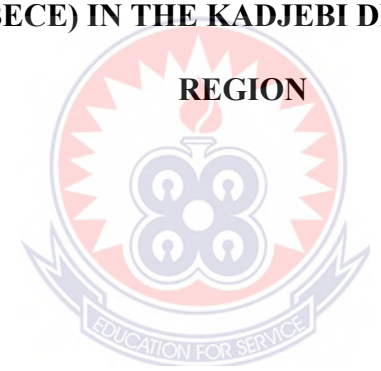
UNIVERSITY OF EDUCATION, WINNEBA

QUALITY OF TEACHING MATHEMATICS AND OPPORTUNITY TO LEARN STANDARDS PROVIDED FOR JUNIOR HIGH SCHOOL PUPILS ON THEIR PERFORMANCE IN BASIC EDUCATION CERTIFICATE EXAMINATION (BECE) IN THE KADJEBI DISTRICT OF THE VOLTA REGION



SELORME SAMUEL AGBANYO

2018

UNIVERSITY OF EDUCATION, WINNEBA

QUALITY OF TEACHING MATHEMATICS AND OPPORTUNITY TO LEARN STANDARDS PROVIDED FOR JUNIOR HIGH SCHOOL PUPILS ON THEIR PERFORMANCE IN BASIC EDUCATION CERTIFICATE EXAMINATION (BECE) IN THE KADJEBI DISTRICT OF THE VOLTA REGION

SELORME SAMUEL AGBANYO

(8110110022)

A THESIS IN THE DEPARTMENT OF MATHEMATICS EDUCATION, FACULTY OF SCIENCE EDUCATION, SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES, UNIVERSITY OF EDUCATION, WINNEBA, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF THE MASTER OF PHILOSOPHY (MATHEMATICS EDUCATION) DEGREE.

JULY, 2018

DECLARATION

STUDENT'S DECLARATION

I, Selorme Samuel Agbanyo, declare that this Thesis, with the exception of quotations and references contained in published works which have all been identified and duly acknowledged, is entirely my own original work, and it has not been submitted, either in part or whole, for another degree elsewhere.

SIGNATURE: ……..

DATE: …….

SUPERVISOR'S DECLARATION

I hereby declare that the preparation and presentation of this work was supervised in accordance with the guidelines for supervision of Thesis as laid down by the University of Education, Winneba.

NAME OF SUPERVISOR: DR. NYALA JOSEPH ISSAH

SIGNATURE:……

DATE:……..

ACKNOWLEDGEMENT

My gratitude goes to my supervisor, Dr. Issah J. Nyala for the patience and time he spent reading through this work and making invaluable suggestions, without which this research would not be complete.

I am also thankful to Dr. Charles. K. Assuah, Professor D. K. Mereku, Prof. Samuel Asiedu-Addo, Dr P. O. Cofie, Dr. J. Nabie, Prof. C. Okpoti, and all the other lecturers in the Mathematics Department of the University of Education, Winneba, for their support.

DEDICATION

This thesis is dedicated to Jehovah Almighty, for protecting my life, strengthening and guiding me through this programme.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABSTRACT

Performance in mathematics by students has persistently been poor. This study sought to investigate the impact of quality of teaching mathematics and opportunity to learn standards provided for Junior High School pupils on their performance in Basic Education Certificate Examination (BECE). The study also sought to establish the strategies that could be adopted to improve performance in the subject by students in Kadjebi District of the Volta Region. The population for the study was two-hundred respondents which comprised of third year students from ten(10) randomly selected Junior High Schools, 10 Mathematics teachers and twenty (20) parents or guardians. The data for the research was collected by the use of questionnaires, test items, interviews and observation guides. The design used in the study was mixed method research design which emphasized qualitative and quantitative methods. Simple random sampling was used to select the sample for the study. Descriptive statistics such as mean and standard deviation were used to analyse the data. It was found that the major factors that contributes to poor performance are, inadequacy of teaching and learning materials, lack of textbooks and resources such as computers, projectors, chalk, and others, parents or guardians socio-economic status, methods employed by mathematics teachers and inadequate opportunity to learn standards provided to pupils. It was recommended that mathematics teaching and learning should be based on student-centred and discussion approaches coupled with problem solving techniques.

CHAPTER ONE

INTRODUCTION

1.1Preview

This chapter deals with background of the study, statement of the problem, purpose of the study, objectives of the study and research questions. It then continued with significant of the study, organization of the study, limitation and delimitations of the research.

1.2 Background of the Study

According to Adetunde (2009a), mathematics is one of the most important subjects in the school curriculum. It is obvious that mathematics is a tool for science and technology. Mathematics has now entered into the field of studies which were thought to be non-mathematics in the past such as law, journalism, agricultural science and so on. Mathematics is now being seen as the pivot on which all other subjects revolve because it trains the brain. It enable students to acquire critical thinking skills, and also helps them reason logically and sequentially.

Adetunde (2009b) asserted that mathematics enables the individual to reason fast and to forecast what is immediately ahead of him/her. As a result, the poor performance of students in the subject cannot be allowed to go unattended to. Right from nursery classes, mathematics is one of the basic skills impressed upon. This shows how mathematics forms the foundation of any solid education.

Research carried out by Fletcher (2001) revealed that mathematics is a subject found in every school Curriculum in almost every country. Here in Ghana, mathematics is a compulsory subject in both the basic education (i.e. primary and junior high schools) and senior high school curricula. Fletcher, then argues that in spite of the desire of

mathematics educators in Ghana to pursue a constructivist agenda with regard to the teaching and learning of the subject, mathematics teachers at the basic and senior secondary levels continue to place undue emphasis on ‘memorization’ and 'imitation' rather than understanding and explaining. The difficulties involved in making the switch from the transmission approach of mathematics teaching to activity-based approaches include counteracting the effect of an examination system which encourages rote learning and recall of facts, lack of expertise among teachers of mathematics and teachers' resistance to change. Fletcher (2001) then concluded that these are the causes of fallen standards of education in the country, Ghana, because mathematics plays a vital role in the education of the individual.

According to Adetunde (2009a), the overall national development of any nation and building of a healthy, happy and prosperous society or nation cannot be successfully achieved without mathematics. The pursuit of mathematics is therefore, vital and imperative for any society, community or nation in order to maintain its independence and ensure increased prosperity and keep its place amongst the civilized nations of the world in this era of technology. Adetunde (2009a) continued that rich and advanced countries of the world have attained their affluence through advances they made in mathematics which is a part of science and technology. This implies that mathematics is a very important input in the scientific and technological development of any society.

Adentude (2009a) continued that “the old slogan of fail in Mathematics, fail in all other subjects” is back on the stage because no applicant can gain admission to higher/tertiary institutions without a credit pass in mathematics. It has now been the awareness that mathematics is the key to all subjects, be it the Sciences, Technology,

Accounting, Social Sciences or Law. Not only could mathematics help to develop these potentials in the individuals, but also help to develop problem solving skills.

Creswell (2012) asserted that overall national development of any nation and building of a healthy happy and prosperous society or nation cannot be successfully achieved without mathematics because mathematics is the bed rock of science and technology. Despite the important of the subject, the teaching and learning of mathematics and pupils' performance in the subject is not encouraging.

Tripathi (2003) found that teaching mathematics and making it compulsory to all students at the pre-tertiary school stage has been motivated by the belief that a study of mathematics helps students to learn to reason and apply such reasoning to everyday problems. The deeper understanding that educators are looking for is to enable students to look at and understand a new situation, delve into the repertoire of mathematical knowledge that they have in terms of concepts, processes, and ideas and adapt or modify those ideas so as to apply them towards resolving a new problem situation. Such understanding calls for building deep connections between concepts, a variety of lenses and representations with which to view the concepts and flexibility that allows one to sufficiently modify concepts so as to apply them to a new situation. It requires students to develop a rich network of ideas that one may draw from when faced with a novel situation. In this process, students develop habits of the mind that enable them to analyze other situations that they may encounter in life, mathematical or otherwise and to develop a strategy to overcome the situation. This critical blend of processes is what mathematics educators refer to as problem-solving (Tripathi, 2003). It is this kind of cognitive development that most modern societies would like their citizens to develop. It thus appears that this approach is lacking in the Kadjebi–Akan district as trends in mathematics performance appears generally poor.

The low academic achievement of Junior High School (JHS) pupils in the rural areas of Ghana has been one of the greatest challenges facing the educational system in the country. This was revealed through a research carried by Fredua–Kwarteng and Ahia (2005) which showed that several rural Junior High Schools recorded between 0 – 5 percentage pass from 1998 to 2003 in the Basic Education Certificate Examination (BECE). Currently this situation remain the same as chief examiners repot from West Africa Examination Council also reveal same (West Africa Examination Council, 2018) They continued that these poor educational achievements therefore close the door to further academic achievements on the educational ladder. Fredua–Kwarteng and Ahia (2005) then asserted that there is a wide spread belief in Ghana that mathematics can only be learned by those endowed with special mental abilities. They continued that the British colonial masters, who initiated this believe were influenced by their racist views. And over the years some educated Ghanaians and mathematics teachers have propagated this erroneous belief and now it has become a deeply entrenched belief among students and non – students alike. They then posited that those countries that performed well on the Trends in International Mathematics and Science Study in mathematics, in 2004, especially Asian countries, have a culture that tends to belief that mathematics learning is significantly dependent on effort, but not on inherent special brains or abilities.

Due to the importance of mathematics, the government of Ghana is committed to ensuring high quality mathematics education in both Junior High and Senior High schools in the country. Various attempts have been made to improve its success in schools such as organizing in – service training for mathematics teachers, and organizing seminars for members of Mathematical Association of Ghana (MAG). In spite of government efforts, learning of the subject has not undergone much change in

terms of how it is structured and presented in our schools. This has resulted in consistently low achievement levels in the mathematics education (West Africa Examination Council, 2018).

In another study, Bassey, Joshua and Asim (2007) posited that mathematics education is to a nation what protein is to young human organisms. They continued that mathematics is a vital tool for the understanding and application of science and technology. The discipline plays the vital role of a precursor and harbinger to the much needed technological and of course national development, which has become imperative in the developing nations of the world. They asserted that the technological advancement of developing countries lived much to be desired. They then asserted that mathematics education, that is, the teaching and learning of the subject should be much investigated. This is in true connection with that of Adetunde (2009b) who posited that mathematics is the pivot on which science and technology revolves. In this case, the dwindling effect of the subject cannot be left unattended to.

Furthermore, Ampiah (2008), found that there is a general perception in Ghana that mathematical standards are low in public, urban and rural schools as compared to private schools throughout the country. This is because teachers hardly use mathematics textbooks provided by the government. Ampiah (2008) further posited that results from Basic Education Certificate Examination (BECE), School Education Assessment (SEA) in 2005 and National Education Assessment (NEA) in 2007 examinations showed that there is dwindling performance of students in mathematics. Ampiah (2008) explained that private owned schools are performing better than public schools. The major differences between private and public schools are the superior English language facility of the pupils, greater availability and use of

textbooks by pupils and more access to activity-class, extra classes as well as special tuition for students.

This research carried out by Ampiah (2008) is typically true about Kadjebi District as there are more government assisted schools than privately owned. This is so because statistics from the education office proved that performances in mathematics in the Basic Education Certificate Examination (BECE) are nothing to write home about. For example in 2006, candidates that obtained qualified grades (that is, pupils that had aggregates from 1 to 6) were 29.6% out of 707 candidates, dropping to 27.3% out of 853 candidates in 2007 in the subject. It increased a little to 49.2% out of 597 candidates in 2008 and then saw a deadly drop in 2009 to 29.2% out of 901 candidates but fortunately saw a little rise to 32.4% out of 771 candidates in 2010. What this means is that throughout those years less than 50% of the total number of students in each year passed in mathematics.

According to Agbemafo (2009), figures coming from the West African Examination Council, have established that most candidates perform poorly in English, Mathematics and the Sciences in examinations conducted by the West African Examinations Council (WAEC). In a statement, the International Final Awards and Examiners Appointment Committee of WAEC emphasized that the situation does not augur well for national development, and calls for immediate steps to reverse the trend. WAEC currently conducts the Basic Education Certificate Examination (BECE) for junior high schools and West Africa Senior School Certificate Examinations (WASSCE) at the senior high school level in the sub-region. The committee noted that English, Mathematics and the Sciences are the basic disciplines for the planned technological advancement envisaged in the Vision 2020 Programme of Ghana. In this vein the improvement of students in Mathematics, Science and

English language should be given necessary attention. In this case, serious attention should be given to the fallen standard in mathematics in order to avert the situation (West Africa Examinations Council, 2010).

Some researchers in Nigeria found that the students' achievement in the outcome of mathematics performance tests depends on how much interest the students have in the subject. Achievement processes have been viewed by the characteristics of students and their environments, utilization of teaching-learning models, instructional materials as well as the structural ability of the students. Thus it is a belief that if an examinee has an unfavorable attitude towards a subject, then this will reflect in his performance in that subject. They confirmed that attitude predicts behavior. It is a general concern to all that, performance of Nigerian candidates in mathematics in both basic and secondary education levels are generally poor. In this vain, the Federal Government of Nigeria should formulate policies in order to curb this anomaly. Thus, it can be inferred that the perceived difficulty of mathematics tests, by examinees is as a result of their poor attitude towards the subject (Maliki, Ngban, & Ibu, 2009).

Ozturk and Debelak (2009) did their research in the United States of America and found out that the challenge to the educational establishment is how to keep academic expectations high for all students. Stakeholders consistently find low academic performance because of low levels of student achievement in mathematics in the United States of America schools today. In international comparisons of academic achievement, United States of America students lag behind their global counterparts in mathematics. But once again, the general academic expectations across the globe of a public education are low, not matching the levels of accomplishment necessary for future employment and success. Furthermore, data from international comparisons of student achievement in mathematics and science consistently place United States of

America students well behind their counterparts in advanced, industrialized nations though the general performance was lower than expected. Low academic expectations at preceding levels result in unprepared students for the next level of study or work. But, in academic achievement comparisons with international students of the same ability, United States of America students perform poorly in mathematics.

In this study, the researcher intends to find out the factors of poor mathematics performance in the Kadjebi District at the Basic Education Certificate Examination (BECE) level. The researcher had considered those arguments put forward by Fletcher to enable him determine whether teaching styles affect performance of the subject in the Kadjebi district. According to statistics from the district education office, BECE candidates that obtained qualified grades from 2001 to 2005 are 281 out of 579 candidates which was 48.6%, 307 out of 686 candidates scoring 44.7%, 202 out of 713 candidates as 28.4%, 228 out of 688 which was 33.2%, and 277 out of 873 scoring 31.3% respectively. During these years, studies such as (Fletcher, 2001) revealed that, mathematics teachers emphasized memorization and imitation rather than critical thinking and problem solving.

1.3 Statement of the Problem

According to Ampiah (2008), there is a general perception that standards of mathematics is dwindling over the years throughout the country. The performance of candidates in Basic Education Certificate Examinations in the subject is appalling. Statistical data from West Africa Examination Council (2018) prove that there is a downward trend of performance in mathematics in the Kadjebi-Akan district of the Volta Region.

The low academic achievement of Junior High School pupils in mathematics in the rural areas of Ghana have been one of the greatest challenges facing the educational system in the country (Fredua-Kwarteng & Ahia, 2005)

Research carried by Fredua-Kwarteng and Ahia (2005) posited that low academic achievement of Junior High School pupils in mathematics in the rural areas of Ghana have been one of the greatest challenges facing the educational system in the country. Research carried out by Fredua-Kwarteng and Ahia (2005) revealed that several rural Junior High schools recorded less than five percent pass between 1998 and 2003 inclusive in the final Basic Education Certificate Examination (BECE). They continued that these poor results therefore closed the doors to further academic achievements on the educational ladder. The implication is that the people are confined to the lowest level of the educational system which will fit them for menial jobs and occupations. Fredua-Kwarteng and Ahia (2005) posited that both mathematics teachers and students still think that mathematics is abstract in nature as was handed over to them by their British colonial masters.

Mereku (2001) posited that there was low academic attainment of students in Ghana primary schools. This is as a result of marks obtained by these students at the end of primary education in Criterion Referenced Tests (CRT). According to Mereku (2001) there was no proper connection between performances in Basic Education Certificate Examination (BECE) and that of West Africa Senior School Certificate Examination (WASSCE) written at secondary education level due to the grading system used to grade BECE candidates. Mereku (2001)opined that, this anomaly led the Director General of the Ghana Education Service (GES) to examine the BECE and its grading system and make recommendation for its improvement. He continued that, the committee found the type of grading system which is 'the norm referenced grading

system' with the percentage passes already fixed, also referred to as the 'Stanine system' which was used in the BECE as the major cause of the inefficiencies. The following are the grading and their interpretation as posited by (Mereku, 2001)

Grade	Interpretation	Grade	Interpretation
1	Excellent	6	Low Average
2	Very Good	7	Low
3	Good	8	Lower
4	High Average	9	Lowest
5	Average		

In order to obtain a qualified grade, a candidate has to get grade 4 or better as mathematics is considered as a core subject.

Alston (2012) explain that stanine stands for standard nine and indicates nine statistical units from a scale of 1 to 9. These units are used to indicate a performance level on a psychological or educational test. Alston continued that stanine is easy to find because there are only nine units. Although stanines provide the same information as other standard scores, they are less accurate.

