays can easily be seen in our everyday life such as the activities we undertake in our

homes, at school, at work places, at market places and in almost every human endeavour. Mathematics as a logical body of knowledge can be used as a guide for arriving at result in a systematic ways.

Mathematics has long been thought of as a subject for only those with special talents. Bulletin, School Division (1989) stated that, until now students still have the perceptions that mathematics is the most difficult subject. This was, proven by Junior High School students' lack of confidence in their mathematical answers because they constantly seek confirmation for their answers from their teachers and parents. But across nations, this attitude is now changing. Mathematics has been accepted to be no longer for the few, but for all (McIlrath & Huitt, 1995).

The environment for learning mathematics today is inviting and inclusive for all students regardless of gender, age, ethnicity, physical challenges, or cultural background. Lau, Sigh and Hwa (2009) emphasized that the mathematics skills required for the youth of today to function in the workplace are different from that for youth of yesterday. At first students were doing traditional mathematics which encompasses arithmetic and plane geometry, but the youth of today are doing core mathematics which is quite broader than the former.

Mathematics is one of the educational disciplines that have a universal attraction because of its unique nature. It cuts across all subject areas which has made some countries to study it as a core subject so that it will form a basis for students to build their future students to build academic pursuit. Mathematics curriculum state that "the strong mathematical competences developed at the

basic and secondary levels are necessary requirements for effective study in mathematics, science, commerce, industry and vocations as well for those pupil(s) terminating their education at the level” Curriculum Research and Development Division (CRDD, 2007).

The History of mathematics education in Ghana dates back to the colonial era when castle schools were established. Under this school system, despite religious education being predominant, arithmetic was taught as a component of the school curriculum and this had enhanced their trade and commerce (Annabelle-Addo, 1980).

Currently, mathematics is studied as a core and an elective subject in Ghana. It is a compulsory subject to be studied by pupils at the basic level (primary and junior high schools) and senior high schools. The rationale behind this policy is to help the pupils to develop interest in the use of mathematics and the ability to conduct investigations using mathematical ideas. It is the acquisition of some of these qualities that mathematics education in Ghana aims to emphasize in the school system (CRDD, 2007). The subject is also studied as a core in all junior high schools and it is intended to build on the knowledge and competencies developed at the primary level. The student is expected at the J.H.S level to develop the required mathematical competence to be able to use his/her knowledge in solving real life problems.

The current syllabus is based on the premise that all students can learn mathematics and that all need to learn mathematics (CRDD, 2007). One needs no further description to accept the subject as important and dear to the heart of

curriculum designers in Ghana. Apart from the fact that mathematics is compulsory for all pre-university students, the subject is a hurdle to be cleared by all students who wish to enter into the university. It is required of a student to pass four core subjects in addition to two elective subjects to guarantee a Senior High School admission in Ghana.

One of these four core subjects happens to be mathematics and this has triggered the urge of students in basic level to do everything possible to pass mathematics. This creates an unnecessary tension on both students and mathematics teachers any time the Basic Education Certificate Examination draws closer and closer. The solution to the above anxiety lies in the ability of mathematics educators to assess what learning opportunities have been provided to their students to learn mathematics in their various schools.

Mathematics educators need to make such an assessment to provide adequate and timely instructions of specific content and skills prior to an examination. Ysseldyke, Thurlow, and Shin (1995) have defined opportunity to learn as the criteria for, and the basis of assessing the sufficiency or quality of the resources, practices, and conditions necessary at each level of the education system to provide all students with the needed materials, facilities and instructional experiences that enable students to achieve high standards (Schwartz, 1995).

The instructional experiences involve that aspect of the learning process that is learning process that is provided by the teacher during the lesson delivery. Teachers by this measure have to design their lesson activities to benefit all, (the

high, average and weak students). This can be done by teachers' effort to blend assessment intermittently to know students' grasp of content at different levels during a lesson delivery. An experienced mathematics teacher would get close with his or her students to know in depth what their capabilities, interest, weaknesses and needs are in studying mathematics (Barwell, 2007).

If what has been elaborated above are necessary factors that facilitate students' performance, then what should be the teachers' role, parents role, schools' role and education stakeholders' role in ensuring success in the teaching and learning of mathematics? How can teachers and students play their destined roles to enhance mathematics performance at the J.H.S level? In this research, the researcher focused on factors that are perceived as influencing students' mathematics learning and performance at the JHS level.

### **Statement of the Problem**

The junior high school, of the educational system in Ghana is a crucial one because it is at this level that a child decides on what to do in the near future. However, this level of Ghana's educational system is bedeviled with problems such as teacher motivation, poor infrastructure and various criticisms making it less functional. According to the Anamuah-Mensah Committee (2002), this sub-sector has had its ups and downs since the 1987 Educational Reform. Criticisms of the Reform have ranged from overloaded curriculum, impassionate nature of some teachers and external interference from educational stakeholders.

Though there are some interventions to correct some of the glaring anomalies, there are still agitations over the type of educational delivery at this



level as well as the duration of the J. H. S. programme. The goal of the 1987 Educational Reforms was to increase access to formal education to the good citizens of Ghana first as enshrined in the 1992 Constitution Article 25, Clause which states: “the development of a system of schools with adequate facilities at all levels shall be actively pursued.”

As mentioned earlier, the final year students write a common examination known as Basic Education Certificate Examination which is organized by a unique body called West Africa Examination Council. This examination is an external and a high stake assessment which every JHS student has to pass in order to enter any second cycle institution in Ghana. Since the examining body is unique and independent, they set standard questions depending on the curriculum content that have been approved and provided to all schools. This examination has produced disheartening results over the years in mathematics in some schools.

Anamuah-Mensah Committee report is outdated when talking about performance in Basic Education Certificate Examination (BECE) today. Today, there are no failures in BECE; the so called pass in BECE defined by Anamuah-Mensah Committee (2002) depicted that though there has been some improvements in the result of the BECE in mathematics about 40% of the students failed the subject. Some of these disheartening results in mathematics over the years have raised questions about what teachers are teaching, what the students are learning and what learning opportunities are being provided for students by schools. If the results from the examinations, which were written by students, believed to have gone through a common curriculum, depict a

discrepancy, then it is worthwhile that a study is conducted to find out what learning factors or experiences are lacking and which ones facilitate student learning in junior high schools. Well, if in the same country, some public basic schools can have a school examination score above 90% while other public basic schools get below 50%, then certain factors that promote higher mathematics performances is lacking in some schools.

It is still imperative for researchers to consider the contributions of individual partners (the teacher, students, the parent and the school) who make the above factors possible or matter. This is because most of the JHS have libraries, and mathematics textbooks are not limited in supply, yet some JHS students are finding it difficult to pass mathematics. This means that it is not only the available facilities in the school that matters but other factors that seem to put facilities into its appropriate use need to be considered. Our limited knowledge of such factors is a problem that should be addressed.

The performance of students in the BECE in mathematics has generally been poor. This is evident in the results released by the West Africa Examination Council (WAEC) over the last few years. Statistics from the WAEC on mathematics in BECE results indicate that from the year 2000 to 2005, more than 50% of the total candidates who sat for the BECE final examination failed in mathematics. However, the percentage failure decreased (less than 40%) from 2006 to 2010 with females having more failures.

Many factors could account for such poor performance. Some factors that have been suggested for students' poor performance in mathematics are students'

attendance to mathematics lessons, learning styles, environmental factors, students' study time among others (Walstad,2001)

### **Purpose of the Study**

The study aimed at finding out which teacher factors, school factors and parents or home factors perceived as influencing junior high schools students' mathematics learning in the Central Region.

### **Research Questions**

The following research questions were used to guide the study:

1. What do teachers perceived as best classroom practices that promote students' mathematics learning and performance at the JHS level?
2. What do students perceive as best teachers' classroom practices that influence their do mathematics performance at the JHS level?
3. How do students' self-rated assessments influence their performance at the JHS level?
4. What role should the school, as a learning community play to enhance students' mathematics learning at the J.H.S level?
5. How do parents' attitudes influence their wards performance in mathematics at the JHS level?

### **Significance of the Study**

The findings of this research are expected to reveal some of the deficiencies existing in the teaching and learning of mathematics. Since the study sought to trace factors perceived to be influencing the teaching and learning of

mathematics, it will inform mathematics educators and policy makers on what has to be done to improve the mathematics standard at JHS level.

Moreover, the finding of this research will help inform the Ministry of Education to develop a comprehensive strategy to equip existing junior high schools with the necessary teaching and learning facilities that promote learning of mathematics at that level. Furthermore, the findings of this research will add to the already existing knowledge that policy makers and other educational stakeholders possess concerning JHS duration.

### **Delimitation of the Study**

There are many public junior high schools in the Cape Coast Metropolis. The study was limited to twelve schools in all six circuits in the metropolis due to number of constraints including time and finance. The researcher found it more expedient to use Cape Coast for the study due to the fact that, it is the cradle and centre for education in Ghana.

Also, Cape Coast has most of the best junior high schools in the country. The study was delimited to finding out the perceived factors that influence students' mathematics performance at the JHS level. The study was also conducted in public schools only. No private school was covered.

### **Limitations of the Study**

Various limitations existed in this study could possibly influence the result. Though Likert scales are powerful in research it has limitations. For instance, there is no assumption of equal intervals between the categories, hence a rating of four indicates neither that is twice as powerful as two nor that it is twice

as strongly felt. Also using a Likert scale, the researcher has no way of knowing if the respondents might have wished to add any other comments about the issues under investigations (Cohen, Manion & Morrison, 2004). In addition to the above, the result of the study could also be influenced by whether or not the participants answered the questions honestly.

### **Organization of the Rest of the Study**

The thesis has four additional chapters, which have provided insight into the issues raised in this section and to provide answers to the research questions.

Chapter two focuses on review of the related literature. It comprises theoretical framework and other sub-topics like curriculum and evaluation standards and strategies, school and students' assessment, brief history of mathematics textbooks in Ghana and conclusion.

Chapter three is basically about the methodology employed in the study. This includes the research design, population, sample and sampling procedure. It also looks at the design and administration of the instrument used for the study. It also describes the procedure adopted in collecting data and how the data was analysed.

Chapter four describes the data analyses used for the study. Chapter five presents summary of the findings, conclusions, recommendations for practice and suggestions for further studies.

## **CHAPTER TWO**

### **REVIEW OF RELATED LITERATURE**

Students' mathematics performance in public education is an important concern for several reasons. Two of these centres on the large scale of expenditure of public funds on education and the beneficial effects mathematics education have on the well-being of both individual students and society (Hanushek, 2002). However, the rising costs of educational inputs which increased the unit costs of conventional approaches to education make it difficult to fully equip schools with the necessary mathematics facilities especially in most developing countries.

In Ghana for example, mathematics performances in most JHS are not encouraging. Evidence available to the Anamuah-Mensah Committee (2002) shows that although, there have been some improvements in the results of the BECE presently, mathematics result reveals that, about 45% of the students failed to pass the subject. The purpose of this research is, therefore, to investigate the factors that are perceived to facilitate students' mathematics learning and performance at the JHS. Already some researchers on school effectiveness have demonstrated that factors such as location of school, in-service training, the provision of teaching and learning materials, and students' assessment increase students' learning outcomes, particularly in developing countries where schools

are deprived of the most basic resources (Hanushek, 1995; Pennycuick, 1998; Fuller & Clarke, 1994).

The desire to place schools in developing countries on attractive levels to meet high mathematics standard has been an issue of concern to many international agencies and donors. In 2004, for instance, the United States Agency for International Development funded Educational Quality Improvement Programme which investigated community-based schools as a mechanism for providing underserved populations with an opportunity to learn mathematics (Detsefano, Gillies & Moore 2007). Destefano, et al cited again that international donor communities are beginning to recognize that without changing how educational opportunities are delivered in many developing countries, the goals of Education for ALL will not be achieved. It is some of these concerns that have necessitated this research and hence this literature review.

In this review, literature will be provided to support the study under the following sub-topics.

1. Theoretical Framework
2. The Concept of Learning
3. Curriculum and Evaluation Standards and Strategies
4. School and Students' Assessment
5. Difficulties of Mathematics
6. Nature of Assessment in Mathematics
7. Teaching, Instructional time and Students' Mathematics Performance
8. Parents' Involvement and Students' Mathematics Performance

9. Textbooks and Students' Learning
10. Brief history of Mathematics textbooks in Ghana
11. Home and Students Performance in Mathematics
12. Teaching Methodology and Students' Performance in Mathematics
13. Role of Technology and Students Mathematics Performance
14. Conclusion.

### **Theoretical Framework**

Over a period of years, models have been examined, reviewed, revised and edited to fit into today's modern society, beginning with Carroll (1963) model to date. During these periods, several models were developed to explain the teaching and learning process. One of this models that has been adapted to support this research in terms of theory is that of Huitt (1995). Huitt's model is one of the most recently developed models that discusses and identifies the major categories of variables that have been related to schools performance. The model is not only school, teacher, and student-based, but includes additional contextual influences as well. Huitt's model attempts to categorise and organise all the variables that might be used to explain students' performance. This model was a revision of a model that was developed by Huitt (1995) which focused only on those variables thought to be under the control of educators. This earlier model focused on school-and classroom-level processes that predicted school learning as measured on students' performance and standardized tests of basic skills.

Additionally, Huitt's model (The Teaching/Learning Process) includes variables related to context and student and teacher characteristics, some of which



were the focus of the models by Procter (1984) and Cruickshank (1985). It is an interactive model along the lines of Cruickshank (1985) and Laosa (1982). This model shows a relationship among the categories of Context (family, home, school and community environments), Input (what students and teachers bring to the classroom process), Classroom Processes (what is going on in the classroom), and Output (measures of learning done outside of the classroom). The categories appear superimposed in the model since it is proposed they are essentially intertwined in the learning process.

The model shows Input and Output as the beginning and end of the teaching/learning process. Huitt (1995) believes that educators must first identify or propose an end result because how one identifies and measures the end product (Output) will influence the selection of important predictor variables. According to Gage and Berliner (1992), until the outcome objectives are known, nothing else can be considered. Once performance measures are selected, educators can begin to focus on those variables that can explain fluctuation or variability in the performance measures.

The direct impact on measures of Huitt's model of school learning is those variables related to Classroom Process. This category includes two major subcategories: Teacher Behaviour and Student Behaviour. It is so because the success of any educational process depends on what teachers offer and what students are ready to accommodate. Teacher Behaviour includes the subcategories of planning (getting ready for classroom interaction), management (getting the class under control), and instruction (guiding the learning process).

