UNIVERSITY OF EDUCATION, WINNEBA

EXPLORING UPPER PRIMARY AND JUNIOR HIGH SCHOOL MATHEMATICS TEACHERS' PERCEPTIONS AND PRACTICES OF CLASSROOM ASSESSMENT IN THE GOMOA EAST DISTRICT OF GHANA

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OCTOBER, 2015

DECLARATION

Candidate's Declaration

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

CYRIL ABABIO TITTY DATE:

…… ……

Supervisor's Declaration

This dissertation has been read and approved as meeting the requirements of the school of research and graduate studies, University of Education, Winneba.

M. J. NABIE (PhD) DATE:

…… ……

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DEDICATION

This thesis is dedicated to my parents Mr. and Mrs. Titty and my beloved siblings and the entire family for their physical and spiritually support.

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ABSTRACT

The study sought to explore Upper Primary and Junior High School mathematics teachers' perceptions and practices of classroom assessment in the Gomoa East District in the Central Region of Ghana. A mixed method sequential explanatory study was undertaken using Mohamad's (2009) conceptual framework (Classroom Assessment Process). A survey was first conducted using the Classroom Assessment Conception Instrument to gather quantitative data on the respondents (n = 289). Quantitative data were analyzed using descriptive statistics, independent-sample t-test and Pearson product-moment correlation. Statistical analysis was conducted with the help of Statistical Package for Social Sciences. In the follow-up qualitative phase, semi-structured interview and observational check-list (Classroom Assessment Lesson Observation Protocol) exploring teachers' perceptions and practices of assessment were undertaken with 10 and 4 participants respectively. The data from the interview was subjected to interpretive thematic analysis while data from the classroom observation was subjected to content analysis. The findings revealed that, the teachers perceived assessment as test or exercise. Results showed that the planning, designing and implementing stages of assessment were perceived as serving summative purposes while the reporting stage was perceived as serving formative purposes. The respondents had a split view on the marking of assessment. The results further indicated that, the teachers' perceptions and practices of assessment were related. The findings also showed that teachers had limited ability to use alternative assessment tools. Finally, assessment practices were mostly administered at the end of the lesson. Organizing in-service training, mentoring program and providing assessment materials were suggested as ways of developing desirable classroom assessment perceptions among the teachers.

CHAPTER ONE

INTRODUCTION

1.1 Overview

This chapter discusses the background to the study, statement of the problem, purpose of the study, research objectives, research questions, significance of the study, the delimitations and limitations of the study as well as the organization of the study.

1.2 Background to the Study

Mathematics has been described as the mother of all the sciences and the language of nature (Gauhar, 2005; Kumar, 2012; Marcus & Davis, 2013). The application of its findings transcends all other fields like Physics, Cryptography, Chemistry, Economics, Neurology, Geography, among others. Almost everything we do in our daily life has something to do with mathematics. For example, shopping involves not only the knowledge of addition and subtraction, but also the ability to estimate and understand percentages. Additionally, ordering furniture to our houses demands an amount of pre-measurement skills. This has made mathematics an important and a major part of human endeavor. The demand for mathematics has increased in the 21st century. According to Ontario Ministry of Education (2007) and Ministry of Education (Ghana) [MOE] (2012), mathematics has the potential of developing in students, critical and logical thinking, creativity and problem solving skills. A more compelling demand for the subject in recent time emanates from the fact that the world is running into a more complex scientific evolution which demands people with more advanced skills in mathematics. The benefits inherent in educating people mathematically, has earned the subject an important place in school curriculum throughout the world.

In order to understand and appreciate what mathematics students know or do not know, educators need to assess. It is generally accepted that, classroom assessment is the first and most important part of the teaching and learning process. It includes not only measurement, but also feedback, reflection, observation, planning among others. The National Council of Teachers of Mathematics [NCTM] (2000) regard assessment as a tool for learning mathematics. The NCTM contends that effective mathematics teaching requires understanding what students know and need to know. Classroom assessment therefore plays an important role as it is essential for generating information for making decisions. It also serves many purposes for teachers such as: grading, identifying students with special learning needs, motivating students, clarifying of students' achievement expectations, and monitoring instructional effectiveness (Ohlsen, 2007). As tools for students' learning, Shepard (2008) is of the view that classroom assessments must be transformed in two ways, "first, the content and character of assessments must be significantly improved, and second, the gathering and use of assessment information and insights must become part of an ongoing learning process" (p. 5).

Over the years, it has become clear that, the purpose of classroom assessment is not only for producing data for decision making, but also to foster and promote learning among students. In this regard, if properly administered on frequent basis, assessment has the potential of helping students to refine and deepen their understanding of what they learn in the mathematics classroom. Classroom assessments are also important for conveying expectations that can motivate students' learning. It can further affect student's study patterns, self-perceptions, attitudes and efforts. The more assessment data we have about students, the clearer the picture we have about their achievement and

learning challenges. According to Stiggins (2005), there is a need to pay attention to how classroom assessment is used. Failure to do this may lead to inaccurate assessment of students' achievement that may ultimately prevent students from reaching their full academic potentials.

The attention paid by educators and researchers has yielded some result. For example, most research studies in both education and cognitive psychology have reported weaknesses in the way mathematics is taught (Susuwele-Banda, 2005; Vance & Bezuk, 2001; Sheffield & Cruikshank, 2000). The most serious weakness is the psychological assumption about how mathematics is learned, which is based on the "stimulus-response" theory (Cathcart, Pothier, Vance & Bezuk, 2001; Sheffield & Cruikshank, 2000). The "stimulus-response" theory states that learning occurs when a "bond" is established between some stimulus and a person's response to it (Cathcart, Pothier, Vance & Bezuk, 2001). Cathcart et al. (2001) went further to say that, in the above scenario, drill becomes a major component in the instructional process because the more often a correct response is made to stimulus the more established the bond becomes. Under this theory children are given lengthy and often complex problems, particularly computations with the belief that the exercises will strengthen the mind. It is however imperative that schools and teachers realize that great philosophers, psychologists, scientists, mathematicians and many others created knowledge through investigation and experimentation (Baroody & Coslick, 1998; Phillips, 2000). These experts understood cause and effect through curiosity and investigation. They were free to study nature and phenomenon, as they existed in their natural setting. Today, learning mathematics seems to suggest repeating

operations that were already done by other people and examinations that seek to fulfill the same pattern (Brooks & Brooks, 1999).

The constructivist view is different from the position expressed above and, therefore, calls for different teaching approaches have been made in literature (Cathcart, et al., 2001; Susuwele-Banda, 2005). The constructivist view takes the position that children construct their own understanding of mathematical ideas by means of mental activities or through interaction with the physical world (Cathcart, et al., 2001). The assertion that children should construct their own mathematical knowledge is not to suggest that mathematics teachers should sit back and wait for this to happen. Rather, teachers must create the learning environment for students and then actively monitor the students through various classroom assessment methods as they engage in an investigation. The other role of the teacher should be to provide the students with experiences that will enable them to establish links and relationships. Teachers can only do this if they are able to monitor the learning process and are able to know what sort of support the learners need at a particular point.

It is important that classroom mathematics teachers adopt the constructivist approach to assessment because classroom assessment is not the only tool and method used by educators for collecting meaningful data on students' achievements and progress. In Ghana, assessment tools such as Basic Education Certificate Examination (BECE), National Education Assessment (NEA), Early Grade Mathematics Assessment (EGMA) and Trends in International Mathematics and Science Study (TIMSS) are also used for collecting information on schools' and learners' achievements, progress, and weakness. These assessments are referred to as external examination (Tamakloe, Amedahe & Atta,

2005) and are terminal and summative in nature. These external examination tools are mostly the means through which educators make important educational decisions such as students' graduations, selections, placements and school and curriculum appraisals. The use of these external examinations in our Basic Schools can yield useful information and benefits. For example, external examination can provide useful analytical information on the strengths and weakness of both students and teachers. External examination results may also complement everyday classroom assessment results. External testing results can help alleviate society's fears about the quality of education provided at the basic education level.

According to Matinez, Stecher and Borko (2009), previous research has often found substantial positive correlation between classroom assessment and standardized or external examination. This suggests that if teachers are able to assess students based on the purpose and principles of classroom assessment as proposed by constructivist theory, students are more likely to perform well on their external examination. However, if teachers are unable to identify the purposes and follow the principles of classroom assessment, students are most likely to fail in their external examinations. Therefore, it is in the interest of teachers to practice classroom assessment based on its purposes and principles.

In recent times, there has been a general concern among the measurement community in Ghana about the poor performance of students on their external examination results. Stakeholders are therefore trying to put in mechanisms that will help teachers incorporate classroom assessments practices that will promote students' critical and logical thinking, creativity, problem solving skills and academic performance.

Educational researchers have identified a range of activities which are regarded as the core components of classroom assessment practices. They have also identified some tools and methods that have the potential of promoting classroom learning. The activities and tools identified generally range from informal observation to examinations conducted by the classroom teacher (Mohamad, 2009) and include paper and pen test, test revision, grading and communication of assessment results, among others. The identified assessment processes are aimed at improving teachers' classroom assessment practices.

In Ghana, mathematics curriculum for Basic Schools (Primary and Junior High School [JHS]) has been delineated into cognitive, affective and the psycho-motor domains from which teachers are to develop assessment tools. The assessment practices of mathematics teachers are expected to be reliable and valid in order to inform instructional decisions and provide feedback to students, parents and educational authorities to enable them make informed policy decisions. Consequently, the mathematics syllabus recommends that, "teachers should avoid carrying out only tests which focus on a narrow range of skills (or profile dimensions) such as the correct application of standard algorithms (procedures)…[because] children tend to learn in that way" MOE (2012, p. xi). The measurement community in Ghana has also developed professional courses in teacher education institutions which are geared towards enhancing the capacities of teachers for better classroom assessment practices. The courses range from Measurement and Evaluation, Assessment, Trends in Education, among others. Classroom teachers can access these courses by enrolling on teacher education programs, in-service training programs and so on. The ultimate goal of these courses is to move the modern day teacher away from using classroom assessment as an end in its self (where

the schools rank students and either announce their performance publicly or send their reports to parents and guardians for them to see their wards' progress) to a place where assessment is used as a means to improve students' learning in the classroom continuously (Mohamad, 2009).

In reality however, it appears that Basic School mathematics teachers' classroom assessment practices have remained unchanged for the past years. A review of literature (Anamuah-Mensah & Mereku, 2005; Nenty, Adedoyin, Odili & Major, 2007) indicates that some teachers spend most classroom instructional time asking low-level cognitive questions when assessing their pupils. These questions, according to Nenty, Adedoyin, Odili and Major (2007), "concentrate on factual information that can be memorized" (p. 75). Low-level questions are believed to limit pupils' critical thinking abilities as they do not help them to acquire a deep, elaborate understanding of the subject matter. These kinds of practices are a reflections of the behaviourist theory. Studies have therefore for proposed that teachers adopts the constructivist view of teaching and learning. The main hypothesis of constructivism is that knowledge is not passively received from an outside source but is actively constructed by the individual learner (Brooks and Brooks, 1999; von Glasersfeld, 1995). Within this hypothesis lies the crucial role of the teacher. Today many psychologists and educators believe that children construct their own knowledge as they interact with their environment (Brooks and Brooks, 1999; Cathcart, et al., 2001; von Glasersfeld, 1995). Unfortunately, classrooms do not seem to reflect this thinking. Some teachers still continue to teach in the way perhaps they themselves were taught because human beings naturally look back and claim that the past offered the best. McMillan (2003) reveals that, teachers struggle to improve their assessment practices,

mainly because the whole process is characterized by the tension between their beliefs about assessments and the values of curriculum innovation.

Researchers have attempted to investigate teachers' perceptions of assessment in many different ways (Susuwele-Banda, 2005; Chester & Quilter, 1998). Chester and Quilter believed that studying teachers' perceptions of assessment is important in the sense that it provides an indication of how different forms of assessment are being used or misused and what could be done to improve the situation. More critical also is the fact that perceptions affect behavior (Atweh, Bleicker & Cooper, 1998; Susuwele-Banda, 2005; Cillessen & Lafontana, 2002). It can therefore be deduced that teachers' assessment practices may be influenced by their beliefs and perceptions about assessment. The set of beliefs and perceptions that teachers have constructed as a result of their classroom experiences, both as student and as teacher, have over the years served as a lens through which they view assessment practices (Susuwele-Banda, 2005). This lens can facilitate or hinder teachers' efforts in the classroom. Some teachers on the other hand continue to teach in the way perhaps they themselves were taught because human beings naturally look back and claim that the past offered the best.

Ghana has realized the need to support mathematics teachers to assess students better. But without understanding of what exactly happens in the classroom and what perceptions teachers have, all support programs, systems and efforts may not adequately equip basic school teachers to assess better in the 21st century mathematics classroom.

1.3 Statement of the Problem

Classroom assessment, in the 21st century, has become more useful than a tool which aims at measuring students' achievement for promotion, placement and certification. Today, classroom assessment has become one of the most important tools for promoting critical and logical thinking and problem solving skills in students. The educational community in Ghana has recognized this role and has made recommendations for classroom assessment practices. These recommendations are documented in educational journals and curriculum materials. Students' academic performances will improve if mathematics teachers are able to comprehend and implement the recommended strategies in their classroom assessment practices.

In spite of the mechanisms put in place to help basic school mathematics teachers assess better, studies (Anamuah-Mensah & Mereku, 2005; Kassim, 2013, NEA, 2015; Fletcher, 2016) have shown that students' academic performance in mathematics keeps falling. The poor academic performance, Anamuah-Mensah and Mereku (2005) noted, is largely a reflection of the nature of school assessment system students have experienced in their classroom. For example Anamuah-Mensah, Mereku, and Asabere-Ameyaw (2004) postulated that, analyses of the students' performance on the TIMSS mathematics test items show that the few (about 15%) items for which most students were able to answer correctly were those that were testing knowledge of facts and procedures. The students however, performed poorly on items that tested their ability to use concepts, solve non-routine problems and reason mathematically. Mereku (2012), advanced that a large proportion of prospective teachers lack basic knowledge and skills in assessment. This suggest that when these teachers graduate and are practicing in the classroom, they

may design assessment instruments that elicit responses in the lowest cognitive domain (knowledge of facts and procedures). Consequently, students are then unable to cope with the high order cognitive domain (using concepts, solving routine problems and reasoning) questions required for acceptable international standards (external examination). The question to ask then is, is there an assessment culture that has been so deeply rooted within mathematics tradition of teaching and learning that is hampering the assessment practice to be reformed? Could it be that Upper Primary and Junior High School mathematics teachers' perceptions are having effects on their classroom assessment practices? Answers to these questions necessitated the current study. It is therefore vital to explore mathematics teachers' assessment practices, perceptions and their experiences in their attempt to use various assessment tools to evaluate students' learning outcomes. Importantly, we need to understand teachers' thought processes as they develop and use assessment methods, grade students' work and interpret assessment results. Teachers' assessment practices are an essential element for addressing students' learning needs, and they can ultimately improve the education system and accountability. Understanding teachers' assessment practices serves as a way of finding out if teachers adopt or use quality assessment methods to meet the learning needs of students (McMillan, 2008). Therefore, the study was designed to explore Gomoa East District Upper Primary and Junior High School mathematics teachers' perceptions and practices of classroom assessment.

1.4 Purpose of the Study

Teachers' perceptions of assessment in the mathematics classroom may influence the way they assess their students, which may influence the way their students perform

during external examinations. It can also effect students' study patterns, self-perceptions, attitudes, effort, and motivation to learn. The purpose of the study therefore was to explore Basic School mathematics teachers' perceptions and practices of classroom assessment. Specifically, the study sought to explore Upper Primary and Junior High School mathematics teachers' perceptions and practices of classroom assessment in the Gomoa East District in the Central Region of Ghana. It further sought to gain an in-depth understanding of the methods and tools teachers use to assess their students in the mathematics classroom.