Mereku (2001) posited that the emphasis on junior secondary education in the early part of the reform was therefore to ensure every child is equipped with the essential knowledge and skills that can make him/her develop the ability to function effectively in the society. In other words, the need to make the first half of secondary education comprehensive that is accessible to as many children of school-going age as possible is to ensure the youth is equipped with the essential knowledge and skills that will make them interact meaningfully with their changing environment and adapt to the advancement in science and technology in the society. In Ghana, what students must experience in basic school in order to acquire these essential knowledge and skills, which are the minimum levels of educational goals each individual is expected of, as a right, are contained in the subjects taught at the junior secondary level. These

subjects are Ghanaian Language and Culture, English, Mathematics, Integrated Science, Social Studies, French (optional for schools), Religious/Moral Education and Basic Design and Technology (BDT) which includes pre-technical skills, technical drawing and home economics.

Mereku (2001) continued that besides the ease with which Stanine grades can be computed, the system was found to be the best system that could be used for both certification and selection after the abolition of the common entrance examination in the early years of the Educational Reform. However, since it is the norm-referenced grading system with the percentage passes already fixed, it was found to have several demerits. Major among these demerits are:

i. It makes it almost impossible to compare candidates' performance and to determine from year to year whether or not there has been a nationwide improvement. For instance, the minimum raw score for the top 4 per cent obtaining Grade 1 in mathematics one year can be 78%, and in another year this can get as low as 56%, and yet 4 per cent of the candidates will still obtain a Grade 1.
ii. It does not reflect steadily rising or declining standards at the basic level, and thus, the results neither reflect improvements in teaching and learning nor in candidates' performances.

According to Agyei and Voogt (2011), in spite of government efforts, learning mathematics has not undergone much change in terms of how it is structured and presented, and has resulted in consistently low achievement levels in mathematics education.

This study therefore sort to investigate the impact of quality of teaching mathematics and opportunity to learn standards provided for Junior High School pupils on their

performance at Basic Education Certificate Examination (BECE) level in Kadjebi district of the Volta Region and suggested its solutions.

1.4 Purpose of the Study

The main purpose of this study was to find out the impact the quality of teaching mathematics and the opportunity to learn standards provided for Junior High School pupils had on their performance in Basic Education Certificate Examination (BECE) between 2001 and 2010 in the Kadjebi-Akan district of the Volta Region. It also intended to find out the causes and factors responsible for quality of teaching and opportunity to learn mathematics in school and home.

1.5 Objectives of the Study

Specifically, the study addressed the following objectives:

1. To investigate opportunities provided for pupils to learn mathematics in schools and homes.
2. Assess the quality of teaching mathematics in basic schools in the district.
3. To determine mathematics performance rate in the basic education certificate examinations in the Kadjebi District of the Volta Region from 2001 to 2010.

1.6 Research Questions

This study sought to answer the following questions:

1. Which Opportunities exist for Students to Learn Mathematics both at school and at home?
2. What is the quality of teaching mathematics in Basic schools in the Kadjebi District of the Volta Region?
3. What is the mathematics performance rate of students in Basic Education Certificate Examinations in the Kadjebi District Between 2001 and 2010?

1.7 Significance of the Study

The findings of this paper will serve as a source of advice to Ministry of Education in order to formulate good policies and to understand what is happening in basic schools. It will also help curriculum implementers to suitably structure the basic school curriculum in order. The paper will also give awareness to teachers in order to formulate policies, practices and pedagogical techniques that would address the difficulties faced by students in their course of learning mathematics.

According to Cosby (2002), research contributes to knowledge production in the field in which it is conducted. The purpose of academic research is to gain a better understanding of and/or gives more insight perspective on the subject matter. In this case, this research will bring out hindrances students and teachers face in the teaching and learning of mathematics and suggest ways to rectify the situation. It will also let the District Directorate, teachers, parents or guardians and other stake holders aware of factors responsible for the good or bad performance of mathematics.

The recommendations would include a variety of classroom activities and teaching strategies, which are focused on improving students' conceptual understanding of some major topics in mathematics such as collecting and gathering of data, fractions, percentages, proportions and rates, etc. The recommendations presented here are designed to ensure that students understand what goes into learning some of those topics and can successfully solve computational problems involving them. It then examines ways of helping students use concepts in certain topics to solve questions in other topics. The final recommendation suggests methods to increase teacher's conceptual knowledge in mathematics. Teachers with a firm conceptual knowledge in

mathematics, along with knowledge of students' common errors and misconceptions, are essential for improving students' learning.

1.8 Organization of the Study

The study consists of six chapters. Chapter one deals with introduction which includes the background to the study, statement of problem, purpose of the study, research question, significance and delimitation of the study. Chapter two deals with the literature review, while chapter three is devoted to methodology which covers research design, population, sample, data collection procedure, research instrument and methods of data analysis. Chapter four covers data analysis, findings and results whilst chapter five talks about discussion of the entire research. Finally chapter six gives conclusion, summary and recommendation of the research work.

1.9 Limitation

The study drew upon very few schools in Kadjebi District. Moreover, only four (4) circuits out of 13 were chosen. The sample comprised 200 students (88 girls and 112 boys) out of a population of 1087 students (538 girls and 549 boys) were selected for the research. The scope therefore, is very limited for any generalizations to be established, hence there is the need for a further and more detailed study into this problem. A major limitation of this study is the consequence of using non probability sample. Since this study was not based on a large population, it might have limitations in terms of generalizability of the practicality of the intervention. For instance, one may ask, can the study be applicable in similar situations in the other districts. The answer may be yes, or no depending on the situation and the basic factors. However, the issue of difficulty in generalizing findings from a small sample study partially comes from conceiving generalizability in the same way as do investigator using

experimental or correlational designs. Regarding this respect, Yin (2003) contends, small sample studies, like survey, are generalizable only to theoretical propositions and not to populations or universe. In this sense, the small sample study, like experiment or survey, does not represent a sample and in doing a small sample study, your goal will be to expand and generalize theories (analytic generalization) and not to enumerate frequencies (statistical generalization). Yin's argument above is helpful in the sense that what the small sample study seeks is not to generalize the study results from sample to a large population. In an effort to resolve the issue of the study attempts to provide a rich and thick description of events that emanated from the study were thoroughly discussed. This study could not and in fact did not seek to establish the effectiveness of the intervention. This was due to the limited time for the study. Effectiveness of an intervention in design-based research answers the question, what are students' achievements after the intervention is used in the classroom. Effectiveness is usually measured in a quasi-experimental design using much larger groups of students. In terms of curriculum, effectiveness of an intervention is related to attained curriculum level.

1.10 Delimitations

It would have been proper to cover the entire schools in the district but due to the organization of workshop and in view of constraints such as time and finance and difficult accessibility of the means of transportation, the research was restricted to only three out of the 13 circuits in the district. Fortunately, these circuits are the most densely populated in the district. In this case, the generalization can be a fair reflection on the entire district. Also, there exists a variety of instructional strategies and methods of teaching and learning of mathematics so this study resort to find out the most suitable for the district.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The performance of mathematics at the Basic Education Certificate Examination is a cause of worry to the people of Ghana. The following sub-headings were discussed under the literature review.

A. Quality and Factors Necessary for Teaching and Learning of the Subject

I. Impact of Quality of Teaching Mathematics on Pupils' Achievement

II. Basic School Teachers' Understanding of Mathematics Concepts

III. Mathematics Teachers' Knowledge of Subject Content and Methodology

IV. Teachers and Students Interaction in the Classroom

V. Factors that affect quality of teaching and learning of mathematics in the classroom

B. Trends of Mathematics Performance at Public Basic Schools in Basic Education Certificate Examination

C. Opportunity to Learn mathematics at school and at home

2.2 Impact of Quality of Teaching Mathematics on Pupils' Achievement

A research by Fong-Yee and Normore (2011) posited that teacher quality is a priority area of quality teaching in education policy. In other to get quality teaching of mathematics, it is advised that every state put "highly qualified" teacher in every classroom. Fong-Yee and Normore (2011) defines a highly qualified teacher as a person who holds at least a Bachelor's degree, and is fully licensed to teach based on certification, and has demonstrated competence in each academic area in which the teacher teaches. The researchers continued that to meet the "highly qualified" teachers challenge, the role of teacher quality and variables that influence student learning

should come to the forefront in current educational goals of teacher training curriculum.

According to Fong-Yee and Normore (2011) recent studies have shown that teacher quality which led to quality of teaching is the most important school-related factor in student achievement. Fong-Yee and Normore (2011) identified five factors that constitute teacher quality and therefore quality of teaching mathematics. These factors are cognitive ability, subject matter knowledge, knowledge of teaching and learning, licensure, and teacher behavior and practices.

Cognitive Ability

The researchers opined that there is positive relationship between teacher cognitive ability and student achievement. Cognitive ability is how the teacher explains whatever he/she is teaching to the total understanding of his students.

Subject Matter Knowledge

Subject matter knowledge is another variable that is related to teacher effectiveness and quality of teaching. Subject matter knowledge is in-depth understanding the teacher had about the topics he/she taught.

Knowledge of Teaching and Learning

Teacher education coursework has a positive effect on student achievement. Teacher education makes a difference in teaching performance; education coursework is a more powerful predictor of teacher effectiveness that measures expertise in content area subjects (Fong-Yee & Normore, 2011).

Licensure

The researchers further opined that in addition to a degree in the field to be taught, licensure is the most consistent predictor of student achievement in reading and mathematics.

Teacher Behaviours and Practices

Teacher behaviours in the classroom demonstrated that effective teachers tend to be those who are able to use a variety of teaching strategies and demonstrate a flexible style rather than a single, rigid approach (Fong-Yee & Normore, 2011).

Fong-Yee and Normore (2011) concluded that education leaders, policymakers and educators need to invest in critical areas that impact the quality of teacher and the quality of teaching. While it is no secret that better teachers produce better learning, educational reform must work toward restructuring and reinventing teacher preparation and professional development by connecting clinical work in schools with knowledge about what works for teaching and subject-matter knowledge.

A quality teacher is one who has a positive effect on student learning and development through a combination of content mastery, command of a broad set of pedagogic skills, and communications/interpersonal skills (Hightower, et al., 2011). Hightower et-al continued that quality teachers are life-long learners in their subject areas, teach with commitment, and are reflective upon their teaching practice. They transfer knowledge of their subject matter and the learning process through good communication, diagnostic skills, understanding of different learning styles and cultural influences, knowledge about child development, and the ability to marshal a broad array of techniques to meet student needs. They set high expectations and support students in achieving them. These definitions suggest that teaching quality in practice constitutes a set of actions and activities that improve student outcomes.

Hightower et al (2011) then opined that there are three main approaches to defining teaching quality and the interplay between effective teaching and increased student learning. These are;

- Structure of teacher qualifications,
- Influence on the human capital pool, and
- Contextual factors that act as mediating influences.

Academic degrees

Furthermore, Hightower et-al posited that studies indicate that a teacher's advanced degrees in mathematics is positively related to student achievement in the subject. The researchers continued that educators with a bachelor's degree are found to be more responsive to children and to provide more activities that promote language development and emergent literacy than teachers without a bachelor's degree.

Certification

Hightower et-al (2011) on teacher certification opined that is a formal process that has been the subject of myriad and a centerpiece of policy related to teaching and learning. Some researches support a relationship between subject-specific certification and student learning.

Coursework

According to Hightower et-al (2011) coursework contributes to teacher quality; the impact varies across academic subjects and grade levels. The most consistent cross-study finding from the research on teacher coursework is a positive connection between student achievement in mathematics and teachers' coursework in that subject. Some studies indicate that coursework in pedagogy is positively related to student achievement in mathematics and science.

Teacher preparation programmes

Hightower et-al (2011) continued that teacher preparation programmes are very crucial in producing quality teachers. They then argued that graduates of teacher preparation programmes are poorly prepared for teaching. Concerns include low

admissions standards, fewer high-powered professors, and a disorganized teacher education curriculum.

In light of this, both Fong-Yee and Normore (2011) and Hightower et al (2011) agreed that the pivot of quality education is quality of the teacher. Both researches opined that bachelor's degree, course work, professional development and teacher licensure constitute teacher quality. In this vein, it is advised that, the minimum qualification of the teacher should be at least bachelor degree.

Eshun (2000) disagreed with Fong-Yee and Normore (2011) and Hightower et al (2011) by aguing that the quality of teaching and learning of mathematics depends mostly on the learner. He posited that the determinants that affect the learning of mathematics include the learner's intellectual ability, maturity, his/her learning style, emotional and social adjustment of the learner and his or her attitudes towards the subject. According to Eshun (2000) students who do well in mathematics are those who were effectively motivated, saw the subject as useful, liked it, had less anxiety and had confidence in doing mathematics.

Oluwatoyin (2011) revealed that the world of science and technology will be without meaning in the absence of mathematics. He continued that more importance will be given the subject if the important role knowledge of mathematics plays in the provision of amenities for human convenience is realized. The performance of students in both the internal and external examinations, most importantly the examination conducted by West African Examinations Council in the past and present are not so encouraging.

Oluwatoyin (2011) agreed with Eshun (2000) that quality of teaching mathematics depends on the learner. Both researchers opined that the learner's attitude coupled with intellectual ability towards the subject determined the quality of mathematics

teaching and learning. Both researchers further agreed that learners should be highly motivated to learn the subject.

In view of Asare-Nkoom (2006) mathematics is a subject found in every school curriculum. In Ghana, all pupils in basic and senior high schools must study the subject. Despite this, the learning of the subject is still not satisfactory. Anamuah-Mensah,Mereku, and Asabere-Ameyaw (2009) reported that over 80% of the students in Ghana did not reach the low international benchmark in mathematics, implying that the majority of Ghanaian students have no good grasp of knowledge and conceptual understanding of basic mathematical principles.

Asare-Nkoom (2006) findings are in line with Fong-Yee and Normore (2011) that teacher quality is the pivot of quality of teaching mathematics. Asare-Nkoom (2006) posited that children's attitudes were influenced more by parents' and teachers' attitudes than by their own past performances. However, variables such as mathematics anxiety, difficulty of mathematics and stereotyping of mathematics as a male domain were cited in the literature as preventing females from opting to study elective mathematics at the Senior High School level.

2.3 Basic School Teachers' Understanding of Mathematics Concepts

Nabie, Anamuah-Mensah and Ngman-Wara (2010) posited that quality of teaching mathematics depended upon the teachers' understanding of the mathematics concepts. The researchers opined that the aim of basic mathematics and science education for children in Ghana is to enable them meet their mathematical and scientific needs in later life and to provide a mathematical base for those who would wish to further their study in mathematics. However, the Criterion Referenced Test (CRT) conducted in Ghana over the period 1992-1997 consistently indicated children's poor performance

in mathematics. The average number of pupils reaching mastery level, of a score of 55 and above, was around 1.7%. This poor performance has been attributed to factors including poor teacher preparation and content knowledge (CRT) and cannot be left unattended to.

Nabie, Anamuah-Mensah and Ngman-Wara (2010) found out that there is an inconsistency in teachers' perceived level of understanding of topics investigated such as integers, place value, measurements, standard form, fractions and algebra and their performance in those topics. Moreover, the researchers found out that teachers had problem about place value, integers and fractions. In addition, many teachers had difficulty in algebraic expressions. Finally, Nabie et-al (2010) concluded that teachers' poor content knowledge was the cause of their students' low mathematics performance.

Kamtet, Ngamman, Liewkongsthapom, Pativisan and Dechsri (2009) research into subject content knowledge of teachers. Their argument are in line with Nabie et-al (2010). Teachers' subject matter knowledge has been considered as an important component of teaching expertise. There are three components of content knowledge: subject matter content knowledge, pedagogical content knowledge, and curricular content knowledge. This was also shared by Drews (2007). Teachers' understanding in their teaching concerning subject matter knowledge affects students' opportunities to learn which determines students' mathematics performance.

Kamtet et-al (2009) opined that teachers' Subject Matter Knowledge in each curriculum content area could be indicated by what teachers know and their level of competency. The researchers are of the view that the level of the teachers' academia correlates with their competence. They further posited that teachers show more

knowledge in topics such as ratio and proportion, sub-topics under percentages as simple interest, profit and loss, and capacity, time and distance. Adversely, Kamtet et-al (2009) posited that most of the teachers had difficulty in fractions, mensuration and algebraic expressions. These findings are in line with that of Nabie et-al (2010).

A research by Hill, Rowan and Ball (2005) are in line with Nabie et-al (2010) and Kamtet et-al (2009) that quality of teaching and learning mathematics is dependent on teacher's competence in understanding of mathematics concepts. The researchers opined that teachers of mathematics not only need to calculate correctly, but also should know how to use pictures or diagrams to represent mathematics concepts and procedures to students, provide students with explanations for common rules and mathematical procedures, and analyze students' solutions and explanations.

Hill et-tal (2005) found that teachers' mathematical knowledge for teaching positively predicted student achievement during the sixth and ninth grades. In addition, the researchers opined that both teachers and students are in difficulty when multi-digit addition or multiplication, functions, fractions, and decimals were being taught. Finally, they opined that teacher's subject content knowledge mostly depends on their students' mathematics achievement.

2.4 Mathematics Teachers' Knowledge of the Subject Content and Methodology

A research by Steele and Kimberly (2007) revealed quality of teaching and learning mathematics depends upon teachers' knowledge of the subject content and the methodology they employed in the teaching. Therefore, mathematics teachers need rich, multidimensional content knowledge for teaching mathematics, which incorporates knowledge of the subject matter, students, and teaching. Studying this

mathematical knowledge for teaching (MKT) necessitates more than a unidirectional assessment. This argument was also shared by Petrou (2007).

Steele et-al (2007) found out that teachers' mathematical knowledge for teaching is an important factor which affects their students' performance in the subject. They also posited that the academic level of teachers correlates with their mathematical knowledge for teaching. The researchers finally concluded that for mathematics performance to improve, teachers who hold bachelor degree in pure mathematics and mathematics education should be given an opportunity to teach the subject.

Petrou (2007) is of the view that teachers' knowledge of mathematics is pivotal to their capacity to provide effective mathematics instruction and to their ability to assess student's learning.