In general, planning activities have little predictable relationship with student performance (Gage & Berliner 1992). Both management and instructional variable have been found to be moderately related to performance, but the lack of a strong relationship may be due to a factor of teaching inconsistency (Rosenshine & Stevens, 1986). That is, teachers often change their management and instructional practices based on the time of day of the characteristics of a particular group of students.

What teachers and students do in the classroom will depend to some extent on the characteristics or qualities they bring into the teaching/learning process. In Huitt's (1995) model these are labelled Input variables. The subcategory of Teacher Characteristics includes such variables as values and belief; thinking (what teachers perceive) and personality. While each of these is important to the classroom environment, teacher efficacy is one of the best predictors of student performance subcategory (Proctor, 1984). If a teacher believes that, in general, students can learn the knowledge or skills, and that, specifically, he can teach them, then that teacher is more likely to use the knowledge and skills he has and the students are more likely to learn.

A second subcategory of Input is Student Characteristics. This includes all of the descriptions of students that might have an influence on the teaching/learning process and student performance. Study Habits, Learning Style, Age, Motivation, Socio emotional, Cognitive and Character Development all become important in the relationship of classroom behaviour and school performance (Huitt, 1995).

Finally, Huitt (1995) includes the category of Context that includes such subcategories as Family, Community, State and Federal Government, TV/Movies, and the Global Environment. While all of the variable in these subcategories are important and influence variables in the other three major categories, probably the two most important are Family and the Global Environment. Mother's education and family expectations for student performance have been shown to be excellent predictors of student performance.

The family characteristics and processes impact on school climate which is made up of teacher and student characteristics that are regulated by management and supervisors. School and state policies combine impact on teacher behaviour. The family (parent) assistance creates the needed student behaviour and student classroom behaviour then influences teacher classroom behaviour in an interactive pattern that eventually results in student performance as measured by instruments influenced by state policies. Student performance at the end of one school year then becomes a student characteristic at the beginning of the next.

From Huitt's model (at least as far as this review is concerned), teachers, school systems, students' behaviour, families and entire communities are having an influence on students' school learning and performance. However, none of the variables appears to be so influential that we need only to pay attention to that particular factor in order to produce the kinds of performance changes we desire.

## **The Concept of Learning**

In psychology and education, a common definition of learning is a process that brings together cognitive, emotional, and environmental influences and experiences for acquiring, enhancing, or making changes in one's knowledge, skills, values, and world views (Beitz, 1995). Many authors have also attempted to define the learning. For instance, Burns (1995) defines learning as “a relatively permanent change in behaviour including both observable activity and internal processes such as thinking, attitudes and emotions” (p.99). Burns contends that learning might not manifest itself in observable behaviour until sometimes after the educational programme has taken place. Similarly, learning is seen as relatively permanent change in behavioural potential that occurs as a result of reinforced practice. This definition postulates that the change needs not be an improvement. Addictions and prejudices are learned as well as high-level skills and useful knowledge. The psychological study of learning embraces more than learning a new job or academic subject. It also has a bearing on the fundamental development, motivation, social behaviour and personality.

The development of learning, the view of Hilgard (1962) is revealed through the changing probability that an awaited behaviour may result. It is rather an intervening variable, one that is inferred as a connecting process between an antecedent variable and consequent behaviour. Hilgard inferring from Kohler's theory of insight learning stated that “a learner is a resourceful person, one who is able to use what he knows in new situations and one who is able to discover for himself solutions to problems that he has never before faced” (P.276). Insightful

learning encourages problem-solving behaviour in the learner. The learner must have prior familiarity with the essentials of the problem. For example, no one can solve a novel algebraic problem without knowing the meaning of the symbols and operations for which they stand. Insightful learning requires the learner to see facts in relation to understanding the essentials they bear upon the problem. Insightful learning depends upon the capacity of the learner. For example, older children can learn things that younger children cannot learn. This is influenced by past experiences.

All instances of learning involve the learner in behaviour of some sort. He learns to do something. An example is learning to read. The same feature of behaviour is exhibited by instances that could be described as learning to become somebody. For example, one can learn to become a teacher. To learn to be somebody is to learn to do something. Learning involves the changing of one's behaviour. From a variety of instances of learning, Burns (1995) deduced four features of learning. In the first instance, the learner learns to do something. This, he interpreted as a feature of behavioural change. Secondly, he previously did something different. That is a change of behaviour. For the third feature, that change of behaviour occurs in a particular kind of situation. Fourthly, the learner changes from one situation to another. In terms of these four features that appear to characterize learning, any instance of learning must get two responses, namely, an old response and a new different response. That is, any instance of learning involves a two-fold series of behaviour. Burns then defined learning as adopting a new response to a situation. A fundamental implication of this definition is that

learning is not a single “thing”. There are a lot of theories which seeks to explain the concept of learning such the Bandura (1969) social learning theory and the classical conditioning learning theory of Ivan Pavlov.

### **Curriculum and Evaluation Standards and Strategies**

Many educational researchers believe that setting standards will help schools, particularly those in deprived schools. National Council on Education Standards and Testing (NCEST, 1995), commissioned by American Congress to determine the feasibility of national standards and assessments, asserted that standards are necessary to help close the mathematics performance gap between advantaged and disadvantaged students. The following were highlighted as standards and strategies:

### **Curriculum and Instruction**

#### **Access to Courses**

All students should have access to high level courses that will allow them to meet performance and content standards and provide them with good career opportunities (Oakes, 1989).

#### **Curriculum**

Curriculum should:

1. Meet the content standards for the subject,
2. Be logically integrated with other coursework,
3. Reflect the challenges of real life problems,
4. Present material in a context relevant to students, and
5. Be as free as possible from hidden bias (Darling-Hammond, 1994).

## **Time**

1. Teachers should spend adequate time covering the content in class.
2. Students should have time to learn content on their own.
3. Schools should emphasise more important curricula by assigning more class time for it.
4. Schools should provide students with time to do general academic work on the campus (Oakes, 1989).

## **Teacher Competence**

Pre-and in-service teacher training should lead to mastery of course content and techniques to teach it meaningfully, with particular attention to the material in the content standards, and

Include strategies for reaching diverse student populations and students with different learning styles.

## **School Organization**

### **Resources**

1. Schools should have enough physical space to accommodate all their students safely.
2. Schools should have an adequate number of teachers and classrooms to ensure optimum class size.
3. Students should have access to textbooks and educational facilities.
4. Teachers should have the materials, time, private space, and support staff they need for lesson preparation and professional development.

5. Schools should establish curricular priorities, ensure appropriate teacher assignments, and provide students with needed supports (Oakes, 1989).

### **Environment and Culture**

1. The school building should be clean, safe from hazards, and in good condition.
2. The school culture should foster learning and demonstrate concern for students' well-being.
3. Schools should promote respect for diversity and protect student population from discrimination.
4. Staff and students should be expected to behave respectfully toward each other, and feel protected from potential violence.

### **Students' and School Assessment**

Assessing students' performance has been an issue of interest to many people because it has been a yardstick for academic judgement. However, only few people are asking questions concerning what knowledge regarding curriculum has been imparted into students. According to Gredler (1992), it is immoral to begin by measuring outcomes before we have seriously engaged the equitable and sufficient distribution of input-that is, opportunities and resources essential to the development of intellect and competence. Gredler (1992) was trying to draw attention to the fact that one needs to assess what academic knowledge has been provided to students to learn mathematics before students' assessment. The alignment of curriculum and classroom assessment was found to



be important to students' performance in several studies (Knapp & Associates, 1995).

Students in some of the SHS Schools in Ghana are victims to the sentiment being shared by Gredler above. Many students in Ghana have suffered the pain of writing the final mathematics examination that is organised by the WAEC. This is as a result of little or inadequate opportunity provided to students to learn the designed content syllabus and this has normally produced mathematics results which are not encouraging. Linn and Baker (1993) stated that before students are tested with high-stakes assessments, evidence must be provided that the students have had adequate opportunity to learn the material on which they are being tested. This explains why the educational proposals of most countries have called for the development of mathematics learning standards that coincide with content standards and performance standards.

According to Hills (1992), assessment involves the multiples steps of collecting data on a child's development and learning, determining its significance in the light of the programme goals and objectives, incorporating the information into planning for individuals and programmes, and communicating findings to parents and other involved parties.

Most mathematics teachers at the JHS level also have a basic aim of teaching their students to achieve better result in their examination (WAEC). This aim has shifted teachers' attention from holistic assessment to testing activities thereby limiting themselves to class exercise, assigned classroom projects, end of term test and sometimes homework with few committed ones marking them. All

these activities are done with no proper documentation which would help the school to make reference to when need be. Anamuah-Mensah Committee Report (2002) confirms that, the education system in Ghana continues to suffer from high stakes examinations such as BECE and SSSCE, which are used as indicators of quality. These are so competitive that teachers tend to overemphasis solving problems for examinations rather than encouraging meaningful learning (p50).

However, assessment in education goes beyond the above mentioned factors, Steen (1999) offers six guidelines to follow regarding assessments. He claims assessment should:

1. Be a continuous cycle
2. Be an open process
3. Promote valid inferences
4. Employ multiple measure of performance
5. Measure what is worth learning, and
6. Support every student's opportunity to learn mathematics

A great deal of assessment can also be done informally. Teachers can watch how the students react to the instructional activities in the classroom and make informal assessments based on their impressions and expectations of each student's mathematics performance. Though, informal assessment is useful, it is important for mathematics teachers to consider the quality of their informal assessment practices to ensure that these practices support learning which are not base on inaccurate teacher expectations. Instructional decisions that are based on inaccurate expectation may impede students' learning (Steen, 1999). This means

that a mathematics teacher should be able to provide adequate information on his/her students upon which other decisions concerning the students' future academic progress could be planned around.

### **Difficulties of Mathematics**

Parents, students and mathematics educators are worried about mathematics learning in school. Many a time, it is believed that many students lack interest in mathematics because it is difficult and boring, that there are not good textbooks, that is not taught well for them to understand, that is abstract and takes their time and energy when solving mathematics problem, some even assert that you have to be born with it. All these beliefs are manifestation of the difficulty of mathematics learning. It is not surprising because mathematics learning has been a problem to many over the world, not our times only but from the time immemorial.

From the foregoing, it is seen that the difficulty of mathematics was expressed in many forms of learning mathematics, no confidence in learning mathematics, mathematics for a privilege few, and mathematics as necessary evil. Such feelings or emotions associated with mathematics learning difficulties contribute to a large extent to the poor participation and performance in mathematics at higher levels by students with the more acute at higher levels.

The cognitive factors are related to the choice of methodology, while the personality factors include, how the learner perceives the subject. For instance, it is useful and important to him, and the relationship between the learner and his/her environment. Such environment includes, the characteristics of the

teacher, parents, peers, classrooms, among others which provide conducive atmosphere for mathematics learning.

### **Nature of Assessment in Mathematics**

The assessment of many students in the mathematics classroom is still one that is based on an approach where grading and ranking is the primary goals (Niss, 1993). In these classrooms, students just passively listen to a teacher presenting procedures, then, with follow-up examples. Current theories of learning mathematics suggest that students are not passive receivers of knowledge but actively construct knowledge consensual with social and cultural settings.

Kilpatrick (1992) argues that an alternative vision is necessary for today's mathematics classrooms. Kilpatrick argues that the challenge for the 21<sup>st</sup> century, as far as mathematics educators are concerned, is to produce an assessment practice that does more than measures a person's mind and then assign a mind treatment. We need to understand how people, not apart from but embedded in their cultures, come to use mathematics in different social settings and how we can create a mathematics instruction that helps them use it better, more rewarding, and more responsibly. To do that will 'require mathematics teachers to transcend the crippling visions of mind as a hierarchy, school as a machine, and assessment as engineering' (Kilpatrick, 1992: p.44).

This view changes the focus of assessment from summative assessment where students are assessed principally to determine an overall measure of performance, to the more supportive role of formative assessment where students' performance result in action plans for both teacher and student in the pursuit of

further learning. According to Wolf, Bixby, Glenn and Gardner (1991) School communities use assessment results in a formative way to determine how well they are meeting instructional goals and how to alter curriculum and instruction so that goals can be better met. But unless the content of assessment (what schools assess) and the format of assessment (how schools assess) match what is taught and how it is taught (opportunity to learn), the results are meaningless, if not potentially harmful.

The need to change mathematics assessment practices must be seen in the wider context of changes to society, changes to the way we view mathematics, teaching mathematics and learning mathematics. Today's society has moved from an industrial to an information-based society that relies on a greater use and application of technological understanding and has goals that promote equal opportunity or mathematics learning for all its citizens (NCTM, 1989). Rather than relying on approaches that provide assessment solely for the purpose of grading and ranking, assessment practices are needed to integrate learning activities that support students' construction of knowledge and that which reflect the diversity found in the curriculum.

Multiple sources of assessment will involve different ways of presenting tasks to students as well as different ways of probing assessment information so that valid inference about students' mathematics progress can be made. For the purpose of achieving high performances in mathematics, the National Council of Teachers of Mathematics (NCTM 1995) highlighted six point issues that any mathematics assessment should focus on:

1. Assessment should enhance mathematics learning and support good instructional practices
2. Tests and other assessment instruments should reflect broad curricular goals including the full range of the mathematics that students need to know.
3. Assessment should support every student's opportunity to learn mathematics.
4. Systematic assessment should reflect broad expectations of student learning including the ability to solve problems, to communicate ideas, to use technology appropriately, to work in teams, and to read technical material.
5. Student should be offered varied opportunities to demonstrate their mathematical knowledge.

Instruments used for assessment should be consistent with the opportunities that students have had to learn mathematics.

### **Teaching, Instructional Period and Students' Performance**

The findings about the relationship between instructional period and students' performance have important implications for teachers. Particularly, it seems prudent to allocate sufficient time for mathematics instructions at every grade level. Short contact periods in mathematics, instituted by policy makers for whatever practical or philosophical reason, should be seriously questioned. To ensure that students receive the best education and mathematics performance standards, teacher-students contact periods need to be reconsidered. According to

McKnight, *et al.*, (1987) the more time students engage in learning activities, the more they learn, even when teaching is weak.

Direct instructional time is related to the number of instructional days and hours per year as well as the allocation of instructional time within each class period. Evidence has it that when teachers spend more time on learning activities and less time on classroom management and discipline, student learning improve (DeStefano, Gillies & Moore, 2007). The issue of instructional time is beyond mere propositions because a number of studies have found a positive relationship between total time allocated to mathematics and general mathematics performance.