1.5 Objectives

The study was designed to achieve the following objectives:

i) To explore Upper Primary and Junior High School mathematics teachers' perceptions of classroom assessment in the Gomoa East District.

ii) To identify differences that might exist between Upper Primary and Junior High School mathematics teachers' perceptions of classroom assessment

iii) To identify Upper Primary and Junior High School mathematics teachers' tools and methods used in assessing learners in the Gomoa East District.

iv) To establish, if any, the relationship that exist between Gomoa East District mathematics teachers' perceptions and practices of classroom assessment.

v) To explore how Gomoa East District mathematics teachers practice classroom assessment.

1.6 Research Questions

In order to achieve the purpose and the objectives of the study, the following research questions were framed to guide the study:

1) What are Upper Primary and Junior High School mathematics teachers' perceptions of classroom assessment in the Gomoa East District?

2) To what extent do Upper Primary mathematics teachers' perceptions of classroom assessment differ from that of their counterparts in the Junior High School mathematics classroom?

3) What assessment methods and tools do Upper Primary and Junior High School mathematics teachers use in assessing learners in the Gomoa East District?

4) To what extent do Upper Primary and Junior High School mathematics teachers' perceptions of classroom assessment relate to their current assessment practices?

5) How do Gomoa East District Basic School mathematics teachers practice assessment in the mathematics classroom?

1.7 Significance of the Study

The study investigated teachers' perceptions and practices of classroom assessments in the Gomoa East District in the Central Region of Ghana. The finding of the study may provide valuable insight for Primary and Junior High School teachers on their assessment practices which may in turn help them improve their classroom assessment practices. Basic school authorities may use the information from the study to

develop better assessment guidelines for classroom teachers. The findings of this study may help Ghana Education Service in organizing professional development courses and in-service training programs for teachers in the mathematics classroom based on the knowledge of what they are already doing or not doing right in relation to classroom assessment. Jere (2012) recommends training classroom teachers in how to assess students in order to improve and enhance the quality of primary education. The results of the study can further guide curriculum developers in planning and designing effective assessment for classroom practices. The findings of the study will add to the already existing literature on classroom assessment.

1.8 Delimitations

The study was conducted among Upper Primary and Junior High School mathematics teachers in the Gomoa East District of Central Region of Ghana. Although the region has 20 districts, one district was used for the study in order to include the variables of interest and to reach out to all information-rich respondents. Although, the scope of assessment in the mathematics classroom is evidently wide, the study focused only on mathematics teachers' perception of assessment in the mathematics curriculum, their perceptions of the role of assessment in teaching and learning of mathematics and the methods and tools that teachers use to assess their students.

1.9 Limitations

The study like other research works, falls short of the ideal. Limitation in terms of the design, data collection procedure and data analysis were identified at each stage of this research work. Steps were therefore taken to minimize these limitations. The study

used the multi-stage sampling techniques in order to include most of the variables of interest (gender, years of experience, type of teacher education program, school location and grade level).

Limited resources did prevent a wider coverage of the entire Central Region of Ghana. The study was consequently based on the accessible sample in the Gomoa East District despite the large number (20) of districts in the region. This procedure therefore decreased the generalization of the findings to the entire population (Central Regional mathematics teachers). The codification, organization and classification of the data collected for analysis and discussions were the most demanding in the research design. It was also particularly difficult to sieve all useful responses from the interviews and observations in categories for presentation and analysis. The categories identified in the study were therefore shaped by the researcher's perception, interpretation, and building of meaning of the data collected with guidance from the supervisor. This method of data analysis is not unusual as it remains typical of qualitative study (Patton, 2002).

1.10 Organization of the Study

The study is organized in five chapters. The first chapter, the introduction, includes the background of the study, statement of the problem, purpose of the study, objectives of the study, research questions and significance of the study, delimitations and limitations which set the study in context. Chapter 2 discusses the theoretical framework and the review of relevant literature. Chapter 3 discusses the strategies and design approaches employed in the collection and analysis of data. Chapter 4 presents and discusses the results of the study. Chapter 5 presents summary of the results, recommendations and suggestions for further study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Overview

This chapter provides a comprehensive literature review on the following sub-headings: conceptual framework, the concept of classroom assessment, formative and summative assessment in contention, assessment tools and methods, teachers' perceptions of classroom assessment, classroom teachers' assessment practices, and summary of the chapter.

2.2 Conceptual Framework

A sound and an effective classroom assessment practice must be rooted in a well-researched theoretical or conceptual framework. Authorities in assessment agree that instruction and assessment are cyclical in nature (Gardner, 2006; Nicol, 2007). The cyclical nature of instructions and assessment has interestingly evolved over the past few decades. As such, teachers' classroom assessment practices, in this study, is conceptualized within the framework of Mohamad's (2009) assessment process. He developed the framework from literature with the aim of guiding teachers' assessment practices. The framework emphasized the following cyclical stages or processes of classroom assessment practices: Planning, Designing, Implementing, Marking and Reporting Stage. The cyclical nature of assessment is diagrammatically presented in Figure 2.1

Figure 2.1: Conceptual Framework of Assessment Process

Source: Mohamad (2009)

2.2.1 Planning Stage:

The first stage of the assessment process is the planning stage. According to Mohamad (2009), one of the considerations that teachers need to be aware of at the planning stage is the assessment purpose(s). Thinking about assessment from the perspective of purpose rather than method puts the emphasis on the intended end result. In this light, the purpose of assessment (Assessment *for* learning; Assessment *as* learning; and Assessment *of* learning) are examined as follows:

2.2.1.1 Planning Assessment *of* Learning

According to Leung (2005), China is the first country in the world (A.D. 587) to have introduced examination system as an assessment method for selection purpose. Forms of national examination appeared in Europe in the nineteenth century. Hence, it is not surprising that the traditional purpose of assessment was to serve summative functions. Assessment *of* learning, Earl and Katz (2006) opine is referred to the strategies designed to confirm what students know, demonstrate whether or not they have met curriculum outcomes or the goals of their individualized programs, or to certify

proficiency and make decisions about students' future programs or placements. It is designed with the view of providing evidence of achievement to parents, other educators, the students themselves, and sometimes to outside groups (e.g., employers, other educational institutions) (Earl & Katz, 2006). Assessment *of* learning is the assessment that becomes public and results in statements or symbols about how well students are learning. In Ghana assessment of learning may take the form of the following: end of lesson exercise, periodic test, end of term exams, Basic Education Certificate Examination (BECE), National Education Assessment (NEA), Early Grade Mathematics Assessment (EGMA) and Trends in International Mathematics and Science Study (TIMSS) (Ministry of Education [MOE], 2006). It often contributes to pivotal decisions that will affect students' futures. The consequences of assessment *of* learning are often far-reaching and affect students seriously. It is important, then, that the underlying logic and measurement of assessment *of* learning be credible and defensible.

Teachers have the responsibility of reporting student learning accurately and fairly, based on evidence obtained from a variety of contexts and applications. With the help of their teachers, students can look forward to assessment *of* learning tasks as occasions to show their competence, as well as the depth and breadth of their learning.

The ultimate goal of assessment of learning is to measure, certify, and report the level of students' learning so that reasonable decisions can be made the about students. Assessment *of* learning requires the collection and interpretation of information about students' accomplishments, in ways that represent the nature and complexity of the intended learning. Because genuine learning for understanding is much more than just recognition or recall of facts or algorithms, assessment *of* learning tasks need to enable

students to show the complexity of their understanding. Students need to be able to apply key concepts, knowledge, skills, and attitudes in ways that are authentic and consistent with current thinking in the knowledge domain.

In assessment *of* learning, the methods chosen need to address the intended curriculum outcomes and the continuum of learning that is required to reach the outcomes. The methods must allow all students to show their understanding and produce sufficient information to support credible and defensible statements about the nature and quality of their learning, so that others can use the results in appropriate ways. Assessment *of* learning methods include not only tests and examinations, but also a rich variety of products and demonstrations of learning—portfolios, exhibitions, performances, presentations, simulations, multimedia projects, and a variety of other written, oral, and visual methods.

2.2.1.2 Planning Assessment *for* learning

Assessment process is typically considered cyclical. Literature suggests that formative assessment is also known as assessment for learning (Hargreaves, 2005; Popham, 2008). Assessment *for* learning according Earl and Katz (2006) occurs throughout the learning process. They further argued that assessment *for* learning is designed to make each student's understanding visible, so that teachers can decide what they can do to help students progress. Students learn in individual and idiosyncratic ways, yet, at the same time, there are predictable patterns of connections and preconceptions that some students may experience as they move along the continuum from emergent to proficient. In assessment *for* learning, teachers use assessment as an investigative tool to

find out as much as they can about what their students know and can do, and what confusions, preconceptions, or gaps they might have. The wide variety of information that teachers collect about their students' learning processes provides the basis for determining what they need to do next to move student learning forward (Harris, 2008). It provides the basis for providing descriptive feedback for students and deciding on groupings, instructional strategies, and resources. Formative assessment therefore is the systematic process of continuously gathering evidence about learning (Heritage, 2007). Within these definitions of assessment for learning, Hargreaves (2005) identified implicit conceptions of assessment through the identification of two distinct meanings for assessment: "assessment as measurement" and "assessment as inquiry" (p. 218). The researcher defines measurement as the act or process of determining the amount or extent of each child's learning, which is typically assessed through the use of a test. The second meaning of the word assessment, assessment as inquiry, referenced action verbs such as "reflecting, reviewing, finding out, discovering, diagnosing, learning about, examining, looking at, engaging with, understanding" (Hargreaves, 2005, p. 218). At the conclusion of this investigatory process, a heightened awareness of students as learners, not just performers, is gained. Although the assessment techniques may remain the same in the measurement and inquiry paradigms, the inquiry model underscores not only who and what is being tested, but also the assessor and the inquirer. Teachers need to be capable of using information from prior assessment processes, especially from the reporting stage (Figure 1), as a diagnostic tool, to improve the next cycle of assessment processes at this planning stage

2.2.1.3 Planning Assessment *as* Learning

The final (and new) stage of classroom assessment is planning Assessment *as* learning. Earl and Katz (2006) described assessment *as* learning based on how learning happens, and characterized by students reflecting on their own learning and making adjustments for deeper understanding. They argued that assessment *as* learning focuses on students' metacognition (knowledge of one's own thought processes). Assessment *as* learning, according to Callingham (2010) is an informal assessment undertaken as part of the teacher's 'normal' activity. It often involves a teacher recognizing a 'teachable moment' and acting on it. Assessment *as* learning emerges from the idea that learning is not just a matter of transferring ideas from someone who is knowledgeable to someone who is not, but is an active process of cognitive restructuring that occurs when individuals interact with their ideas (Afflerbach, 2002). Within this view of learning, students are the critical connectors between assessment and learning.

For students to be actively engaged in creating their own understanding, they must learn to be critical assessors who make sense of information, relate it to prior knowledge, and use it for new learning. This is the regulatory process in metacognition. Students become adept at personally monitoring what they are learning, and use what they discover from the monitoring to make adjustments, adaptations, and even major changes in their thinking. Classroom assessment, both assessment *for* and *as* learning, relies on dialogue between the child and the teacher (Callingham, 2008). The ultimate goal in assessment *as* learning is for students to acquire the skills and the habits of mind to be metacognitively aware with increasing independence. Assessment *as* learning focuses on the explicit fostering of students' capacity over time to be their own best

assessors, however, teachers need to start by presenting and modeling external, structured opportunities for students to assess themselves. Assessment *as* learning is based on the conviction that students are capable of becoming adaptable, flexible, and independent in their learning and decision-making. Teachers must plan assessment as learning to involve students and promote their independence. By so doing, they are giving them the tools to undertake their own learning wisely and well.

2.2.2 Designing Stage

Some researchers in assessment argue that the level at which teachers design, develop, embed, and implement classroom assessment practices is not clearly articulated (Koloi-Keaikitse, 2012). For this reason, Mohamad (2009) outlined the two main dimensions that are encompassed in the designing stage. According to him the first is, criteria and standards, and the second is, contents of assessment. In discussing both of these dimensions, the former relates to communication between teacher and their students, while the later concerns the quality of assessment design.

Ayala, Shavelson, Ruiz-Primo, Brandon, Furtak, Young, and Tomita (2008) outlined five critical activities that teachers can adopt as they design, develop, embed, and implement classroom assessment practices. These include: (1) Mapping and experiencing the curricular unit in which the classroom assessments will to be embedded, (2) Determining the unit goal to be assessed, (3) Determining the critical points where the assessments should be embedded, (4) Defining the assessment development guidelines, and (5) Developing the assessments. Stiggins (2009) identified effective planning activities that teachers can use from to improve their assessment practices. Teachers can

use a table of specification, a two-way table that matches the objectives or content teachers taught with the level at which they expect students to perform. The table will contain an estimate of the percentage of the test to be allocated to each topic at each level at which it is to be measured. The other activities includes teachers relying on a list of instructional objectives to guide their test construction process, and matching the instructional objectives with assessment tasks (tests, assignments, projects).

These activities are essential for planning assessment tasks. However, the single most important test planning and construction process that teachers must understand is how to design appropriate learning objectives or learning outcomes, which specify what the teachers want students to know or be able to do at the end of the course or at the end of a unit, topic, term, or a class activity. Everything that goes on the course including instructional methods used, assessment methods used (tests, assignments, projects) are driven by learning objectives. For this reason, teachers must have a good understanding of how to construct specific, measurable, attainable, realistic, and student-centered instructional objectives (Gronlund & Waugh, 2009; Reynolds, Livingston, & Willson, 2009). Teachers' effective assessment design sets the stage for implementing assessment

2.2.3 Implementing Stage

After classroom teachers have planned and designed their assessments, they are expected to implement the instrument in the classroom. The assessment instrument is expected to help students develop "problem-solving strategies; to identify conceptual similarities in different situations; to assess the relevance of different procedures to applied contexts; and to work productively with others, coordinating individual efforts to

achieve a group goal" (Clarke, 1996, as cited in Mohamad, 2009, p. 382). Based on Clarke's description, varied forms of assessment methods necessarily need to be implemented in the new assessment culture. It has been argued that traditional tests alone, typically containing multiple choice items, short and medium answer problem, has a limited capacity to inculcate and assess the above criteria of being mathematically successful students (McMillan, 2001; Volante, 2004). Yet, studies (Firestone, Winter, & Fitz, 2000; Watt, 2005) shown that mathematics teachers often rely more heavily, or exclusively, on the written approaches, typically via testing.

In traditional assessment practice, the convention is that teachers are invigilators at the implementation stage of assessment, while students sit quietly responding to written questions or tasks individually. However, in recent years, literature has advocated assessment practice, especially when alternative assessment methods are used, that there is a change in the role of teacher-student and student-student. For example, oral assessment approach, such as project presentation or group work, necessitates dialogues during the implementation. Clarke (1996) claims that meaningful dialogue encourage reflection on learning which simultaneously recognises students' contributions as valuable. An extensive study on small-group discussions in mathematics classrooms (of over 1000 high school students) was conducted by Fiori (2015) found that "student discussions frequently emulate discussions among professional mathematicians, thus creating authentic engagement experiences for the students" (p. 7). Such group discussions can be used to assess students' understanding and can at least serve formative purposes (Stiggins, 2007).

In short, there are two most significant changes in the classroom assessment culture during the implementation stage. First, the new assessment culture recognises the various assessment methods that can, and should, be implemented as opposed to conducting traditional testing alone (e.g., Clarke, Goos, & Morony, 2007). However, it is not about implementing more assessments or tests, rather it is about varying the assessment techniques (Watt, 2005). Second, the implementation of various assessment strategies suggests modified roles for teachers and students. Assessments are no longer presented as the teacher's prerogative and students' active participation at this stage of assessment are expected (Department of Education and Early Childhood Development, 2006b).