Assiedu-Addo and Yidana's (2000) research also posited that quality of mathematics teaching is highly complemented by teachers' knowledge of the content and methodology used. They posited that in the entire history of education, mathematics has held its leading position among all other school subjects because it has been considered as an indispensable tool in formation of the educated man. The poor performance in mathematics in Ghana came to light in 1992 when a criterion reference test (CRT) which was conducted for pupils in basic schools throughout the country showed that their competent in numeracy was low.

Assiedu-Addo and Yidana (2000) found out that most of the mathematics teachers have low content base in the subject. They then opined that how one teaches a subject is influenced by the many ways one understands it. The researchers continued that curriculum developers must accept that the knowledge of subject matter in the training of mathematics teacher in particular and the classroom teacher in general is as

important as the methodology aspect of it. They then posited that there should be a judicious balance between the topics in the methodology and that of the content. Awanta's (2007) study explores teachers' subject- matter knowledge and its link with their pedagogical content knowledge in the context of teaching the concept of vectors. According to him teachers' subject-matter knowledge and its interrelations with pedagogical content knowledge are the determinant of quality of teaching mathematics.

Research carried by Turnuku and Yesildere (2007) on pre-service teachers' pedagogical content knowledge in Turkey among other things also agreed that quality of mathematics teaching depends on teachers' competency in mathematics content and methodology. According to them, a number of factors may influence the teaching of mathematics but teachers play an important role in the teaching process. The common belief in society is if a mathematics teacher knows mathematics very well, he or she is the best person to teach the subject.

Turnuku and Yesildere (2007) considered skills in teaching to rest on two fundamental systems of knowledge, subject matter and lesson structure. The first is the knowledge of the content to be The second is the knowledge required to construct and conduct a lesson. This consists of the use of manipulative, board buddies, cooperative group learning, technology, and good control of classroom discussion. Teaching Mathematics requires a basic skill in explaining abstract mathematical concepts. Abstract thinking is one of the skills to be introduced to student at the early stage of mathematics learning. Abstract thinking is one of the core elements to learning mathematics (National Council of Teachers of Mathematics, 2007)

2.5 Teachers' and Students' Interaction in the Classroom

Bruce's (2007) research tells us that student interaction–through classroom discussion and other forms of interactive participation, is foundational to deep understanding and is related to student's achievement. But implementing discussion in the mathematics classroom has been found to be challenging. For effective teaching and learning of mathematics teachers need to engage their students in efficient classroom discussion. Bruce's (2007) found that mathematics teachers face a number of challenges in facilitating high-quality student interaction. The biggest is the complexity of trying to teach mathematics in ways teachers did not experience when students themselves. Bruce then continued that discomfort for some with their own level of mathematics content knowledge and lack of sustained professional development opportunities also make teachers reluctant to adopt student-teacher interaction strategies. She further explained that, the complex negotiation of what is referred to as mathematics-talk in the classroom requires facilitation skills and heightened attention to classroom dynamics.

Bruce (2007) opined that time is another challenge for classroom interaction. In the face of curricular demands, the time required for facilitated interaction has been identified by teachers as an inhibitor to implementing mathematics-talk. However, the researcher opined that despite these challenges, some teachers have devised some particularly effective strategies for facilitating mathematics-talk. Knoell's (2012) agreed with Bruce (2007) that quality of mathematics teaching is dependent upon teacher and students interaction in the classroom. Knoell's (2012) results showed that students could have favourable perceptions about mathematics with only their strong cordial relationships with their classroom teachers.

Chaviaris and Kafoussi (2008) opinion was also in line with those of Bruce (2007) and Knoell's (2012) that quality of mathematics teaching depends on teacher and students interaction in the classroom but added that there should be interaction among students themselves. Chaviaris and Kafoussi (2008) found that through classroom interaction or drama students had become aware about the characteristics of an effective collaboration in mathematical problem solving, like the discussion of their ideas with pleasure in order to find a common solution or the effort to find different solutions for a given mathematical problem. Furthermore, the concrete dramatic activity gave the opportunity to all the students to reflect on the history of their own attempts to collaborate with their partners in mathematics and to point out the critical moments of these efforts, like the evolution of the mathematical discussion from focusing on the right or wrong mathematical result to focusing on the exploration of the given proposals.

2.6 Factors that Affect Quality Teaching and Learning of Mathematics in the Classroom

Andaya (2014) asserted that mathematics is considered the mother of all learning in both arts and sciences. It is essential in almost every field: measurement in fashion, angles in sports, technology and economics. This perspective on Mathematics has gained more attention with the rapid advances of information and communication. Mathematics is not just computation but a tool for understanding structures, relationships and patterns to produce solutions for complex real life problems. Mathematics is a necessity for people of all ages to be successful in life.

Andaya (2014) continued that despite the usefulness of mathematics in daily life, there are factors that adversely affect the students' ability to understand and apply mathematics concepts. Apparently, learning mathematics involved operational

thought. Andaya (2014) then asserted that recent studies in mathematics achievement highlight the importance of the classroom, teacher and school as factors affecting performance in the subject.

Andaya (2014) affirmed that teachers have major effect on student achievement. Teachers' quality contributes a lot in the effectiveness of the school; hence quality instruction produces high achievement. Demographic factors such as gender, parents' educational attainment and socio-economic status are also found to be factors in students' achievement. Parents' educational attainment was found to be a significant factor in achievement of students in mathematics. Parents with higher level of education could be role models for their children to perform well in mathematics. Parents with higher level of income could provide more instructional resources to their children which eventually help them improve grades in mathematics. Hence, students from different economic strata manifest different attitudes and performance in mathematics.

Andaya (2014) then opined that curriculum, instructional strategies, mathematics teacher competency, school context, and facilities are other significant factors in teaching and learning mathematics. The mathematics curriculum contains specific subject matter and instructional design principles to enable students to develop logical and mathematical skills needed to understand fundamental mathematical concepts. Andaya then posited that designing an instruction based on a curriculum that is in harmony with instructional design can scaffold students learning and promote their achievement in mathematics.

According to Andaya (2014), the poor achievement of students in mathematics is caused by four factors: 1. individual (student), 2. instructional (teacher), 3.classroom management and 4. evaluation.

A research by Hamilton, Engberg and Mihaly (2012) posited that many factors contribute to a student's academic performance, including individual characteristics and family and neighborhood experiences. But researches such as (Ayres, Dinham, & Sawyer, 2003; Banicky, 2000) suggests that, among school-related factors, teachers matter most. When it comes to student performance on reading and mathematics tests, a teacher is estimated to have two to three times the impact of any other school factor, including services, facilities, and even leadership.

Hamilton et al (2012) continued that compared with teachers, individual and family characteristics may have four to eight times the impact on student achievement. But policy discussions focus on teachers because it is arguably easier for public policy to improve teaching than to change students' personal characteristics or family circumstances. Effective teaching has the potential to help level the playing field. The researchers asserted that despite common perceptions, effective teachers cannot reliably be identified based on where they went to school, whether they are licensed, or (after the first few years) how long they have taught. The best way to assess teachers' effectiveness is to look at their on-the-job performance, including what they do in the classroom and how much progress their students make on achievement tests. This has led to more policies that require evaluating teachers' on-the-job performance, based in part on evidence about their students' learning. Recent evidence suggests that a teacher's impact on student achievement remains reasonably consistent even if the teacher changes schools and regardless of whether the new school is more or less advantaged than the old one (Hamilton, Engberg, & Mihaly, 2012).

Fleming (2011) opined that there are five factors which militate against students' mathematics achievement. In the statistical analysis, they call these the 'control variables', but the key message is that these are the five things external which have a big impact on the attainment of students. These five factors are:

1. **Previous student attainment**

   This is used to ensure that you are measuring the 'value added' to students' performance, not just their final achievement

2. **Socio Economic Status of the student intake**

   This is used to remove bias from a school being in a particular area which may affect it's student intake. For example, if a school is located in an area with a higher proportion of social housing, statistically the students are likely to be less engaged with education (eg higher absence rates), with less well educated parents.

3. **School size, based on number of students**

   Research quoted in the report shows that as school size falls below 1,000 students, average student attainment falls too

4. **Rural/Urban location**

   Research shows that this is an important influencer of school performance

5. **School sector - Public, Private or Catholic**

   Fleming (2011) continued that when one don't take this factor into account, then the analysis of school performance tends to show schools grouping into three bands, representing the different sectors. By taking these factors into account when looking at school performance, one is able to get a better idea of how each school is performing compared to other schools, and a better idea of the 'value added' to individual students.

Research carried by Mengenai (2013) posited that mathematics is a subject that consists of the material count operations like addition, subtraction, multiplication, and division. Mathematics is considered as a difficult subject by students. However, this difficulty can be overcome with a lot of practice at home, with tutoring, and cannot be separated from a parent's attention. With this assumption, then the mathematics would be an obstacle in the learning process for most students. Mathematics subjects are not much liked by the students at the school. Most of the students in the school are afraid of the mathematics subject. Therefore, the effort required teachers to be able to make the subject of mathematics into subject that are not scary but it is a subject of interest by students at the school (Mengenai, 2013).

Mengenai (2013) continued that teaching and learning in the classroom is interaction between students and teachers. Therefore, teachers must be able to provide the opportunity for students to be able to participate actively in learning. But in fact, many teachers are using the conventional method in teaching. The teachers give the explanation and the students just listen to what the teachers say without activeness in the classroom. So what happen is student to be good listeners.

Mengenai (2013) then asserted that some of the things that affect teaching and learning process in the classroom include:

1. Educational Facilities: Existing facilities in the classroom or school affect teaching learning in the classroom. With the existence of adequate facilities, it will be very easy for teachers to provide an innovative learning system.
2. Teaching Media: Media is a tool that can be used in teaching learning process in the classroom. Such as white boards, board markers, rulers, etc. With the tools, learning in the classroom can be done.

3. Teaching Aids: Teaching aids is an aid that can be used in learning in the classroom. Such aids may include props. This aids that can increase the creativity of students in learning. Some of the purposes of teaching aid used in the learning of mathematics, among others are:
   a. Make students more understand the concepts being studied
   b. Provide a variety of activities for students
   c. Provide a variety of learning methods that can be used in studying a topic
   d. Provide a different atmosphere in the learning.
4. Teaching Method: In teaching and learning mathematics teacher should use many more methods to provide the opportunity for students to solve mathematics problems by using his way. In this way, it will produce students who are active, critical, increase interest and excitement in learning mathematics. Several methods can be used in mathematics teaching and learning activities, among others:
   a. Expository Method
   b. Discussion Method
   c. Exercise Method
   d. Demonstration Method
   e. Discovery Method
   f. Problem Solving Method
5. Psychological Aspect: Another thing that affects teaching learning process in the classroom is the psychology of students and teachers. Because of psychology students and teachers are not good, and then learning in the classroom is not going to get maximum results.

6. Context of Teaching and Learning (culture): Culture of teaching provided by teachers in the classroom also very affect in students learning result. Because of the way of teaching provided by teachers that will determine what students will understand about the material learned.
7. Syllabi: Syllabi prepared based on the curriculum set by the school. The content of syllabi is such as standards of competence, basic competence, indicator, and the purpose of learning to be implemented.
8. Lesson Plan: Lesson plan is a step that carried out the teacher where the teacher makes the planning process learning activities in the classroom. Lesson Plan also prepared based on the curriculum set by the school. With the lesson plan is expected to be better prepared teachers in teaching, teachers have a reference in learning activities that will be implemented, teachers also can develop lesson plan that engage students so that students not only became a listener only, and thus students will have a role as well as being more actively in learning activities.
9. Assessment: Assessment is the process of collecting and processing information to determine student achievement. With the assessment, the teacher will know which students who have understood the material in learning and which students who have not understood the material in learning.
10. Teaching Learning Resources: Learning resources used in teaching learning process very effort the learning process in the classroom. Learning resources is what will be a reference to learn the students and teachers.
11. Technology: The development in technology also may affect learning system of students. With the development in technology can be used to develop the insight and knowledge of students.

Mengenai (2013) then continued that another thing that is important in mathematics learning is motivation. Students need the motivation that will encourage them to become more active in learning activities. Student motivation can be obtained either from parents or teachers at school. According to the researcher some of the teacher's efforts to improve student's motivation in learning mathematics, among others include:

a. Teachers provide fun activities for students
b. Teachers noticed the students' wishes
c. Teachers creates a classroom atmosphere that supports and stimulates students' learning
d. Teachers provide activities that correspond to the learning objectives
e. Teachers provide challenging activities for students
f. Teachers appreciate every achievement of students
g. Teachers build understanding through what students know
h. Teachers provide activities that give hope of success

Mengenai (2013) finally concluded that the method that is used in teaching learning process in the classroom is affecting the activity and creativity of students in the classroom. Therefore, teachers are expected to provide an innovative learning system so that students will be more involved in teaching learning in the classroom. Innovative learning system must be implemented by teachers from time to time.

Tuncay and Omur (2009) posited that the quality of teaching and learning mathematics has been one of the major challenges and concerns of educators. Instructional design is an effective way to alleviate problems related to the quality of teaching and learning mathematics. Their study was conducted to identify the factors

affecting mathematics achievement of students. Tuncay and Omur (2009)'s result revealed that instructional strategies and methods, teacher competency in mathematics education, and motivation or concentration were the three most influential factors of quality mathematics teaching. The quality of teaching and learning mathematics is a major challenge for educators. The discussion emphasizes new instructional design techniques to produce individuals who can understand and apply fundamental mathematics concepts. A central and persisting issue is how to provide instructional environments, conditions, methods, and solutions that achieve learning goals for students with different skill and ability levels. Innovative instructional approaches and techniques should be developed to ensure that students become successful learners.

Tuncay and Omur (2009) revealed additional factors which could have an impact on students' achievement. These factors are, gender involvement, family structure, parents' educational level, socio-economic status, parent and student attitudes toward school, and parent. According to the researchers, other three factors or predictors in mathematics achievement, are divided into sub factors as: Demographic Factors (gender, socio-economic status, parent's educational level), Instructional Factors (teacher competency, instructional strategies and techniques, curriculum, school context and facilities), and Individual Factors (self-directed learning, arithmetic ability, motivation).

Demographic Factors

Various demographic factors are known to be related to mathematics achievement. Gender, socio-economic status, and parents' educational level are factors that have been analyzed in this study as predictors of mathematics achievement.

Instructional Factors

Curriculum

The current curriculum also recognises information and computer technology (ICT) skills as tools which can be used to access knowledge in all the other areas of the curriculum. It is essential that ICT skills become incorporated in the specific areas of the curriculum. The mathematics curriculum should contain factors that would promote quality teaching. Many mathematics curricula overemphasize memorization of facts and underemphasize understanding and application. Memorization must be raised to conceptualization, application and problem-solving for students to successfully apply what they learn.

Instructional Strategies and Methods

Being successful in mathematics involves the ability to understand one's current state of knowledge, build on it, improve it, and make changes or decisions in the face of conflicts. To do this requires problem solving, abstracting, inventing, and proving. These are fundamental cognitive operations that students need to develop and use it in mathematics classes. Therefore, instructional strategies and methods that provide students with learning situations where they can develop and apply higher-order operations are critical for mathematics achievement.

Teacher Competency in Mathematics Education

Many studies such as (Broussard & Garrison, 2004; Cai, 2003) report that what teachers know and believe about mathematics is directly connected to their instructional choices and procedures. In mathematics, it seems to be undisputed fact that the teacher's philosophy of mathematics teaching has a significant influence on the students' achievement. Teachers need to have skills and knowledge to apply their philosophy of teaching and instructional decisions. Teachers not only need knowledge

of a particular subject matter but also need to have pedagogical knowledge and knowledge of their students. Teacher competency in these areas is closely linked to student thinking, understanding and learning mathematics. There is no doubt that student achievement in mathematics requires teachers to have a firm understanding of the subject domain and the epistemology that guides mathematics education.

School Context and Facilities

School context and its facilities could be an important factor in student achievement. In fact, identifying factors related to the school environment has become a research focus among educational practitioners. For instance, researches such as (Drews, 2007; Carr, 2002) suggests that student achievement is associated with a safe and orderly school climate. In terms of the condition of school building, student achievement scores in standard buildings was lower than the scores of students in above standard buildings. In addition, facts findings indicated that a high population of students had a negative effect on student achievement.

Individual Factors

Self-Directed Learning

Self-directed learning could be a factor in students' mathematics achievement. Mathematics learning requires a deep understanding of mathematical concepts, the ability to make connections between them, and produce effective solutions to ill-structured domains. There is no perfect, well-structured, planned or prescribed system that lets students think and act mathematically. This can be done if, and only if, students play their assigned roles in their learning progress. Self-directed learning has an important place in successful mathematics learning. The teacher's role is to engage students is by helping to organize and assist them as they take the initiative in their own self-directed explorations, instead of directing their learning autocratically.

Arithmetic Ability

Arithmetic ability could also be another predictor of mathematics achievement. Arithmetic ability includes the skills such as manipulating mathematical knowledge and concepts in ways that transform their meaning and implications. It allows students to interpret, analyze, synthesize, generalize, or hypothesize the facts and ideas of mathematics. Students with high arithmetic ability or mathematical reasoning can engage in tasks such as solving complex problems, discovering new meanings and understanding, and arriving at logical conclusions.

Motivation or Concentration

Mathematics education requires highly motivated students because it requires reasoning, making interpretations, and solving problems, mathematical issues, and concepts. The challenges of mathematics learning for today's education are that it requires disciplined study, concentration and motivation. To meet these challenges, learners must be focused and motivated to progress.