McKnight, *et al.* (1987) in a review of research on instructional time, found strong support for the link between allocated instructional time and students' performance. Internationally, Keeves (1976) found a significant relationship across Australian states between performance in mathematics and total curriculum time spent on mathematics. D'Amico, Harwell, Stein, and Van den Heuvel (2001) also found that high-quality instructional practice and implementation of curriculum together may be associated with student performance. In spite of the numerous findings linking instructional time and students' performance, there are some policy makers, teachers and students who have turned deaf ear to it. They attend school irregularly and sometimes absent themselves during mathematics periods. Grouws and Smith (1996) acknowledged that in spite of these research findings, many students still spend only minimal amounts of time in the mathematics class.

Teachers are widely viewed as the group that most directly affects student performance. They help ensure students learn content and control the classroom activities most related to learning. As a result, teacher training is often the most widely used strategy to improve educational quality based on the presumption that better trained teachers will lead to increased levels of student learning (DeStefano, Gillies & Moore 2007). Recent studies of teacher effects at the classroom level using the Tennessee Value-Added Assessment System and a similar database in Dallas, Texas, have found that differential teacher effectiveness is a stronger determinant of differences in student learning (Sanders & River, 1996; Wright, Horn, & Sanders, 1997; Jordan, Mendro, & Weerasinghe, 1997). In Ghana, the Ghana Education Service is trying several means to get all teachers trained. However, it is still common to find untrained personnel recruited by GES to teach mathematics in Ghana, especially, in the rural areas.

The effects of a teacher's experience (number of years taught) on students' learning are enormous and cannot be overlooked. A research conducted by Murnane and Philips (1981) and Klitgaard and Hall (1974) have found a relationship between teachers' effectiveness and their years of experience. For example, a controlled study of middle school mathematics teachers, matched by years of experience and school setting, found that students of certified mathematics teachers experience significant gains in performance than those taught by teachers not trained in mathematics. Variables presumed to be indicative of teachers' competence which have been examined for their relationship to students' learning include measures of teachers' academic ability,



years of education, years of teaching experience, measures of subject matter and teaching knowledge, certification status, and teaching behaviours in the classroom (Darling-Hammond, 1999).

### **Parents' Involvement and Students' Mathematics Performance**

Parents play a vital role in their children's education. Schools can capitalize on parental support to assist children to learn mathematics. Some Educational researches have focused on the role that families play in their children's educational development over the past decades and have established a direct relation between parents' involvement and students' performance. Henderson and Mapp (2002) reviewed a wide range of studies on parents' involvement. They found that students with involved parents, no matter what their income or background, were more likely to earn higher grades and test scores and enroll in higher-level programs; be promoted, pass their classes, and earn credits; attend school regularly; have better social skills, show improved behaviour, and adapt well to school; and graduate and go on to further education.

The proactive parents in supporting their children with school work, enhances improvement of the students behaviour and social adjustment (Cordry & Wilson, 2004). The most challenging task facing mathematics educators today is how to improve parents' involvement. In Ghana, most of the parents lack the training to offer continuous involvement in their children's education. Another problem is parents' personal beliefs about the causes of school performance and their involvement to help their children (Hoover-Dempsey & Sandler, 1997). In

most cases, parents spend more time watching television than talking about school issues with their children (Clevenson, 1999).

In spite of the above problems, some proactive parents believe the school should be blamed for the lack of parental involvement because parents do not receive enough information about what is going on in schools. According to Munk *et al.* (2001), inconvenient opportunities to communicate, differing attitudes of parents and teachers toward homework, and teachers' limited knowledge about the students' strengths and needs are factors that cause information flow problems. Effective communication requires a two-way flow of information and the onus rest on school authorities to get parents informed about their wards mathematics performance and what role parents have to play to help. Research suggested different ways for teachers to keep the communication open-ended such as phone calls or e-mail (Munk, *et al.*, 2001).

Parental or family role in their children's Education is normally seen outside the school environment, that is, when students have closed form school or vacated. Their efforts are frequently measured by the contributions they make to assist their children to complete mathematics homework or assignment. A research on the effects of parental involvement in mathematics homework showed that training parents to be involved in their children's homework results in elevated rates of homework completion, fewer homework problems and possibly, enhanced academic performance among elementary school children (Patall, Cooper, & Robinson, 2008). However, several studies like Cooper, Robinson, and Patall (2006) and Haas and Riley (2008) have found that such results were not

obtained at the middle school level where an inverse relationship between parental involvement and mathematics homework completion was recorded.

Psyching parents and providing greater motivation, sense of purpose and confidence in them could contribute to increase students' mathematics performance with homework completion. Pezdek, Berry, and Renno (2002) found that increasing the accuracy of parents' awareness of their children's mathematical skills may be a sensible first step toward improving the poor mathematics performance of children. Participation of both parents and teachers to help with homework was found to increase the depth and quality of mathematics learning (Hatch, 1998). Parental involvement appears to be part of the solution in improving students' homework completion and mathematics performance. Clearly, parents' involvement is important to the success of students, so also is communication with parents to support that involvement.

### **Library and Student Performance**

In a research like this one where assessment is being done to know what learning opportunities improve mathematics performance in Junior High Schools, the library as one of schools resource cannot be left out. Evidence has shown that library correlates to student performance and in fact, a functional variable of student success. A research was conducted in 200 Colorado schools and the findings were that the performance of students with quality school library programmes on the Colorado Student Assessment Programme Reading Test was 15% higher than the performance of students without high functioning School libraries (Lance, 2001).

Many studies have investigated the positive impact school libraries can have on student performance. The studies identified several aspects of school library service as direct and/or indirect predictors of academic performance. Particularly, findings show that the size of a school library's collection is the best school predictor of academic performance. Similarly, Smith's (2001) study, which examined data from a random sample of 600 Texan school libraries, at elementary and junior and high school levels, in order to determine the impact of school libraries on student performance, found that students achieved higher scores on the Texas Assessment of Academic Skills at each level in schools with teacher librarians than in schools without librarians.

There is certainly no shortage of research that investigates the link between school libraries and student performance. According to Lance (2001) over the past sixty or so years there have been about seventy-five studies on the impact of school library media programmes on academic performance. From this large body of research, Lance identifies some of the key trends as being:

1. A strong library programmes that is adequately staffed, resourced and funded can lead to higher student performance regardless of the socio-economic or educational levels of the adults in the community;
2. A strong computer network connecting the library's resources to the classroom and laboratories has an impact on student performance;
3. The quality of the collection has impact on student learning;
4. Test scores are higher when there is higher usage of the school library;

5. Collaborative relationships between classroom teachers and school librarians have a significant impact on learning, particularly in relation to the planning of instructional units, resource collection development, and the provision of professional development for teachers;
6. Libraries can make a positive difference to students' self-esteem, confidence, independence and sense of responsibility.

Although a substantial body of research since 1990 shows a positive relationship between school libraries and student performance, many of these studies are based on overseas data and the extent to which this body of evidence is transferable to a Ghanaian setting is not obvious. Library service in Ghana has not received the needed attention to enable it play its role in the educational process. This is due mainly to the inadequate funding of the Ghana Library Board which is responsible for the management and supervision of the existing libraries, both public libraries and school libraries in Ghana (Anamuah-Mensah 2002). If practitioners in Ghana are to mount a strong case for recognizing the positive impact of school libraries and school librarians on student learning, it is important for Ghanaians to know how applicable the existing researches are to a Ghanaian context and what kind of additional research might be needed to demonstrate the positive relationship between school libraries and student performance.

Most of the JHS in Ghana have no library assistance and even if there is an assistance, they are mostly untrained and unqualified making the needed professional library functions in JHS schools lacking. While the school librarian's job today, at a fundamental level, remains the same in that it is still about

facilitating access to information, it has also become more complex and demanding because most of the people at this job positions are not professional librarians.

A position paper by the Australia Education Union, Tasmanian Branch, (2000) noted that in recent years school libraries have undergone cuts in staffing and resources and that teacher aide have replaced professional staff. Principals, senior staff and parents, the paper suggests, have not sufficiently valued either the school library or the teacher librarian. The position paper also stated that precisely at a time where schools are in the middle of an information explosion, 'libraries have been marginalized and considered optional or non-core services in school' (p. 5). Evidence from other researches also buttresses the fact that qualified teacher librarians who are needed to manage school libraries to enhance student performance keep diminishing in number. Reynolds and Carroll (2001) found that since 1983 the number of school libraries being staffed by qualified teacher librarians has dropped dramatically.

Other problems found by Anamuah-Mensah Committee (2002: p212) as militating factors against the provision of effective Library in Ghana include the following:

Lack of libraries in some schools;

Poor/non existent accommodation;

Inadequate and obsolete materials and equipment;

Outdated reading materials;

To address the problems and improve library and information services, the committee which was led by Anamuah-Mensah (2002: p. 212) recommended the following:

1. District Assemblies with the support of the GET Fund (Ghana Educational Trust Fund) should establish and fund basic school and community libraries and in addition provide ICT facilities to, among others, facilitate distance learning and non-formal education;
2. First and second cycle schools should have library periods on their timetable;
3. The Department of Information Studies of the University of Ghana should be supported by Government to expand its training facilities to train librarians for public, community, academic and school and college libraries;
4. A Directorate for school and college libraries should be created as the Ministry of Education (MOE) to be responsible for school and college libraries.

If school libraries are to be adequately staffed and resourced, and if their expertise is to be considered fundamental to curriculum development rather than complementary or peripheral, then the impact of school libraries on student learning needs to be made explicit.

### **Textbooks and Students' Learning**

In this era of high-stakes testing and public accountability, educational policy makers and other school stakeholders are searching for ways to improve mathematics learning opportunities for all students. Although, there is no straight forward solution, one avenue for strengthening school mathematics programmes is the selection and implementation of high-quality mathematics textbooks. A

textbook is a book that contains facts about a subject which is usually used by someone who is studying that subject. It is an essential book for both teachers and students. Textbooks are of paramount importance in any consideration of educational reform because more often than not textbooks are the sole reading material that the students will have access to and which the teachers will use as an instructional resource.

Similar contribution from McCrory (2006) states that textbooks are important source of content in classes that uses them and can be used to define the boundaries of content as well as the specific topics, the order in which they are taught, and most importantly, how they are presented. In mathematics classrooms, a textbook can be a source for problems, explanations, and examples. Students make use of textbooks before or after lessons either to add to the classroom taught knowledge or to clarify any misunderstanding of the subject. Teachers also use textbooks as their reference book for lesson preparations and delivery. Hence the impact of textbook could be immense.

In spite of the positive attributes that has been associated with textbooks, some textbooks contain much content that is new to students. Textbooks that devote major attention to review and address little new content each year should be avoided, if not their use should be heavily supplemented in appropriate ways. In recent past, according to Nayyar and Salim (2003) there have been several reports on the inadequacies, biases, and other weaknesses in prescribed textbooks. Teachers should use textbooks as just one instructional tool among many, rather than feel duty-bound to go through the textbook on a one-section-per-day basis. A



survey undertaken recently regarding a thorough analysis of textbooks being used in mathematics and science classroom in some public schools, found for example, that some prescribed textbooks do not encourage retaining factual material as it is presented. They do not contain the required level of detail to apply ideas to real world phenomena, (Barwell et al., 2001).

Flanders (1987) also examined several textbooks series and found that fewer than 50% of the pages in textbooks for grades two through eight contained any material new to students. This makes some of these textbooks user unfriendly to some students because students will need an additional guidance to use them. Therefore, a critical assessment should be made before recommending or selecting a textbook for student use. In a review of a dozen middle-grade mathematics textbooks series, Kulm, Morris and Grier (1999) found that most traditional textbook series lack many of the content recommendations made in recent standards documents.

### **Brief History of Mathematics Textbooks in Ghana**

Until 1952, Mathematics syllabus and textbooks were developed and authored by foreigners, mainly Europeans. Some of the famous authors including La Combs from France who authored the book entitled “Arithmetic for Primary Schools” and Alexander Symon and George D. N. Millikin co-authored the Mathematics book entitled “Arithmetic for Schools” (Eshun, 1979). The same Europeans also authored textbooks at the secondary school level. It should be noted the before independence, none of the mathematics textbooks was written by Africans or Ghanaians either at primary school level or secondary level.

The content of the textbook was rather difficult, and examples were far from students' experience. There were little or no learning activities provided for most of the topics. Therefore students were required to considerably memorized and imagine things that they have never seen before. This made the teaching and learning of Mathematics difficult. At the primary school level, the traditional mathematics largely involved mechanical number facts and measurements with little or no application to daily lives (Mereku, 2004).

The first attempt to involved Africans in writing textbooks for primary, secondary and teacher training colleges levels was in 1962 which took place in a town called Entebbe, Uganda. Many African Mathematics lecturers from universities, mathematics teachers from secondary schools, and training college tutors from Anglophone African countries as well as the American and British experts were brought together to write using new ideas in mathematics education, (Kuwayama et al., 2007). The series of texts produced at the workshop came to be popularly known as the Entebbe Mathematics Series. These series became the modern mathematics textbooks for primary and secondary schools as well as teachers training colleges (Mereku, 2004).

Years later, the Entebbe mathematics series which were the products of African Mathematics Programme (AMP) were replaced by the Ghana Mathematics Series (GMS) which were being used in by basic schools in Ghana. According to Mereku (2004), the GMS scheme had been criticised because its contributors were controlled and dominated by academicians rather than school teachers. The criticisms resulted in new schemes called Joint School Project

(JSP), initiated by the members of the Mathematics Association of Ghana (MAG). This idea came about after discussions on the new trends of the mathematics curriculum and teaching methods at MAG's annual conference in April 1963 (Eshun, 1979). The project aimed at producing a mathematics course for both Junior and Senior secondary schools at the West African School Certificate Level (Mereku, 2004).

Following the review of the mathematics syllabus by the Ministry of Education, Ghana, the original textbooks have now been revised to reflect the changes that have naturally taken place as a result of innovation and modernization. The new series, entitled Mathematics for Junior Secondary School, takes into account:

1. Ensuring full syllabus coverage.
2. Providing chapter summaries to reinforce learning outcomes
3. Extending and focusing worked examples (CRDD 1997).

However, the supply of these textbooks from the Ministry of Education has not achieved the target of one textbook to one student in all schools in Ghana. This shortfall needs to be given a serious attention since textbooks constitute a major input in teaching and learning of mathematics. As a way of solving the textbook supply problem, Anamuah-Mensah Committee (2002) recommended that teachers should be encouraged and supported to write textbooks, which should be assessed and recommended by CRDD for use in schools.