2.2.4 Marking Stage

At the stage of marking, teachers must first decide the purpose grades will serve even before they choose the grading schemes and the grading must also be based on a defined plan. Such a grading schemes and plans must meet the needs of both the teacher and the student (Hammons & Barnsley, 1992). One way of meeting the needs of both students and teachers at the marking stage, is the change in role for teachers and students. In the past, typically teachers did the marking of tests (Earl, 2003) and eventually provided the students with their grades. The traditional view of a teacher as the expert of the subject matter justifies the unidirectional practice of teacher-as-assessor. Hence, Natriello (1987) as cited in Mohamad (2009), proposed that instead of teachers directly marking the work, they could sample some students work and appraise their performance

based on the pre-determined criteria and standards. The collected samples can become valuable exemplars for analysis.

In the traditional assessment culture, students are generally not expected to participate in the marking process. In fact, this stage is generally considered and alien to the students. However, in the new assessment culture, students have two major roles during the marking stage. They become peer-assessors and self-assessors of their learning process (Elwood & Klenowski, 2002). According to Stiggins (2002), students engaged in regular self-assessment during the marking stage of assessment, with criteria and standards held constant, will be able to watch their progress over time, and thus feel in charge of their own success.

At the same time, an awareness to the positive and negative kinds of feedback is also crucial. In his review, Wiliam (2007) discusses some issues with respect to feedback by providing examples of positive and negative impact of feedback. For instance, the positive effect of feedback is when it is used to encourage students to be engaged in meaningful activity which can be profound in their learning. Meanwhile, an example of the negative effect of feedback can occur when there is miscommunication, such as when there is the existence of inconsistencies between students' and teachers' use and understanding of mathematics notations (Wiliam, 2007).

The above description depicts the view of new mathematics assessment culture. Both teachers and students are expected to take an active role to mark, analyze, and reflect on the assessment to improve teaching and learning process. Marking stage is no longer limited as teachers' prerogative especially when assessment is meant to serve formative purposes. Thus, in order for assessment to serve formative purposes, it is

necessary for students and teachers to provide and receive feedback (Elwood & Klenowski, 2002).

2.2.5 Reporting Stage

Assessment entails a broad spectrum of activities that includes collection of information for decision making. The responsibility of teachers is to collect information through various assessment methods that can be used to make informed decisions about students' learning progress. Zhang and Burry-Stock (2003) argued that to be able to communicate assessment results more effectively, teachers must possess a clear understanding about the limitations and strengths of various assessment methods. Teachers must also use proper terminology as they use assessment results to inform other people about the decisions about student learning. Stiggings (2004) echoed the same sentiments by arguing that in the past, schools were designed to use assessment results to sort students from the lowest to the highest achievers. When assessment information was used this way, many students did not perform well and had a sense of hopelessness in learning.

"As teachers diagnose student needs, design and implement instructional interventions, evaluate student work, and assign grades, they need continuous access to evidence of student learning arising from high-quality classroom assessment practices" (Stiggings, 2004, pp. 25-26). Teachers depend on the classroom assessment information to improve their instructional methods, and as such, that information plays an important role in student learning. It is apparent that teachers should be competent in the collection, analysis and use of assessment information.

The new culture of assessment practice also encourages students' involvement in interpreting and communicating with their teacher and their families about their achievement status and improvement (Stiggins, 2002). Students' engagement in reporting their own achievement allows them to monitor their own learning progress, through using tools such as 'developmental achievement maps' (Griffin, 1990) which can be utilised as a guide for teachers and students to seek ways to enhance the teaching and learning process. This claim is backed by literature (e.g., Clarke, 1996; Earl, 2003), and acknowledged by educational authorities and professional bodies (e.g., AAMT, 2002; DEECD, 2006b).

The five stages in assessment process: planning, designing, implementing, marking and reporting the assessment results used as concept frame the study. When teachers are therefore prepared to harness all possible pedagogical strategies of assessment and make use of them in the classroom it is likely to improve the teaching and learning of mathematics in the classroom.

2.3 The Concept of Assessment

In order to understand what students know or do not know educators need to assess. It has been estimated that teachers spend up to 50 percent of their instructional time on assessment-related activities (Stiggins, as cited in Calveric, 2010). The measurement community describes assessment as a concept that keeps evolving with many definition.

Assessment according to Harlen, Gipps, Broadfoot and Nuttal (as cited in Teach, 2010) is the process of gathering, interpreting, recording, and using information about

pupils' responses to an educational task. According to Reynolds, Livingstone, and Wilson (2009) described assessment as a systematic process for collecting information that can be used to make inferences about characteristics of people or objects. In the view of Marriot and Lau (2008) assessment is not just about collecting data, but is also a processes used to appraise students' knowledge, understanding, abilities or skills and it is inextricably linked to a course or program's intended learning outcomes. Assessment also can be defined as the process of collecting and interpreting evidence of student progress to inform reasoned judgments about what a student or group of students knows relative to the identified learning goals (National Research Council [NRC], 2010). Furthermore, assessment according Tamakloe, Amedahe and Atta (2005), "occurs when one person, through some kind of interaction with another, obtains and interprets information about the other person in terms of his knowledge and understanding or abilities or attitudes" (p. 176). Tamakloe, Amedahe and Atta further point out that as teachers attempt to know their pupils/students in various ways by gathering and interpreting information on them, they are assessing them. From the above, the definition of assessment can be summarized as the systematic collection, review, and use of information about educational programs undertaken for the purpose of improving student learning and development. Assessment is a powerful and strong process that can optimize or inhibit learning, depending on how it is implemented. This is why assessment, teaching and learning are said to be inextricably linked, as each informs the others.

The major argument for assessment can be viewed from five main dimensions: (1) *Why assess*? Deciding why assessment is to be carried out and what outcomes the assessment is expected to produce. (2) *What to assess?* Deciding, realizing or otherwise

coming to an awareness of what one is looking for in people being assessed. (3) *How to assess*? Selecting from among available means, those assessments we regard as being most truthful and fair for various sorts of valued knowledge. (4) *How to interpret*? Making sense of the outcomes of the observations or measurement or impressions we gather through whatever means we employ; explaining, appreciating, and attaching meaning to the raw 'events' of assessments. (5) *How to respond*? Finding appropriate ways of expressing our response to whatever has been assessed and communicating it to those concerned (Rowntree, 1977)

2.4 Formative and Summative Assessments in Contention

Over the years, the measurement community has awakened to strives that has ensued between formative assessment (assessment *for* learning) and summative assessment (assessment *of* learning). Taras (2008) confirms the tension between these two purpose assessments when he posits that "assessment vies with learning for supremacy at the heart of the educational experience" (p. 172). This is seen in the tension between formative and summative assessment functions, that is, assessment to support learning and assessment for validation and accreditation, although these are not separate or fixed paradigms (Wiliam & Black, 1996). Delineated concisely in Rudner and Schafer (2002), McMillan (2001) presents eleven fundamental principles to guide the assessment training of both teachers and administrators in light of current assessment demands and contemporary theories of learning and motivation. The third of such principles as in Rudner and Schafer (2002) is that "assessment decision-making is influenced by a series of tensions" (p. 7). Explaining this particular principle, it is contended in Rudner and

Schafer (2002) that competing purposes, uses, and pressures result in tension for teachers and administrators as they take assessment-related decisions. For instance, good teaching is characterized by assessments that motivate and engage students in ways that are in consonance with their philosophies of teaching and learning and with theories of development, learning and motivation. Ayala, Shavelson, Ruiz-Primo, Brandon, Furtak, Young, and Tomita (2008) also agree that tensions arise between the formative and summative functions in evidence elicited, interpretation of evidence, and actions taken.

A good number of teachers want to use constructed-response assessments due to their belief that this kind of assessment is the best to ascertain student understanding. However, factors external to the classroom, such as mandated large-scale testing, promote different assessment strategies, such as selected-response tests and objective test-taking (McMillan & Nash, 2000; Rudner & Schafer, 2002). Black and Wiliam (1998) assert that summative assessment has increasingly been used to sum up learning. Similarly, Harlen (2006) opines that summative assessment: looks at past achievements, adds procedures or tests to existing work, involves only marking and feedback grades to student, is separated from teaching and is carried out at intervals when achievement has to be summarized and reported. Formative assessment on the contrary often means no more than that the assessment carried out frequently and is planned at the same time as teaching (Black & Wiliam, 1998); provides feedback that leads to students recognizing the (learning) gap and closing it and it is forward looking (Harlen, 2005); it includes both feedback and self-monitoring (Shavelson, Black, Wiliam, & Coffey, 2003) and it is essentially used to feed the teaching and learning process (Teach, 2010). In considering evidence, Shepard (2003) noted that, issues of reliability and validity are paramount in

the summative function on the grounds that, typically, a "snapshot" of the breadth of students' achievement is sought at one point in time. The forms of assessment used to elicit evidence are likely to vary from summative to formative. Shavelson, Black, Wiliam, and Coffey (2003) argued that in summative assessment, typical "objective" or "essay" tests are given on a particular occasion.

With formative assessment however, students' real-time responses are given to one another in group work, to a teacher's question, to the activity they are engaged in or to a curriculum-embedded test. The summative and formative functions vary in the reliability and validity of the scores produced. In summative assessment, each form of a test needs to be internally consistent (for example, the CA conducted) and scores from these forms need to be consistent from one rater to the next or from one form to the next. Items on tests have to be a representative sample of the broad knowledge domain defined by the curriculum syllabus/standards. Contrary to this, as formative assessment is iterative or cyclical, issues of reliability and validity are resolved over time. Finally, the same test question might be used for both summative and formative assessment but, interpretation and practical uses will probably differ (Shavelson, Black, Wiliam, & Coffey, 2003).

The potential conflict between summative and formative assessment as Shavelson et al. (2003) noted can also be seen in the interpretation of evidence. The summative function typically requires a norm-referenced or cohort-referenced interpretation where students' scores come to have meaning in respect of their standing (rank) among peers. Such comparisons typically combine complex performances into a single number and put the performance of individuals into some kind of rank order. A norm- or cohort-

referenced interpretation would indicate how much better an individual needs to do, highlighting the existence of a gap, rather than giving and indicating how that improvement will happen. It tells the individual (the student) that they need to do better rather than telling him or her how to improve as well as how the teacher will necessarily adjust his or her instruction to meet a set target.

Drawing from the formative and summative assessments contentions, it can be concluded that summative assessments can also generate critical information about students' overall learning as well as an indication of the quality of classroom instruction, especially when they are accompanied by other sources of information and are used to inform practice rather than to reward or sanction. But that notwithstanding, Formative assessments according to research (Black & Wiliam, 1998; Leahy, Lyon, Thompson & Wiliam, 2005; Marzano, 2006: Heritage, 2010) are the most instructionally sensitive types of assessment and are considered an ongoing process. Formative assessments are embedded in classroom instructional activities (Pinchok & Brandt, 2009; FCPS, 2012). Marzano (2006) indicates that classroom formative assessment is an effective way to plan and apply instructional interventions to close the gap than summative assessments.

2.5 Assessment Tools and Methods

In the educational setting, assessment can be carried out using different of tools and methods. These methods may produce similar results if not the same. The selection of an assessment method depends on what to assess, how to assess and why assessed. It also rests on the teachers' perceptions and practices of classroom assessment. Choosing assessment strategies and tools require that teachers consider the range of classroom

situations that students will experience. A variety of tools and resources may be used. These may include anecdotal records, check list, rating scales and rubrics, conferences performance assessment among others. A brief write-up is provided on these tools below.

2.5.1 Anecdotal Records

Anecdotal records are systematically kept notes of specific observations of student behaviours, skills, and attitudes in the classroom that provide cumulative information regarding progress, skills acquired, and directions for further instruction (Hattie, 2012). Anecdotal notes are often written as the result of ongoing observations in a lessons but may also be written in response to a product or performance the student has completed. Systematic collection of anecdotal records on a particular student provides excellent information for evaluating the learning patterns and the consistency of the students' progress. Well-kept anecdotal records provide a valuable, practical, and specific references about a student.

2.5.2 Checklists, Rating Scales, and Rubrics

Checklists, rating scales, and rubrics are assessment tools that state specific criteria for teachers and students to make judgments about developing competence. They list specific behaviours, knowledge, skills, attitudes, and strategies for assessment, and offer systematic ways of organizing information about individual students or groups of students (Swaffield, 2008). Checklists usually offer a yes/no format in relation to the specific criteria and may be directed toward observation of an individual, a group, or a whole class. Checklists may be single-use or multiple-use.

Rating scales allow for an indication of the degree or frequency of the behaviours, skills and strategies, or attitudes displayed by the learner. They may be used to gather individual or group information, and are usually single-use. Multiple-use rating scales may be achieved by having students or teacher complete the same rating scale at different times during the school year and making comparisons.

Rubrics are an expanded form of rating scale that list several specific criteria at each level of the scale (Hattie, 2012). They may be used to assess individuals or groups and, as with rating scales, may be compared over time. The quality of information acquired through the use of checklists, rating scales, and rubrics is highly dependent on the quality of the descriptors chosen for assessment. Their benefit is also dependent on students' direct involvement in the assessment and interpretation of the feedback provided.

2.5.3 Conferences

According to Conferences provide opportunities for students and the teacher to discuss learning strengths and areas for improvement, and to set learning goals (Jones, 2002). In conferences, it is possible to learn a great deal about students' understanding of information, attitudes toward learning, and the skills and strategies students employ during the learning process. Conferences provide opportunity for individualized teaching, for guiding students to more challenging materials, and for determining future instructional needs.

Conferences are usually short informal meetings held with individual students, or a small group of students, and involve diagnostic listening, questioning, and responding.

Interviews, on the other hand, are conferences that are conducted to gather specific information. They may involve a set of questions you ask for a specific purpose. For example, you may need information about the student's reading patterns and difficulties and may use a formal conference or interview to ask questions directly related to a particular aspect of the student's performance.

2.5.4 Performance Assessments

Performance assessment is defined as an assessment activity that requires students to construct a response, create a product, or perform a demonstration (Bailey, & Dale, 2010). Since performance assessments generally do not yield a single correct answer or method for solution, evaluations of student products or performances are based on judgements guided by criteria (McTighe & Ferrara 2004). Performance assessments are concerned with how students apply the knowledge, skills, strategies, and attitudes that they have learned to new and authentic tasks. Performance tasks are short activities (generally between one and three class periods) that provide an opportunity for students to demonstrate knowledge, skills, and strategies. They are highly structured and require students to complete specific elements. They may be content-specific or interdisciplinary and relate to real-life application of knowledge, skills, and strategies.

Performance assessment tasks can be organized into three categories: products (such as dioramas, slide shows, reports, videotapes, etc.), performances (such as dramatic readings, interviews, debates, etc.), and processes (such as problem solving, cooperative learning, etc.).

2.5.5 Portfolios

Paulson (2009) defines portfolio as "a purposeful collection of student work that exhibits the student's efforts, progress, and achievements in one or more areas. The collection must include student participation in selecting the contents, the criteria for judging merit, and evidence of student self-reflection" (p. 60). The physical structure of a portfolio refers to the actual arrangement of the work samples and can be organized according to chronology, subject, types of student product, or goal area. The conceptual structure refers to the teacher's goals for student learning. For example, the teacher may have students self-assess a work sample, then self-reflect, and then set a goal for future learning. The work-sample self-assessment and the goal sheet may be added to the portfolio. Students generally choose the work samples to place in the portfolio. The teacher may also choose to have specific work samples placed in the portfolio.