The teacher's role in students' motivation to learn should not be underestimated. In helping students become motivated learners and producers of mathematical knowledge successfully, the teacher's main instructional task is to create a learning environment where students can engage in mathematical thinking activities and see mathematics as something requiring "exploration, conjecture, representation, generalization, verification, and reflection"

A research by Ayres, Dinham and Sawyer (2003) opined that the teacher should be passionate about teaching their subject, has excellent knowledge of their subject, and has a clear purpose for the learning. When the attitude of the teacher and students is enthusiastic, the attitude of the class must be positive. The teacher should be willing to compromise and be flexible about the rules where appropriate and really connects

with the students. The researchers continued that students learn best when their teacher is well organised and prepared, and carefully plans the learning. There is a clear structure in both the planning and delivery of a unit of work and in individual lessons. The teacher sequences the work, makes judgments about the learning by questioning, testing, and encourages students to think logically and creatively.

Ayres et al (2003) then opined that there should be a high level of interaction between students and teachers with lots of discussion, brainstorming and talking. The teacher moves around the room providing one-on-one help for all students. Interesting methods of teaching: discussions, topic examples, diagrams, textbook work and creativity should be employed by the teacher. Discussion where the teacher leads the whole class discussion to aid understanding, ensuring the opinions of students in form of debate, and everyone in the class is involved. Ayres et al (2003) continued that careful explanation of assessment tasks, where the teacher demonstrates learning skills, using examples, simulation of real projects. The teacher should be constantly checking the learning through questioning, reviewing and answering. Group work used to create proper learning environment, where students are able to bounce ideas off each other, learn from each other. Students like freedom in learning and the opportunity to be creative.

Furthermore Ayres et al (2003) asserted that students learn best when there exist strong positive relationships between the students and teachers in order to build mutual trust and respect. Teacher should treat students as adults. The teacher makes a genuine effort to get to know students and how each of them learns, to ensure everyone feels comfortable and cared about. The class should be like a family, where students are listened to, treated equally, individual connections are made with them and the teacher shows empathy to them and interest in them.

2.7 Trends of Mathematics Performance in Basic Education Certificate Examination

Maliki, Ngban and Ibu (2009) opined that mathematics as a subject affects all aspects of human life at different degrees. The social, economic, political, geographical, scientific and technological aspect of man is centered on numbers. The researcher used inferential survey design because of its descriptive nature. In addition, the junior secondary school examination test items in mathematics for the year 2006 were used. The researchers found out that students develop positive attitude towards mathematics resulting in the high performance in the subject. Also, it is found that male students obtained higher mean score than their female counterparts from the calculated t-value significant. Furthermore, it was found that students from rural areas performed significantly better than those from urban schools. Finally, the researchers opined that students from private owned schools performed significantly better than students in public schools.

Research carried by Ododgwu (2009) opined that due to discouraged effect of mathematics performance, the government of Nigeria had put some measures in place in order to curtail the dwindling teaching and learning of the subject. The researcher used teachers from private owned schools in Lagos State. The questionnaire consisting of nineteen (19) items were both structured and open-ended questions. The researcher found out that student - teacher ratio is one of the factors that promote mathematics teaching and learning. She also opined that the sitting arrangement that is row and column form in the classroom is another factor that affects quality teaching and learning of the subject.

Furthermore, Odogwu (2009) was of the view that teacher quality that is the educational level of the teacher was another factor. In addition, she opined that the use

of curriculum materials such as textbooks, syllabuses, teaching and learning materials and the use of equipment such as chalks, blackboard (chalkboard), blackboard drawing instruments are another factor that promotes mathematics teaching and learning. Finally, the researcher suggested that classroom interaction was one of the factors. She posited that interaction between teacher and students and among students themselves should be encouraged in the mathematics classroom.

Mbugua, Kibert, Muthaa and Nkonke (2012) opined that mathematics is seen by society as the foundation of scientific and technological knowledge that is vital in social- economic development of the nation. Because of this Mathematics is a compulsory subject at both primary and secondary levels in Kenya. Mathematics is also used as a basic entry requirement into any of the prestigious courses such as medicine, architecture and engineering among other degree programmes. Despite the important role that mathematics plays in society, there has always been poor performance in the subject at national examinations.

Mbugua et-al (2012) used descriptive statistics to analyze the obtained data. The researchers found out that the inadequacy of teaching/learning materials and equipment's are among factors that hinder effective teaching and learning of mathematics. To add, it was found out that poverty on the part of parents was another factor. The parents are so poor that they are not capable of providing basic needs such as textbooks, school uniform, foot wears, pens and exercise books to their wards. The researchers opined that socio – cultural beliefs and practices such as female genital mutilation and moranism prohibit effective participation which results to poor performance in mathematics. The next factor was lack of motivation of mathematics teachers. Finally, the researchers were of the view that school curriculum should be

reviewed in order to make it relevant and flexible to the diverse needs of different regions and background of the students.

2.8 Opportunity to Learn Mathematics at School and at Home

A research carried by Mereku, Amedahe, Etsey, Adu, Acquaye, Synder, Moore and Long (2005), revealed that, equitable conditions or circumstances within a school or classroom that promotes learning for all students constitutes opportunity to learn. It includes provision of curricula, teaching and learning material, facilities, teachers, and instructional experiences that enable students to achieve high standards. The term also refers to the absence of barriers that prevent learning.

According to Mereku et al (2005) the purpose of their study was to ascertain:

- teacher preparedness to implement the content of the national curriculum in English and Mathematics
- the adequacy and availability of resources for the delivery of the national curriculum content in English and Mathematics
- how well the instructional times for teaching English and Mathematics were managed
- extent of teachers' coverage of the national curriculum content in English and Mathematics
- extent of teachers' emphasis on content in English and Mathematics in the national curriculum
- teachers' content emphasis for individual students or groups of students that is whether or not the instruction is differentiated to ensure each student achieves his/her highest potential

The researchers opined that opportunity to learn standards is usually set around the following areas.

- **Resource Standards** - to assure that all schools have sufficient resources to deliver high level of curriculum content and to therefore achieve higher levels of outcomes for all students
- **Curriculum Delivery Standards** - to assure high levels of curriculum delivery to all students
- **Outcome and Capacity Building Standards** - to assure that all schools have improved capacity to deliver quality education and are evaluated by their delivery of quality educational opportunities to all students

The study examined whether or not the opportunities provided in primary schools for learning are good enough to promote learning for all pupils and to assure high levels of outcomes for all pupils. The study involved 1,063 teachers and sampled schools from the ten regions of the country. The research team Mereku et al (2005) used a questionnaire to gather data. The questionnaire was designed to provide information about teachers, specifically their schools, classes taught, class size, and gender. Through the questionnaire, researchers also gathered information about professional qualifications, instructional resources and time for teaching English and Mathematics. The questionnaire also seeks to find the coverage of content areas of English and Mathematics curriculum over the school year.

According to Mereku et al (2005) their major finding of the study was that Opportunity to Learn (OTL) standards for most schools were very low and that the majority of teachers completed only 60% of the content of the Mathematics and English syllabuses. The analysis also indicated that there were grave inequalities between schools, as well as districts, in the following areas.

- availability and adequacy of instructional materials like textbooks
- instructional practices and management of instructional time
- teacher preparedness to implement the content standards.

These inefficiencies could be attributed to the fact that while the curriculum content standards are clearly defined by the syllabuses of the various subjects taught at the basic level, no OTL standards have been set to guide their implementation.

Perception of the mathematics classroom as an arena in which there are various opportunities to learn mathematics leads to a fine-grained focus on the structure of mathematical tasks. Each mathematical task affords engagement with mathematics in certain ways. Variation within a task is a major factor influencing learning.

Watson (2006) wrote about opportunities to learn standards and listed Construction of Types of Learner, Opportunities in Classrooms, Cognitive Opportunity, Learners Perceiving Opportunities for Choice and Affordances and Constraints

Construction of 'Types of Learner'

Watson (2006) opined that if there is a label around, such as 'low attainer', then teachers, schools, classmates and even parents will act together to apply that label to particular individuals. The existence of the label acquires people to fit it. Similarly, the label 'high achiever' will cast around looking for students to fit and others found that teacher expectations create self-fulfilling prophecies. The construction of types of learner show clearly how that can happen, by demonstrating how gendering of mathematics achievement can be created by many aspects of classroom practice.

Watson (2006) continued that those who fail to adopt such behavioural forms in early opportunities therefore get fewer opportunities to exercise them subsequently. Wherever students are segregated according to some notion of ability, for mathematics, ability if there are similar constructions at work. Watson (2006)

concluded that opportunities to learn new behaviours, or to use what one already knows in other contexts, can open up opportunities to learn mathematics. In conclusion, opportunity to learn in the class is limited by the teachers' construction of mathematics, discourse, and of learner-types.

Opportunities in Classrooms

Furthermore Watson (2006) revealed that social, cultural, and linguistic lenses are useful in answering the question 'what do learners have the opportunity to learn? What they learn is what is acceptable in mathematics lessons, both in terms of behaviour and also in terms of their relationship with mathematics. Mathematics is not negotiable because it has to have internal coherence and validation., The learner has an opportunity to learn at least three dimensions of mathematics teaching identified in the curriculum which are cognitive, metacognitive, and affective, can all be seen as manipulable in order to provide different opportunities. Lessons which explicitly pivot around negotiation do not only attend to the metacognitive and affective aspects of mathematics lessons but also can be organised to be cognitively powerful. In classrooms where students actively negotiate meaning, the teacher's role is to structure the content of such negotiation with examples, counter-examples, or by encouraging the development of these, so that what is eventually learnt is coherent and valid. This should be based on exemplification, generalisation, conjecture, justification, and so on.

Cognitive Opportunity

Watson (2006), then asserted that cognitive opportunities to learn is concerned about students as being similar, rather than different, because as much can be gained from assuming similarity as by trying to explain, find out about, understand and take account of difference. The teacher, by creating a participative atmosphere, overcame

the potential meaninglessness of the task. Opportunity to learn is focused and refined by controlling the variation in what is offered so that useful generalization is likely to arise from students' normal thinking complex the mathematics gets, the faster we expects students to generalize (Watson, 2006).

Learners Perceiving Opportunities for Choice

A research carried by Watson (2006) posited that analysing mathematical tasks in terms of the dimensions of variation offer learners ability to explain some aspects of their own behaviour. Opportunity to spend time on irrelevant variations was reduced. Development of the use of dimension of variation as a tool for analysing both tasks and student responses owes much to others.

It became clear that what was important about tasks was not the openness of the question, but the opportunities it offered the learner to adapt, extend, and refine a personal understanding of the concept. Sometimes a closed question would do this better than an open one, and this could depend on many cognitive, metacognitive, affective, social, and cultural factors.

Watson (2006) continued that learning is defined as the discernment of variation in events which occur almost simultaneously. Dimension of variation is a way of looking at the different learning outcomes of similar teaching situations. Identification of dimensions of variation is a tool which extends to every level of classroom practice. Classrooms have the potential to be places of the exercise of power, of language, of personal success or failure, of working alone or with others, of working on mathematics or working on carving initials on a desk. These affordances are constrained in some way, by tools, rules, custom, language, power; so that the actual

possibilities are a subset of what might be possible. There is a complex interplay between what could be possible, what is possible, and what is seen as possible. (Watson, 2006).

Affordances and Constraints

In addition, Watson (2006) asserted that socio-cultural perspective was another opportunity which fits with the idea of a classroom as an arena in which the identities of learners develop. A mathematical topic provides an arena which affords learning, constraints limit the variation which can be perceived, and learners bring attunements which include their capacity to categorise and generalise. Thus the design of the mathematical task is a crucial factor in providing opportunity to learn.

Provision of opportunities for quality learning involves focusing on four key areas. These areas are, 'Process', 'Learner', 'Personnel' and 'Resources' (Ministry of Education, 2015).

1. Process

According to (Ministry of Education, 2015) the process highlights the content and instruction and has to address the following issues:

i. The National Curriculum that is the syllabus should be made suitable for every learner. Teachers should adapt the content of the national curriculum to make them relevant and functional to all learners.

ii. Teachers should set appropriate objectives and achievable targets for all learners, ensure learners cope with the levels set for them and use appropriate for all learners.

iii. Teachers should use diverse strategies in their course of teaching. Some of these strategies are, multi-sensory approaches, demonstration, project,

fieldtrips, direct-teaching, differentiated teaching, individual teaching, peer teaching, small group teaching, role plays, scenarios and co-teaching.

iv. Teachers should use different communication techniques in order to inculcate speech, sign language and information and communication technology while teaching (Ministry of Education, 2015).

v. Teachers should provide appropriate and adapted games that should make their teaching interesting to learners.

vi. Teachers should provide additional time for learners to complete learning activities or tasks and assignment.

vii. Teachers should provide learners opportunities to participate in all activities both within and without their schools.

viii. Teachers should use inclusive education materials such as monitoring toolkit and checklist to monitor schools during inspection (Ministry of Education, 2015).

2. Learner

i. Teachers screen all learners for special educational needs. Learners' families should be invited to witness and learn about the process and importance of screening and early intervention of special educational needs.

ii. Teachers shall refer learners suspected of having special educational needs for further assessment by District Inclusive Education Team (DIET) and later by the District Assessment Team (DAT) (Ministry of Education, 2015)

iii. District Inclusive Education Team (DIET) shall organize case conferences and develop Inclusive Educational Programme (IEP) for learners diagnosed with special educational needs

iv. Teachers shall complete school registers indicating the diverse learning needs in their classroom (Ministry of Education, 2015).

3. Personnel

All schools should have ways of satisfying themselves that staffs involved with the teaching of learners are qualified and competent to do so (Ministry of Education, 2015).

The following are what the body wrote about qualities of the teaching personnel:

i. All teachers should have the requisite qualifications and license.

ii. All schools should ensure that their staff recruitment and appointment procedures include a means of making certain that all new staff have at least the minimum level of competence in inclusive education.

iii. All schools should have qualified special educational needs coordinator (Ministry of Education, 2015).

iv. All staff and learners should respect one another. Teachers should respect all learners including those with special educational needs (SEN). Those learners without SEN should respect their peers with SEN. Staff and learners should use appropriate language, avoid canning, teasing and name-calling.

v. All forms of discipline should take cognizance of the needs of learners. Teachers should not isolate learners who are hyperactive or introverts.

vi. Every school should provide continuous in-service training for the teachers.

vii. Teachers who provide services outside the normal working hours should be remunerated (Ministry of Education, 2015).

viii. All schools should have qualified supporting staff for lower primary classes that are from kindergarten 1 to class 3.

ix. All schools should provide learners with special needs such as deaf, blindness, autism, attention deficit, hyperactivity disorders with support assistant.

x. Every school should have adequate qualified related services staff such as Guidance and Counseling Coordinator, Social Workers and Speech therapists (Ministry of Education, 2015).

4. Resources

Stake holders should ensure that material resources for the support of the learner should be available, adequate and appropriate for each programme and subjects offered (Ministry of Education, 2015).

The following are the body's view about resources:

i. Appropriate requisite materials or resources should be accessible to all learners.

ii. Schools shall adopt relevant computers software and hardware in teaching and learning.

iii. Every school shall provide appropriate and adequate assistive devices and related materials for all learners such as hearing aids, screen readers and magnifiers (Ministry of Education, 2015)

iv. All schools shall have libraries or e-libraries stocked with adequate, relevant and current books in accessible format.

v. Every school shall have adequate space which is secured for recreational activities where appropriate (Ministry of Education, 2015).

A research carried out by Elmore and Fuhrman (2009) opined that opportunity to learn standards (OTL) is a term which define a set of conditions that schools, districts, and states must meet in order to ensure students have an equal opportunity to meet expectations for their performance. States have been concerned about the issues raised by OTL standards for over a century, but they have not had much success in

addressing these issues with state policy. Elmore and Fuhrman (2009) continued that once the term "standards" became part of the opportunity to learn discourse, confusion ensued. Does opportunity to learn standard simply continuing, or even adding to, the plethora of regulations in existing state policy? To assure equity, must states sacrifice the goal of reducing overall regulation of schools and introducing greater flexibility for local districts and schools to meet performance expectations? In an ideal world, the most efficient means of achieving public purposes is to use public policy to set goals and then allow implementing agencies to find the most effective way of achieving those ends.

Elmore and Fuhman (2009), then asserted that a key element in this approach to the opportunity to learn problem is continuity and consistency of state policy over time. It isn't necessary, or even feasible, to make all the necessary policy decisions at onetime, given the high degree of uncertainty attached to big changes in the state role. It is necessary, however, for state policy to be consistent in its broad purposes and in the general outline of its strategy over time, if only because schools need stability and guidance if they are to make large changes in teaching and learning (Elmore & Fuhrman, 2009).

A corporate body (National Council of Teachers of English, 2012) asserted that Opportunity-to-Learn is a process that provides a framework that makes it possible for all students to have equitable access to high-quality education. The opportunity to learn is the inherent right of every student. Full, positive participation in democracy is contingent upon every child's access to quality education. Such access to high-quality education should not be dependent upon the specific community in which a child

lives. By focusing and building upon the strengths of learners, Opportunity-to-learn standards can help ensure equitable access to high-quality education for all students.

According to the corporate body (National Council of Teachers of English, 2012), Opportunity-to-learn standards should:

- enable all students to achieve high content standards and learn to their full potential
- be directly tied to students' learning and performance in content standards
- consider the diverse, multiple ways students learn
- enable all teachers to teach all students
- be supported by the best classroom practice and research
- include on-going professional development of educators
- be based on research on how effective schools use resources
- address necessary conditions and resources for successful learning in our schools as well as effective use of resources, including safe, secure environments free of prejudice and violence; attractive, comfortable environments that invite learning, risk taking, and problem solving; updated library media centers and technologies
- consider opportunities for preschool and beyond school learning (National Council of Teachers of English, 2012).