## **Parents' Mathematics Perception**

It is commonly recognized that expectations for one's success are important determinant of performance-related behavioural choices such as course enrollment and career choice (Parson, 1982). For both mathematics and English, plans for future course enrollment are related to self-concept of ability in the subject task value (Parson, 1982). Because expectation play such an important role determining this type of behavioural choices, it is important to identify the factors that influence their development. Parson further proposed that theoretical model that specifies several such influences. This model has two basic components: psychological component and socialization component. According to the psychological component expectations for such success are most directly influence by individuals' estimate of the difficulty of the task. In support of this predictions (Parson, 1982) found that both self-concept of mathematics ability and perceived difficulty of mathematics are related to mathematics course enrollment plans primarily through their significant association with expectations for success in mathematics. According to socialization component, parents' expectations of their children's ability are a major determinant of all three of these self-and task believes (ability self-concept, perceived task difficulty and expectations for success). In support of this prediction, Parsons (1982) found that children's self-and task concept were more strongly directly related to their parents' perceptions of their mathematics abilities than to their grades.

Parents have also been found to contribute to the emergence of stereotypical gender differences in children's self-task perception and

expectations. Research has shown that parents act as gender role socializers of children's self- and task perceptions in several performance areas through their actions and communications. For example, research has shown that parents' perceptions of both the difficulty and the value of mathematics for their child are affected by their child's gender even after controlling for performance differences. In turn, these gender stereotype perceptions and beliefs account for the gender differences that emerge in adolescents' self-perceptions and course enrollment plans. Other studies also have shown that mothers' stereotypes and perceptions of their children's ability influence children's self-perceptions.

### **Information Communication Technology (ICT) use in Mathematics Teaching**

In spite of government efforts, mathematics has not undergone much change in terms of how it is presented. These reflect consistently in low performance levels in mathematics among students at the SHS and JHS. Results from the Trends in International Mathematics and Science Study (TIMSS); an international study conducted by the International Association for the Evaluation of Educational Performance (IEA) of the USA in 2003 and 2007 at the JHS level (grade 8 equivalents) are instances of poor mathematics performance in the country. In the aforementioned study, Ghana's 8 graders were ranked 43rd among 44 and 46th among 47 countries that participated in the study in 2003 and 2007 respectively. The situation is not too different in the SHS. For many years the failure rate in mathematics has been dramatically high at this level. The low scores of students' over the years in the Senior Secondary School Certificate Examination attest to this. As a result many students are unable able to pursue

higher education after graduating from the SHS because they failed in their mathematics examinations.

The teacher factor is considered one of the prominent reasons for students' poor performance in mathematics. In Ghana, the approach of teaching mathematics is mainly teacher centred which is characterized by transmittal techniques (chalk and talk, dominated by teacher talk), making students to completely depend on teachers. With this teaching approach, students can use formulaic algorithms, but they rarely internalize and develop deeper insight into the mathematics they are learning. But should we be quick to blame these mathematics teachers? Obviously, the answer is no; these teachers also have been taught in the same manner and for most of them adapting new methods for instruction to enhance mathematics learning is a complex innovation.

### **What could be done?**

There is no doubt that something needs to be done! Students must understand mathematics to the extent that they see how mathematics ensures efficiency in all human endeavours, especially how it applies to their future professions. This is possible if the study of mathematics is made less stressful and mathematics itself becomes meaningful and relevant to those who study it. For this reason, it is very important that teachers of mathematics are sensitised and equipped to provide opportunities for their students to enjoy the study of mathematics and be good at it.

Recent research findings from mathematics education show that integrating of ICT changes the nature of teaching and learning. ICT seems to provide a focal point which encourages interaction between learners and the technology itself. This implies that ICT used in instruction support constructivist pedagogy, where learners use technology to explore and reach an understanding of mathematical concepts. However, for ICT to be used effectively in everyday teaching, radical changes are advocated in approaches to teaching. Teachers must adapt to new roles.

### **Conclusion**

If we accept the assumption that “mathematics is a science of pattern and order” (SCRE, 1995) it should not preclude the notion of philosophy in terms of a search for truth. The “science” aspect lies in the need for inductive reasoning; to find out what is not at first clear and to define the truth to which that reasoning leads. The “order” aspect lies in the use of deductive reasoning which uses the truths found inductively, and applies them to that which needs to be defined. This is the essence of the reviewed literature discussed above which brings to light what has been done, through researches, concerning ‘opportunity to learn’ and students’ mathematics performance.

It is from these feedbacks made in previous studies that have inspired the researcher to undertake this study to trace the factors perceived as influencing students’ mathematics learning.

## **CHAPTER THREE**

### **METHODOLOGY**

This chapter discusses the overview used to carry out this study in order to find out the various factors that facilitate JHS students' mathematics learning and performance. It discusses the research design that was adopted for the study, the population, the sample and the sampling procedures and the instrument used for the data collection. The procedures for the data collection and the method of analysis of the data for the research are explained in this chapter.

#### **Research Design**

Research designs are set of guidelines and instructions that are followed in conducting research. The choice of research design for a particular study is based on the purpose of the study (Cohen, Manion & Morrison, 2004). For this study, descriptive survey as a research design was considered a suitable design to be used. According to Gay (1992) the descriptive survey is an attempt to collect data from members of the population in order to determine the current status of that population with respect to one or more variables. This justifies the choice of descriptive survey design by the researcher because that is exactly what this study is all about. The researcher collected data from members of the population and determined the current status of that population with respect to one or more variables. Osuala (2001) also indicated that descriptive survey research gives a



picture of a situation or a population. It is basic for all types of research in assessing the situation as a pre-requisite for inferences and generalizations. It also helps or enables the researcher to collect data on a large number of people. Descriptive research design is useful because it can provide important information regarding the average member of a group. Specifically, by gathering data on a group of people, a researcher can describe the average member, or the average performance of a member, of the particular group being studied. Descriptive research design is highly regarded by policy makers in the social sciences where large populations are dealt with using questionnaires, which are widely used in educational research since data gathered by way of descriptive survey represents field conditions (Osuala, 2001).

Surveys permit the researcher to study more variables at one time than is typically possible in laboratory or field experiments. It is an efficient and accurate means of determining information about a given population. The results from surveys are provided relatively quickly, and ensure higher reliability than some other techniques. Cozby (2001) using survey, employed questionnaires to ask people to provide information about themselves, facts such as people's attitudes, perceptions, beliefs, demographics (age, gender, income, and so on) and other facts of the past or intended future behaviours. Baumgartner, Strong and Hensley (2002), also stated in their publication that, 'descriptive survey involves determining the views or practices of a group through interviews or by administering a questionnaire'. In a nutshell, it can be said that the aim of a

survey is to obtain information which can be analysed and patterns extracted and comparisons made (Bell, 2004).

However, the researcher was not oblivious of some of the weaknesses associated with survey design. According to Tuckman (1972), sampling error may occur due to chance selection of different individuals. Osuala (2001) has also pointed out that the descriptive study may have the problem of low response rates that can have adverse effect on the results of the survey. Furthermore, according to Leedy (1985) “one of the most subtly and ineradicably shortcomings of descriptive survey is the presence of bias” (p.132) and especially when one uses questionnaires.

The following suggested ways were employed to reduce the bias nature of descriptive survey: Questions answered were clear and not misleading, getting respondents to answer questions thoughtfully and honestly. Descriptive survey design was used to sample views of 311 persons, of which 30 were mathematics teachers, 56 parents and 225 students from the six circuits of the Cape Coast Metropolis. The primary aim was to explore the factors that are perceived to influence students’ the Central Region. In all 311 questionnaires were completed and returned from mathematics teachers, parents and students thereby ensuring meaningful data analyses. Despite the shortcomings identified, the descriptive survey design was used. An advantage of the design is that it has the potential to provide a lot of information obtained from quite a large sample of individuals (Fraenkel & Wallen, 2000).

In this study, a multiple research method was adopted and this permitted the researcher to make use of both quantitative and qualitative data collection techniques and data analysis procedures. Though, the two approaches have distinct procedures in terms of research directions, any single approach will be suitable for the study. Saunders, Lewis and Thornhill (2007) emphasized this point by saying; “not only is it perfectly possible to combine quantitative and qualitative within the same piece of research, but in our experience it is often advantageous to do so (p.119)”. The choice of the approaches had also depended on what the researcher sought to achieve, thus, the stated objectives of this research and the research questions.

The quantitative aspect of the work dealt with the quantitative technique that was used in collecting the data and the follow up statistical tools for the analysis. Quantitative research design is all about quantifying relationships between variables. It aims at determining the relationship between one thing (an independent variable) and another (a dependent or outcome variable) in a population (Hopkins, 2000). The researcher used questionnaire to collect data on what teachers, and students and parents perceived as best teachers’ classroom practices that promote students’ mathematics learning and performance as well as parents attitudes towards mathematics and the support from their wards.

### **Target Population**

Cohen et al (2004) explain a target population as a group of elements or cases, whether individuals, objects or events, that conform to specific criteria and to who the researcher intends to generalise the study. In this study the target

population was 14,978 students from all Junior High Schools (JHS) in the Cape Coast Metropolis, (GES, 2011) their Mathematics teachers and parents who have their wards in basic schools.

**Table 1: Target Population per School**

School	Population
Amanful Catholic JHS	126
Nkanfoa St. Paul's Catholic	133
St. Monica's Girls	284
Aboom Zion B	98
Jacob Wilson Sey	53
St. Augustine's Practice	147
Pedu M/A 'A'	147
Abura Ahamadiyya 'B'	129
Ola Presby	190
Amamoma Presby Model	100
Mpeasem AME Zion	83
Ankaful M/A	103

Source: GES Cape Coast Metro, (2011)

### **Accessible Population**

The accessible population was 850 made up of students from St. Monica's JHS, Aboom Zion JHS, Nkanfoa St. Pual Catholic JHS, Amanful Catholic JHS, Pedu M/A 'A' JHS, St .Augustine Practice Catholic JHS, Jacob Wilson Sey JHS, Abura Ahamaddiyya JHS 'A' Ankanful M/A JHS, Ampeasem AME Zion JHS,

OLA Presby JHS and Amanmoma Presby Model JHS together with their parents or guardians and mathematics teachers.

### **Sampling Techniques**

The researcher used both purposive and simple random sampling methods, which are non-probability methods, to select the respondents. Jack and Norman (1993) cited in Adrah (2002) and Glasne (1999) confirm that these types of sampling are ideal for inquiry into the lived experience of people. Qualitative researchers tend to select each of their cases purposefully. Glasne (1999) citing Patton (1990; p. 29) posits that:

The logic and power of purposive sampling lies in selecting information-rich cases for study in-dept. information-rich cases are those from which one can learn a great deal about issues of central importance to the purposive of the research... (p. 29).

The researcher foresaw difficulties associated with collecting data from the entire regional schools (JHS). The researcher, therefore, sampled some schools for the research. Sampling refers to the process of selecting a portion of the population to represent the entire population. Six JHS schools were selected from six circuits in Cape Coast Metropolis in the Central region. Thus one school was selected from each of the circuits within the metropolis.

Purposive sampling was used to select the targeted number of mathematics teachers needed for the research from all the selected schools in the three sampled districts. Purposive sampling, according to Nueman (2000) occurs when one selects cases with a specific purpose in mind. To Brink (1996) this method is

based on the judgment of the researcher to select teachers who are representative to the phenomenon and well-versed with the issue at hand. Purposive sampling is preferred to other sampling techniques because the researcher selected mathematics teachers based on teachers' willingness to participate in the research in terms of responses.

Further, simple random sampling was used to select the targeted students needed for the research in all the JHS. There are three different forms in each school. This is Form One (F1), Form two (F2) and Form Three (F3). Simple random sampling is selected such that (i) each population unit has an equal probability of being chosen, and (ii) units are chosen independently without regard to one another. By making population units equally likely to be chosen, random sampling is as fair and unbiased as possible (Siegel, 1997) by ensuring independent selection random sampling aims at gathering as much independent information as possible. In order to reduce bias in the selection of the sample using the simple random sampling, a table of random numbers was employed by the researcher. First, a frame was established and the students were numbered from 1 through N using the form register.

The first number the researcher finger rested on automatically became the first respondent for the study. More, starting at the selected place, the researcher read the digits successfully in the usual way (i.e. from left to right and continuing on the next line. This was continued from class to class and school by school until the required respondents was acquired).

In the case of sampling of parents, the researcher employed the self-selection sampling technique. This sampling occurs when a researcher allows each case, usually individuals, to identify their desire to take part in a research (Saunders, Lewis & Thornhill, 2007). With the help of this sampling technique, 56 parents whose ward(s) are in JHS were selected to participate in the study.

### **Sample**

The respondents sampled included mathematics teachers, students and parents. In all a sample size of 311 respondents comprising thirty (30) mathematics teachers' two-hundred and fifty-five (255) students and fifty-six parents (56) were selected for the study. According to Nwana (1992) the researcher should always bear in mind that a sample size of about thirty is required in order to provide a pool large enough for even the simplest kind of analysis. Also, it should be borne in mind that the sample size needs to be large enough to ensure that it is theoretically possible for each sub-group (cell) in the analytical table to have at least five cases fall in it. This guided the researcher to select a reasonable sample size of 311 for the study.

### **Research Instruments**

In order to answer the various research questions, it was imperative to choose appropriate data collection devices. As a result, a careful examination of relevant literature and expert judgment, questionnaire was chosen to gather the data for the study. According to Borg et al. (1993) survey research typically employs the questionnaire to determine the opinions, attitudes, preferences and perceptions of persons of interest to a study and since the research is on assessing

perception, experiences, thought and attitude of parents, teachers and students in connection with mathematics, it will be appropriate to use questionnaire.

In developing the questionnaire, the researcher in consultation with the supervisor used a five point Likert Scale and five point performance ranking levels. Again, each questionnaire was scrutinised using the relevance and potential of the item in answering the research questions as a yardstick. Some of the questionnaire items were adapted from the work of Avhasei (2009). Three (3) sets of questionnaire were developed for three different responding groups, namely, teachers, parents and students (Appendices A, B and C respectively). Each questionnaire item was made up of two main parts, close-ended and open-ended parts.

The first aspect of the questionnaire item elicited information on the demographic background of each group of the respondents and their views on teaching and learning of Mathematics (Section A). The demographic component of the questionnaire was essentially designed to elicit information on variables like gender, academic/professional qualification, number of years of teaching Mathematics at JHS level and teaching experience. This was in tune with the research since these variables helped the researcher to make deductions from views of respondents.