2.5.6 Think-Aloud

Think-Aloud involve asking students to verbalize their thought aloud while engaged in a task (Reeves, 2000). Think-Aloud are an effective instructional strategy, can provide insight into how readers process text, and serve as a very effective assessment strategy for written interpretation and use of strategies.

2.6 Teachers' Perceptions of Classroom Assessment

Researchers have attempted to investigate teachers' perceptions of assessment in many different ways (Chester & Quilter, 1998). Chester and Quilter believed that studying teachers' perceptions of assessment is important in the sense that it provides an indication of how different forms of assessment are being used or misused and what

could be done to improve the situation. More critical also is the fact that perceptions affect behaviour (Cillessen & Lafontana, 2002)

Just as society and education have changed over the years, the study of opinions, conceptions, perceptions, beliefs, and policies regulating assessment pedagogies and practices reveal multiple transformations. This process has made a specific impact upon assessment are teachers' perceptions of assessment (Brown, 2003). Therefore, some researchers have simply concluded that because of the complexity attached to the term "teacher beliefs", it cannot be defined easily (Cantu, 2001). However, it is unclear according to literature whether teachers' beliefs influence instructional behavior (Yates, 2006). Yet Yates, citing a number of studies asserted that, what is clear in scholastic work however is that teacher beliefs are robust, resistant to change, serve as filters for new knowledge, and act as barriers to changes in teaching practices. Furthermore, teachers' beliefs can either facilitate or inhibit curriculum reform (Yates, 2006).

According to Calveric (2010), perception is defined as a framework or mental structure encompassing beliefs through which a teacher views, interprets, and interacts with the instructional environment. Despite a conceptions' individualistic appearance, Van den Berg (2002) determined conceptions to be interrelated and complex reflections of socially and culturally shared phenomena. Additionally, Delandshere and Jones (1999) research depicts a person's conceptions as individual assertions about reality, which the individual believes as truth at that moment. Since these beliefs are developed through people's experiences, researchers conclude that the conceptions are pervasive and will influence the individual's subsequent interactions with the world (Delandshere & Jones, 1999).

It is important to study teachers' perceptions of assessment due to previously cited research documenting the impact educators' perceptions of learning and teaching on instruction and students' achievement (Remesal, 2007; Calveric, 2010). Calveric (2010) studied a sample of 143 elementary to secondary teachers to investigate any potential relations between differences in assessment practices and background characteristics such as gender, grade level, and years of teaching experience. Their quantitative results revealed diversity among teachers' assessment perspectives and practices. Calveric, associated diversity in practice with individual assessment policies that reflected teachers' own individualistic values and beliefs about teaching.

In another study regarding teacher conceptions, Kahn (2001) examined teacher-created assessment materials to determine what conceptions or models of teaching and learning were reflected. Kahn 10th grade English teachers, assessment materials to be an "eclectic mixture of approaches" (p. 284). Further analysis of the data and teacher comments revealed that some materials adopted a constructivist methodology, required students to construct and interpret meaning, while other assessment modalities represented a more traditional process of recalling information. Kahn concluded that teachers' assessment practices were influenced by individual beliefs or conceptions related to what constitutes learning and concerns about "maintaining student attention, cooperation, and classroom control" (p. 286).

In 2003, Brown studied teachers' assessment conceptions' relationship to learning, teaching, curriculum, and teacher efficacy. Results from a survey of 525 New Zealand primary teachers were analyzed and correlation coefficients assisted Brown (2003) with the identification of four main assessment conceptions or beliefs of

assessment: improvement of teaching and learning, certification of students' learning, accountability of schools and teachers and the irrelevance or rejection of assessment (Brown, 2004). It is critical for educators and policy makers to have a sound understanding of these assessment conceptions as research has documented their impact upon teaching and learning (Brown, 2004; Remesal, 2007). Research evidence have outlined the fundamentals associated with the conception of assessment for improvement of learning and teaching (Brown, 2003; Popham, 2008). When learning is viewed as continuous development enhanced by structured and meaningful educational experiences, the resulting assessment selection is more likely for documentation and providing feedback for improvement (Delandhsere & Jones, 1999). Brown (2003) detailed this improvement conception as assessment for learning, with two key indicators; (a) students' achievement or performance depicted through assessment results and (b) reliable and valid data necessary for accurately describing student performance. Under these circumstances, the assessment requires the use of wide-ranging use of varied assessment tools, both formal and informal to succinctly capture students' academic profiles, "with the explicit goal of improving the quality of instruction and student learning" (p. 4).

Brown's (2003) second conception of assessment, certification of students' learning, contends that students are individually accountable for their performance and achievement on assessments. Assessment for the purpose of determining the acquisition of facts and skills is "more likely to be viewed as serving the function of sanction and verification: the student either has or has not learned the content" (Delandshere & Jones, 1999, p. 219). Due to the increasing number of student accountability measures at the

secondary level and the high stakes nature of many assessment activities, Brown specifically emphasizes the positive and negative consequences related to students' performance results such as graduation, grade retention, grades, and tracking.

The third conception of assessment, accountability of teachers and schools, underscores society's use of assessment data to determine school and teacher quality (Brown, 2003). Comparable to other documented research (Brown, 2003; Remesal, 2007) teachers' beliefs about assessment are influenced by external functions and purposes. Brown, 2003 indicates that researchers' final analysis has yielded three key assertions or beliefs about the function of assessment: to place students in the accurate leveled curriculum; to formally describe students' achievement and provide justification for grades; and to serve as preparation for mandated testing.

Similar to Brown's (2003) second and third conceptions, certification of students' learning and accountability of teachers and schools, Delandshere and Jones (1999) determined the three participants' assessment views as predominantly summative. Teacher interview responses regarded assessment as "a required means of conveying information to external audiences (parents, district, state, other teachers), and rarely as a way to understand learning and inform teaching" (p. 229). Teachers' perceptions of an externally defined assessment pedagogy, limits their assessment practices to summative approaches that imitate the state and federal-mandated testing (Calveric, 2010). As an unintended consequence, Delandshere and Jones (1999) point out "teachers are left dissatisfied and unable to learn about their teaching or how their students learn" (p. 238). Additionally, the researchers surmise that teachers' assessment practices play an integral

role in the preservation of their conceptions about assessment and its functions and usefulness.

Assessment as irrelevant, the fourth assessment conception, represents teachers who view assessment as unrelated to the work of educators and students (Brown, 2003). Typically associated with formal testing, educators who adopt this assessment conception reject assessment due to its perceived harmful impact upon teacher autonomy and professionalism (Brown, 2003).

Followers of the irrelevance conception believe assessment detracts from student learning and excludes the inclusion of teachers' intuitive evaluations, student-teacher relationships, and in depth knowledge of curriculum and pedagogy (Brown, 2003). Remesal (2007) presented research detailing thirty primary and twenty secondary teachers' conceptions of assessment. This study built upon Black and Wiliam's (2005) study which documented four nations' experiences related to teachers' conceptions of assessment and pedagogical reform. Remesal's research focus was to contribute to Black and Wiliam's previous research findings that the acknowledgement of teacher beliefs about various aspects of the instructional practice contributor to differences in assessment practices. The results of the study suggest that the four main conceptions of assessment exist within the elementary classroom. Despite the varying terms used to describe these four assessment beliefs, researchers indicate that teachers' individualistic ideas and thoughts regarding assessment impact their acceptance of various assessment methodologies. To gain further information pertaining to the relationship between teachers' assessment perceptions and practices, this study incorporated survey items specifically aimed at the dependent variables.

A study conducted by Chester and Quilter (1998) on in-service teachers' perceptions of classroom assessment, standardized testing, and alternative methods concluded that teachers' perceptions of classroom assessment affected their assessment classroom practices. Teachers that attached less value to classroom assessment used standardized tests most of the times in their classrooms. Chester and Quilter went further to say that teachers with negative experiences in classroom assessment and standardized testing are least likely to see the value in various forms of assessment for their classroom. They recommended, therefore, that in-service training should focus on helping teachers see the value of assessment methods rather than "how to" do assessment.

A study conducted by Green (1992) on pre-service teachers with measurement training revealed that the pre service teachers tended to believe that standardized tests address important educational outcomes and that classroom tests are less useful. In the same study in service teachers believed that standardized tests are important, but not to the degree that pre-service teachers did. A case study of one science teacher conducted by Bielenberg (1993) showed that the teacher's beliefs about science defined how she conducted her science classes. Diene (1993) conducted a study to understand teacher change. The study considered the classroom practices and beliefs of four teachers. Findings suggest that teachers' beliefs and practices were embedded within and tied to broader contexts, which include personal, social and previous ideas about a particular aspect.

2.7 Classroom Teachers' Assessment Practices

National Council of Teachers of Mathematics (2005) believes that assessment has the potential to enhance mathematics learning and to promote students' interest in mathematics. This is too general a statement considering the fact that in most schools assessment means testing and grading (van de Wallen, 2001). Classroom assessment, in the view of Zhang and Burry-Stock (2003), embraces a broad spectrum of activities from constructing paper-pencil tests and performance measures, to grading, interpreting standardized test scores, communicating test results, and using assessment results in decision-making. Teachers are regarded as the foundation for bringing about positive change and preparing students for future endeavors. It is very essential therefore, to understand teachers' practices particularly how they assess and evaluate student learning outcomes.

Teacher judgments can directly influence students' achievement, study patterns, self-perceptions, attitudes, effort, and motivation to learn (Rodriguez, 2004). For this reason, Moss (2013) asserted that no serious discussion of effective formative and summative classroom assessment practices can occur, without clarifying the tensions between the practices and the assessment competencies of classroom teachers. Classroom teachers have primary responsibility for designing and using formative and summative assessments to evaluate the impact of their own instruction and gauge the learning progress of their students. Teacher judgments of student achievement are central to classroom and school decisions including but not limited to instructional planning, screening, placement, referrals, and communication with parents (Moss, 2013).

Stiggins (2009) is of the view that, teachers can spend a third or more of their time on assessment-related activities. In fact, some estimates place the number of teacher-made tests in a typical classroom at 54 per year, an incidence rate that can yield billions of unique testing activities yearly worldwide (Worthen, Borg, & White, 2003). These activities include everything from designing paper–pencil tests and performance assessments to interpreting and grading test results, communicating assessment information to various stakeholders, and using assessment information for educational decision making. Throughout these assessment activities, teachers tend to have more confidence in their own assessments rather than in those designed by others. And they tend to trust in their own judgments rather than information about student learning that comes from other sources (Moss, 2013). However, a study conducted by McMillan (2003) reveals that, teachers struggle as they try to improve their assessment practices and make assessment decisions, mainly because the whole process is characterized by the tension between their beliefs about assessments and the values they bring along, as well as other external forces that they have to consider along the way. In light of the above, the measurement community has been conducting research into the nature and scope of teachers' assessment practices.

While seeking the greatest student academic gains, educational organizations have investigated what literature has commonly termed formative assessment practices. Formative assessment is the systematic process of continuously gathering evidence about learning (Heritage, 2007). Heritage suggests that formative assessment, also known as assessment for learning (Hargreaves, 2005; Popham, 2008), utilizes data to accurately prescribe or "measure" (Hargreaves, 2005) a student's instructional level of learning and

to alter lessons to assist students with attaining an identified learning goal. Additionally, formative assessment actively engages both teachers and students in learning goal development, progress monitoring, and preparation of future learning steps.

Formative assessment data provide measurement of student progress toward a particular goal within a curricular unit and are used by students and instructors to guide further instruction and learning (Harris, 2008). To more closely examine teachers' conceptions of assessment for learning, Hargreaves (2005) conducted a survey of eighty-three teachers' understanding of the phrase "assessment for learning" (p. 214). Anonymous responses were submitted and analyzed by Hargreaves to identify and group together responses with similar emphasis. Teacher quotations and classroom observation data were examined to increase validity of participants' responses and develop six summary definitions: assessment for learning means monitoring students' performance against targets or objectives; using assessment to guide the next steps associated with teaching and learning; teachers giving feedback for improvement; teachers learning about students' learning; children taking some ownership over their own learning and assessment; and turning assessment into a learning event.

In a study by McMillan, Myran and Workman (2002) which aimed at describing the nature of classroom assessment and grading practices, found that teachers were mostly interested in assessing students' mastery or achievement and that performance assessment was used frequently. Morgan and Watson (2002) reported that most middle and high school teachers use teacher-constructed tests to assess students' achievement. In addition, Morgan and Watson found that most teachers view classroom assessment as an added requirement to their teaching job and not as a tool to improve their teaching.

Beckmann, Senk and Thompson (1997) studied the assessment and grading practices of 19 high school mathematics teachers. Their study revealed that the most frequently used assessment tools were tests and quizzes and these determined about 77% of students' grades. Twelve of the nineteen teachers used other forms of assessment, such as written projects or interviews with students. These other forms of assessment counted for about 7% of students' grades. Beckmann, Senk and Thompson found that test items were of low level, involved very little reasoning and were almost never open-ended. They also found that teachers' knowledge and beliefs as well as the content and textbooks of the course, influenced the characteristics of the test items and other assessment instruments.

McMillan, Myran and Workman (2002) in their study, aimed at describing the nature of classroom assessment and grading practices, found that teachers were mostly interested in assessing students' mastery or achievement and that performance assessment was used frequently. Morgan and Watson (2002) reported that most middle and high school teachers use teacher-constructed tests to assess students' achievement. In addition, Morgan and Watson found that most teachers view classroom assessment as an added requirement to their teaching job and not as a tool to improve their teaching.

Lekoko and Koloi (2007) conducted a survey with pre-service teachers enrolled in education classes at the University of Botswana. The purpose of this study was to explore students' perceptions regarding the correlation of teacher's feedback and the grades that teachers award to students. Students revealed some experiences regarding how their work is graded and the nature of feedback they receive from their lecturers. This study showed that when lecturers grade students' work they did not provide adequate comments that

could help students understand where they went wrong, teachers gave low marks that are not accounted for in terms of what and how the teacher arrived at the marks, there was no reconciliation of marks and comments accompanying them, and teachers made ticks that were incompatible with the marks given.

There is enough evidence suggesting that in schools assessment mainly refers to tests, examinations and grading (Lissitz and Schafer, 2002; Van deWalle, 2001). School leaders have reached a point of believing that one cannot assess without assigning grades (Lissitz and Schafer, 2002). Although tests seem to be popular in schools, teachers seem to have different skills and views about tests. A study by Morgan and Watson (2002) revealed that different teachers interpreted similar students' work differently. McMillan (2001) studied the actual classroom assessment and grading practices of secondary school teachers in relation to specific class and determined whether meaningful relationships existed between teacher's assessment practices, grade level, subject matter, and ability levels of students. McMillan found that there was no meaningful relationship between teacher's assessment practices, grade level, subject matter and ability level.

Fennell et al. (1992) suggest that specific training is necessary for teachers to learn to assess children's thinking by analyzing students' discourse. Dean (1999) contends that most teacher education programs skim over classroom assessment, leaving teachers to assess in the way they were assessed when they were in school. Campbell and Evans (2000) evaluated pre-service teachers who had completed coursework in educational measurement and found that student teachers did not follow many assessment practices recommended during their coursework.

2.8: Summary of Review

This chapter has presented the conceptual framework for this study (Mohamad's Conceptual Framework). It further proceeded to outline current definitions of the concept of classroom assessment. Prominently among these definitions was National Research Council's definition of assessment. Assessment also can be define as the process of collecting and interpreting evidence of student progress to inform reasoned judgments about what a student or group of students knows relative to the identified learning goals (National Research Council [NRC], 2010). Another area that was examined in this chapter was the contentions between formative and summative assessment. It was evident during the review that this two purpose of assessment are important but have their respective competing roles, purposes, and uses they play in the classroom. A good number of teachers want to use constructed-response assessments due to the belief they hold that this kind of assessment is best to ascertain student understanding. On the other hand, factors external to the classroom, such as mandated large-scale testing, promote different assessment strategies, such as using selected-response tests and providing practice in objective test-taking. The review also focused on classroom assessment tools and methods that teachers use in assessing their students. This chapter closed on, theoretical and empirical review on teachers' perceptions of classroom assessment and their current assessment practices.