In addition, the corporate body asserted that the opportunity-to-learn standards should provide:

- time for students to learn and reflect
- time for teachers to plan, teach, and reflect
- appropriate learning resources

- resources from the community (National Council of Teachers of English, 2012).

2.9 Summary of Literature Reviewed

There is no doubt that there are problems of teaching and learning of mathematics all over the world. This is so because all the literature reviewed confirmed it. Many researchers had tried to delve into the problem in order to find out the causes. Some of the causes found by these researchers are students' attitude towards mathematics, parents or guardians' educational level and economic status, methods used by mathematics teachers and so on. They then suggested that teachers should encourage their students and portray mathematics as real life subject. They try as much as possible to use teaching and learning materials and apply students' centered method in their teaching. It is believed that if the suggestions provided by those researchers and this one are adhered to by stake holders, problems of mathematics will be solved or minimized.

CHAPTER THREE

METHODOLOGY

3.1 Preview

This chapter describes and explains the research design used in the study. The chapter focuses on the research methodology in terms of research design, the setting and the population as well as the sample and the sampling techniques for the study. It continues to deal with instrumentation and how data was analysed.

3.2 Research Design

The design used in this study was the descriptive research design using quantitative and qualitative approaches. Quantitative approach is a procedure in research in which investigators administer or employ survey questionnaires to a sample or to the entire population to enable people provide information about themselves with regard to attitudes, opinions, behaviours or characteristics of the population for observation (Cosby, 2007).

Such attributes provided by the population about themselves may also include facts such as attitudes and beliefs, demographics (ages, gender, income, and so on) and past, present and intended future behaviours. Cosby (2007) stressed that survey research has become extremely important as society demands data about issues rather than only intuition and anecdotes. Doyle (2004) describes surveys as creating questionnaires and collecting responses from a sample to draw a profile of the group as a whole and perhaps perform some cause and effect analysis in order to understand their feelings. Gathering facts from Cosby's (2007) and Doyle's (2004) assertions, survey research design was considered as part for this research because the researcher used the questionnaire and observation to collect data from the sample. The researcher

used survey strategy as survey is well suited for descriptive studies where the interest was to find out how people in a given population possess a particular attribute and opinion.

3.3 Population

According to Miznen (2016) all research questions address issues that are of great relevance to important groups of individuals known as a research population**.** According to Miznen, a research population is generally a large collection of individuals or objects that are the main focus of a scientific query. It is for the benefit of the population that researches are done. However, due to the large sizes of populations, researchers often cannot test every individual in the population because it is too expensive and time-consuming. This is the reason why researchers rely on sampling techniques.

Devin (2016) opined that a research population is also known as a well-defined collection of individuals or objects known to have similar characteristics. All individuals or objects within a certain population usually have a common, binding characteristic or trait. Devin (2016) opined that there are two types of population. These are target and accessible population. Devin described target population as that which refers to the entire group of individuals or objects to which researchers are interested in generalizing the conclusions. The target population usually has varying characteristics and it is also known as the theoretical population. The accessible population is the population in research to which the researchers can apply their conclusions. This population is a subset of the target population and is also known as the study population. It is from the accessible population that researchers draw their samples.

In view of Devin's (2016) assertion, the target population for this study was all students in the public Junior High and private owned schools and mathematics teachers in Kadjebi district in the Volta Region of Ghana. Furthermore, the accessible population was the four randomly selected circuits in that district. The population for the study comprised all Junior High Form 3 students and the mathematics teachers. Table 3.1 shows the population for the study. From the table, one can see that there are seven (7) public schools (government build) and four (4) privately owned schools in Circuit A. In all, there are eighty-seven (87) girls, one-hundred and twenty-nine (129) boys totaling two-hundred and sixteen (216) students and thirteen (13) mathematics teachers in the circuit. It can be seen in Table 3.3 that the total number of public owned schools was twenty-six (26) and that of the privately owned are eight (8) in number. The total number of girls was three-hundred and fifty (350) and that of the boys was five-hundred and twenty-four (524) giving total number of population of eight-hundred and seventy-four (874) students. The total number of mathematics teachers was forty-one (41).

Table 3.1: Population of the study

Circuits	Public sch.	Private sch.	No. of Girls	No. of Boys	No of Trs.
Circuit A	7	4	87	129	13
Circuit B	6	1	72	111	7
Circuit C	6	2	88	125	7
Circuit D	7	1	103	159	14
Total	**26**	**8**	**350**	**524**	**41**

3.4 Sample and Sampling Technique

Mbokane (2009) opined that a sample is simply a subset of the population. The concept of sample arises from the inability of the researchers to test all the individuals

in a given population. The sample must be representative of the population from which it was drawn and it must have good size to warrant statistical analysis. Mbokane (2009) continued that the main function of the sample is to allow the researchers to conduct the study on individuals from the population so that the results of their study can be used to derive conclusions that will apply to the entire population. It is much like a give-and-take process. The population "gives" the sample, and then it "takes" conclusions from the results obtained from the sample.

.

Miznen (2016) opined that most social researchers realize that obtaining information from every person in a population is next to impossible. So instead of trying to collect everyone's information, they collect a sample of the population. According to Miznen (2016) unlike a population, which is everyone, there are different ways one can collect a sample of a population. Miznen (2016) enumerated a list of the different sampling techniques as, random sampling, in which each individual in the population has an equal chance of being selected; stratified sampling where a researcher divides the population into groups based on characteristics, and then the researcher randomly selects from each group based on its size. Miznen (2016) asserted that other ways to collect a sample include quota sampling in which a researcher deliberately sets a requirement to ensure a particular group is represented; purposive sampling where a researcher purposefully focuses on a particular subset of a population, and finally convenience sampling where selection of the sample is based on ease of accessibility. Considering the above definitions, this researcher implore random, purposive and convenience sample techniques in other to collect the sample. The researcher used these as they seemed to him as the most appropriate.

The study was about the impact of quality of teaching mathematics and Junior High School pupils' opportunity to learn on their mathematics performance in BECE. It concerned with students and mathematics teachers from the ten selected Junior High Schools (JHS) in the Kadjebi-Akan District of the Volta Region of Ghana. On the part of the students, samples were taken from Form 3 in each of the selected schools. In all there were twenty students selected from each Form in each of the ten selected schools by random sampling and the Form 3 mathematics teacher. To achieve this, pupils in each form were made to write their names on pieces of paper. These were then neatly folded and placed in an empty box which had been provided. The box shuffled and twenty names picked by some pupils and teachers at random.

In view of the above, the sample for the study was two-hundred (200) students comprising (112 boys and 88 girls) and ten (10) mathematics teachers of which only one was a female. The research was conducted in four circuits, two partially urban and two rural. The partially urban were conveniently selected because of easy accessibility and the two rural circuits were purposively selected as they are nearer where the researcher resides.

3.5 Instrumentation

The instruments used for the collection of data consisted of questionnaires interview guide and observation guide. Diane (2013) opined that the instrumentation is a plan that comprises of a number of decisions that need to be made before the beginning of the study. Diane continued that these decisions are made in order to determine what data are needed to answer the research questions. Diane (2013) continued that the

researcher has a variety of options that may be used as a data collection instrument, such as interviews, observations, questionnaires and rating instruments.

3.5.1. Questionnaire

The researcher used questionnaire as one of the instruments because of the reasons given by some experienced researchers. According to Stefan (2013), questionnaire is simply a 'tool' for collecting and recording information about a particular issue of interest. It is mainly made up of a list of questions, but should also include clear instructions and space for answers or administrative details.

3.5.1A. Questionnaire for Pupils

The pupils' questionnaire comprised sections on demographic data with items such as gender, age, socio-economic and cultural, school based factors with items such as method of teaching by teachers, availability of teaching and learning materials and mathematics text books. It also includes how pupils are motivated in order to learn mathematics. Furthermore, the questionnaire contained questions on 'opportunity to learn standards' such as existence of teaching and learning materials, teaching methods used by teachers, adequacy of textbooks and others. This will enable the researcher gather information in order to answer research questions 2 and 3. Questionnaire for pupils can be seen in appendix C.

3.5.1B. Questionnaire for mathematics teachers

Mathematics teacher's questionnaires had sections on demographic data items such as gender, age, sex, academic qualification, and teaching experience. Socio-economic and cultural, and school based factors with items such as method of teaching, availability of teaching and learning materials, workload and motivation and finally

strategies to be adopted to improve achievement in mathematics. Descriptive statistics were used to analyze the obtained data. This will help answer research questions 2 and 3. This questionnaire is in appendix A.

3.5.2 Observation Guide

A research carried by Wakefield (2012) revealed that the key advantage of conducting observations is that the researcher can observe what people actually do or say, rather than what they say they do. The body opined that people are not always willing to write their true views on a questionnaire or tell a stranger what they really think at interview so observation help to solve those problems.

The five evaluation standards used by University of Education, Winneba, were adopted by the researcher in order to observe and score mathematics teachers. These items are 'planning and preparation', 'instructional skills', 'classroom management', 'communication skills' and 'evaluation'. Weights ranging from 1 to 5 were attached to each item and awarded depending on the performance of the respondent. A mean score of 3 or more depicts quality of mathematics teaching and that below 3 shows poor quality of mathematics teaching (University of Education, Winneba, 2005). The purpose was to ascertain the extent and level of quality of teaching mathematics in schools for effective evaluation.

In addition, 3 assignments, 2 project work and 3 homework were examined in the pupils' exercise books. The assignments and homework were scored over 10 and the project work were marked over 5. In this case the two projects were considered as one. A mean score of about 5 or more shows high performance and mean score below 5 depict low performance in the subject. In all, ten lessons were observed in each of

the school in the district. This was done in other to verify whether performance is dependent on quality teaching. Collection of these data will enable the researcher answer research question 2. These items can be seen in appendix E.

3.5.3 Interview Guide

According to an article in a journal by a corporate body Gill, Stewart, Treasure and Chadwick (2008) there are three fundamental types of research interviews: structured, semi-structured and unstructured. Structured interviews are, essentially, verbally administered questionnaires, in which a list of predetermined questions is asked, with little or no variation and with no scope for follow-up questions to responses that warrant further elaboration. Conversely, unstructured interviews do not reflect any preconceived theories or ideas and are performed with little or no organization. Semi-structured interviews consist of several key questions that help to define the areas to be explored, but also allows the interviewer or interviewee to diverge in order to pursue an idea or response in more detail.

As indicated earlier, the interview schedule forms part of the data collection procedure. This was in a semi-structured form (open ended questions) for parents or guardians and mathematics teachers. The respondents answered the questions by formulating and constructing their own responses. Thus, the interview schedule was designed to serve as a guide to the interviewer in providing general framework for the questions put to the respondents. The researcher, in all, interviewed 10 mathematics teachers and 20 parents. In this, respondents were asked to respond in an open-ended manner to the questions designed on the themes ‘quality of mathematics teaching’ and ‘opportunity to learn mathematics’. Sets of these questions can be found in appendix A and B.

3.6 Validity and Reliability

3.6.1 Validity

Key (2002) purported that validity is the extent to which an instrument measures what it is supposed to measure and performs as it is designed to perform. As a process, validation involves collecting and analyzing data to assess the accuracy of an instrument. Key continued that there are three types of validity. These are 'content validity', 'construct validity' and 'criterion-related validity'. Content validity is the approach that measures the degree to which the test items represent the domain or universe of the trait or property being measured. In order to establish the content validity of a measuring instrument, the researcher must identify the overall content to be represented. Items must then be randomly chosen from this content that will accurately represent the information in all areas.

Construct Validity is the one in which the validity must be investigated whenever no criterion or universe of content is accepted as entirely adequate to define the quality to be measured. The term construct in this instance is defined as a property that is offered to explain some aspect of human behavior, such as mechanical ability, intelligence, or introversion. The construct validity approach concerns the degree to which the test measures the construct it was designed to measure. And finally, criterion-related validity approach is concerned with detecting the presence or absence of one or more criteria considered to represent traits or constructs of interest. One of the easiest ways to test for criterion-related validity is to administer the instrument to a group that is known to exhibit the trait to be measured.

In view of Key's assertion, content validity was implored in this study. The researcher in consideration of Key (2002), constructed questionnaires specifically to solicit respondents' opinion. The questionnaire used as an instrument actually measures the

domain of the research. From the questionnaire, the researcher was able to feature out degree of quality teaching and opportunities available for pupils to learn mathematics in school and at home. The test items were used to verify the impact of quality of teaching on pupils' performance.

3.6.2 Reliability

Awanta and Asiedu – Addo (2008) cautioned that it is possible to design a questionnaire that is reliable because the responses are consistent, but may be invalid because it fails to measure the concepts it intends to measure. Expertise of the supervisor as well as the views of other lecturers and my colleagues before, during and after the construction of the questionnaire was drawn on to validate questions set by the researcher. Biddix (2014) also purported that reliability can be thought of as consistency. Does the instrument consistently measure what it is intended to measure? In this study, the parallel form reliability coupled with split-half method was used to check the reliability of the research instrument. This is because a research carried by Trochim (2006) asserted that it is more reliable and efficient way of testing reliability. Trochin (2006) continued that in split-half reliability the researcher randomly divide all items that purport to measure the same construct into two sets. The researcher then administers the entire instruments to a sample and calculates the total score for each randomly divided half. The value of the reliability coefficient for the questionnaire instrument was 0.74. This value indicates a high degree of reliability of the instrument.

3.7 Data Collection Procedure

A letter of attestation was obtained from the Head of Mathematics Education Department, University of Education, Winneba. This letter was photocopied and the photocopy given to the District Director of Education, Ghana Education Service, Kadjebi for necessary help which would be needed for the research work.

According to the Director, the office staff meets on every Wednesday at 8.00 a.m, in the office conference hall. In this case, on the following week Wednesday, the researcher was in the meeting with the office staff. During the meeting the Director then introduced the researcher to the staff and instructs that any staff that the researcher contacts for help should co-operate. With this directive, the researcher was able to get some documents from the office such as Basic Education Certificate Education results.

In addition the letter of attestation was also shown to the Headmasters and Headmistresses as well as mathematics teachers of the Junior High Schools in areas the research was carried. This would enable the researcher to visit these schools and to carry out the research work. The researcher met the heads of these institutions and briefed them on the purpose of the study, talk to the children about it and asked for the

cooperation of teachers and pupils to help answer questionnaires. The researcher visited the schools to self-administer the questionnaire. The questionnaires were administered with the assistance of the assistant head teacher of each school. In each school visited, the head introduced the researchers to the assistant head teacher who scheduled meetings with teachers and the students. The questionnaire for teachers was administered without any difficulty. The entire sample understood what the whole exercise was about and answered all the questions.

On the part of the pupils, the researcher explained the questionnaire to them. The researcher takes an item of the questionnaire, explain it and allow the pupils to tick the response that portrayed their opinion as seen on the questionnaire. This had to be done because most of the pupils selected could not read comprehensively. All the two-hundred pupils answered and returned them. The researcher was present during the administering and answering of the questionnaires and self-collected them at the end of the process. A cross section of teachers who were randomly selected were interviewed. Also, twenty (20) of the pupils' parents, five from each of the four circuits randomly selected were additionally interviewed.

Furthermore, in order to verify whether pupils' performance is dependent on quality teaching, the researcher observed six mathematics lessons in each of the four circuits. Simple random sampling was used to select a school from each circuit giving a total of four schools. The observation was carried out by using a five point evaluation standards used by the University of Education, Winneba as rating instrument. These evaluation standards are, 'planning and preparation', 'instructional skills', 'classroom management', 'communication skills' and 'evaluation' (see appendix E). The observation took a period of four weeks. The topics on which the lessons were observed are, 'statistics', 'ratio and proportion', 'simple interest', 'area and volume', 'construction' and 'sets'.

3.8 Data Analysis Procedure

The first research question was analysed using data collected from questionnaires and interviews. The Likert scale was followed in preparing the questionnaire used in the study. This scale is based on statements that are classified as positive or negative. Each statement is made up of five options of which one is selected according to the

respondent's feelings. Weights of 1, 2, 3, 4 and 5 were attached to the options of "Strongly Disagree (SD)", "Disagree (D)", "Undecided (U)", "Agree (A)", and "Strongly Agree (SA)" respectively when the statement is positive. This was reversed for a negative statement. For instance, to a positive statement, 'one can use mathematics in daily life', if the response is SA, it received a weight of five. However, to a negative statement, "it is useless for females to learn mathematics", if the response is SA, it received a weight of one. A neutral response of "Undecided (U)" to each item gained a mean weight of three.

A mean score above three was taken to indicate a high quality of mathematics teaching and learning whilst a mean score below three suggested a negative or lack of quality of mathematics teaching and learning. Mathematics teachers were made to respond to the seventeen items comprising, four items on the respondent's background, and five items on respondent's personal opinion about quality of mathematics teaching and eight items on the work performance. The questions were of the close-ended types. Subjects were to provide a tick or write down the most appropriate of their opinions to the responses of each item. As stated earlier, eight main groups of independent dimensions or variables were classified from the questionnaire items. Each dimension consisted of a collection of the various items into a unit that pointed to specific aspects of attitude towards mathematics. For instance, "I am always under a terrible pressure in mathematics class" suggests a feeling of mathematics anxiety.

A four-point item were used in order to score an interview question. These items are 'very often', 'often', 'not often' and 'not at all'. Weights ranging between 4, 3, 2 and

1 were attached to each item. A mean score of 3 or more indicates high participation or possession while a mean score of below 3 proves low or naught participation or lacking. In all, twenty (20) parents or guardians were interviewed, ten from the two rural areas and ten from the other two semi-urban circuits.