The second part of the questionnaire which is teachers' questionnaire consisted of three sections namely A, B, and C. Items in section A elicited responses on how often respondents perform certain activities during instructions hours. Twelve questionnaire items numbering 7 to 19 were provided for



respondents to tick; given a five (5) likert scale (Almost Always, Frequently, Sometimes, Rarely and Never). Section C was open ended items numbering 20 and 21 where views of the respondents were solicited. The purpose of these questionnaire items is to elicit views from teachers' on what they perceived as best classroom practices that promotes students mathematics learning and performance. Also the open-ended questions allowed the respondents to express their personal views regarding teaching and learning of Mathematics at the JHS level.

The students' questionnaire was in four (4) parts folds. The first dealt with students' demographic data. The third part of the questionnaire elicited students' participation in any mathematics workshop, debate or clinic and the experience gained. Eight questionnaire items numbering 4 to 11 were provided for respondents to respond, using a five point Likert scale. (Strongly Agree, Agree, Neutral, Disagree and Strongly Disagree). The items were intended to measure how often students behave with regards to teaching and learning of mathematics. Items 12 and 13 dealt with what the school and parents are expected to do to enhance students' performance and the level of effort they usually put in their mathematics work. Question 14 concerned students' own assessment in mathematics. Here a five point performance ranking scale (excellent, very good, good, weak and very weak) was given to students to tick.

The last aspect of the students' questionnaire elicited students' views on the effort students' put in their mathematics learning. Thus, a five point

performance ranking (almost always, frequently, seldom, really and never) was given to students' to tick.

The questionnaire for parents first measured the respondents' demographic data. The second aspect sought to find out the views of parents in relation to their past school experiences in mathematics. According to Bellingham (2007) perception is the way in which person views things around him/her based on the sense, past experiences, attitudes, current information and other personal variables. The last aspect solicited parents' views on the way they help improve their wards performance in mathematics.

### **Pilot -testing of Research Instruments**

For the suitability of the instrument for collecting data to be determined, it was necessary to pre-test the instrument. The rationale for the pre-testing was to scrutinize the reliability and validity of the questionnaire. The participants for the pre-testing exercise were students and mathematics teachers of some selected schools in KEEA Municipality. The reason for the choice of the schools was due to proximity and accessibility to the researcher. In all, the total number of respondents for the pre-test was 40 consisting of 25 students, 5 teachers and 10 parents. This area was chosen for the pilot testing because the curriculum as implemented in this area has the same characteristics in terms of content and pedagogical practices as compared with what pertains in the Cape Coast Metropolis. The students and teachers also bear similar characteristics in terms of age as compared to their counterparts in the Komenda- Edina -Eguafo -Abrem Municipality. Moreover, students from the Cape Coast Metropolis and those in

the Komenda- Edina –Eguafo- Abrem Municipality write the same examinations. The teachers from both places have similar characteristics in terms of qualifications.

### **Validity and Reliability**

In order to ascertain the content validity of the instrument, some lecturers and mathematics teachers were consulted to review the items. They helped to evaluate whether the items were relevant to the research questions and their suggestions helped to establish the items' face and content validity.

Face and content validities were established by submitting the instrument to the researcher's supervisors for review. Cronbach's Alpha was used by the researcher to establish the reliability of the instrument during the pilot-test. Pavet, Deiner, Colvin, and Sandvik (1991), have indicated that in terms of reliability, the most important figure is the Alpha value which is Cronbach's Alpha co-efficient. Pavet et al (1991) indicated that any scale with Cronbach's Alpha of less than 0.7 cannot be considered reliable. On the basis of that the value of 0.823 which was the Cronbach's Alpha co-efficient for the pilot-test is above 0.7 and therefore be considered reliable.

As a further step to determine the internal consistency of the instrument Cronbach Alpha ( $\alpha$ ) was computed from a sample of forty one (41) responses that were gathered from the pre-testing. The choice of Cronbach alpha ( $\alpha$ ) co-efficient was made on the merit of views of Mitchell (1996) who contended that Cronbach Alpha is used when measures have multi-scored items. This exercise helped to

correct any ambiguities that were detected and other items that will not be relevant to the research.

The research instruments were subjected to a validity and reliability test. The instruments were given to an expert to ascertain how they meet face and content validity. The suggestions as given by the expert were used to effect the necessary changes to improve upon the instrument. Thereafter, a pilot test of the instruments was conducted whereby the questionnaires were administered in selected schools in the Komenda- Edina- Eguafo- Abrem Municipality.

The data gathered were analysed and the Cronbach's alpha established for each of the questionnaires. The values of, Cronbach's alpha of .71 (for students' questionnaires), .76 (parents' questionnaires) and .78 (for teachers' questionnaires) were obtained. Therefore, the instrument was considered reliable and appropriate to collect the relevant data to answer the questions posed. Also Fraenkel and Wallen (2000, p. 17) posited that "For research purposes a useful rule of thumb is that reliability should be at .70 and preferably higher". With this, the instrument was said to be of good quality capable of collecting useful data for the study. The queries that came out of the item analyses were catered for. All these actions were taken to ensure that the instruments were capable of collecting quality and useful data for the study.

### **Data Collection Procedure**

Prior to embarking on the data collection exercise, the researcher made preliminary contacts with the Metro Director of Education and headteachers as well as mathematics teachers in the selected schools. The heads of the various

schools organized their mathematics teachers for a meeting where the purpose of the research was explained to the respondents. Again, some parents who have their wards at JHS level were contacted through a Parent Teachers Association (PTA) prior to the data collection period. The researcher also made a personal contact with most of these parents. This was possible because the researcher took advantage of parents and teachers (in the selected schools) who have their wards in JHS and visited the parents/homes of some sampled students. The respondents were told that the exercise was for academic purpose only and that confidentiality was assured in order to encourage them to give their responses without suspicion. Having finished preparing the research instruments, an introductory letter was obtained from the researcher's department. Copies of these letters were sent to the Metropolitan District Director of Education and all the headteachers of the selected public schools in the Metropolis. The headteachers were given a number of questionnaires to be given to the respondents (mathematics teachers and students) and some selected parents who have their wards at the JHS for the study.

The research did not involve all students and teachers' therefore sampling procedure was employed to get the required number. This made the researcher got involved in the data collection procedure to ensure that students were given equal chances of being selected.

In order to minimize high non-response rate, the researcher entrusted or gave the questionnaires to the various heads of schools for onwards transmission to the mathematics teachers as well as the students and some of their parents.

Again, the researcher visited the sampled schools frequently to either collect those questionnaires that had been completed and/or to remind the respondents of the need to complete their responses. In the course of the researcher's visit, some of the headteachers from the sampled schools in the Metropolis were interviewed.

The researcher thanked the respondents for considering the request for access and for agreeing to the meeting. The previously agreed right to confidentiality and anonymity was reiterated by stating that nothing said by the participant would be attributed to him/her without first seeking and obtaining his/her permission. The participant's right to answer any questions was emphasized and that the interview would be stopped if they wished (Saunders, Lewis & Thornhill, 2007). At the end of the exercise the researcher sent letter of appreciation to the sampled school through the headteachers.

### **Data Analysis**

In this research both quantitative and qualitative methods of analysis were used, in line with modern trends in social and educational research. The merging of the two methods have been seen to offer excellent possibilities for developing a deeper and better understanding of social and educational processes (Creswell, 2003).

For the qualitative data, the content analysis method was used, as explained by Yildirim and Simsek (2000). The data were coded, themes were found, and the data analyses were made. To Marshall and Rossman (1995) qualitative data analysis involves the procedures of categorizing, structuring and putting meaning to the mass of the collected data.

Qualitative data were analysed descriptively by means of parametric statistical tests that included percentages, frequencies, means, standard deviation and so on. Qualitative data were analysed influentially. Influential statistics makes references from sample statistics to the population parameters.

For computation into the SPSS, the coded questionnaires were fed into the computer. In scoring the Likert-type scale items the positive statements were scored in descending order thus;

**Table 2: Coding the Likert Scale of Positive Statement for Students**

SA	A	N	D	SA
5	4	3	2	1

**Table 3: Coding of Likert Scales of Positive Statement for Students, Parents and Teachers**

AA	F	S	R	N
5	4	3	2	1

The abbreviations used for the Likert – type scales are as follows;

SA - Strongly Agreed, A - Agreed, N -Neutral, D - Disagreed,

SD - Strongly Disagreed

AA - Almost Always, F - Frequently, S – Seldom, R – Rare, N - Never

The outcome of the participants' views were found by summing the scores for the items and dividing them by the number of items on the Likert type scales. This formed the mean scores for each respondent.

According to Field (2005) the mean is a hypothetical value that can be calculated for any data set. It does not have to be a value that is actually observed in the data set. As much, the mean is model created to summarize a data. We can determine whether the mean is an accurate model by considering how observed values have deviated from the expected values. The standard deviation, according to Field (2005) measures how well the mean represents the data. Small standard deviations relative to the value of the mean indicates that the data points are close to the mean and the instruments used are effective. A large standard deviation indicates the mean is not an accurate representation of the data.

The determination of positive and negative observation of respondents was based on Kubizyn and Borich's (1984) assertion that "higher weights are associated with positive attitude exists (p. 150). This principle is also supported by Lundstrom and Lamount (1976) and Churchill (1979) who explained that the Likert scales can be analyzed in one of the two ways, either on the item-by-item basis (Profile analysis) or by summing the universal value of the responses to each item hereby yielding one score per subject for the whole attitude scales aggregate analysis.

The deductive statements were coded with Yes (1) and No (2) and the open-ended questionnaire items were scrutinized carefully and constructs were formed for the commonly provided responses.



**CHAPTER FOUR**  
**RESULTS AND DISCUSSION**

The study aimed at finding out which teacher factors, school factors and parents or home factors are perceived to influence students’ mathematics learning and their performance at the JHS level. In order to achieve this purpose and also to answering/answer the stated research questions, data were gathered from mathematics teachers at JHS, JHS students and parents who have their wards in JHS. This chapter presents and discusses the findings that have emerged from the data collected by means of questionnaire and semi-structured interviews. The findings of the study are discussed under three main headings.

1. Demographic characteristics of respondents
2. Findings related to research questions
3. Discussion of results.

**Demographic Characteristics of Respondents**

**Table 4: Gender Distribution of the Respondents**

	Students	Teachers	Parents	Total
Male	62.7 (141)	73.3(22)	53.6 (30)	193
Female	37.3 (84)	26.7 (8)	46.4 (26)	118
Total	225	30		311

Source: Field Data, 2011

Table 4 indicates that, three hundred and eleven respondents were used for the study. They consist of 225 students, 56 parents and 30 mathematics teachers at JHS. Out of the 225 students, 67.7% (n = 141) were males and 37.3% (n = 84) were females. Furthermore, 56 parents participated in the study and out of these, 53.6% (n = 30) were males and 46.4% (n = 26) were females. Also, 22 male teachers and 8 female teachers representing 73.3% and 26.7% respectively participated in the study.

The researcher was interested in the distribution of teacher-respondents' years of teaching experience.

**Table 5: Teaching Experience of Respondents**

Years	Frequency	Percentage (%)
0 – 5	4	13.3
6 – 10	7	23.3
11 – 15	12	40
16 – 20	5	16.7
21+	2	6.7
Total	30	100.0

Source: Field Data, 2011

Table 5 shows that 33.7% of the teacher participant had utmost 10 years teaching experience. 56.7%) of the teacher participant had more than 10 years teaching experience and only a few 6.7% had more than 20 years teaching experience.

The researcher was interested in the distribution of respondents who are qualified teachers.

**Table 6: Distribution of Respondents who are Professionals**

	Frequency	Percentage (%)
Professional	22	73.3
Non-professional	8	26.7
Total	30	100.0

Source: Field Data, 2011

Table 6, depicts that, 73.3% (n = 22) of the respondents are professional teachers while 26.7% (n = 8) are non-professional teachers. The researcher was again, interested in the distribution of respondents' years of teaching experience.

The researcher took keen interest in the respondents' academic qualification.

**Table 7: Distribution of Teachers Academic Qualification/Level of Education**

Level	Frequency	Percentage (%)
Certificate	1	3.3
Diploma	11	36.7
Bachelor's Degree	17	56.7
SSCE/SEC	1	3.3
Total	30	100.0

Source: Field Data, (2011)

Table 7 shows the level of education of the respondents. That is, 56.7% (n = 17) of the teachers hold bachelor's degree, 36.7% (n = 11) are diploma holders and 3.3% (n = 1) are certificate A holders and SSCE holders respectively.

Professional development is a strong feature when it comes to teaching, because teaching is seen as an art not an activity that can be effectively performed by anybody at all as perceived by some people. Teaching is a skill that needs to be developed to enhance proficiency in persons who have the desire to impart knowledge at all levels of education. It is for this reasons that two public tertiary institutions namely; University of Cape Coast and University of Education have been entrusted to offer or organise both distance and regular programmes to train teachers for all the various levels of education.

The researcher also considered in-service training or workshop participants had participated in mathematics.

**Table 8: Distribution of In-service Training or Workshop for Mathematics Teachers**

	Frequency	Percentage (%)
Yes	17	56.7
No	13	43.3
Total	30	100.0

Source: Field Data (2011)

From Table 9, teachers were asked to indicate whether or not they have attended any in-service training or workshop in mathematics. The essence of this questionnaire item was to establish the frequency teachers do update themselves in their field of work. The results show that 56.7% (n = 17) have attended an in-

service training in mathematics and 43.3% (n = 13) have not received or got any in-service training or orientation in mathematics. Having finished that, the researcher also delved into students' participation in either mathematics workshop, debate, clinic or quiz.

**Table 9: Students' Participation in Mathematics Workshop, Debate, Clinic or Quiz**

	Frequency	Percentage (%)
Yes	69	30.7
No	156	69.3
Total	225	100.0

Source: Field Data, (2011)

From Table 9, it was found that only 30.7% (n = 69) of the respondents have participated in either mathematics workshop, debate, clinic or quiz and 69.3% (n = 156) of the students have not been engaged in either mathematics workshop, debate, clinic or quiz.

### **Answers to Research Questions**

The five research questions formulated based on perceived teachers best classroom practices, that promote students' mathematics learning and performance, parents attitudes and their influence towards their wards performance and students self-rated assessment and their performance at the JHS level were answered in the sections that follows.