CHAPTER THREE

METHODOLOGY

3.1 Overview

This chapter presents the methodology of the study. The chapter is organized under the following headings: philosophical underpinning, research design, research setting, population, sample and sampling techniques, research instruments, pilot study, data collection, data analysis procedures and ethics considerations.

3.2 Philosophical Underpinning

Creswell and Plano Clark (2007) stated that all research need a foundation, and that this foundation, whether explicit or implicit, is found in the 'worldview' or philosophical framework chosen by the researcher. In this study therefore, the philosophical framework adopted by the researcher is the pragmatist philosophy. The pragmatic paradigm in its simplest terms implies that, the overall approach to research is that of mixing data collection procedures and analysis within the research process (Creswell and Plano Clark, 2007). Pragmatism is seen as "debunking concepts such as 'truth' and 'reality' and focuses instead on 'what works' as the truth regarding the research questions under investigation" (Tashakkori & Teddlie, 2003, p. 713). The philosophical theory of pragmatism is likewise seen as a means of bridging the gap between the empirical singular scientific approach to research and the newer "freewheeling" inquiry of qualitative research theories (Tashakkori & Teddlie, 2003, p. 52). It draws on many ideas including using "what works," diverse approaches, and valuing both objective and subjective knowledge (Cherryholmes, as cited in Creswell, 2009). Johnson and Onwuegbuzie (2004) argue that mixed methods research uses a

method and philosophy that attempt to fit together the insights provided by qualitative and quantitative research into a workable solution. According to Tashakkori, and Teddlie (2003) taking a pragmatic and balanced or pluralist position will help improve communication among researchers from different paradigms as they attempt to advance knowledge. Pragmatism also helps to shed light on how the research approaches can be mixed fruitfully (Brannen, 2005). Thus, for the mixed methods researcher, pragmatism opens the door to multiple methods, different worldviews, and different assumptions, as well as to different forms of data collection and analysis in the mixed methods study.

This study was conducted in a classroom setting where students and teachers interacted freely and in a structured manner. In the classroom environment, teachers and students were familiar with each other and classroom interactions were seen as natural. In order to describe whatever was on going therefore, it was imperative to gather both quantitative and qualitative data. This philosophical approach therefore enabled the researcher to develop thorough understanding of how teachers perceived and practiced assessment in the mathematics classroom.

3.3 Research Design

Classroom culture is vague, yet its impact on students', schools' and stakeholders' lives and operations is very tangible. To help gain wide and in-depth understanding of classroom assessment culture, adopting one of the two traditional approaches (qualitative or quantitative) to research will only yield shallow information (Cohen, Manion, & Morrison, 2007). Therefore, in order to explore and describe aspects of classroom assessment culture, it was important to combine qualitative and quantitative methodologies for data collection and analysis in the study.

In this study, a sequential explanatory mixed method research design was used for data collection and analysis. That is, using numerical and verbal data in order to gather reliable and valid results. The design was used to explore and explain upper primary and Junior High School mathematics teachers' perceptions and practices of classroom assessment in the Central Region of Ghana. According to Creswell, Plano Clark, Gutmann and Hanson (2003), a mixed method design involves the collection or analysis of both quantitative and/or qualitative data in a single study in which the data are collected concurrently or sequentially, are given a priority, and involve the integration of the data at one or more stages in the process of research. Elliot (2005) opines that the fundamental principle of mixed method research is that the combination of quantitative and qualitative approaches provide a better understanding of the problem than either approach can achieve alone. Creswell and Plano Clark (2007), argued that the mixed method research design provides strength to the weakness of quantitative and qualitative research design. Thus, the design is able to offset the weakness of both quantitative and qualitative research design used separately in a study. They further argued that the mixed method provide researchers the opportunity to draw on a wide range of tools of data collection in order to comprehensively study and understand a problem. In addition, mixed method research also helps answer questions that cannot be answered by a single approach. It also encourages collaboration of researchers across the two fields of inquiry.

This design however has its own challenges which are associated with it. For example, Plano Clark (2005) cautioned that the design requires having certain skills, time, and resources for extensive data collection and analysis. Plano Clark is of the view that the most challenging perhaps, is educating and convincing others of the need to

employ a mixed methods design so that a researcher's mixed methods study will be accepted by the scholarly community.

Morse in 1991 came out with two main types of mixed method research and they are: simultaneous and sequential (Creswell, Plano Clark, Gutmann, & Hanson, 2003). Subsequently, other researchers including Creswell and Plano Clark (2007) and Tashakkori and Teddlie (2003) have also enumerated types of this design to include: sequential explanatory, sequential exploratory, sequential transformative, concurrent transformative, concurrent embedded and concurrent triangulation design.

When measuring and exploring the nature of perceptions and practices of assessment in the mathematics classroom, where teachers have different background characteristics and other classroom and school environment factors contributing to their conception, a mixed method sequential explanatory design is best suited. The explanatory design, according to Creswell, and Plano Clark (2007), is a two phase design in which the qualitative data is used to help explain or build on the initial quantitative results. They further stated that the design is suited to studies in which wants qualitative results to explain significant, non-significant quantitative results. The approach is also more useful when the research problem is more quantitative oriented. The researcher then has to have time and ability to conduct the study in two phases thus, developing qualitative questions out of the issues arising out of the quantitative results (Creswell & Plano Clark, 2011). The diagrammatic representation of Creswell and Plano Clark's Mixed Method Sequential Explanatory Model is illustrated in Figure 3.1.

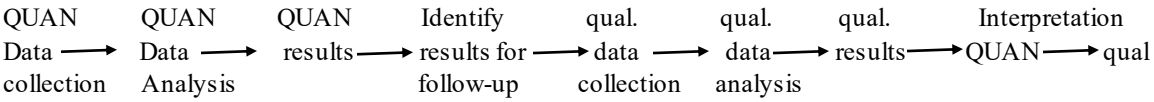

Figure 3.1 Mixed Method Sequential Explanatory Model (Source: Creswell & Plano Clark, 2011)

Figure 3.1 shows that the explanatory sequential design occurs in two distinct interactive phases. The design first starts with the collection, analysis and results of quantitative data, which has the priority for addressing the study's questions. This first phase is followed by the subsequent collection and analysis of qualitative data. The second, qualitative phase of the study is designed so that it follows from the results of the first, quantitative phase. The researcher interprets how the qualitative results help to explain the initial quantitative results (Creswell & Plano Clark, 2011).

In this study, a survey was first conducted to gather quantitative data in order to have a general understanding of Gomoa East District Upper Primary and Junior High School mathematics teachers' perceptions and practices of classroom assessment. Creswell (2002) postulates that a survey study can be done in a short time where the investigators administer a survey (questionnaire) to a sample or to the entire population of people in order to describe the attitudes, opinions, behaviors or characteristics of the population. Survey was thus deemed appropriate for the study as the current perceptions, views, attitudes and opinions of upper primary and Junior High School mathematics teachers, were needed to be sampled and described. Creswell (2002), however noted that, survey data is self-reported information, reporting only what people think rather than what they do. Therefore, issues arising out of the quantitative phase helped to develop qualitative instrument (semi-interview and observational guide) in order to have access to

the to how classroom assessment practices were been carried out in the mathematics classroom.

3.4 Research Setting

The research was conducted in the Gomoa East District in the Central Region of Ghana. According to Ghana Statistical Service (2014), Gomoa East District is geographically located in the Universal Transverse Mercator (UTM) zone $30/6^0$ W, 0^0E. It is situated between Latitudes $5^0$51'and Longitudes $0^0$58' west. The district covers a land area of 461.90 square kilometers with a total population of 207,071, comprising 47.5 percent males and 52.7 percent females with 2.5 growth rate (Ghana Statistical Service, 2014). In the regional context, the district is uniquely situated among other districts, bordered on the North by the Agona West Municipal, North East by Agona East district, on the South-West by Gomoa West, on the East by Awutu-Senya District, and on the South by Efutu Municipality. The Atlantic Ocean is to the South Eastern part of the district. The Gomoa East District Assembly was established by Legislative Instrument 1883 in 2007 with its capital at Gomoa Afransi.

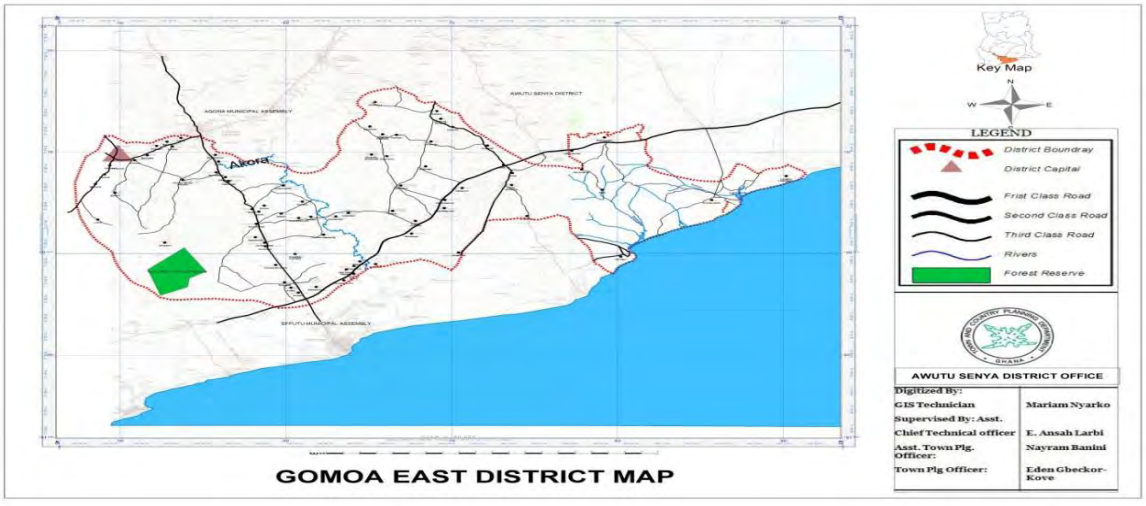

Figure 3.2 Map of Research Area (Gomoa East District)
Source: Ghana Statistical Service (2014)

The district has ten educational circuits which are well spread among the rural and urban communities. The urban segment of this district is among the few privileged places in the Region where access to basic social amenities are guaranteed. The availability of these amenities has attracted many urban dwellers. This therefore, has placed pressure on these basic social amenities. Among the over utilized social amenities is the school. Classroom, furniture, and other school facilities such as curriculum materials which are meant for normal class size are not adequate to meet the demands of the increasing number of students/pupils in the populated urban and rural communities of the district. This has also resulted in the high teacher-student ratio in the classroom. Besides this high teacher-student ratio, there are higher numbers of non-professional teachers in the upper primary and Junior High School in the rural communities. Majority of teachers who teach mathematics at the upper primary and Junior High School are 3-year post-secondary teacher certificate 'A' and diploma holders, with a small number of graduate professional teachers and non-professional teachers in both the rural and urban communities. The indigenes of the districts are mostly peasant farmers and fisher folks.

3.5 Population

According to Agyedu, Donkor, and Obeng (2013) the term "population refers to the complete set of individuals (subjects), objects or events having common observable characteristics in which the researcher is interested in studying" (p. 89). They further stated that, the population may be finite or infinite. A research population is a large well-defined collection of individuals having similar features (Castillo, 2009). Castillo differentiates between two types of population, the target population and accessible population. The target population is the total group of subjects to which a researcher

would like to generalize the results of a study and accessible population is the group of subjects that is accessible to the researcher for a study from which the study sample can be drawn (Castillo, 2009). The target population for this study consisted of all Upper Primary and Junior High School mathematics teachers in the Central Region of Ghana. The region has 20 districts with a number of Upper Primary and Junior High School mathematics teachers. However, the accessible population of this research consisted of all Upper Primary and Junior High School mathematics teachers in the Gomoa East District.

3.6 Sample and Sampling Techniques

The researcher used the multistage sampling techniques. Multistage sampling is where the researcher divides the population into stages, samples the stages and then resamples, repeating the process until the ultimate sampling units are selected at the last of the hierarchical levels (Goldstein as cited in Nafiu, 2012). Firstly, convenience sampling technique was used to select the district, that is, Gomoa East District. According to Agyedu, Donkor and Obeng (2013), convenience sampling technique is an approach where a sample is selected according to the suitability of the researcher. In their view, the suitability may be in respect of availability of data, accessibility of the subjects, among others. Gomoa East District was conveniently chosen because of its proximity and accessibility to the researcher. It was also chosen because it is the most populated district (N = 207,071) in the Central Region of Ghana (Ghana Statistical Service, 2014). Secondly, purposive sampling technique was used to select all public basic schools in the district. Purposive sampling starts with a purpose in mind and the sample is thus selected to include people of interest and exclude those who do not suite that purpose (Fraenkel, & Wallem, 2009). Because the study sought to explore and describe Central Regional public

basic school mathematics teachers' perceptions and practices of classroom assessment, it was imperative to select information-rich-sample who are related to the central issue being studied. As a result, the choice of all Gomoa East District's public basic schools as the sample for the study was based on the fact that, the district is one of the very few to have private universities (Pan African University College in Pomadze and KAAF University in Budumburam). There are also other tertiary institutions around it, including the University of Education, Winneba. All of these institutions are opportunities for the district's basic school teachers to constantly upgrade their knowledge on new pedagogies of teaching and assessing children.

The teachers in each of the one hundred and forty-one (141) primary and Junior High School were stratified into lower primary (BS 1-3), upper primary (BS 4-6) and Junior High School (BS 7-9) teachers. Out of these three strata, the researcher purposively selected all the teachers in the last two strata (Upper Primary and Junior High School). Upper Primary and Junior High School were selected for the study because external examinations are carried out on learners at these class levels. The researcher further stratified these teachers into mathematics teachers and non-mathematics teachers. All two hundred and twenty-two (222) upper primary teachers were selected for the study because they are all expected to teach mathematics at that level. And all sixty-seven (67) Junior High School mathematics teachers were also selected for the study. Therefore, a total of two hundred and eighty-nine (289) upper primary and Junior High School mathematics teachers were used for the study. However, a total of 273 consented teachers completed and returned the questionnaire. This gave a response and return rate of 94.5%.

The quantitative survey component of the study involved the entire sample. Out of the 273 sample frame, the researcher, in each circuit stratified all the participants based on their years of mathematics teaching experience and other variables such as gender. Thus teachers were stratified into two groups namely teachers with teaching experience of between 1 and 10 years and those with teaching experience of 11 years and above. The two strata were further stratified into male and female and upper primary and Junior High School teachers. This was done to obtain divergent views from the teachers. Finally, the participants were stratified according to how they perceived assessment (positive and negative perception). A teachers each was then drawn from the ten circuits using simple random sampling to represent the teachers involved in the study. Therefore, a total of ten (10) mathematics teachers were used for the interview. The random sampling technique was used because, it gave each teacher an equal chance of being selected and it was also to do away with any form of bias. Where there was only one female teacher in each category she was purposively selected to ensure gender representation in the sub-sample. Finally, simple random sampling was used to select four teachers from the ten interviewed teachers for observation.