These data were organized into a table and analysed in order to find out opportunities that are there for students to learn mathematics. Items such as 'methods of teaching', 'use of teaching and learning materials', 'teaching resources', were used as questionnaires and oral interviews. These percentages were critically analyzed to ascertain opportunities available for students to learn mathematics. It was also to ascertain whether the subject is learnt in fearless, friendly and congenial atmosphere.

The objective 2 from which the second research question was generated was analyzed using data collected from questionnaires and oral interviews. Descriptive statistics such as mean and standard deviation were used to evaluate and discuss the quality of teaching mathematics in the district. Teachers were observed and evaluated on quality of mathematics teaching. The evaluation was on 'planning and Preparation', 'Instructional Skills', 'Classroom Management', 'Communication Skills' and 'Evaluation'.

Finally, research question three was analysed by using data collected from the Kadjebi District Education Office. This data was about the ten-year duration results of Basic Education Certificate Examination in mathematics. The data comprises the number registered each year and the number that obtained qualified grades. This data was critically examined and analysed using calculated mean and standard deviation in order to find out the trend in mathematics performance in the examination throughout the ten years.

CHAPTER FOUR

RESULTS/FINDINGS AND DISCUSSION

4.1 Preview

The purpose of this chapter is to enable the researcher present his results and findings from the schools. The chapter dealt with presentation and analysis of the data collected. The analysis was based on the objectives of the study. The data were both quantitative and qualitative in nature. The data were organized and presented using descriptive statistics including tables, charts, means and standard deviation.

Research Question 1:

Which Opportunities exist for Students to Learn Mathematics?

To answer this question, questionnaires were presented to both mathematics teachers and students to express their views in marking or ticking (√) an appropriate alternative that expresses their opinion. In addition, oral interviews were conducted with some of the teachers and parents or guardians. The collected data were coded into statistical table and analyzed as can be seen in Table 4.1.

Table 4.1: Pupils' Rating of Opportunity to Learn Mathematics That Existed in Their Respective Schools

Items		Agree		Undecided		Disagree	
	No.	Freq	%	Freq	%	Freq	%
Metds of Tng	200						
a. Lecture		87	43.5	6	3.0	17	8.5
b. Discussion		27	13.5	0	0.0	21	10.5
c. Individual		16	8.0	4	2.0	22	11.0
TLM	200						
a. Artifacts		30	15.0	8	4.0	62	31.0
b. Electronic		18	9.0	5	2.5	77	38.5
TR	200						
a. Syllabus		111	55.5	2	1.0	13	6.5
b. Textbook		17	8.5	9	4.5	22	11.0
c. Other		8	4.0	6	3.0	12	6.0
Motiv and Con.	200	90	45.0	13	6.5	97	48.5
Tr com. in Math	200	67	33.5	48	24	85	42.5

Shorthand Used:

Metds of Tng: Methods of Teaching (lecture, discussion, individual, etc.)

TLM: Teaching and Learning Materials (charts, drawings, pictures, projectors, etc.)

TR: Teaching Resources (textbooks, chalks, syllabus, teacher's guide)

Motiv and Con: Motivation and concentration

Tr com. in Math: Teacher competence in mathematics

Most respondents opined that mathematics teachers mostly use whole class, that is, lecture method in the course of lesson delivery. This could be seen in the Table 4.1 which shows that 87 (strongly agree and agree combined) respondents out of 200 agree that mathematics teachers use lecture method. This represented44% which is higher than any other methods such as 'discussion' and 'individual' methods which

altogether were 22% as shown in the table. Most of the schools visited lacked teaching and learning materials and hence mathematics teachers rarely use any during contact times. In Table 4.1, only 18 and 30 respondents agree that teachers have and use teaching and learning materials representing 10% and 16% respectively.

All the schools visited have mathematics syllabus but the textbook to accompany it is non-existence. From Table 4.1, 111 respondents agree that they have mathematics syllabus representing 56%. Only 17 respondents representing 9% agreed having government supplied mathematics textbooks. The table also proved that 8 respondents representing 4% agree that they have other teaching resources such as chalk. Projectors and computers are not in any of the school visited and also chalk is available but inadequate. There are mixed reactions about teacher competency in teaching mathematics. Some students opined that their mathematics teachers are competent in handling the subject whilst others disagree. From Table 4.1, 101 respondents representing 50.5% agreed that their mathematics teachers are competent enough to teach the subject. In the other atmosphere 99 respondents representing 49.5% disagreed that their teachers are not competent enough in order to teach mathematics.

It was also necessary to solicit opportunities provided by parents or guardians to their wards in regards to their wards learning of mathematics at home. The responses to the interview were collected and summarized in Table 4.2 using frequency and percentage.

Table 4.2: Frequency and Percentage Distribution of Opportunities Provided by Parents or Guardians to Their Wards to Learn Mathematics in their Homes

		Agree		Undecided		Disagree	
	N	Freq	%	Freq	%	Freq	%
I provide basic needs for my ward	20	7	35	5	25	8	40
I visit my ward at school	20	2	10	8	40	10	50
My ward is well fed before school	20	3	15	5	25	12	60
There is table and chair in the house	20	5	25	3	15	12	60
My ward always learns at home	20	7	35	9	45	4	20
I bought mathematics textbook	20	1	5	6	30	13	65
I help my ward when learning	20	3	15	2	10	15	75

N: number of parents or guardians interviewed
Freq: frequency
%: percentage

From Table 4.2, only 2 of the 20 respondents representing 10% agreed that they visit their wards at school. Furthermore, only 3 of the respondents representing 15% agreed on helping their wards at home when they are learning. This is shown in Table 4.2. One can clearly see from the table that opportunity to learn standards at home is nothing to write home about. This is true because from the table, parents or guardians who are able to provide table and chair for their wards and those who provide basic needs such as pens, pencils, exercise books, mathematical set, sandals, and so on represent 25% and 35% respectively. Furthermore, from Table 4.2, it can be seen that only a parent representing 5% was able to buy mathematics textbook for his/her child for study at home.

Research carried by Mbugua et al (2012) revealed that the extent to which parents or other family members are actively engaged in a student's education has a positive influence on the student's achievement. The researchers continued that parents or guardians with at least university degree have positive influence on their students' academic performance. They opined that parents or guardians who have low academic achievement may not be good role models for their children in academic matters. Considering Mbugua et al (2012) argument, the researcher verified parents' or guardians' academic level and the result was recorded in Table 4.3

Table 4.3 Frequency and Percentage Distribution of Academic Level of Parents or Guardians

Educational Level	Frequency	Percentage
No Formal Education	5	25
Basic Certificate Holder (BECE)	3	15
WASSCE	4	20
DIPLOMA	2	10
DEGREE	-	-
MSLC	6	30
TOTAL	20	100

Among the 20 parents or guardians interviewed, only 2 indicated that they hold Diploma in Basic Education and are therefore Basic School teachers. This therefore means that only these 2 parents are salary earners. In Table 4.3, 5 of the respondents had no formal education, and hence are peasant farmers whose income levels are very low and also not regular. One can ascertain from Table 4.3 that the highest academic level of the parents or guardians was Diploma. This means that income level of them may be low hence difficulty for providing basic needs for their wards. However, it was indicated that the income of parents was low and also not consistent; therefore

pupils whose parents rely on them are likely to get inadequate learning resources and other essential requirements for their wards. Performance from such student will always be poor.

According to Mbugua et al (2012) low parental socio-economic status is associated with diminished resources hence contributing to lower academic achievement. From Table 4.3, because of low level of students' parents' salary, students were not well fed before they go to school. The performance of these students will not be encouraging as it is said that 'a healthy mind in a healthy body'.

Cultural constraints negatively impacts on achievement level among students. Children who come from insecure environments caused by socio-cultural practices such as cattle rustling, early marriages and traditional practices usually perform academically poorly. Research carried by Mbugua et al (2012) revealed that parents serve as role model and guide in encouraging their children to pursue high educational goals and desires by establishing the educational resources on hand in the home and holding particular attitudes and values towards their children's learning. In this case, the educational attainment of parents serves as an indicator of attitudes and values which parents use to create a home environment that can affect children's learning and achievement. It is clear from Table 4.3 that some of the parents (25%) had no formal education and may be low income earners as 12 of them representing 60% were unable to provide tables and chairs in the home for their wards to serve as learning desk.

Views of mathematics teachers in various schools were also solicited about the opportunities they provide to their pupils to learn mathematics in their respective

schools. The questionnaire items and their responses were collected and summarized in Table 4.4 using frequency and percentage.

Table 4.4: Frequency and Percentage Distribution of Opportunities to Learn Standards Provided by Teachers to Pupils to Learn Mathematics in School

Factors	No	Agree		Undecided		Disagree	
		Freq	%	Freq	%	Freq	%
i. I have a detailed knowledge of the methodology	10	8	80	2	20	0	0
ii. I have detailed knowledge of mathematics content	10	7	70	2	20	1	10
iii. My pupils are well fed and ready for mathematics	10	3	30	2	20	5	50
iv. There are teaching resources in the school	10	2	20	1	10	7	50
v. The teaching method I usually use is	10						
a. Lecture		6	60	2	20	2	20
b. Discussion		4	40	4	40	2	20
c. Individual		2	20	6	60	2	20
vi. There is serenity in the school for learning	10	4	40	1	10	5	50
vii.I monitor pupils' achievement in class and outside	10	3	30	2	20	5	50
viii.I use teaching and learning materials	10	1	10	7	70	2	20
ix.I am always motivated for teaching mathematics	10	0	0	2	20	8	8
x. There are enough mathematics textbook	10	2	20	3	30	5	50
xi. Periods for mathematics lessons is enough	10	3	30	2	20	5	50

A research by Banicky (2000) found out that 'opportunity to learn' (OTL) was originally defined as the overlap between the information students were taught and the information on which they were tested. Banicky continued that as the push for accountability has increased, the definition of OTL has expanded to include the quality of resources, school conditions, curriculum, and teaching that students experience. All of these issues are considered critical for ensuring that students are able to meet the increased demands of performance-based accountability systems.

It can be seen from Table 4.4 that only 2 respondents representing 20% agreed that there are teaching resources such as syllabus, chalk, textbooks, board instruments and so on in their schools. As many as 7 respondents representing 70% did not have the required resources and only one (1) respondent was undecided explaining that the resources are old, implying that the content in the syllabus differs from the textbooks they have.

Concerning the school environment or serenity, only 4 respondents (item vi) agreed that they have conducive atmosphere for teaching and learning. About 50% of the respondents said their school environment is not conducive for learning while one (1) respondent representing 10% did not actually know what to go for. This can clearly be seen in Table 4.4. Furthermore, talking about teaching methodology, many respondents indicated that they combine methods during the time of teaching. It can be seen from Table 4.4 that 6 respondents indicated that they use whole class method, that is, lecture. About 3 respondents representing 30% indicated that they use discussion method and on only 2 respondents representing 20% iterated they use individual method of teaching.

A research carried by Myers (2012) revealed that opportunity-to-learn standards should:

- enable all students to achieve high content standards and learn to their full potential
- be directly tied to students' learning and performance in content standards
- consider the diverse, multiple ways students learn
- enable all teachers to teach all students
- be supported by the best classroom practice and research
- include on-going professional development of educators

- be based on research on how effective schools use resources
- address necessary conditions and resources for successful learning in the schools as well as effective use of resources, including safe, secure environments free of prejudice and violence; attractive, comfortable environments that invite learning, risk taking, and problem solving; updated library media centers and technologies
- consider opportunities for preschool and beyond school learning

Myers (2012) continued that opportunity-to-learn standards at their best should reflect teachers and all stakeholders' commitment to equitable access to high-quality education for all students. States and schools that meet Opportunity-to-learn standards will enable students to become lifelong learners and lead productive and rewarding lives. Myers then asserted that opportunity-to-learn standards should provide:

- time for students to learn and reflect
- time for teachers to plan, teach, and reflect
- appropriate learning resources
- resources from the community

Taking Myers assertion into consideration, it can be seen from Table 4.4 that students are not all that ready to learn mathematics as only 3 respondents representing 30% indicated that students are well fed and therefore only these few are ready to learn. About 6 respondents out of 10 representing 60% indicated that they use lecture method in teaching. In addition, opportunity to learn standards provided by schools to pupils to learn mathematics was inadequate as only one (1) respondent indicated that he/she uses teaching and learning materials when teaching.

Research Question 2:

What is the quality of teaching mathematics in Basic schools in the Kadjebi District of the Volta Region?

In order to verify whether if quality of teaching mathematics is the factor that affects students' performance in an examination, mathematics teachers were evaluated in the course of their teaching with the help of the headmaster and the circuit supervisor. They were evaluated based on their performances. The items on which they were evaluated ranged from planning and preparation before the lesson, instructional skills of the teacher, how the teacher manages and controls his/her pupils, his/her communication skills to how well he/she evaluates the lesson.

After all the assessments were collected, descriptive statistics was used to calculate mean and standard deviation of the various items. The average scores on each item about which the evaluation is done are recorded in Table 4.5 It can be seen that all the mean scores are above 3 with little variations.

It can be seen in the Table 4.5 that mathematics teachers perform worse in Classroom Management in which the average score was 3.18. Their best performance area was in Evaluation where the mean score was 3.60. Despite these disparities, all the mean scores were above average which is 3. This can be clearly seen in Table 4.5. This means that the performance of mathematics teachers in the Kadjebi District is encouraging. In this case, one can say that there is quality of mathematics teaching in the district.

Table 4.5 Mean Performance of Mathematics Teachers from Their Observed Lessons

Item	Number	Mean	Std. Deviation
Plan. and Preparation	10	3.33	1.184
Instructional Skills	10	3.33	1.240
Classroom Management	10	3.18	1.259
Communication Skills	10	3.45	1.280
Evaluation	10	3.60	1.150

Research Question 3:

What is the mathematics performance rate of students in Basic Education Certificate Examinations in the Kadjebi District Between 2001 and 2010?

To answer this question, data were collected from the district education office. The data were about Basic Education Certificate Examination pass rate from 2001 to 2010, as can be seen in Table 4.7.

Table 4.6: Distribution of Pupils Obtaining Pass Grades in Basic Education Certificate Examination (BECE) in Mathematics from 2001 – 2010

Year	No. of Pupils	No. that Qualified	Percentage Qualified
2001	579	281	48.6
2002	686	307	44.7
2003	713	202	29.4
2004	688	228	33.2
2005	873	277	31.3
2006	707	209	29.6
2007	853	233	27.3
2008	597	294	49.2
2009	901	263	29.2
2010	771	250	32.4

Source: Kadjebi District Education Office (Examination Officer's Desk)

From Table 4.7, it is clearly seen that by percentage pass students performed best in 2008 in which 597 wrote the examination in mathematics and 49.2% of them passed. The worse year of performance was 2007 in which 853 students took part in the examination but only 27.3% passed in the subject. Generally the performance in mathematics during these 10 years was very poor as no year recorded at least 50% pass. This poor performance is an indication of a low impact the quality of teaching of mathematics and opportunity to learn standards provided for Junior High pupils. For a clearer view of the results, a bar graph was drawn from Table 4.7. Figure 4.1 shows how students performed during the 10 years (2001 – 2010) period in Basic Education Certificate Examination (BECE).

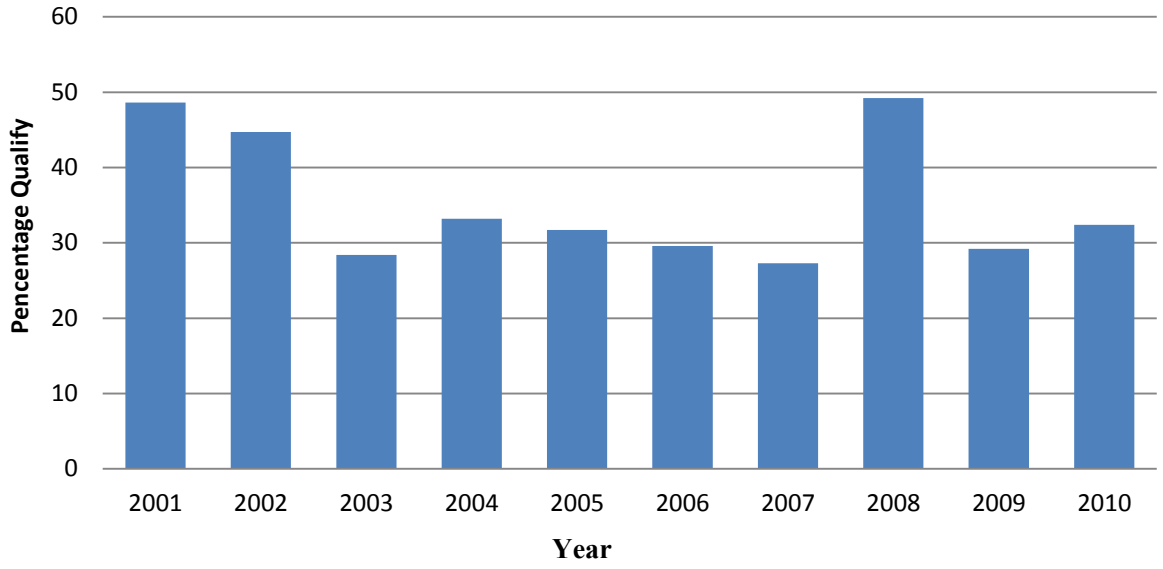


Figure 4.1: Percentage of Students that Pass in Mathematics from 2001 to 2010

The diagram in Figure 4.1 represents a graphical distribution of students' that obtained qualified grades by year in mathematics at Basic Education Certificate Examination (BECE) in the Kadjebi District of the Volta Region. From the graph, one can observe that over the ten-year period, the highest number of students obtaining qualified grades in Mathematics was in 2008. Also, the figure shows that, even in that year, less than 50% (49.2%) of the students passed (that is those obtaining qualified grades) the examination. The analysis reveals a poor performance since the highest number of students obtaining qualified grades within the ten-year period was less than 50%. Years 2001 and 2007 scored the second highest and the least percentage qualified over the ten years, the pass rates were 48.6% and 27.3% respectively.