**Research Question One: What do teachers perceive as best classroom practices that promote students’ mathematics learning and performance in JHS level.**

The aim of this research question was to measure what teachers perceive as best classroom practices that promote students mathematics learning and performance at the JHS level. A summary of this result is presented in table 10. For the purpose of this discussion, the mean scores of 2.0 and above suggest agreement with a given statement and below 2.0 suggest disagreement.

**Table 10: Descriptive Statistics of Participants’ Responses on Perceived Teacher’s Practices**

Item	N	Mean	Standard Deviation
5. Make connection between mathematics and other disciplines	30	2.00	0.878
6. Use additional mathematics text book (s) as instructional tools	30	1.867	0.900
7. Use marking Scheme (s) and other electronic devices to supplement your teaching	30	2.133	0.937
8. Enjoying teaching JHS mathematics	30	1.767	0.858
9. Take student prior understanding into accounts when planning to lesson	30	1.657	0.661
10. Cover all mathematics concept in the syllabus	30	2.100	0.759

**Table 10 continued**

Item	N	Mean	Standard Deviation
11. Involve parents in the mathematics education of their children	30	2.567	1.223
12. Advice students about job opportunity or prospects in mathematics	30	1.967	0.964
13. Inspecting students exercise books at the end of each topic and making the necessary review to correct the mistakes of students	30	1.767	0.728
14. Conducting frequency test and exercises in mathematics	30	1.700	0.651
15. Motivate Students to learn mathematics on their own	30	1.600	0.675
16. Encourage students to work in small groups	30	1.800	0.714
17. Involving students in the teaching and learning process in making teaching of mathematics more interactive	30	1.800	0.714

Source: Field Data, (2011)

Table 10, indicates the average responses of teachers on the extent to which they perform the above items to enhance their teaching learning of mathematics. From table 10 four predominant items reported by respondents as determinants of students learning of mathematics and their performance are stated and discussed below.

The first most perceived classroom practice reported by respondents was “involve parents in the mathematics education of their children” with a mean of 2.57 and SD of 1.22. This implies that most of the teachers normally involved parents in the teaching of mathematics, suggesting that majority of mathematics teachers in Cape Coast Metropolis do involve parents in educating their wards.

This is in line with the findings of Henderson and Mapp (2002) who reviewed a wide range of studies on parents’ involvement. They found that students with involved parents, no matter what their income or background, were more likely to earn higher grades and test scores and enroll in higher-level programmes; be promoted, pass their classes, attend school regularly, have better social skills, show improved behaviour and so on.

Pezdek, Berry, and Renno (2002) found that increasing the accuracy of parents’ awareness of their children’s mathematical skills may be a sensible first step toward improving the poor mathematics performance of children. It is evident that, parents’ involvement is important to the success of students, so also is communication with parents to support that involvement.



A second most predominant item on teachers' practices was "use marking scheme(s) and other electronic devices to supplement one's teaching" with a mean of 2.13 and SD of 0.94 indicating teachers' agreement to the fact that they almost always use marking scheme(s) and other electronic devices to aid their teaching of mathematics. Effective mathematics teaching needs adequate preparation. At first, the uses of government textbooks were the only source of reference material for teaching and learning of mathematics. But due to modernisation and technological advancement, mathematics teachers of today prefer the use of marking scheme(s) and electronic devices such as computers, projectors and other handouts to aid and simplify their teaching. Furthermore, they are of the view that, mathematics teaching at the JHS level is based on performance so they found it prudent to use that approach in order to enhance students' mathematics learning and their performance.

A survey undertaken recently regarding a thorough analysis of textbooks being used in mathematics and science classroom in the government school found, for example, that some prescribed textbooks do not encourage retaining factual materials as it is presented.

The third most predominant item was "cover all mathematics concepts in the syllabus" with a mean of 2.10 and SD of 0.76. Most teachers frequently cover all mathematics concepts in the syllabus. This is in line with the direct impact on measures of Huitt Model (1995) of school learning examines the variables related to classroom process. This supports the facts that, the success of any educational process depends on what teachers offer and what students are ready to

accommodate. Thus, if teachers are able to plan and manage their lessons well, by making connection or seeing mathematics as inter-woven between other discipline; it would help students to understand mathematics well and see mathematics as the things they do every day.

Lastly, under the same teacher's classroom practices, "make connection between mathematics and other disciplines" with a mean of 2.00 and S.D of 0.88 indicates that, some mathematics teachers in the Cape Coast Metropolis seldomly make teaching of mathematic more practical and interactive. With this, mathematics would be seen as what they do every day. This means that, if teachers are encouraged to use this methodology, students would understand mathematics well and they would be able to relate it to other discipline.

It is evident from table 10 that, certain classroom practices of teachers such as "use additional mathematics tools" with a mean of 1.87 and S.D 0.90; "enjoying teaching JHS mathematics" with a mean 1.77 and S.D of 0.86; "advice students about job opportunity or prospects in mathematics" with a mean of 1.97 and S.D of 0.96; "inspecting students exercise books at the end of each topic and making the necessary review to correct their mistakes" with a mean of 1.77 and S.D of 0.73; "conducting frequent test" with a mean of 1.70 and S.D of 0.65; "motivate students to learn mathematics in their own" with a mean of 1.60 and S.D of 0.68; "encourage students to work in small groups" with a mean of 1.80 and S.D of 0.71; and "involving students in the teaching and learning process in making teaching of mathematics more interactive" with a mean of 1.80 and S.D of 0.71 all these question items have mean which is below 2.00. This shows that,

some of the respondents do not frequently practice the above items when they are teaching mathematics.

Again, table 10 depicts that, some mathematics teachers' seldomly take students' pace into considering but rather adapted to a method that would enable them complete mathematics topics in the syllabus before they write their BECE or final exams. This finding is not consistent with Anamuah-Mensah Committee Report (2000) which stipulated that the education system continues to suffer from high stake examination such as Basic Education Certificate Examination which are used as indicators of quality. These examinations are so competitive that teachers resort to the use of marking scheme(s) and solving examination questions rather than encouraging meaningful learning.

**Research Question Two: What do students perceive as best teachers' classroom practices that influence their mathematics performance at the JHS level?**

The researcher further solicited students' views on teachers' classroom practices that are perceived to influence students' mathematics performance. The summary of the report are presented in table 11.

**Table 11: Distribution of Students' Responses on Perceived Teachers**

<b>Practices</b>			
Item	N	Mean	Standard Deviation
3. Teaching of mathematics should be more interactive	225	2.489	0.840
4. Vary their method of teaching mathematics	225	2.716	0.986
5. Enough mathematics exercise/assignment should be given to students	225	2.444	0.849

**Table 11 continued**

Item	N	Mean	Standard Deviation
6. I am highly motivated in my mathematics class	225	3.209	1.227
7. Other supplementary textbooks/electronic gadgets are recommended to students	225	3.190	1.120
8. Teacher should instill discipline when teaching mathematics	225	2.738	1.038
9. Teacher do regular inspection of exercise/assignments	225	2.742	1.140
10. Mathematics clinics should be organized to orient students	225	3.112	1.033

Source: Field Data (2011)

Table 11 depicts some of the best classroom practices of teachers that are perceived to influence students' mathematics performance at the JHS level. Some of the items are done frequently while others are not done regularly as indicated by the students.

Table 11 reveals that considerable number of respondents disagreed that most teachers frequently engaged in items 3, 4, 5, 8 and 9. This is because the average value of each of these items is less than 3.0. This goes further to explain that majority of teachers do not frequently use the interactive approach in teaching mathematics, some do not frequently vary their teaching approach, enough

mathematics exercises/assignments are not given, no discipline is instilled when teaching mathematics and also, most teachers do not do regular inspection of exercises/assignments. In other words, these negative practices of teachers would not improve students' mathematics learning and performance. Assessing students' performance has been an issue of interest because it has been a yardstick for academic judgment. This is in line with Gredler (1992) who tried to draw attention to the fact that one needs to assess what academic knowledge has been provided to students' assessment. Furthermore, current theories of learning mathematics suggest that students are not passive receivers of knowledge but actively construct knowledge consensual with social and cultural settings.

Again some respondents were of the view that, teachers' classroom practice such as "I am highly motivated in my mathematics class", "other supplementary textbooks or electronic gadgets are recommended to students and "mathematics clinics should be organized to orient students" could impact positively on students' learning since their means are above the mean of means (1.8). That is to say, they are of the view that, teachers practices such as motivating students in mathematics class, using of supplementary textbooks/electronic gadgets (BECE Past Questions on CD) and organizing mathematics debate and clinics would impact positively on students' mathematics learning and performance. In this era of high-stakes testing and public accountability, educational stakeholders are seeking for ways to improve mathematics learning opportunities for all students. Thus textbooks are an important source of content in classes that use them and can be used to define the

boundaries of content as well as the specific topics, the order in which they are taught, and most importantly how they are presented. Simply put the use of textbooks and other mathematics software impact positively on students' mathematics learning and performance.

From Table 11, it is evident that all the items in the table are effective and beneficial if teachers adhere to these practices.

**Research Question 3: How do students' self-rated assessments influence their performance at the JHS level?** This was to find out the effort students usually put in their mathematics learning.

**Table 12: Distribution of Students' Behaviour/Attitude towards Mathematics Learning**

Items	Frequency	Percentage (%)
I do not try at all	23	10.0
I do just enough to get by	50	22.0
I give an average amount of effort	90	40.0
I try very hard, but not as hard as I could	18	8.0
I work as hard as I can	45	20.0
Total	225	100

Source: Field Data (2011)

From the above analysis, conclusion can be drawn that, only 10.0% (n = 23) of the students do not practice or work mathematics on their own. This may be attributed to ill-feeling they have in the subject that is why they are adamant to mathematics. Again, 22.0% (n = 50) do just enough to get by which implies that they sometimes make the attempt to work mathematics but do not put in

maximum effort. Furthermore, majority of the respondents, that is 40.0% (n = 90) give an average amount of effort and 20.0% (n = 45) of the respondents work as hard as they can. This means that a considerable number of the respondents do constant practicing. This could be attributed to multiplicity of behavioural factors such as complacency, peer influence, parental factors and so on. In order to know whether there exist relationship between students' self-rated performance and their learning behaviour in mathematics, the researcher combined the two themes and used Pearson correlation to answer research question 3.

**Table 13: Correlation between Student Mathematical Learning Behaviour and their Self-rated Performance**

		Students self-rated performance	Students behaviour
Students self-rated performance	Pearson correlation	1	.407**
	Sig. (2-tailed)		.000
	N	225	225
Students behaviour	Pearson correlation	.407**	1
	Sig. (2-tailed)	.000	
	N	225	225

\*\* . Correlation is significant at the 0.01 level (2-tailed)

Result in Table 13 indicates a positive weak relationship between student behaviour and students performance. This is indicated by a correlation coefficient  $r = 0.407$ . In other words, the result shows that students' learning behaviour do

not relate significantly with students' performance. Even though Middleton and Spamiyas (1999) study concluded that the effort to achieve is a powerful influence in performance in mathematics, the results above have clearly shows otherwise. This implies that whether or not students put much effort by studying hard; it does not necessarily affect their performance in mathematics which means it's the intelligence that matters.

**Research Questions 4: What role should the school as a learning community play to enhance students' mathematics performance/learning at the J.H.S level?**

The aim of this research question was to seek views of students, parents and teachers on what the schools as a learning community do to enhance students' mathematics learning and performance. The views of the students, parents and teachers were sought through the use of questionnaires.

**Responses of Students**

Students were asked to give their responses on what role the school as a learning community plays to enhance students' mathematics learning and performance or achievement at the J.H.S level.

A total amount of 225 responses came from respondents and their responses, upon critical considerations, were grouped under some major themes. The researcher deemed the grouping necessary because the researcher noticed that similar ideas had been expressed in numerous language forms by the respondents. However, there were overlapping groups. Table 14 illustrates the summary of open-ended response from students.



**Table 14: Summary of Open-ended Responses from Students on Classroom Environment**

Item	Frequency	Percentage (%)
Provision of infrastructure	30	13.3
Teaching/learning materials	49	21.8
Teacher motivation	20	8.9
Instructional period	35	15.5
Teaching methods	44	19.7
Competent teachers	25	11.1
Provision of more textbooks	12	5.3
Assessment	10	4.4
Total	225	100.0

Source: Field Data (2011)

From Table 14, 13.3% (n=30) commented on good infrastructure as a means to help them in learning mathematics. They are of the view that studying in good classrooms where there are enough tables and chairs will aid or enhance their learning. Again, they are of the view that physical environment is an important influence on teaching and learning. Thus, schools with facilities like computer laboratory, science laboratory, recreational grounds, library and so on tend to perform better than the less endowed schools where they lack these basic amenities. Evidence has shown that well stocked library contributed to students' performance, which is in fact, a functional variable of students' success.

Lance (2001) revealed that students who score higher on norm-referenced test tend to come from schools with more Library staff, more books, more

periodicals and more videos. The question now is, is it always the case? Research shows that most of the J.H.S in Ghana have no library assistants and if there is an assistants, they are mostly untrained and unqualified making the needed professional library functions in J.H.S lacking.

Also, 21.8% (n = 49) of the respondents complained of inadequate teaching and learning materials. That is to say, the researcher had opportunity to interact with the mathematics teachers and they were emphatic that, they lack basic mathematical tools like chalkboard instruments, grid board, chalk and white board markers and so on. 8.9% (n = 20) of the total respondents thought of teacher motivation. Teachers are the live wire in every educational setup. It is obvious that majority of teachers at the Basic School Level are not professionals simply because the profession is not attractive. As a result, they are not urged to give off their best. One respondent wrote “the school should see to it that mathematics teachers do not rush through teaching as it is done by other subject teachers because mathematics is difficult”. This implies students wished that, teachers adopted a more favourable teaching approach that would help them build mathematics concepts and move at a pace that would help all and not only the good ones.

From the literature reviewed in this study, the method of teaching affect learning. Hitz and Scanlon (2001) stated that students who attended traditional teacher-centered classes showed better results immediately after their programme. However, students who were taught using constructivist teaching approach had better results and had a greater level of retention and an ability to use acquired

knowledge and skills over time. Again, similar views were expressed by Lord (1999) and Klein and Merritt (1994) who believed that constructivist teaching approach leads to improved students' mathematics learning and performance because it develops critical thinking, interpretation and analytical skills. Although, Papanastasiou (2000) who has studied achievement in mathematics and factors that affect it, found that even though teaching methods affected achievement, its impact was not statistically significant. A handful of the respondents lamented on provision of textbooks and assessment which are 11.1% (n=25) and 4.4% (n=10) respectively.