Table 3.1 Identification of Basic Education Schools and teachers within the circuits in Gomoa East District

Name of Circuit	Primary Category		Junior High School Category	
	Number of schools	Number of Teachers	Number of schools	Number of Teachers
Circuit 1	6	18	6	6
Circuit 2	10	30	7	7
Circuit 3	6	18	6	6
Circuit 4	8	24	8	8
Circuit 5	9	27	7	7
Circuit 6	7	21	7	7
Circuit 7	7	21	7	7
Circuit 8	8	24	7	7
Circuit 9	7	21	6	6
Circuit 10	6	18	6	6
Total	**74**	**222**	**67**	**67**

Source: Gomoa East Educational Directorate

3.7 Research Instruments

In order to collect relevant data on Gomoa East District Upper Primary and Junior High School mathematics teachers' perceptions and practices, three instruments were used, namely: questionnaire, interview guide and observation checklist (see Appendix A, B and C respectively). The combination of several data collection strategies or methods allows for triangulation (Creswell, 2003). Triangulation involves confirming evidence from different sources to shed light on a particular theme or issue. In addition, these instruments were used to offset the weakness of the other.

3.7.1 The Questionnaire

A questionnaire is a written instrument that contains a series of questions or statements called items that attempt to collect information on a particular topic (Agyedu, Donkor, & Obeng, 2013). A questionnaire could be answered by the person from whom

information is sought or through an interpreter. Questionnaire usage in collecting large data is efficient because: (i) large quantity of data can be collected in a relatively short period of time and (ii) data can be collected from participants in distant places and in the absence of the researcher (Thomas, 2003). The disadvantage of using questionnaires as outlined by Agyedu, Donkor, and Obeng (2013), are as follows: (i) the opportunity to build rapport with the respondents is limited and (ii) probing for more details or explanations of responses is not possible.

There are many ways of classifying questionnaire items. However, the two broad categories are: i) Open-ended or semi-structured questionnaire, this type requires the respondents to construct or write a response, from a word to several paragraphs. ii) Closed-ended or structured questionnaire requires the respondent to make a choice by ticking, checking or circling the one they wish. The structured questionnaire may be in the form of dichotomous response items (say – yes or no), multiple choice items (say – 0-5, 6-10, 11- and above), rating scale items (say – strongly disagree, disagree, etc.), among others (Agyedu, Donkor, & Obeng, 2013). The main advantages of the structured questionnaire are that it consist of items meant to collect numerical data that can be subjected to statistical analysis (Jack, & Norman, 2003). Kusi (2012) asserts that, most research participants feel more comfortable responding to pre-determined response than items that require them to express their views and feeling.

In this study, the researcher used the structured questionnaire to collect numeric data on Gomoa East District mathematics teachers' perceptions and practices of classroom assessment. The respondents were limited to a list of options from which they were to choose one as a respond to each item. This was done to collect numeric data to

describe the respondents' perceptions and practices of classroom assessment in the district.

Specifically, the study used Classroom Assessment Conception Instrument (CACI) as the quantitative data collection instrument. The questionnaire contained 53 closed-ended items. The CACI is divided into four main sections. The first section of the instrument asked the respondents to provide demographic information that include: gender, age, academic qualification, teaching experience, mathematics teaching experience, classes which they teach and the types of assessment training received (7 items). The second section of the CACI questionnaire consisted of 18 Likert-type items. Out of these 18 items 8 where adapted Likert-type items from Assessment Practices Inventory (API) developed by Zhang and Burry-Stock (2003). This API was adapted to reflect the context and objectives of this research work. API instrument was created and used in the United States of America to measure teachers' skills and use of assessment practices. Zhang and Burry-Stock's instrument consists of 67 items and was divided into two main section "*use*" and "*skill*". The "*use"* scale was meant to measure teachers' usage of assessment practices on a scale from 1 (*not at all used)* to 5 (*used very often*). The "*skill*" scale was designed to measure teachers' self-perceived from 1 (*not at all skilled) to* 5 (*very skilled*). Based on the modification process, the aim of the second section was to explored basic school mathematics teachers' perceptions of classroom assessment and it consisted of 18 Likert-type items scored on a scale from 1 to 5 (1 = *strongly disagree* and 5 = *strongly agree*) which addressed perceptions of assessment (planning, designing, implementing, marking and interpreting and reporting and using); the third section addressed the various assessment tools and methods that basic school mathematics teachers used in their

classroom and it also comprised 10 Likert scale items. The scale ranged from 1 (*not used*) to 5 (*used very often*); and the last section consist of 18 items regarding basic school teachers assessment practices. The fourth section's Likert-type scale ranges from 1 to 5 with 1 equaling *never* and 5 equaling *always*. Items under the second section were re-worded to measure Gomoa East mathematics teachers' assessment practices (section four).

3.7.2 Interview Guide

An interview is a survey in which the researcher orally asks participants questions (Mitchell, & Jolley, 2010). Thomas (2003) describes interviews as an effective means of eliciting responses from participants in a research study. They provide elaborate responses and a forum for sincere participation in a study. Mitchell and Jolley (2010), opine that there are three main types of interviews namely; structured, semi-structured and unstructured interview. Mitchell, and Jolley (2010) explained that, the structured interview is a type in which all respondents are asked a standard list of questions in a standard order. The semi-structured interview, like the structured interview is constructed around a core of standard questions. However, the interviewer may expand on any question in order to explore a given response in greater depth. Finally, Mitchell and Jolley, postulated that with the unstructured interview, the interviewers have objectives that they believe can be best met without an imposed structure. The interviewer is free to ask what he/she wants, how he/she wants to, and the respondent is free to answer how he/she pleases.

As such, a semi-structured interview guide was used to collect qualitative data on Gomoa East District mathematics teachers' perceptions and practices of classroom assessment. The guide was designed based on the issues emerging out of the results of quantitative data. The interview questions were centered on the following themes of classroom assessment: planning, designing, implementing, marking and interpreting and reporting and using. The interview was conducted on one-on-one basis in the school setting. This enabled the participants to express their views and concerns freely and explicitly.

3.7.3 Observation Check List

Mitchell and Jolley (2010) defined observation as the process of watching behavior. Observation can be used to collect exploratory data on what is happening on a situation or to set in perspective data obtained by questionnaire or interviews (Robson, 1995). Creswell (2002) recommended the use of observational protocol as a method for recording notes. This is to enable the researcher to know exactly what was going on in the classrooms. The observation provided the researcher the opportunity to follow up on the results emanating from the questionnaire and interview instruments.

The study adapted the Classroom Assessment Lesson Observation Protocol (CALOP) by Local Systematic Change International to collect systematic data on mathematics teachers' perceptions and practices of classroom assessment. This research tool was particularly adapted because it has the potential of gathering data to represent all aspects of teachers' classroom assessment practices that can help not only teachers see the connections between all parts of the assessment cycle but also researchers who wants to further research in this area. The items were therefore modified to meet Ghanaian

classroom context. This was done by selecting only the items which in the researcher's view best suited the Ghanaian classroom situation.

The CALOP was a check-list that contained 12 items. The lesson observation protocol required background information on the teachers and the students, time and date of observation as well as the name of the school. It also required information on the classroom context (physical environment). Again, it also required information on how students' activities were structured, major way(s) in which students engaged in class activities, kinds and levels of questions asked. It ended with rating of key assessment indicators.

3.8 Pilot Study

To determine the strength and weakness of the Classroom Assessment Conception Instrument (CACI) questionnaire, a draft was pilot tested in the Effutu Municipality of the Central Region. A total sample of fifty-two Upper Primary (n = 32) and Junior High School (n = 20) mathematics teachers were conveniently sampled for the pilot-test. The researcher used this sampling technique after taking into consideration time and other resources at his disposal. The researcher chose the municipality because it was deemed to have exhibited the similar characteristics as the district of interest to the researcher. The observational guide was also pilot-tested. The pilot-test helped the researcher to ensure the validity and reliability of both the questionnaire and the observational guide. Pilot-testing the instruments enabled the researcher to modify items that were difficult to understand, reduce ambiguities and incorporate new categories of responses that were identified as relevant to the study (Awanta, & Asiedu-Addo, 2008).

3.8.1 Reliability of the Instruments

The term Reliability concerns the degree to which an experiment, test, or any measuring procedure yields the same results on repeated trials (Ruland, Bakken, & Roislien, 2007). A reliability analysis using Cronbach's Alpha statistics was performed to determine the internal consistency of the items on CACI questionnaire instrument. Reliability of the questionnaire was determined through the use of the Statistical Package for the Social Sciences (SPSS) version 20. The reliability measurements for each section of the piloted instrument were calculated. For Teachers' Perception of Classroom Assessment α = 0.746, Assessment Tools and Methods had α = 0.784 and that of Teachers' Assessment Practices α = 0.873. According to Creswell (2007) Cronbach's Alpha reliability coefficient values of 0.70 and above are considered reliable.

The Classroom Assessment Lesson Observation Protocol (CALOP) was also piloted with a smaller number of the teachers (n = 2) used in piloting the questionnaire. Two trained raters, the researcher and an M. Phil colleague undertook the rating during the pilot study. Inter-rater reliability analysis using the Kappa statistic was performed to determine consistency among raters. According to Goodwin (2010), inter-rater reliability is a measure used to examine the agreement between two people (raters/observers) on the assignment of categories of a categorical variable. It is an important measure in determining how well an implementation of measurement system works. The inter-rater reliability for the raters was found to be Kappa = 0.72 ($p < .0.001$), 95% CI (0.504, 0.848). This measure of agreement, while statistically significant, is only substantially convincing. As a rule of thumb, values of Kappa ranging from 0.40 to 0.59 are considered moderate, 0.60 to 0.79 substantial, and 0.80 outstanding (Landis & Koch,

1977). Landis and Koch opines that, most statisticians prefer for Kappa values to be at least 0.6 and most often higher than 0.7 before claiming a good level of agreement. This suggested that the lesson observation schedule guide could be used to undertake the study.

3.8.2 Validity of the Instruments

Validity of a research instrument is determined by how well it measures the concept(s) it is intended to measure (Awanta, & Asiedu-Addo, 2008; Ruland, Bakken, & Roislien, 2007). In order to establish the validity of the research instruments, the following validity test were carried out: Face, Content and Construct validity.

3.8.2.1 Face Validity

After developing the research instruments, a group of graduate students from the University of Education, Winneba and other teachers from some basic schools in Winneba, were requested to carefully and systematically scrutinize and assess the instrument for its relevance and face validity. The feedback from the graduate students and teachers were factored into the final preparation of the instrument. Issues such as length of the items and general format of the questionnaire were some of the concern pointed out to the researcher during the pilot stage.

3.8.2.2 Content Validity

Content validity of an instrument focuses on the extent to which the content of the instrument corresponds to the concepts it is design to measure (Agyedu, Donkor & Obeng, 2013). They opine that, the usual process of establishing content validity is to examine the objectives of the instrument and compare to its content. Cooper and

Schindler (2008) suggested two ways of determining content validity. Firstly, the designer may determine it through a careful definition of the topic of concern, the items to be scaled and the scale to be used. Secondly, an expert may judge how well the instrument meets the standard. Based on this knowledge, suggestions of my supervisor and other lecturers who are experts in Assessment, Measurement and Evaluation, were sought to content validated the instruments.

3.8.2.3 Construct Validity

Construct validity refers to the extent to which a measure relates to expectations formed from theory for hypothesized construct (a variable which is not directly observable but is inferred from other behaviors for example, anxiety, self-concept and intelligence) (Agyedu, Donkor & Obeng, 2013). The purpose of construct validity is to ascertain if the measure of the variable of interest can be assumed to be an acceptable measure. Cohen, Morrison and Manion (2000) explained that in construct validity, agreement is sought on the 'operationalised' forms of construct, clarifying what we mean when we say we used this construct. The researcher subjected the pilot questionnaire to Exploratory Factor Analysis (EFA) to ensure that the Classroom Assessment Conception Instrument (CACI) was construct validate.

3.8.2.3.1 Factor Analysis

Factor analysis is a type of analytical statistical technique used to develop questionnaire in order to make sure that the instrument measures what (the behaviour) it is supposed to measure. According to Field (2009), factor analysis is a multivariate technique for identifying whether the correlations between a set of observed variables stem from their relationship to one or more latent variables in the data, each of which

takes the form of a linear model. Exploratory factor analysis was used in the early stages of research to gather information about (explore) the interrelationships among a set of variables. Exploratory Factor Analysis (EFA) was used to reduce a large number of items into a smaller number of factors that can be analyzed and interpreted with ease (Field, 2005).

Major assumptions that underpin factor analysis were visited to confirm the suitability of the data set before attempting to run the analysis on the questionnaire instrument. Knalf (2005) and Ainsworth (2009) outlined some of these assumptions and they include:

a) Adequate Sample Size
b) Normality of the distribution
c) Strength of the relationship among the variables (Reliable Correlation) and
d) No multicollinearity or matrix singularity

The sample size used for the pilot study was fifty-two. This was deemed adequate because Ainsworth (2009) is of the view that, the sample size which is to be used in the factor analysis should be fifty and above. He further clarified that, a sample size below fifty is described as very poor and over 1000 is excellent. Secondly the data set was screened to ensure normality of the distribution, thus meeting one of the major assumptions underlining parametric test. The screening Field (2009) opined, should be done using the skewness of the distribution on each of the variables. He further argued that, any distribution with z-statistic more than ± 3.29 after dividing the skewness value of the distribution by it standard error is abnormally skewed. Using this criterion, all the items were found to have been normally distributed and were therefore subjected to

further analysis. In order to confirm whether the data set meets the remaining two assumption or not, factor analysis needed to be performed. The second section of the Classroom Assessment Conception Instrument was subjected to Principal Component Analysis (PCA) with Varimax Rotation with the help of SPSS version 20. Knafl (2005), Pallant (2005, 2007), Field (2009) among other researchers are of the view that, the most widely used orthogonal rotation method among the three found in SPSS, is the Varimax. This is because "it, (Varimax) attempts to maximize the dispersion of loadings within factors. Therefore, it tries to load a smaller number of variables highly onto each factor resulting in more interpretable clusters of factors" (Field, 2009, p. 644). The items were confirmed using factor loading exceeding 0.4. The idea of using 0.4 was because the greater the loading the higher the variable is efficient to measure what it is supposed to measure. Stevens (2002) recommends interpreting only factor loadings with an absolute value greater than 0.4 (which explains about 16% of the variance in the variable).

An inspection of the R-Matrix reveals that most of items, except 25, 28, 29, and 30, were found to have correlated at 0.3 or more ($r \geq 0.3$) with one or more items, suggesting reasonable factorability. The items that did not correlate were deleted. This implies that the data set meets the third assumption outlined at the beginning of the analysis (thus, strength of the relationship among the variables). The Kaiser–Meyer–Olkin (KMO) measure verified the sampling adequacy for the analysis, (KMO) was .517. Kaiser (1974) recommends a bare minimum of 0.5 and sets the rule of thumb for KMO values between 0.5 and 0.7 are acceptable, values between 0.7 and 0.8 are good, values between 0.8 and 0.9 are great and values above 0.9 are superb (Hutcheson & Sofroniou, 1999). Therefore, the researcher can describe the KMO obtained result as acceptable

because the sample size for the pilot test was fifty (50). This confirms Ainsworth (2009) position that a sample size of fifty and above is adequate. Bartlett's test of sphericity χ^2 (351) = 743.924, $p < 0.000$, indicated that correlations between items were sufficiently large for Principal Component Analysis (PCA). The commonalities on the other hand, were all above 0.3. The diagonal of the anti-image correlation matrix were also all above the bare minimum of 0.5 for all variables. An initial analysis was run to obtain eigenvalues for each component in the data. Eleven factors had eigenvalues over Kaiser's criterion of 1 and in combination explained 78.19% of the variance. The scree plot on the other hand, was slightly ambiguous and showed variations that would justify retaining about six factors which explain about 58.92% of the total variance. Given the sample size of 50, and the convergence of the scree plot, Kaiser's criterion on the sixth factor and the five main factors that are underpinning the assessment process cycle, the researcher decided to maintain five factors in the final analysis. Therefore, the total variance explained by these five factors was 53.43%. Table 3.2 (see overleaf) shows the factor loadings after rotation. From the table, all but items 4, 5, 9, 10, 12, 13, 16 and 19 fit into their component correctly.