4.2 Discussion

The delivery of educational opportunities defined by the national curriculum includes a number of inputs and processes. These inputs and processes are what constitute 'opportunity to learn standards' (Mereku, et al., 2005). The study sought to determine

the impact of quality teaching and the opportunity to learn standards provided for Junior High pupils to learn mathematics on their performance in Basic Education Certificate Examination (BECE) between 2001 and 2010. The study also seeks to find the current resource standards; that is, whether or not schools have sufficient resources to deliver a high level of curriculum content and to therefore achieve higher levels of outcomes for all students.

Data obtained indicate that 60% of the teachers use lecture method, 30% use discussions, and individual method was used by 20%. According to Yara (2009), lecture method is ineffective in that it turns the learners into passive participants in the learning process. However despite the disadvantage, lecture method is useful in covering large content. Also Assuah (2010) posited that discussions, project and discovery methods creates an enabling environment for the learners and ensures that individual differences are taken care of. Ampadu (2012) opined that mathematics teachers mostly use teacher-centred that is lecture method in their course of teaching. This teaching method is the least among other methods that promotes effective and quality teaching and learning of the subject. The use of lecture method is ineffective in that it turns the learners into passive participants in the learning process. Using class discussion coupled with problem solving techniques is mostly beneficial to students and promotes quality teaching and learning of mathematics. These arguments were put forward by Bruce (2007) and Chaviaris and Kafoussi (2008). The above assertions by these researchers are in line with the findings of this research.

Results indicated that most parents or guardians had no formal education. According to the respondents, 10% are Diploma in Basic Education (DBE) holders out of the 20 interviewed. It was revealed that 5 out of the 20 respondents representing 25% did not have formal education. A number of studies indicated that student achievement is

correlated highly with the educational attainment of parents. For instance, students whose parents had less than high school education obtained lower grades in mathematics than those whose parents had higher levels of education. Research has shown that parents' educational level not only impact student attitudes toward learning but also impact their mathematics achievement (Banicky, 2000). This is also in line with the findings of this research. It was revealed that performance of students in mathematics in the district is not encouraging as most parents or guardians had no formal education and those who are educated are only up to diploma level.

Information obtained on availability of teaching and learning materials and textbooks for mathematics in schools showed that adequate teaching resources are only 20% and textbooks 40% as indicated by ten mathematics teachers interviewed. In addition only 2 respondents representing 20% (Table 4.4) indicated that their schools had adequate teaching resources. This means that opportunity to learn standards provided to Junior High school pupils to learn mathematics are not sufficient. According to Psacharopolous and Woodhall (2002) textbooks and teaching and learning materials are a major input for performance in examinations. This view were shared by Mbugua, Kibert, Muthaa, and Nkoke (2012) who observed that availability of and quality of textbooks in schools is strongly related to achievement among students from lower income families especially those in rural schools. The research revealed that 83.5% of all students indicated that schools lacked physical facilities, mathematics textbooks, teaching and learning materials and the ones existing were poorly used. According to Karen (2009) physical facilities contribute positively to students' academic performance. This was in line of findings of this research which revealed that schools lack mathematics textbooks.

Students were asked if anybody helps and motivated them at home with their studies or homework. A total of 200 students provided responses. The results are shown in Table 4.1. Provision of basic school needs such as school uniform, school bag, exercise books, pencils, ruler, and pens from parents to their ward are also shown in Table 4.2. For the provision of basic needs, only 7 out of 20 parents or guardians representing 35% agreed they do. Mathematics education requires highly motivated students because it requires reasoning, making interpretations, and solving problems, mathematical issues, and concepts. The challenges of mathematics teaching and learning for today's education is that it requires disciplined study, concentration and motivation. To meet these challenges, learners must be focused and motivated to progress. Broussard and Garrison (2004) examined the relationship between classroom motivation and academic achievement in elementary-school-aged children. Consistent with previous studies, they found that for a higher level of mastery, motivation was related to higher mathematics grades. This researcher found that most respondents complain that they are not motivated in any way.

It was observed that the mathematics textbooks currently in use in the Junior High Schools in the Kadjebi District for teaching mathematics were published over a decade of years ago. This finding was confirmed by (Adetunde, 2009a). Over half of the schools involved in the study reported inadequate or few supplies of these books. More than half of the respondent teachers complain that the students' mathematics textbook available are out of date. They opined that the content in these textbooks did not tally with the syllabus given to them. In addition, students complain that they do not have mathematics textbook and thus hindering them from learning the subject in home.

School context and its facilities could be an important factor in student achievement. For instance, Saritas and Akdemir (2009) suggest that student achievement is associated with a safe and orderly school climate coupled with parents' socio economic factors. According to them researchers also found a negative impact on student achievement where their parents' income level is low. A number of studies showed that parents with higher socio-economic status are more involved in their children's education than parents of lower socio-economic status. This greater involvement results in development of positive attitudes of children toward school, classes, and enhancement of academic achievement. Finding in this research revealed that pupils' parents or guardians' income level is low leading to poor mathematics performance.

Self-directed learning could be a factor in students' mathematics achievement. Mathematics learning requires a deep understanding of mathematical concepts, the ability to make connections between them, and produce effective solutions to ill-structured domains. There is no perfect, well-structured, planned or prescribed system that lets students think and act mathematically (Ojose, 2012). This can be done if, and only if, students play their assigned roles in their learning progress. Self-directed learning has an important place in successful mathematics learning. Self-directed students can take the initiative in their learning by diagnosing their needs, formulating goals, identifying resources for learning, and evaluating or monitoring learning outcomes. The teacher's role is to engage students by helping to organize and assist them as they take the initiative in their own self-directed explorations, instead of directing their learning autocratically (Cai, 2003). This research revealed that self-directed learning is not cultivated by students as 67 out of 200 respondents representing 35% agreed that they learn the subject alone. About 85 respondents

representing 42.5% said they always need help before they can learn the subject and 48 said they are undecided.

The teacher's role in students' motivation to learn should not be underestimated. In helping students become motivated learners and producers of mathematical knowledge successfully, the teacher's main instructional task is to create a learning environment where students can engage in mathematical thinking activities and see mathematics as something requiring "exploration, conjecture, representation, generalization, verification, and reflection" (Carr, 2002).

Effective supervision of instruction can improve the quality of teaching and learning in the classroom. Etsey, Amedahe and Edjah (2005) in a study in Ghana found that academic performance was better in private schools than public schools because of more effective supervision of work. This research revealed that proper supervision is lacking in all the public schools visited. Another factor is motivation. A highly motivated person puts in the maximum effort in his or her job. Several factors produce motivation and job satisfaction. Another research by Okyerefo, Fiaveh and Lamptey (2011) examined the job satisfaction of Californian public school teachers in the United States of America and found that one of the overall job predictors was the salary one earned from it. Studies indicated that lack of supervision and professional commitment produce poor attendance and unprofessional attitudes towards students which in turn affect the performance of students academically.

Several studies and researches have been done in many countries to find the factors that influence the students' performance in mathematics. Among these factors, students' attitude towards mathematics is one of the important factors that has been consistently studied. Often, the studies on relationship between students' attitude and

the students' academic performance show a positive relationship. Yara (2009) opined that attitude of students toward mathematics can be influenced by the attitude of the teacher and his method of teaching. Studies carried out have shown that the teachers' method of mathematics teaching and his personality greatly accounted for the students' positive or negative attitude towards mathematics and that, without interest and personal effort in learning mathematics by the students, they can hardly perform well in the subject.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Preview

This chapter deals with the outcome of the research, the conclusion and the recommendations. The outcome or the summary of findings talks about salient points of the research briefly. Conclusion dealt with the researchers' opinion about the outcome of the research and the recommendations concern with what the researcher think is good to do in order to curb the problem or minimize it.

5.2 Summary

The study was intended to find out the impact of quality of teaching mathematics and opportunity to learn standard provided for Junior High Schools on their performance at Basic Education Certificate Examination (BECE) mathematics in the Kadjebi District of the Volta Region. It was also intended to find out factors that contributed to good performance in the subject. Purposive random sample was used to select four (4) out of thirteen (13) circuits in the district. Simple random sampling was used to select twenty (20) pupils from each of the ten (10) schools and the mathematics teachers in the four circuits. In all there were two–hundred (200) pupils and ten (10) mathematics teachers for the study. The researcher used questionnaires as the instrument for the study. In addition interviews guide and observation guide were used to collect data. The data were analysed by using descriptive statistics such as standard deviation and mean. The major findings are summarized below.

5.3 Findings

The following is a summary of major findings.

1. Schools do not have sufficient resources to deliver the necessary amount of curriculum content to achieve high levels of outcomes for all students. Teachers cannot deliver their best instruction and help pupils achieve their highest potentials without basic resources like textbooks.
2. Opportunity to learn standards provided to Junior High pupils in schools and at home was inadequate as all schools do not have sufficient teaching resources. In addition, most parents or guardians are unable to provide basic school materials for their wards.
3. The quality of teaching mathematics was on the average but its impact on the pupils' achievement was far below average. This may be caused by pupils' poor learning conditions in their homes.
4. Most of the schools lack or have inadequate teaching and learning materials and mathematics textbooks. In this case, teachers only cover up to 70% of the content of mathematics syllabus at the end of the school year.
5. The rate of mathematics performance is below average. On the average, only 30% of the candidates obtained qualified grade. This may be because the quality of teaching does not bear any impact on pupils' performance. In addition, parents' socio-economic factors and their educational level were the key factors that contributed to these poor performances over the years.
6. Most mathematics teachers use whole class or lecture method in teaching. Lecture method is ineffective in that it turns the learners into passive participants in the learning process.

5.4 Suggestions for Further Research

This researcher suggests that future efforts be made to delve into the problem. As this research covers only small number of schools, its findings may not be generalized to the entire district. It is therefore suggested that other schools in a substantial number should be chosen for further research. Financial constrain and time hinder this researcher to choose such a small number of schools.

5.5 Conclusion

It is evidence from the findings that the poor performances of students in basic education certificate examination in mathematics may be the result of student's negative attitude toward the subject. It may also come from the students' parents, stake holders, the community but not the fault of the teacher. Many students see mathematics as a difficult subject. Especially girls see mathematics as male domain. Most often, government failure to supply schools with basic needs such as chalks, textbooks, teaching and learning materials, and so on was one of the causes.

Furthermore, parents inability to give their wards basic commodities as school uniform, pens, pencils, exercise books, and so on are also dictated as part of the causes. In addition, the behavior of some parents toward their wards education is nothing to write home about. These parents usually send their wards to farm during school hours. Also, during market days, students labour in order to fend for themselves.

5.6 Recommendations

From the summary of the major findings of the study, the researcher is of the view that mathematics teaching and learning should largely be based on student-centred coupled with problem solving techniques. That mathematics teacher should always use class discussion and activity base method and relate every topic to real life problem. Teachers before the lesson should endeavour to find everything about the topic they are going to handle. Mathematics teachers should do everything possible in order to let students have positive attitude toward the subject. It is recommended that headmasters should use part of capitation grant to buy teaching and learning materials for the school.

5.7 Shortcomings of the Research

Kadjebi District has about 50 junior high schools but the research covers only 10. In addition, private owned schools were not included in the research. The respond given to questionnaires by both teachers and students may not actually reflect what is happening on the ground. Furthermore, parents could not answer all the oral interview granted them.

5.8 Personal Reflection

As a novice researcher, I found the research process a fascinating and enriching experience. The identification of research topic was a difficult task. I thought the process was easy especially when I had to write research questions and the objectives. It is this time I realized that doing research needed much of someone's attention and concentration. With the kind courtesy of my supervisor, all the difficulties were overcome. Although the writing of the research proposal did not cause major challenges, I found it difficult to source out relevant literature. This difficulty was

exacerbated at the time of writing the review of relevant literature chapter. The process of data collection was also found to be challenging especially about the choice of the type of a particular method to be implored. It was very difficult to secure the full participation of my colleague teachers. This was overcome by the instruction from the district directorate.

REFERENCES

Adetunde, I. A. (2009a). *Improving The Teaching And Learning Of Mathematics*. Retrieved MAY 2, 2012, from Report and Opinion: http://www.sciencepub.net.pdf

Adetunde, I. A. (2009b). *Report and Opinion*. Retrieved May 13, 2012, from Improving The Teaching And Learning Of Mathematics: http://www.sciencepub.net

Agbemafo, A. (2009). *Reversing The Decline In Academic Archivement*. Retrieved November 3, 2012, from The falling standard of education: www.modernghana.com/212768/1/the-falling-standard-of-education.html

Agyei, D. D., & Voogt, M. J. (2011). *Pre-Service Mathematics Teachers Learning and Teaching of Activity Based Lessons Supported with Spreadshets*. Retrieved October 14, 2012, from Computers and Education: www.paèer-3049-35206-MicrosoftWord

Alston, C. (2012). *Study.Com*. Retrieved December 6, 2017, from Stanine: Definition & Explanatoin: https//study.com/academy/lesson/Stani

Ampadu, E. (2012). *International Online Journal of Educational Sciences, 2012, 4 (2), 351-358*. Retrieved June 11, 2013, from Students' Perceptions of their Teachers' Teaching of Mathematics: The Case of Ghana: http://www.iojes.net/userfiles/Article/IOJES_784.pdf

Ampiah, G. J. (2008, February 21). *Quarlity Basic Education in Ghana*. Retrieved May 4, 2012, from Journal of International Cooperation: www.edupaper.com/no1-3/interjour.pdf

Anamuah - Mensah, J., Mereku, D., & Asabere - Ameyaw, M. (2009, August 14). *Ghanaian JSS2 Students Abysmal Mathematics Achievement in TIMSS*. Retrieved October 23, 2012, from A Consequence of the Basic School Mathematics Curriculum: www.TIMSS.2007.011.pdf

Andaya, O. J. (2014, October 4). *Journal of Arts, Science and Commerce*. Retrieved December 5, 2018, from Factors that affect mathematics achievement: www.researchersworld.com/vol5/issue4/Paper_09pdf

Asare - Nkoom, S. (2006, April 23). *Mathematics Achievement*. Retrieved May 3, 2012, from Sex-Differences in Attitudes towards Mathematics: www.teachmaths.net/013.pdf

Assiedu-Addo, S. K., & Yidana, I. (2000). Mathematics Teachers' Knowledge of the Subject Content and Methodology. *Journal of the Mathematical Association of Ghana*, Vol 5, 65-71.

Assuah, C. (2010). Use of technology for college mathematics instruction: African instructors' experiences. *Mathematics Connections*, Vol 7, 41 - 54.

Awanta, E. K., & Assiedu-Addo, S. K. (2008). *Essential Statistical Techniques in Research.* Accra: Salt 'N' Light Publishers.

Awanta, K. E. (2007). Mathematics Teacher Subject Matter Knowledge And Pedagogical Content Knowledge in Vectors. *Journal of Research and Development in Education*, Vol 7, 62-69.

Ayres, P., Dinham, S., & Sawyer, W. (2003, November). *The Entrance Campus Learning Project*. Retrieved January 23, 2018, from What Constitutes Quality Teaching and Learning Practice in a Senior Campus?: http://www.thentrance-h.schools.nsw.edu.au/documents/636032/641074/TEC%20Learning%20Report%20Version%202.pdf

Banicky, L. A. (2000, October 5). *Opportunity to Learn*. Retrieved July 3, 2016, from College of Human Resources, Education & Public Policy: http://udspace.udel.edu/bitstream/handle/19716/2446/opp+to+learn.pdf?sequence=1

Bassey, W. S., Joshua, T. M., & Asim, E. A. (2007, February 10). *Gender Differences and Mathematics Achievement*. Retrieved May 5, 2012, from Proceedings of epiSTME: www.acsa.edu.com/paper/epiSTEME 3/09-bassey-joshua-asim.pdf

Biddix, P. J. (2014). *Research Rundowns*. Retrieved June 26, 2016, from Uncomplicated Reviews of Educational Methods: https://researchrundowns.com/quantitative-methods/instrument-validity-reliability/

Broussard, S. C., & Garrison, M.-E. B. (2004). *The Relationship Between Classroom Motivation and Academic Achievement in Elementary-School-Aged Children*. Retrieved July 23, 2013, from Family and Consumer Sciences Research Journal: http://www.sagepub.com/wrightstudy/articles/Broussard.pdf

Bruce, D. C. (2007). *What Works? Research into Practice*. Retrieved June 14, 2013, from Student Interaction in the Math Classroom: http://www.edu.gov.on.ca/eng/literacynumeracy/inspire/research/bruce.pdf

Cai, J. (2003). Singaporean students' mathematical thinking in problem solving and problem posing: an exporatory study. *International Journal of Mathematical Education in Science and Technology, 34*(5), Vol 5, 719-737.

Carr, M. (2002). *Motivation in mathematics*. Retrieved July 23, 2013, from getCited: http://www.getcited.org/pub/103306009

Chaviaris, P., & Kafoussi, S. (2008). *International Electronic Journal of Mathematics Education*. Retrieved July 13, 2013, from Developing Students‟ Collaboration in a Mathematics Classroom through Dramatic Activities: http://www.iejme.com/012008/d4.pdf

Cosby, P. C. (2002). *Applying Educational Research*. Retrieved November 13, 2011, from Educational Research: http://www.harris.com

Cosby, P. C. (2007). *Methods in Behavioral Research.* Retrieved December 7, 2011, from Mcgraw-Hill Web Site: http://www.linghered.mcgraw-hill.com

Creswell, J. W. (2012). *Boston Pearson Educational Inc.* Boston: Pearson Educational Inc.