### **Response of Parents and Teachers on the Role the School should play to enhance Students' Mathematics Learning**

Below are summary responses of the parents and teachers on what the school should do to influence students' mathematics learning at the JHS level.

These were:

1. The school should motivate teachers of mathematics so as to give off their best
2. The school should encourage mathematics teachers to teach with prescribed textbooks syllabus, related reference materials, computers, projectors and so on.
3. The school should try to adopt measures to motivate students who excel in their field of study. This will in one way or the other influence other students to learn hard.

4. The school should organize in-service training to enrich teachers' methods of teaching.
5. The school should provide enough infrastructures such as enough classrooms, library which is well stuffed and computer and science laboratories.
6. The school should put in place mechanisms that would enforce mathematics teachers to assess students regularly so that teachers will be well informed of their students' performance.
7. The school should make sure that all the necessary teaching and learning materials are provided to facilitate students understanding in mathematics.

Mcknights et al, (1987) for example in view of research on instructional time found strong support for the link between allocation of instructional time and students' performance and D' Amico, Harwell Stein, and VanDenHeuve, (2001) also found that high quality instructional time and practice and implementation of curriculum together were associated with students' achievement. It is therefore imperative to allocate sufficient time for mathematics instructions at the J.H.S level. In effect parents and teachers were of the view that, Ghana Education Service should allot more time for mathematics at the J.H.S level and also ensure that the curriculum is well designed to suit the norms and aspirations of the society.

**Research Question Five: How do parents' attitudes influence wards performance in mathematics at the JHS level?**

This was to find out the extent to which parents' attitude enhance their wards mathematics learning and performance at the JHS level. It involves parents'

perception towards mathematics and the role they play to ensure their wards learning and performance in mathematics.

Table 15 shows parents attitude towards mathematics. **Table 15: Response on Parents Attitude towards Mathematics**

Statement	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total
1. Mathematics is not difficult	5 (8.9)	10 (27.9)	6 (10.7)	15 (36.8)	20 (35.7)	56 (600)
2. I am afraid of mathematics	23 (41.1)	16 (28.6)	4 (7.1)	8 (14.3)	5 (8.9)	56 (100)
3. Mathematics is a subject for those who are fast learners	21 (37.5)	10 (17.8)	7 (12.5)	9 (16.1)	9 (16.10)	56 (1.0)
4. Doing mathematics makes me nervous	16 (28.6)	17 (30.4)	5 (8.9)	10 (17.8)	8 (14.3)	56 (100)

**Table 15 continued**

Statement	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total
5. I had wish to continue mathematics to higher level	10 (17)	5 (17.8)	9 (16.1)	20 (16.1)	12 (21.4)	56 (100)

Source: Field Data (2011)

It is evident from Table 15 that 35.1% of the parents perceived that mathematics is difficult while, 41.1% (n = 23) are afraid of mathematics. Again, 17.9% (n = 10) were of the view that, mathematics is a subject for those who are fast learners or who have interest in the subject. 12.5% were of the view that “doing mathematics makes me nervous or upset” and only a few 7.1% (n = 4) wished to have continued mathematics to a higher level.

The above analysis showed that considerable number of parents have negative attitude toward mathematics. These may be attributed to multiplicity of factors when they were in school. This might be due to teachers methodology coupled with other factors.

**Table 16: Response on role of Parents towards their Wards Mathematics Learning and how it affects their Performance**

Items	Frequency	Mean	Std. Deviation
8. I am able to support my children to learn mathematics after school	56	3.0180	0.863
9. I am able to assist my children to do mathematics assignments	56	2.964	0.934
10. I employ additional teacher to help my children to learn mathematics	56	3.46	1.175
11. I inspect what my wards are doing in mathematics	56	2.91	0.900
12. I reward my children for good performance in mathematics	56	2.857	0.819
13. I motivate my children to learn mathematics	56	2.768	0.831
14. I buy/acquire other electronic gadgets to facilitate my children mathematics learning	56	3.143	1.102
15. Mathematics teachers must give students homework always	56	2.500	0.661
16. Mathematics teachers must prepare well before going to class	56	2.304	0.601
17. The teachers must be motivated to teach well in schools	56	2.304	0.502

**Table 16 continued**

Items	Frequency	Mean	Std. Deviation
18. School administrators/headmasters must make sure mathematics teachers attend classes regularly	56	2.429	0.535
19. Mathematics teachers who fail to attend classes must be sanctioned	56	2.643	0.616
20. Schools must ensure mathematic laboratory or library in schools	56	2.643	0.616
21. Schools must motivate students by giving special award to students who excel in class	56	2.500	0.714
22. Schools must encourage students to use part of their spare time learning mathematics	56	2.554	0.807

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Source: Field Data (2011)

Table 16 indicates that majority of the parents performed items 13, 15, 16, 17, 18, 19, 21, 22 and 23 most often because their means are all below the mean of 3.0 which implies, they were of the view that if they practice the following items frequently, thus, motivate their children, enough assignment are given to student to practice, mathematics teachers prepare well before they go to class, if teachers are given correct teaching/learning materials mathematics, teachers are motivated well, libraries and computer laboratories are built and students do



constant practicing, it will go a long way to enhance students' mathematics learning and achievement. Furthermore, it is evident that parents' involvement in "I am able to support my children to learn mathematics after school", "I am able to assist my children to do mathematics assignments", "I employ additional teacher to help my children to learn mathematics", "I inspect what my wards are doing in mathematics", "I reward my children for good performance in mathematics", and "I buy/acquire other electronic gadget to facilitate my children mathematics learning" were not as effective since their mean of means exceeds 3.0. In sum, it is evident not all parents supports their children to learn mathematics after school or support their children to learn mathematics because of the ill-feelings they have in mathematics.

### **Discussion of Results**

This research was conducted to find how individual factors like the teacher, the student, the school and the parent (family) contribute to enhancement of students' mathematics learning and performance at the J.H.S level. In order to realize this research purpose, four research questions were answered in addition.

Evidence from the analysis made above indicates that over (60%) of the teacher participant had at least 10 years teaching experience at the JHS level. This could have positive effect on teachers' performance because research has shown that number of years of teaching improves teachers' classroom effectiveness and their years of experience. For example, a controlled study of middle school mathematics teachers, matched by years of experience and school setting, found that students taught by mathematics teachers with significant experience gained in

achievement than those taught by teachers with lesser or no experience. Maybe, this finding might explain the reason why a handful of students advocated in their response to the open-ended questions that schools should provide them with competent and experienced mathematics teachers. The theoretical framework that supports this study stated that one of the best teacher characteristics which predict students' achievement is teacher efficacy (Huitt, 1995). Therefore, educational stakeholders and policy makers should try to institute policies that would help retain mathematics teachers in schools so that those experiences that come with long service would be gained to support mathematics learning and performance.

Another issue of concern was professional development and in-service training. Professionalism is a stronger feature when it comes to teaching because teaching is not an activity that can be effectively performed by anybody at all as perceived by some people. Teaching is a skill that needs to be developed to enhance proficiency in persons who have the desire to impart knowledge at all educational levels. It for this reason that two tertiary institutions namely, University of Cape Coast and University of Education, Winneba have been entrusted to train teachers for Ghanaian SHS classrooms. Therefore, the 26.7% of respondents who indicated not being professionals in this study should be provided with professional development opportunities to enhance their proficiency in teaching.

According to Bolam et al (1993), in-service training are those education and teaching activities engaged in by Basic and Secondary school teachers and heads, following their initial professional certification, and intended exclusively

to improve their professional knowledge in order to educate students more effectively. In-service training is a necessary part of any profession, most especially, because of the increasing demand on teacher performance. It provides opportunities for individuals to develop themselves to the highest level of professional competencies. It also updates teachers' knowledge about current developments, encourages exchange of ideas and experiences with other colleagues, and enables teachers to constantly review their own teaching strategies, assessment and evaluation skills. Therefore the teacher's education should not end with obtaining a diploma or degree. That is the more reason why a considerable number of mathematics teachers who participated in this study called on the school to organize in-service training for them to improve teaching and learning of mathematics.

Although the importance of in-service training has been recognized by the Ghana Education Service, its implementation has been difficult due to lack of effective plans as well as inadequate logistics (Anamuah-Mensah Committee, 2002).

Analysis so far depicted that majority of the respondents (teachers, parents and students) perceived that assigning more mathematics homework and reviewing the given homework, encouraging learners to work in groups, engage the whole class in discussion using additional mathematics textbooks as instructional tools, taking students' prior understanding into account when planning a lesson, and motivating students to practice mathematics on their own could enhance teaching and learning of mathematics at the J.H.S level. (Table 11

and Table 12) indicated, each of the activities has influence on the learning outcomes of students since data collected for this study has proved it.

Many researchers have emphasized that teaching techniques such as peer grouping and cooperative learning that was associated with some of these factors really improved students' mathematics learning because both techniques involve discussion among students. According to Posamentier *et al.* (2006) teaching of mathematics is not about dispensing rules, definitions and procedures for students to memorize, but engaging students as active participants through discussion and collaboration among students. Johnson and Johnson (1990) also concluded that to achieve success in learning mathematics, students should be given the opportunity to communicate mathematically, reasoning mathematics, develop self-confidence that motivates them to solve mathematics problems and one of the ways this could be done was through cooperative learning. In cooperative learning, students study in small groups that permit discussion among peers to achieve the same goals using social skills. This technique erases any shyness that has resulted in several trials and fail associated with weaker students in mathematics.

According to the theoretical framework (Huitt 1995 model) what students and teachers bring to the classroom process (input) influence students' learning and performance. Study habits of students are one of the subcategories under Students' Characteristics of Huitt's (1995) model and this variable (study attitude/behaviour) influences students' performance. Students study attitude/behaviour such as, attending extra classes, working mathematics problems among classmates, going to library to practice questions, approaching

their teachers with questions they do not understand, asking questions that bother them in class, encouraging friends to practice mathematics ceaselessly and being bold to ask a friend for help in mathematics are factors that would improve their mathematics learning (Table 10). These factors are not new as far as existing mathematics research findings are concerned. NEETF (2000) group factors that influence learning outcomes in addition to other factors mentioned in other research into five categories. Under these categories, the findings of this research could be found among curricular factors that contribute to students' learning and performance.

Giving students additional tuition in Mathematics is a common thing being done in J.H.S today and it has improved students' mathematics performances. Students' involvement in group discussion, mingling with closed peers and cooperative learning have been proven to support and improve mathematics learning. This is because these learning techniques help students to erase mathematics shyness and embrace confidence which enables them to ask questions that will lead to their understanding of mathematical concepts. According to Papanstasiou (2000) attitude of students and students classroom practices are strong factors that enhance students' mathematics achievement.

Well-stocked libraries and their high patronage from students have been found to be a strong contributing factor of students' achievement in general. According to Lance (2001) over the past sixty or so years there have been about seventy-five (75) studies on the impact of school library programmes on academic achievement. Therefore, an establishment of libraries in J.H.S in Ghana will go a

long way to improve mathematics learning and performance in schools. For instance, a research conducted in 200 Colorado schools found that the performance of students with quality school library programmes on the Colorado Student Assessment Programme Reading Test was 15% higher than the performance of students without high functioning school libraries (Lance, 2001).

However, it should be noted that an establishment of the libraries without patronage brings no result therefore it is also expedient for school authorities to institute measures that will compel students to make use of school libraries. It was for this very reason that made Anamuah-Mensah Committee (2002) to recommend that “basic and second cycle schools should have library periods on their timetables for library activities” (p. 213).

The zeal students put into learning of mathematics was also found to be another complex issue that needs consideration because it influences students’ mathematics learning and performance. This effort could only be achieved if students are given the needed motivation. It is motivation that will move students to reach heights that will make them resistible to ‘easily give ups’ when solving mathematics problems. In this study, students’ mathematics effort was found to be strongly linked with students’ performance.

Involving parents in the teaching and learning of Mathematics could as well improve students’ mathematics learning and performance. This is true because it makes learning a continuous activity. That is, the child goes to school to learn in the morning, and after school, the family (parent) takes over the responsibility of continuing what the child learnt at school. The next day this child

will go to school for the teacher to teach him/her and when he/she has closed, the family takes over again and the system goes on and on. This makes it essential for parents to be drawn into the school programme to assist students to learn Mathematics. Pezdek, Berry and Renno (2002) found that increasing the accuracy of parents' awareness of their children's mathematical skills may be a sensible first step toward improving the poor mathematics performance of children.

However, the level of parental involvement will depend on the mathematics perceptions of parents. Literature, for instance, has it that parents who lack enthusiasm to do mathematics might transform this belief to show less involvement with his/her wards mathematics achievement. Hoover-Dempsey and Sandler (1997) found that one of the problems associated with parents' mathematics involvement was parents' personal beliefs about the causes of school achievement and their involvement to help their children.

A review of a wide range of studies by Henderson and Mapp (2002) on parents' involvement also found that students with the involvement of parents, no matter what their income or background, were more likely to earn higher grades and test scores and enroll in higher-level programmes, be promoted, attend school regularly, have better social skills, show improved behaviour, adapt well to school and graduate and go on to further education (p 7). These findings suggest that school authorities, in drawing both parents and teachers help increase the depth and quality of mathematics learning (Hatch, 1998). At the moment, very little of this is seen at the J.H.S level in Ghana because most of the J.H.S school authorities lack the needed communication tools.

## **CHAPTER FIVE**

### **SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

This chapter looks at the summary, conclusion and recommendation of the study.

#### **Summary**

The objective of this study was to find teacher factors, student factors and parent factors that are perceived as influencing Junior High School (J.H.S) students' mathematics learning. Hence research questions were used to find out what teachers, students' and parents perceive as best classroom practices that promotes students' mathematics performance, the effort students' put in learning mathematics and their self rated performance as well as parents attitudes towards mathematics and its influence on their wards.

The purposive sampling to sample technique was used the mathematics teachers and simple random sampling for both students and parents. In all, 311 respondents were selected comprising 30 mathematics teachers, 225 students and 56 parents were used for the study.

In order to answer the research questions, a mixed methodology involving both quantitative and qualitative methods were adopted for the data collection and analysis. This chapter being the final chapter for this research study contains the summary of findings made from the analysis of data, the conclusion that could be



drawn on the analysis made and the necessary recommendations made for future research work.