Table 3.2 Rotated Component Matrix with Kaiser Normalization and Commonality

	FACTOR LOADING					Commonality
FACTORS	**1**	**2**	**3**	**4**	**5**	
Factor 1 – (alpha = 0 .87)						
Q24	0.834					0.731
Q26	0.822					0.743
Q27	0.796					0.709
Q23	0.738					0.716
Q22	0.724					0.640
Factor 2 – (alpha = 0 .62)						
Q7		0.795				0.658
Q6		0.731				0.747
Q8		0.599				0.588
Factor 3 – (alpha = 0 .63)						
Q17			0.632			0.602
Q20			0.630			0.506
Q21			0.586			0.572
Q18			0.445			0.479
Factor 4 – (alpha = 0 .72)						
Q1				0.735		0.679
Q2				0.674		0.586
Q3				0.573		0.461
Factor 5 – (alpha = 0 .89)						
Q11					0.787	0.695
Q15					0.552	0.635
Q14					0.414	0.323
Eigenvalues	**6.235**	**3.177**	**2.767**	**2.402**	**1.982**	
% of Total Variance	**20.11**	**10.25**	**8.93**	**7.75**	**6.40**	
No. of Test Measures	**5**	**3**	**4**	**3**	**3**	

Source: Field Data - Questionnaire (May, 2015)

The first five factors represents Teachers' Perceptions Questionnaire retention factors. The items that cluster on the same factor suggest that Factor 1 represents Reporting and Using Assessment results factor (thus, item 24, 26, 27, 23, and 22) with an eigenvalue of 6.235 explaining a total variance of 20.11%, Factor 2 was Design of Assessment factors (item 7, 6, and 8) with an eigenvalue of 3.177 explaining a total variance of 10.25%, Factor 3 Marking and Interpreting Assessment results (thus, item 17, 19, 20 and 21) had an eigenvalue of 2.767 explaining a variance of 8.93% of the total

cumulative variance, Factor 4 represents Planning Assessment Factors (with items 1, 2 and 3) with an eigenvalue of 2.402 explaining a total variance of 7.75%, and finally, Factor 5 represents Implementing Assessment factors (thus, item 11, 14 and 15) had an eigenvalue of 1.982 explaining a variance of 6.40% of the total cumulative variance. The other items cross loaded unto some other factor but did not contribute to that factor and therefore they were deleted.

Because the steps involved in the assessment process is cyclical, the factors were rearranged on the final questionnaire. Thus, Factor 1 was Planning, Factor 2 was Designing, Factor 3 was Implementing, Factor 4 was Marking and Interpreting and Factor 5 was Reporting and Using of assessment results. The items under each factor were re-worded to measure Gomoa East mathematics teachers' assessment practices.

3.9 Data Collection Procedure

According to Creswell (2002), respecting the site where the research takes place and gaining permission before entering a site is very paramount in research. An introductory letter (see Appendix D) was obtained from the Department of Basic Education, University of Education, stating the aims and purpose of the study and the need for the participants to give their consent and co-operation. The letter was sent to the Gomoa East Education Directorate in order to gain access to the schools, participants, and other document that would facilitate the study. The Educational Director subsequently gave a permission letter to the researcher in order to have access to the participants (see Appendix E). A copy of the permission letter was given to the Heads of Upper Primary and Junior High Schools (JHS), where the research was carried out in order to have access to the mathematics teachers.

3.9.1 Administration of the Questionnaire

After seeking permission from each school's headteachers, the researcher administered the questionnaires to the teachers for later collection on an agreed date (two weeks later). The researcher used six weeks to administer the questionnaire to all the ten circuits in the district. To ensure that the respondents did not communication among themselves, the researcher assured the participants that there was no wrong or correct answer to an item and that they were to feel free to change an option if they felt the need to do so. This was done to ensure that responses were not affected by views of persons other than that of the respondents (reliability). Arrangement was made with a Resource Teachers in-charge of each school to see to the collection of the completed questionnaire for subsequent collection by the researcher. The collection of the questionnaire also took another six. A total of two hundred and eighty-nine (289) upper primary and Junior High School mathematics teachers were used for the study. However, a total of 273 consented teachers completed and returned their questionnaire. This gave a response and return rate of 94.5%.

3.9.2 Conducting of Interviews

The researcher used a semi-structured interview guide to gain an in-depth understanding of the perceptions upper primary and Junior High School teachers' had on classroom assessment practices. It was a one-on-one interview. The proceeding of the interview was audio-taped and transcribed subsequently.

3.9.3 Observing Participants in the Classroom

The researcher visited four schools in four different circuit in order to gather observational data. A total of four lessons were observed, a lesson per teacher. The

lessons were video-tape recorded. A video-tape recorder was placed in one of the back corners in the classroom to capture enough of the classroom discourse. The video-tape recording was not only to augment the use of the observation schedule but also to provide information on other aspects of the lesson which were not captured in the schedule. Each classroom observation took 80 minutes, equivalent to a double period stipulated on the Ghanaian Senior High Schools' teaching time table. Notes were also taken during the lesson to take care of relevant issues not covered by the observation schedule, such as the topic and the objectives for the lesson, list of materials and equipment (teaching/learning materials) used in each observed lesson. Notes were also taken on the nature of classroom activities and the involvement of the students in these activities. The video-tape recording of each observed lesson was transcribed verbatim on the same day the lesson was observed. This was to ensure the credibility and accuracy of the transcription since some of the observed episodes and other relevant issues would be fresh on the researchers' mind.

3.10 Data Analysis Procedure

In mixed method research the analysis of data involves the analysis of both quantitative and qualitative data (Creswell & Plano Clark, 2007). Each data set was analyzed using the appropriate method of analysis; quantitative data was analyzed quantitatively and qualitative data qualitatively. Creswell and Plano Clark (2007) postulated that although there are similarities in the data analysis process, that is, data preparation, data exploration, data analysis, representation and data validation, in mixed method research the analysis is dependent on the design of the study. As this study used a

sequential explanatory design, sequential data analysis was employed initially followed by the final data integration and analysis phase.

3.10.1 Quantitative Data

The responses from the questionnaire items were coded (Strongly Disagree = 1, Disagree = 2, Undecided = 3, Agree = 4, Strongly Agree = 5) and analyzed through the use of Statistical Package for Social Science (SPSS version 20). The SPSS software was chosen for the data analysis because it is reasonably user friendly and does most of the data analysis one needs as far as quantitative analysis is concerned. SPSS is also by far the most common statistical data analysis used in educational research (Muijs, 2004). The data entries were done by the researcher in order to check the accuracy of the data.

The following illustrates how data were analyzed for each research question.

Research Question 1: What are Upper Primary and Junior High School mathematics teachers' perceptions of classroom assessment in the Gomoa East District?

In order to answer this question, the second section on the Classroom Assessment Conception Instrument (CACI) had its scales of measurement reduced/recoded from five Likert-type scale to three Likert-type scale (see Figure 3.2) for easy analysis of the data.

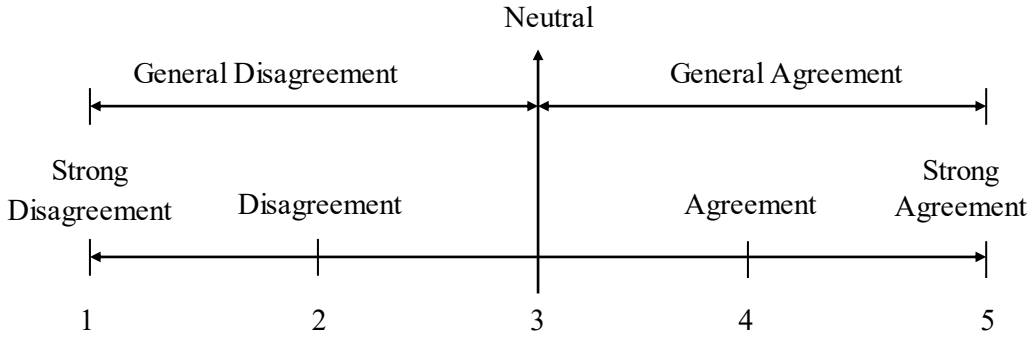

Figure 3.3: The neutral position on the five-point Likert-type scale.

Items were negatively and positively coded in order to maximize participant satisfying responses. Item 10, which was coded negatively was re-coded before the data were analyzed. Descriptive statistics (frequencies, percentages, means and standard deviations) was calculated to determine teachers' levels of agreement with factors and the items that loaded on each factors regarding their perceptions about classroom assessment. A mean of means score was likewise calculated on the factor means score values. A sub-scale mean score above or below 13.1 was considered positive or negative perception respectively while a mean score which was equal 13.1 was considered as neutral perception. It must be noted that, a mean value above or below the mean of means score does not imply that all respondents had positive or negative perception of assessment, but that majority of them had. Positive or negative perception was therefore, considered on majority basis. The standard deviation of the items also indicates the extent to which participant agree or disagreed with the items.

Research Question 2: Do Upper Primary mathematics teachers' perceptions of classroom assessment differ from the perceptions of their counterparts in the Junior High School mathematics classroom?

To answer this question, mean differences between Upper Primary and Junior High School teacher respondents were calculated. An independent-sampled t-tests were run to determine if the mean differences between perceptions of the respondents in the two class level (Upper Primary and Junior High School) were statistically significant.

Research Question 3: What assessment tools and methods do Upper Primary and Junior High School mathematics teachers use in assessing learners in the Gomoa East District?

Descriptive statistics (frequencies, percentages, means and standard deviations) was calculated to explore the tools and methods Basic School mathematics teachers use in undertaking classroom assessment. A mean of means score (3.5) was calculated for the items. The proposition is that, any mean score which is above or below the mean of means score indicates that the tool was highly utilized or highly underutilized in the Gomoa East District mathematics classroom. However, any mean scores which was equal to the mean of means score was considered neutral, that is, the tool was neither underutilized nor over utilized. The underutilization or overutilization of the tools was considered on a majority basis. The standard deviation of the items also indicate the extent to which participant agree or disagreed with the items.

Research Question 4: To what extent do Upper Primary and Junior High School mathematics teachers' perceptions of classroom assessment relate to their current assessment practices?

Pearson product-moment correlation was used to assess the strength and nature of relationship between mathematics teachers' perceptions and practices of classroom assessment.

Research Question 5: How do Gomoa East District Basic School mathematics teachers practice assessment in the mathematics classroom?

Descriptive statistics (means and standard deviations) was calculated to determine teachers' levels of classroom assessment practices. The analysis were run separately for

the difference class levels (Upper Primary and Junior High School) teachers. A mean of means score was likewise calculated for each class level. A sub-scale's mean score less than 13.7 among the upper primary teachers assessment practice indicate that practices is below average while any means score equal to 13.7 shows that the assessment practice is average. Finally, any means score which is more than 13.7 indicates that practices is above average. Also, a mean of means score (13.5) was also calculated for Junior High School mathematics teachers' assessment practices. Any sub-scale means score less than the mean of means score among the Junior High School teachers' assessment practices indicates that sub-scale is below average practices while a means scores equal to the mean of means score indicates that the assessment practice is average. And an assessment practice's means score which is more than the mean of means (13.5) shows that, that assessment is above average. Above, below or average, assessment practice of the respondents were considered on majority basis. The standard deviation of the items also indicate the extent to which participant agree or disagreed with the items.

3.10.2 Qualitative Data

The primary method of analysis for the qualitative interview and observation in this study was thematic analysis. Thematic analysis is a method of identifying, analyzing and reporting themes or patterns within data set (Braun & Clarke, 2006). Reicher and Taylor (2005) noted that with qualitative analysis the researcher needs to be clear and explicit about what they are doing and what they say they are doing actually matches up with what they do. In this study the qualitative interview data was use to address issues on teachers' perceptions of assessment arising from the quantitative phase. An interpretive analytic approach was applied on the interview data set. The audio-taped

recordings were transcribed after serval played backs. Individual transcripts were read and re-read a number of times, followed by a writing process, which is critical component of the van Manen (1990) hermeneutic process. As part of the writing process, meaning units were grouped together and eventually organized into themes and sub-themes.

Content analysis was also used to analyze the qualitative observation data. The content analysis is a common approach to qualitative data analysis. This analytical tool is defined as a process of coding and identifying themes or patterns. There are three types of content analysis: conventional, summative and directed. In conventional content analysis the coding categories are derived from the data. In summative content analysis the process involves counting and comparisons. The directed approach on the other hand, starts with a theory as a guide to the analytical process (Haieh & Shannon, 2005). A summative approach to content analysis was used to analyze the observation data in this study. Summative content analysis usually begins with identifying and quantifying certain words or content. The quantification is not initially an attempt to infer meaning but to explore assessment practices. The summative process then goes on to where the codes are interpreted to discover underlying meaning. In this way, the counting process allows for interpretation of the associated context (Haieh & Shannon, 2005).

3.11 Ethical Considerations

Kusi (2012) opines that in educational research, ethics are the issues that are related to how the researchers conduct themselves or their practices and the consequences of these on the participants in the research. Similarly, Cohen, Manion, and Morrison

(2007) suggest two concerns to watch for in ethical considerations; first, the manner in which the research has been conducted in relation to the research subject (matters such as informed consent, confidentiality, and persons involved) and secondly, acknowledgement of the contribution of all the people who have been involved in the research and as well as open recognition of individuals whose research influenced this present study.

Having discussed the methodological aspects of the research, the researcher contemplated on ethical issues of the study. This became evident since teachers' perceptions and classroom assessment practices describes teachers' moral, cultural, and social behaviors (Baumrind, 1991). Asking teachers to reveal their behaviors to an unknown therefore raises important ethical considerations. The ethical issues the researcher considered were: confidentiality, maintaining the anonymity of respondents, and data security

3.11.1 Confidentiality

The participants were assured that all their information gathered will be treated as confidential data. Thus, the data was used for the stated purposes and no other person will have access to the gathered data. The participants will be informed that their names and other personal details of theirs will be omitted (Patton, 2002; Liamputtong & Ezzy, 2005). The participants will be assured that if the anonymity is been threatened, all other records would be destroyed. At the end of the process, all documents will be shredded and tapes will be erased (William, 2006).

3.11.2 Anonymity

One of the important ethical consideration the researcher considered was 'maintaining the anonymity of respondents'. Providing anonymity of information

collected from research participants means that either the project does not collect identifying information of individual subjects (e.g., name, address, Email address, etc.), or the project cannot link individual responses with participants' identities. In this study the researcher did not seek for any information that was likely to reveal the identity of the respondents. This was done to protect the identity of research respondents. Personal anonymity may be central to gaining reliable information and that the issue of anonymity was dealt with when one respondent asked whether they had to give their names on the questionnaire.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Overview

The chapter is organized under four major sub-sections, A, B, C and D and the results presented in three parts. The first part (Section A) presents the results of the questionnaire. The second (Section B) and third (Section C) parts present the results of the interviews and the observations respectively. Finally, section D presents a discussion on the findings and a summary of the chapter. This presentation style was influenced by the research designed.

4.2 Introduction

The purpose of this study was to explore Upper Primary and Junior High School mathematics teachers' perception of classroom assessment and their current assessment practices in the Central Regional of Ghana. Specifically, the study sought to explore Gomoa East Upper Primary and Junior High School mathematics teachers' perceptions of classroom assessment strategies, their perceptions of assessment in teaching and learning of mathematics and finally to understand the methods and tools teachers use to assess their students. The following research questions to guided the study:

1) What are Upper Primary and Junior High School mathematics teachers' perceptions of classroom assessment in the Gomoa East District?