Devin, K. (2016). *Samples & Population in Research:Definition*. Retrieved April 15, 2016, from Study.com.Psychology 105:Research Methods in Psychology/Psychology Courses: Study.com/academy/.../samples-populations-in research-definition-html

Diane, C. B. (2013). *Applied Research and Evaluation Methods in Recreation*. Retrieved Aprail 27, 2016, from Creating instrumentation plans for research studies: http://www.humankinetics.com/excerpts/excerpts/creating-instrumentation-plans-for-research-studies

Doyle, C. (2004). *The Legend of Drunken Master.* NewYork: Mcgraw-Hill. Retrieved December 6, 2011, from wikipedia.

Drews, D. (2007). *Do resources matter in primary mathematics teaching and learning?* Retrieved May 30, 2013, from Resources.pdf: http://xtec.cat/centres/a8005072/articles/resources.pdf

Elmore, F. R., & Fuhrman, S. (2009). *Opportunity to Learn and the State Role in Education*. Retrieved December 5, 2018, from Opportunitry to Learn: http:/www..ncela.us/files/rod/BEO22357/opportunity.pdf

Eshun, B. A. (2000). Sex-Differences in Attitude of Students Towards Mathematics in Secondary Schools. In M. A. Ghana, *Journal of the Mathematical Association of Ghana* (pp. 1 - 13). Accra: Mathematical Association of Ghana.

Etsey, Y. K., Amedahe, F. K., & Edjah, K. (2005). *Do Private Primary Schools Perform Better Than Publc Schools in Ghana.* Cape Coast.

Fleming, R. (2011). *Australian Education IT Blog*. Retrieved December 6, 2017, from The 5 factors which affect school performance: blogs.msdn.microsoft.com/

Fletcher, J. A. (2001). *Constructivism and Mathematics education in Ghana*. Retrieved October 14, 2012, from Education: http://www.ajol.info/index.php/mc/article/viewfile/214991/19006

Fong-Yee, D., & Normore, H. A. (2011). *The Impact of Quality Teachers on Student Achievement*. Retrieved August 17, 2018, from Quality Teachers on Students Achievement.pdf: https://files.eric.ed.gov/fulltext//ED520769.pdf

Fredua-Kwarteng, & Ahia. (2005). *Ghana's Math Textbooks and Curriculum Out of date?* Retrieved May 8, 2012, from The way we train maths teachers and teach mathematics: http://www.proghana.com/USER/ghana's-math-textbooks-and-curriculum-out-of-date.htm

Gill, P., Stewart, K., Treasure, E., & Chadwick, B. (2008). *British Dental Journal 204,291-295*. Retrieved June 26, 2016, from Methods of data collection in qualitative research: interviews and focus groups: http://www.nature.com/bdj/journal/v204/n6/full/bdj.2008.192.html

Hamilton, L. S., Engberg, J., & Mihaly, K. (2012). *Measuring Teacher Effectiveness*. Retrieved January 16, 2018, from Rand Education: https://www.rand.org/pubs/corporate_pubs/CP693z1-2012-09.html

Hightower, M. A., Delgado, C. R., Sterling, L. C., Wittenstein, R., Sellers, K., & Christopher, S. B. (2011). *Improving Student Learning By Supporting Quality Teaching*. Retrieved August 16, 2018, from Key Issues, Effective Strategies: https://sprocorg/ojs/index.php/cerj/article/view/2717

Hill, C. H., Rowan, B., & Ball, L. D. (2005). *American Educational Research Journal*. Retrieved May 31, 2013, from Effects of Teachers' Mathematical Knowledge for Teaching on Students Achievement: http://aer.sagepub.com/content/42/2/371.full.pdf+html

Kamtet, W., Ngamman, J., Liewkongsthaporn, W., Pativisan, S., & Dechsri, P. (2009). *Assessing Subject Matter Knowledge of Mathematics Teachers*. Retrieved May 31, 2013, from Paper_4d328075pdf: http://www.iaea.info/documents/paper_4d328075.pdf

Karen, J. (2009). *Relationship between School Facilities and Academic Achievement*. Retrieved July 23, 2013, from : An Act Relative to the Consideration of Ergonomically Designed School Buildings: http://blogs.bu.edu/kjacobs/files/2010/02/Testimony-by-Karen-Jacobs-on-HB-443-Final-10-10-09-use-pdf.pdf

Key, J. P. (2002). *Oklahoma State University*. Retrieved June 28, 2016, from Research Design in Occupational Education: http://www.okstate.edu/ag/agedcm4h/academic/aged5980a/5980/newpage18.htm

Knoell, M. C. (2012). *The Role of the Student-Teacher Relationship in the Lives of Fifth Graders: A Mixed Methods Analysis*. Retrieved June 12, 2013, from Major: Educational Studies: http://www.cedu.niu.edu/~shumow/itt/StudentTchrRelationships.pdf

Maliki, A. E., Ngban, A. N., & Ibu, E. J. (2009). Analysis of Students' Performance in Junior Secondary School Mathematics Examination in Bayelsa State of Nigeria. *Educational Policy Document*, Vol 4, 131 - 134.

Mbokane, A. (2009). *Samples-Populations*. Retrieved April 17, 2016, from 04chapter 3 pdf: uir.unisa.ac.za/bitstream/handier/10500/1313/04chapter3pdf

Mbugua, Z. K., Kibet, K., Muthaa, G. M., & Nkonke, G. R. (2012). *Factors Contributing to Students' Poor Performance in Mathematics in Kenya*. Retrieved December 12, 2012, from A Case of Baringo County, Kenya: http://www.aijcrnet.com

Mbugua, Z. K., Kibet, K., Muthaa, G. M., & Nkonke, G. R. (2012). *Factors Contributing To Students' Poor Performance in Mathematics at Kenya Certificate of Secondary Education in Kenya: A Case of Baringo County, Kenya.* Retrieved February 13, 2013, from American International Journal of Contemporary Research: http://www.mbuguakibetmuthaankonke. edu. 823547 .pdf

Mengenai, S. (2013). *English for Mathematics*. Retrieved January 23, 2018, from KESIMPULAN BERFILSAFAT: http://fifiyuniartipmatswa09.blogspot.com/

Mereku, K. (2001). *The BECE Grading System Committee Report: Implications for Minimum Educational Qualifications for Basic Education Certificate*. Retrieved December 6, 2017, from GSA_PAPER_CAPE COAST_ ARTICLE.pdf: wikieducator.org/images/a/ac/GSA_PAPER_CAPE

Mereku, K. D., Amedahe, F. K., Etsey, K., Adu, J., Acquaye, E., Synder, W., . . . Long, B. (2005). *Opportunity to learn English and Mathematics*. Retrieved December 6, 2017, from e2-OTL.pdf: www.equip123.net|docs|e2-OTL.pdf

Ministry of Education. (2015). Standards and Guidelines for Practice of inclusive Education in Ghana. *Providing all Learners Opportunities for Quality Learning*, 15 to 17.

Miznen, W. (2016). *EXPLORABLE*. Retrieved Aprail 16, 2016, from Research Population: http://explorable.com/research_population.

Myers, M. (2012). *Opprtunity-to-Learn Standards, Statements of Principles*. Retrieved July 4, 2016, from Opportunity to Learn Standards: http://www.ncte.org/positions/statements/opptolearnstandards

Nabie, M., Anamuah-Mensah, J., & Ngman-Wara. (2010). Basic School Teacher' Understanding of Mathematical Concept in Ghana. *International Journal of Pedagogy, Policy and ICT in Education*, Vol 8, 41 - 53.

National Council of Teachers of English. (2012). *Position Statements*. Retrieved December 5, 2018, from Opportunity-to Learn Standards, Statement of Principles: www2.ncte.org/statement/opportunitytolearnstandards

National Council of Teachers of Mathematics. (2007). *Teaching Fractions*. Retrieved June 30, 2012, from International Bureau of Education: http://www.teachfrac.sac/ntcm.org

Ododgwu, H. N. (2009). Mathematics Classroom from Private Perceptive in the Achievement of Universal Basic Education. *Ghana Journal of Education and Teaching*, Vol 5, 174 - 182.

Ojose, B. (2012). Content Knowledge and Pedagogical Knowledge of Algebra Teachers on Certain Mathematical Axioms. *International Education Studies, 5*(4), Vol 6, 150-165.

Okyerefo, M. P., Fiaveh, D. Y., & Lamptey, L. S. (2011). *Factors prompting pupils' academic performance in privately owned Junior High Schools in Accra, Ghana*. Retrieved July 25, 2013, from International Journal of Sociology and Anthropology: http://www.academicjournals. org/ijsa/PDF/pdf2011/Aug/ Okyerefo % 20et%20al.pdf

Oluwatoyin, A. J. (2011). Path Analytic study of Gender, Mathematics Conception, Manipulative Skills, learning readiness and Students Achievement in Mathematics. *Ghana Journal Of Education and Teaching*, Vol 5, 11 - 20.

Ozturk, A. M., & Debelak, C. (2009). *High Academic Standards And Expertations*. Retrieved May 17, 2011, from Maintaining Standards: http://www. outarkrev.com/ opub/charpter3.pdf

Petrou, M. (2007). *Using Mixed Methods Methodology to Investigate Cyprus Pre-Service Teachers' Mathematics Content Knowledge*. Retrieved May 17, 2012, from 11_Petrou.pdf: http://www.mar.11_petrou.edu.pdf

Psacharopolous, G., & Woodhall, M. (2002). *Education for development: An analysis of investment choices*. Retrieved July 23, 2013, from Economic development; Education; Effect of education on; Finance; Developing countries: http://www.getcited.org/pub/102453291

Saritas, T., & Akdemir, O. (2009). *Identifying Factors Affecting the Mathematics Achievement of Students for Better Instructional Design*. Retrieved June 18, 2013, from Home Page: http://www.itdl.org/Journal/Dec_09/article03.htm

Steele, D. M., & Kimberly, C. R. (2007). *Mathematical Knowledge and Teaching Practice.* Retrieved March 14, 2012, from Relationships between Mathematical Knowledge for Teaching and Teaching Practice: The Case of Proof: http://www.Steele.Cervello-MKT-Proof-JMTE-FOR-PUB.pdf

Stefan, D. (2013). *Questionnaires*. Retrieved June 23, 2016, from Research & Consultation Guidelines: http://www.kirklees.gov.uk/ community/yoursay/ questionnaires.pdf

Tripathi, P. (2003). *Problem Solving in Mathematics*. Retrieved May 12, 2012, from Problem Solving - A tool for Cognitive Development: cvs.gnowledge.org

Trochim, W. M. (2006). *Types of Reliability*. Retrieved June 28, 2016, from RESEARCH METHODS KNOWLEDGE BASE: www.socialresearchmethods.net/kb/relitypes.php

Tuncay, S., & Omur, A. (2009). *Factors that affect mathematics achiement*. Retrieved January 22, 2018, from Identifying Factors Affecting the Mathematics Achievement of Students for Better Instructional Design: www.itdl.org/Journal/Dec_09/article03.htm

Turnuklu, B. E., & Yesildere, S. (2007). *The Pedagogical Content Knowledge in Mathematics: Pre-Service Primary Mathematics Teachers' Perspectives in Turkey*. Retrieved April 20, 2012, from IUMPST: The Journal, Vol 1 (Content Knowledge): http://www.k-12prep.math.ttu.edu

University of Education, Winneba. (2005). *Student intenship programme; Intern Record Book.* Accra: CETDAR.

Wakefield, A. (2012). *Advantages and Disadvantages of Conducting Observational Research*. Retrieved June 26, 2016, from Primary Data Collection - Observations:http://compss.port.ac.uk/UoP/file/66e8001-f121-4e5d-ae06-6c95c797e8af/1/Observations IMSL

Watson, A. (2006). *ResearchGate*. Retrieved December 5, 2018, from Opportunities to Learn Mathematics: www2.ncte.org/statement/opptolearnstandards/

West Africa Examination Council. (2018). *Chief Examiner's Report.* Accra: Ghana Education Service.

West Africa Examinations Council. (2010). *Chief Examiners' Report.* Accra: Ghana Education Service.

Yara, P. O. (2009). *Students Attitude Towards Mathematics*. Retrieved May 23, 2012, from European Journal of Scientific Research: http:// www. eurojournals. com /ejsr.htm

Yin, M. (2003). *Power research.writingcenter.unc*. Retrieved May 8, 2013, from The Writingcenter-Literature review: http://writingcenter.unc.edu

APPENDIX A

Mechanism to help improve academic performance in mathematics

QUESTIONNAIRE FOR MATHEMATICS TEACHERS

PART A

Please tick [√] the appropriate box

Teachers' demographic information

1. Sex [ ] **Male** [ ] **Female**
2. Year group [ ] **20-30** [ ] **31-40** [ ] **41-50** [ ] **51-60**
3. Level of education [ ] **Cert A**[ ] **Diploma**[ ] **Degree**
4. Major in [ ] **Mathematics** [ ] **Science** [ ] **General**

PART B

Experiences acquired on the work

How long have you been teaching? [ ] 1-5 years [ ] 6-10 [ ] more than 10

How many in-service training did you attend [ ] none [ ] at least one

I find teaching some topics difficult [ ] Yes [ ] No

If yes, list them: …….....

PART C

Teachers' on the work performance

	Strongly Agree	Agree	Undecided	Disagree	Strongly Disagree
What would you say about the availability of classroom materials such as tables, chairs, chalkboard, cardboard, etc in your school?					
How long have you been teaching mathematics?					
Are you able to complete the syllabus at the end of the year?					
I enjoy teaching mathematics					
Teaching mathematics is boring for me					
I always attend in-service training in mathematics any time I learnt about it					
I blend different methods when teaching mathematics					
I like using several approaches when solving questions in mathematics during teaching					
I do not like preparing teaching and learning materials for mathematics					
I do not like using teaching and learning materials when teaching mathematics					
I always prepare lesson notes for mathematics lessons					
I always give pupils homework after end of every topic aside class exercises					
I mark every assignment given and let pupils do rework					

PART D

Opportunity to Learn Mathematics

Items	Agree	undecided	Disagree
Have detailed knowledge of the mathematics methodology			
Have detailed knowledge of the content			
Pupils are well fed, healthy and ready during mathematics lesson			
The school have sufficient and adequate materials such as textbooks, computers, projectors, tables, chairs, etc.			
Which method do you use in teaching mathematics?			
Lecture			
Discussion			
Individual			
Other			
There is serenity in the school that is peaceful environment for teaching and learning and space for play and out of class work			
Assess and monitor achievement of pupils and their progress in class and out of class			
Have sufficient adequate teaching and learning materials			
Use teaching and learning materials when teaching mathematics			
There is enough motivation in order to teach the subject with free mind			
The community and the pupils' families give enough support to both pupils and teachers			
Community members visit the school regularly to monitor their wards' progress			
There are sufficient and adequate mathematics books for learners			
Periods for mathematics are enough in order to finish the syllabus at the end of the academic year			
The socio-cultural activities of the community affects teaching and learning in the school			
The socio-economic factors of pupils' parents (work schedule, income, educational level, etc) affects teaching and learning of mathematics in the school			

APPENDIX B

Interview Questions for parents or guardians

- Do you think formal education is very important for everybody?
- Is your income sufficient enough to cater for your wards basic school needs such as school uniforms, sandals, exercise books, textbooks, pens, etc?
- How often do you visit your wards' school to verify his or her academic performance?
- Do you assist your ward to study at home?
- Are you able to provide your ward necessary basic needs such as table, chair, lighting, textbook, writing materials, exercise books etc to enable him or her to study at home?
- Do you think homework is relevant to learning?
- How do you take care of your ward extra studies at home?
- In what ways did your ward assist you in your work at home?
- How importance is your ward's education to you?
- Do you always attend Parent Teacher Association (PTA) meetings?

APPENDIX C

Questionnaire for Pupils

PLEASE TICK [√] ANSWER THAT REFLECTS YOUR OPINION

	Stronglya gree	Agree	Undecided	Disagree	Stronglyd isagree
Teacher uses teaching and learning materials whenever he or she teaches					
Teacher listen to pupils' opinion during mathematics lessons					
We learn mathematics in free, fearless and congenial atmosphere in the school					
Teacher uses mathematics textbook supplied by the government					
I have mathematics textbook myself					
My parents or guardians are literate and help me in my studies at home					
I learn mathematics at home					
I have enough materials in other to learn mathematics at home					
I find learning mathematics difficult					
I always need assistant before I can learn mathematics					
My mathematics teacher always assist me whenever I am in difficulty					
I enjoy learning mathematics					
I see mathematics as an important subject that could help me in my daily activities					
Which of these methods your mathematics teacher use when teaching the subject Lecture Discussion Individual Other					
I am motivated in order to learn mathematics at school and at home					

APPENDIX D

LETTER TO THE DISTRICT DIRECTOR TO SEEK APPROVAL

Dodi – Mempeasem E. P. SchoolsP. O.

Box 120

Kadjebi16th March, 2013.

Dear Sir,

Seeking Approval for a Research in Junior High Schools

In the Kadjebi District

I, AgbanyoSelorm, staff of above named school, studying M. Phil in University of Education, Winneba wish to conduct a research in some of the Junior High Schools in the district. The area of my study is mathematics and therefore the topic is 'trends in mathematics performance at Basic Education Certificate Examination (BECE) in the Kadjebi District of the Volta Region.

The rational for the research is to find out whether mathematics performance at basic level is encouraging or falling. If it is improving, what can be done to improve upon it the more and if there is falling standard, what are the factors and solutions for the problem.

I would be very grateful if my request is granted.

The District Director

Ghana Education Service

Kadjebi

Yours faithfully,

(……)
AgbanyoSelorm