The major findings of the study are:

1. That certain teacher classroom practices such as “use of interactive approach in teaching, varying their methods of teaching, teaching mathematics, giving enough exercises and assignment and inspecting their exercises and assignment” are not frequently practiced. Even though they practice it to some extent, the rate at which they practice them is not as high as it is expected of them.
2. Majority of teachers’ perceived that classroom practices such as “making connection between mathematics and other disciplines, use of marking scheme(s) and other electronic devices to supplement their teaching, cover all mathematics concepts in the syllabus and involve parents’ in mathematics education of their children” influence students’ mathematics learning and performance. Thus findings reveal that their above practices are the most frequently used items by the teachers.
3. Considerable number of parents have negative attitude toward mathematics. These may be attributed to multiplicity of factors when they were in school. This might be due to teachers methodology coupled with other factors.
4. Majority of the teachers perceived that, encouraging learners to work in groups, engaging the whole class in discussion using additional mathematics textbooks as instructional tools, taking students’ prior understanding into account when planning a lesson, and motivating students to practice

mathematics on their own could enhance teaching and learning of mathematics at the J.H.S level.

5. Concerning the efforts students put in learning mathematics, findings shows that majority of students' put in maximum efforts to learn mathematics this may be attributed to the facts that they have interest or zeal in learning mathematics while few students' put little effort in learning mathematics.

### **Conclusions**

The following conclusions can be drawn from the study.

It is now obvious from the study that mathematics teachers at the J.H.S level can enhance students learning and performance by engaging in the following professional activities.

1. Making the teaching of mathematics more interactive.
2. Encouraging students to work in groups.
3. Assigning mathematics homework and reviewing them.
4. Using additional mathematics textbooks and electronic gadget.
5. Proper planning of lesson notes and scheme of work.
6. Motivating students to ensure constant practicing.
7. Organising Mathematics, Clinics, quizzes, debates for students.
8. Gather confidence in the subject or have authority in mathematics.
9. Complete their syllabus

Again, this research has established that the school as a learning community should provide the following to enhance student's mathematics learning and performance at the J.H.S. Level

1. Provide teaching and learning materials for mathematics
2. Employ qualified teachers
3. Motivate teachers
4. Adequate infrastructure
5. Stock the school library with modern textbooks
6. Enough computers should be provided
7. Effective supervision
8. Take good care of their children

Finally, teaching and learning of mathematics depend greatly on the teachers' competence in the subject. Yet some teachers' do not use appropriate methods in their teaching and this may impact negatively in students' mathematics performance.

### **Recommendations**

The importance of mathematics in the life of a human being cannot be over-emphasized. It is not only imperative to assess factors that facilitate students, mathematics learning and performance but also important for all and sundry to appreciate that there are more to be done as a nation to help move mathematics forward. Based on the findings of the study, the researcher would like to make the following recommendation as important issues for consideration.

1. Teaching and learning of mathematics depend greatly on the teachers' competence in the subject. It is apparent that the mathematics teachers should be better equipped vis-à-vis the current trends in mathematics learning. Mathematics classes should be made more interesting and relevant to

everyday life activities. The Ghana Education Service should therefore organize periodic in-service training courses for all mathematics teachers, not only in the Junior High Schools, but also in the Senior High Schools. The institutions responsible for the training of teachers should seriously address the issue of how to effectively handle large mathematics classes.

2. The teaching and learning of mathematics on teachers' competence in the subject. It is apparent that the mathematics teachers should be better equipped vis-a-vis the current trend in mathematics 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, not only in the Junior High Schools but also in Senior High Schools.
3. More relevant materials, textbooks, and learning aids in mathematics are needed in the Junior High Schools. Encouragement should be given to agencies or individuals to write more textbooks in mathematics for the schools and the public instead of relying on G.E.S. Mathematical Association of Ghana should as matter of urgency consider taking up the challenge to write relevant textbooks in mathematics.
4. In order to attract more students, especially females into studying mathematics at higher level, mathematics clubs in schools should be given urgent attention. These clubs can arrange or organize quizzes in mathematics among forms and schools. Prizes should be awarded to deserving students to motivate them learn more mathematics. In mixed schools the competitions should be done on

the basis of sex, females compete with females and males with males so that females would be encouraged more to study mathematics.

5. Mathematics clinics, seminars and workshops could also be used to encourage more students into mathematics and related jobs. It is therefore gratifying to note that G.E.S has started in this direction by organizing clinics/workshops for students during the long vacations. However, the scope should be widened to include more schools. More students could be reached if the programme could be rotated among the regional capitals instead of concentrating in Accra. A team of experts in mathematics and mathematics related jobs should go to the regions to give talks on important of mathematics in all works of life.
6. Public education is also needed for parents and guardians. GES should therefore provide mobile cinema vans which will go to the towns and villages in the districts to educate the parents on the need to encourage children to study more courses in mathematics. This could form part of the literacy programme which is currently going on in the country. These programmes should include interviews, activities of students in mathematics and career guidance. It is hoped that when these programmes are instituted more students would be attracted into the learning of more courses in mathematics at the tertiary level.
7. Mathematics curricula for schools must be designed to suit the changing nature of the society.
8. Teaching and learning of mathematics at the J.H.S. level should be strengthened with the provision of qualified and committed mathematics

teachers so that students receive the best out of them. Furthermore, in-service training courses should be organized to update the teachers' methodology skills and also alert them on the new innovations in teaching.

9. All mathematics teachers need to be properly motivated with good conditions of service to ensure their effectiveness and retention. Conditions of service and incentive packages for mathematics teachers should be attractive and motivating enough to induce qualified persons into the profession to help salvage the present situation. This recommendation has been made because most of the teachers who took part in this research hinted on lack of motivation in the teaching profession. This implies that steps have to be taken before this motivation issue brings teachers commitment to declined levels.
10. A mechanism for organizing regular in-service training, workshops and seminar for all mathematics teachers in the system should be put in place. In addition, mathematics teachers must be encouraged to join subjects associations such as Mathematics Association of Ghana. These subject Associations should be strengthened so that they can organize short courses for their members from time to time in order to improve members teaching ability which was one of the major concerns in this research.
11. Educational Stakeholders should provide adequate mathematics resources in all basic schools (JHS) in the country so that no school will be handicapped. This will ensure equal opportunity to all students to learn mathematics. Mathematics textbooks and computers should be provided for all students and mathematics teachers as well to be used as additional source of information

just as this study has revealed. Finding of this study shows that textbooks have immense contribution to the teaching and learning of mathematics. In order to increase and improve the availability of mathematics textbooks, mathematics teachers should be encouraged to write textbooks or handouts of their own research and experience.

12. The public universities (UCC and UEW) which have been charged to train professional teachers in Ghana should be well resourced to increase enrollment so as to produce enough mathematics teachers for the JHS level.
13. Effective mechanisms should be put in place by GES to supervise all teachers to perform their work well.
14. Students must show some sense of purpose decorum towards mathematics. This attitude is needed to motivate students to put more effort in the learning of mathematics.

In addition, the factors below would also influence students' mathematics learning and performance.

- a. Constant practicing of mathematics questions
- b. Self discipline and self determination
- c. Attend extra classes
- d. Regular visit to library
- e. Work with classmates
- f. Ask questions that bother them in class
- g. Approach teachers with questions they do not understand
- h. Being bold to ask a friend for help

Lastly, positive attitude of parents' commands positive parental involvement. Therefore parents must show liking for the subject so as to help their wards to learn mathematics.

### **Suggestion for Further Studies**

A suggestion is being made that in future, a research would be conducted to find out factors that enhance student's mathematics learning and performance in the private Junior High Schools. A further research can also be conducted on mathematics performance in both Public and Private J. H. S.

Again regarding this study, a further research can be made by improving the sample size. A much larger size would enhance the validity of the findings. Different environmental settings are also suggested for future study at the same time. Some of the findings and conclusions of the study suggest possible directions for further research.

1. The study should be replicated for Junior High Schools in the other regions of Ghana. This should include schools in both urban and rural areas so as to enable inter-regional comparisons in order to provide a basis for general conclusions.
2. Although students indicated that they depend on their peers for extra tuition in mathematics, it was not clear whether female students in mixed schools depend on their female peers only or also on their male peers or both. Research is therefore needed in this area.



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**APPENDICES**

**APPENDIX A**

**UNIVERSITY OF CAPE COAST**

**FACULTY OF EDUCATION**

**DEPARTMENT OF BASIC EDUCATION**

**Questionnaire for Teacher Instructions**

Thank you for taking time to complete this questionnaire. Please answer the question to the best of your knowledge. Your thoughtful and truthful responses will be greatly appreciated. Your individual name or identification number is not required and will not at any time be associated with your responses. Your responses will be kept completely confidential.

**SECTION A**

Please mark with tick (√)

1. Gender [ ] male [ ] female [ ]
2. Years of teaching experience
3. Years of teaching J.H.S. mathematics .
4. Are you professional teacher? Yes [ ] No [ ]
5. What is your highest academic qualification?

Certificate A [ ] Diploma [ ] Bachelors Degree [ ] SSCE/SEC

Other, (please specify) .....

6a. Have you participated in any in-service or workshop on mathematics teaching? Yes [ ] No [ ]

6b. If yes, state the number of times you have participated in such programme.

.....

.....

.....

**SECTION B**

Mark with (√) to indicate your actual classroom practice.

Almost always    Frequently    Seldom    Rarely    Never

Items	Almost always	Frequently	Seldom	Rarely	Never
7. Make connections between mathematics and other discipline					
8. Use additional mathematics textbook(s) as instructional tools					
9. Use marking scheme and other electronics devices to supplement your teaching					
10. Enjoy teaching JHS mathematics					



11. Take students' prior understanding into consideration when planning a lesson					
12. Cover all mathematics concepts in the syllabus					
13. Involve parents in mathematics education of their children					
14. Advise students' about job opportunities or prospect in mathematics					
15. Examining the students' at the end of each topic and making necessary review to correct their mistake of students'					
16. Conducting frequent test					
17. Motivate students' to learn mathematics on their own					
18. Encourage students' to form small group to practice					

and discover concepts in mathematics.					
19. Involving students' in the teaching and learning process.					

**SECTION C**

20. Give the most important classroom practice that you think will contribute to learners' performance in mathematics.

.....

.....

.....

21. What should the school do to support the effective way of teaching mathematics?

Describe briefly

.....

.....

.....

## APPENDIX B

### Questionnaire for Parents

Thank you for taking time to complete this questionnaire; please answer each questionnaire to 'the best of your knowledge. Your thoughtful and truthful responses will be greatly appreciated.

Your individual name or identification number is not required and will not be at any time be associated with your responses. Your responses will be kept completely confidential.

Please tick the appropriate box with tick (✓)

1. Gender: Male [ ] Female [ ]

2. What is your educational qualification?

SSS [ ]

Diploma [ ]

Degree [ ]

Post Degree [ ]

For each question mark only one option with tick (✓)

Items	Strongly agreed	Agreed	Neutral	Disagreed	Strongly disagree
3. Mathematics is difficult					
3. Am afraid of mathematics					

4. Mathematics is a subject for those who are fast learners					
5. I had wish to continue mathematics to higher level					
6. I am able to support my child (ren) to learn mathematics after school					
7. I am able to assist my child (ren) to do mathematics assignment					
8. I employ additional teacher to help my child (ren) to learn mathematics					
9. I inspect what my ward(s) are doing in mathematics					
10. I reward my child (ren) for good					

performance in mathematics					
11. I motivate my child (ren) to learn mathematics					
12. I buy or acquire electronic gadget (s) to facilitate my child (ren) mathematics learning.					

What is your view about the following in improving mathematics performance in basic schools?

Items	Strongly agreed	Agreed	Neutral	Disagreed	Strongly disagree
15. Mathematics teachers must give students' homework always					
16. Mathematics must prepared well before going to the class					
17. The school must					

provide teachers' with teaching and learning materials to support their teaching					
18. Teachers must be motivated to teach well in school					
19. School administrators or head teachers must make sure mathematics teachers attend classes regularly					
20. Mathematics teachers who fail to attend classes must be sanctioned					
21. Schools must ensure mathematics laboratory or library in schools					
22. School must motivate students by					

giving special award to students who excel in class					
23. School must encourage student to use part of their spare time learning mathematics					

**APPENDIX C**

**Questionnaire for Students**

Thank you for taking time to complete this questionnaire. Please answer the question to the best of your knowledge. Your thoughtful and truthful responses will be greatly appreciated. Your individual name or identification number is not required and will not at any time be associated with your responses. Your responses will be kept completely confidential.

**SECTION A**

Please mark with (√)

- 1. Gender : Male [ ] Female [ ]
- 2. J.H.S form.....
- 3. (a) Have you participated in any mathematics workshops, debate or quiz lately? .....
- (b) If yes, what experience have you gained.....  
.....

What perceived practices or what should the teacher do to contribute to students' mathematics learning and achievement at the JHS level.

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
4. Teaching of mathematics					



should be more interactive					
5. Vary their method of teaching mathematics					
6. Enough mathematics exercises assignment should be given to students					
7. Other supplementary textbooks or electronic gadgets are recommended to students					
8. Teacher should instill discipline when teaching mathematics					
9. Teachers do regular inspection of exercises/assignments					
10. Mathematics clinics should be organised to orient students					

11. What is your expectation of the school to facilitate your learning?

.....  
.....

12. What is your expectation for your parents to enhance your mathematics learning?.....

.....

13. How would you grade your own performance in mathematics?

Excellent [ ]

Very good [ ]

Good [ ]

Weak [ ]

Very weak [ ]

	Almost always	Frequently	Seldom	Rarely	Never
I do not try at all					
I do just enough to get by					
I give enough amount of effort					
I try very hard, but had as hard as I could					
I work as hard as I can					

**APPENDIX D**

**LETTER OF INTRODUCTION**

UNIVERSITY OF CAPE COAST

FACULTY OF EDUCATION

DEPARTMENT OF BASIC EDUCATION

Telephone No: 233-042-33379

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Cape Coast

Our Ref: BED/49.1 B/Vol. 1158

23<sup>rd</sup> February, 2011

Dear Sir/Madam,

**LETTER OF INTRODUCTION**

The bearer of this letter Mr. Solomon Kofi Otuo Serebour is a Postgraduate student at the Department of Basic Education, University of Cape Coast.

He is undertaking a study as part of his thesis on "Factors that Facilitate Students' Mathematics Learning and Performances at the Junior High School (J.H.S.) Level. In some selected Junior High Schools in Cape Coast Metropolis, and also Metropolitan Education Office" connection with this he needs to conduct a pilot study and later collect them.

The project is academic in purpose and data collected will be treated as confidential.

We should therefore be grateful if you could give Mr. Solomon Kofi Otuo Serebour the necessary assistance to enable him carry out his thesis.

Yours faithfully

Dr. Fiifi Mensah  
(Head)