2) To what extent do Upper Primary mathematics teachers' perceptions of classroom assessment differ from that of their counterparts in the Junior High School mathematics classroom?

3) What assessment methods and tools do Upper Primary and Junior High School mathematics teachers use in assessing learners in the Gomoa East District?

4) To what extent do Upper Primary and Junior High School mathematics teachers' perceptions of classroom assessment relate to their current assessment practices?

5) How do Gomoa East District Basic School mathematics teachers practice assessment in the mathematics classroom?

Section A: Questionnaire Results

4.3 Demographic Characteristics of the Respondents

Structured questionnaire was administered to Upper Primary and Junior High School mathematics teachers at the Gomoa East District in the Central Region of Ghana. The demographic characteristics of the respondents centered on their gender, age, academic qualification, number of years they have been teaching, number of years they have been teaching mathematics and the class level they were teaching as at the time for the study. Frequencies, percentages and charts were used to present the demographic data.

4.3.1 Gender Distribution of Basic School Mathematics Teachers

Data set on sex distribution of the respondents (as shown in Figure 4.1) indicates that out of the total sample size of 273 Upper Primary and Junior High School mathematics teachers sampled for the study, 184 respondent representing 67.4% were

male whereas 89 representing 32.6% were female. A diagrammatic presentation of the gender distribution is presented in Figure 4.1

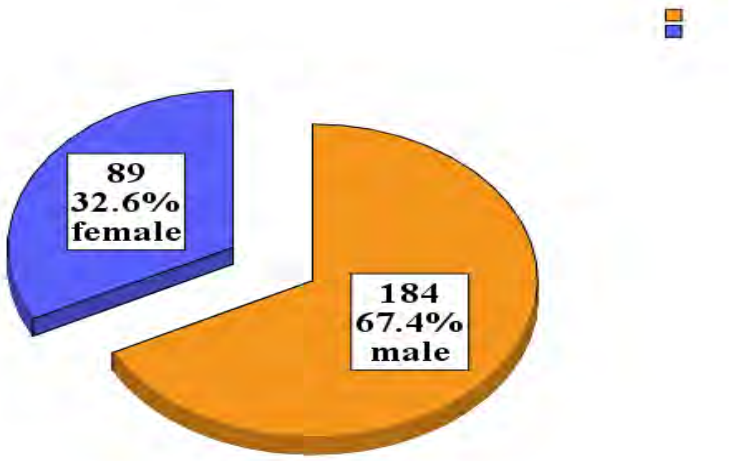

Figure 4.1 Gender Distribution of Basic School Mathematics Teachers.

The result as shown in Figure 4.1 indicates that both male and female Upper Primary and Junior High School mathematics teachers were given the opportunity to participate in the study. Even though there exists to some extend differences in the numbers of the respondents with respect to the gender when it came to responding to the questionnaire data, participants (male and female) were given equal opportunity when it came to responding to the interview items and observation.

4.3.2 Age Distribution of Basic School Mathematics Teachers

The teachers were requested to indicate their age range as applied to them (see Figure 4.2). 33.7% (n = 92) of the respondents indicated that they fell within the 20 – 30

age range, while majority (38.1%, *n* = 104) of the respondents indicated that they fell within the 31 – 40 age range, 65 respondent representing 23.8% were within the of 41 – 50 age range and finally, 4.4% representing 12 respondents were in the 51 and above age range. Figure 4.2 summaries the findings on age distribution of the respondents.

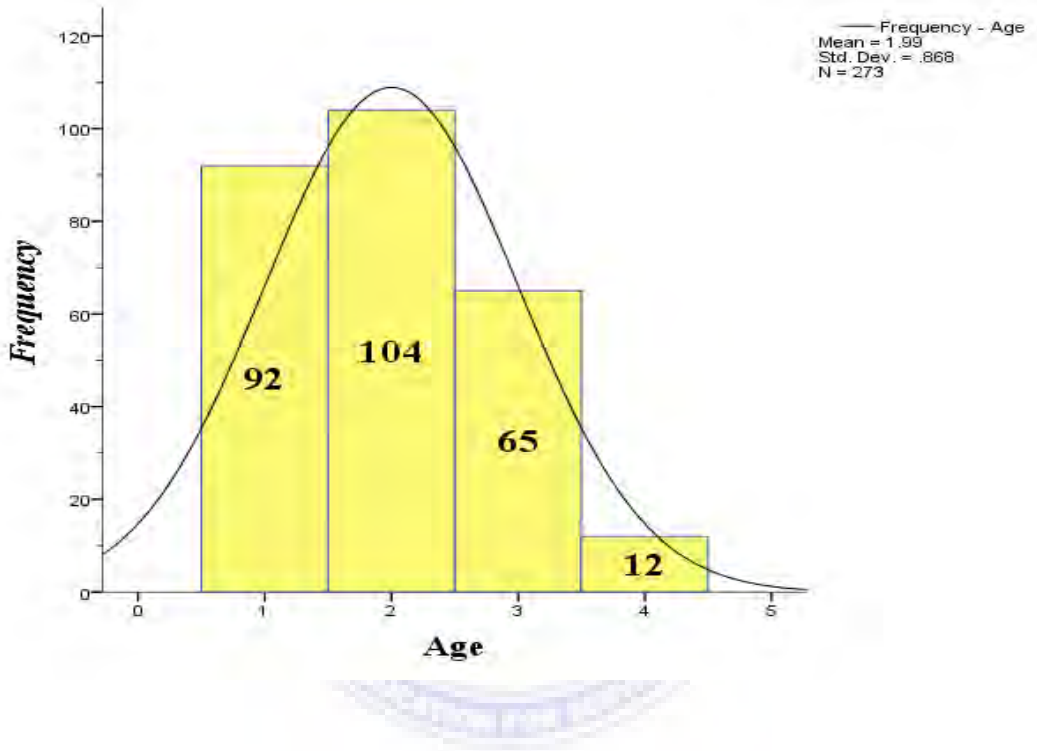

Figure 4.2 Age Distribution of Basic School Mathematics Teachers.

4.3.3 Academic Qualification of Basic School Mathematics Teachers

The teachers were subsequently asked to provide information on their educational background by simply indicating their highest educational standing. The following were the responses gathered from the respondents. Majority of the respondents (131 representing 48.0%) indicated that they had a Bachelor's Degree. 39.9% representing 109

respondents indicated that they had Diploma. Certificate A. holder made up 7.0% of the respondents representing 19 cases of the total sample. 1.8% representing 5 of the respondents indicated that they held Master's Degree. And finally, 9 respondent representing 3.3% also indicated that they held other academic qualification. A summary of teacher respondents and their academic qualifications is as presented in Table 4.1

Table 4.1: Academic Qualification of Basic School Mathematics Teachers.

Academic Qualification	Frequency (*f*)	Percentage (%)
Certificate A.	19	7.0
Diploma	109	39.9
Bachelor's Degree	131	48.0
Master's Degree	5	1.8
Others	9	3.3
Total	**273**	**100**

Source: Field Data - Questionnaire (May, 2015)

4.3.4: Teaching Experience of Basic School Mathematics Teachers

Item four on the bio data sought to find out the number of years the respondents in the Gomoa East District had been teaching in general. The responses are shown in Figure 4.3. Data collected indicates that 95 of respondents, representing 34.8% of the sample size were within the 1 to 5 years of teaching experience. 24.5% of the respondents representing 67 indicated that, they were within the 6 – 10 years of teaching experience. Figure 4.3 (see overleaf) is a diagrammatic representation of the teaching experience of the participants.

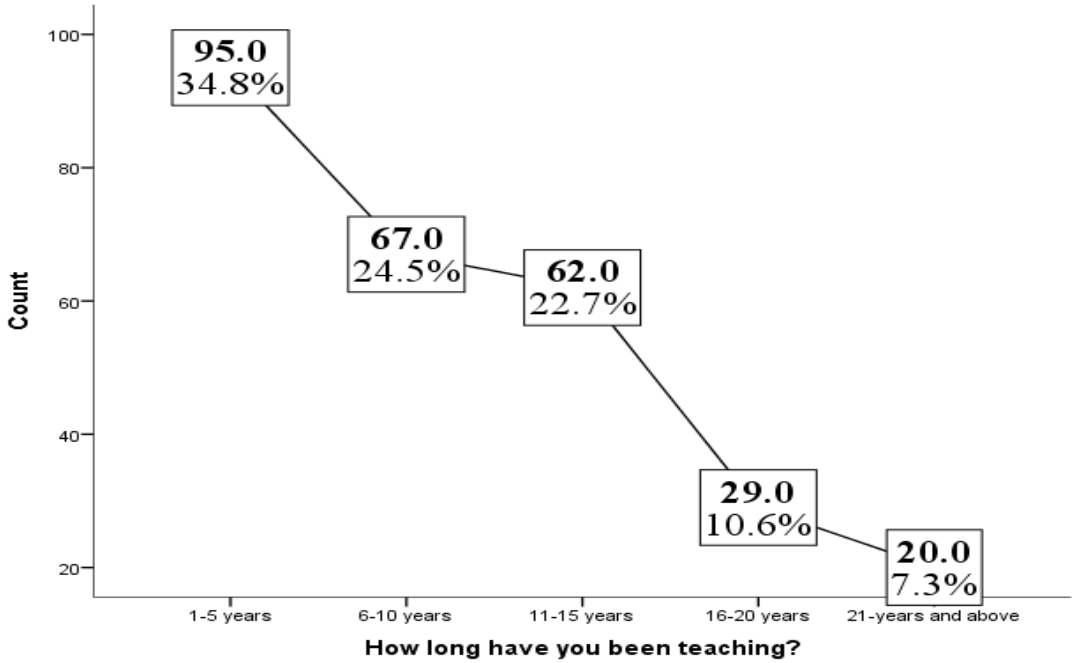

Figure 4.3 Teaching Experience of Basic School Mathematics Teachers.

A sizeable number of the respondents (n = 62, 22.7%) also indicated that they had a teaching experience within the 11 – 15 years of teaching. 10.6% (n = 29) specified that they were within the 16 – 20 years of teaching experience. Finally, 7.3 % (n = 20) indicated that they had been teaching for over 21 years and above. There was no significant difference between answers respondents provided for items four and five. Therefore, the interpretation derived from item four was inferred on item five.

4.3.5 Class Level of Basic School Mathematics Teachers

The respondents were further required to indicate their level of teaching (Upper Primary or Junior High School). The results revealed that, majority (n = 194, 71.1%) of the respondents were mathematics teachers at the Upper Primary level while the rest of the respondents (n = 79, 28.9%) indicated that they were mathematics teachers at the Junior High School level.

4.3.6: Assessment Training of Basic School Mathematics Teachers

The final item on the demographic data, requested the respondents to indicate whether they had received any training in assessing students' learning or not. The outcome revealed that, 5 of the respondents representing 1.9% had had no training at all in assessing students, whereas majority (n = 268, 98.1%) of the respondents indicated that they had at least one or more training in assessing students' learning.

4.4 Findings related to Research Questions

Research Question 1: What are Upper Primary and Junior High School mathematics teachers' perceptions of classroom assessment in the Gomoa East District?

This research question was meant to explore Basic School mathematics teachers' perceptions on the stages of classroom assessment practices. Questionnaire items developed based on the research question were posed to Upper Primary and Junior High School mathematics teachers in the Gomoa East District. Descriptive statistics (frequency, percentage, mean and standard deviation) were the analytical tools used to analyze the responses of the respondent. The following were the stages on which Basic School mathematics teachers' perceptions were sought:

1. Planning
2. Designing
3. Implementing
4. Marking and Interpretation
5. Reporting and Using

The results from the questionnaire data based on research question 1 is presented in Table 4.2 (see overleaf).

Table 4.2: Descriptive Statistics of Mathematics teachers' perceptions of Classroom assessment. (n = 273).

Sub–Scale	Item	RESPONSES			Item *M (SD)*	SS*M* (SS*SD)*
		D (%)	U (%)	A (%)		
Planning	1	20 (7.3)	14 (5.1)	239 (87.5)	**3.8 (0.6)**	**11.0 (1.24)**
	2	77 (28.2)	28 (10.3)	168 (61.5)	**3.3 (0.9)**	
	3	10 (3.7)	15 (5.5)	248 (90.8)	**3.9 (0.4)**	
Designing	4	9 (3.3)	19 (7.0)	245 (89.7)	**3.9 (0.4)**	**11.2 (1.14)**
	5	20 (7.3)	41 (15.0)	212 (77.7)	**3.7 (0.6)**	
	6	40 (14.7)	27 (9.9)	206 (75.5)	**3.6 (0.7)**	
Implementing	7	89 (32.6)	32 (11.7)	152 (55.7)	**3.2 (0.9)**	**10.9 (1.24)**
	8	11 (4.0)	9 (3.3)	253 (92.7)	**3.9 (0.4)**	
	9	24 (8.8)	19 (7.0)	230 (84.2)	**3.8 (0.6)**	
Marking and Interpretation	10	184 (67.4)	35 (12.8)	54 (19.8)	**2.5 (0.8)**	**13.4 (1.45)**
	11	18 (6.6)	39 (14.3)	216 (79.1)	**3.7 (0.6)**	
	12	32 (11.7)	35 (12.8)	206 (75.5)	**3.6 (0.7)**	
	13	57 (20.9)	32 (11.7)	184 (67.4)	**3.5 (0.8)**	
Reporting and Using	14	14 (5.1)	40 (14.7)	219 (80.2)	**3.8 (0.5)**	**19.0 (1.38)**
	15	39 (14.3)	61 (22.3)	173 (63.4)	**3.5 (0.7)**	
	16	7 (2.6)	11 (4.0)	255 (93.4)	**3.9 (0.4)**	
	17	4 (1.5)	4 (1.5)	265 (97.1)	**3.9 (0.3)**	
	18	6 (2.2)	14 (5.1)	253 (92.7)	**3.9 (0.4)**	

Source: Field Data - Questionnaire (May, 2015)

Key: **D** = Disagree, **U** = Undecided, **A** = Agree, **(%)** = Percentage, ***M*** = Mean, ***SD*** = Std. Deviation, **SS*M*** = Sub-scale Mean, **SS*SD*** = Sub-scale Std. Deviation

Results in Table 4.2 show that the sub-scale mean scores ranged from 10.9 (1.24) to 19.0 (1.38). The item mean scores, on the other hand, ranged from 2.5 (0.8) to 3.9 (0.7), while the frequency scores of the teachers' perceptions on the various stages of classroom assessment ranged from 4 (1.5%) to 265 (97.1%). It is evident from the table that, 20 of the respondents representing 7.3% disagreed on the first item, 'I think the classroom assessment is to determine whether students have mastered the learning objectives', 14 representing 5.1% were undecided whereas 239 (87.5%) of the respondents were in agreement with the item. The second item, which was: 'I think

classroom assessment is to determine student grades' had majority (61%, *n* = 168) of the respondents agreeing to the item. Finally, the statement 'I think classroom assessment is to help students develop, practice, and become comfortable with reflection' attracted 248 (90.8%) of the respondents in agreement with the item. Items 1, 2 and 3 under sub-scale 1 attracted a means score of 3.8 (0.6), 3.3 (0.9) and 3.9 (0.4) respectively. Finally, the Planning of Assessment sub-scale had an overall mean score of 11.0 (1.24) which was less than the sub-scale mean of means value (13.1). This shows that the teachers had negative perception of planning classroom assessment.

The second sub-scale, Designing of Assessment, had an overall mean score of 11.18 (1.14). This sub-scale's means score was also less than the mean of means score (13.1). It therefore also suggest that, these respondents negatively perceive the designing sub-scale of assessment. From Table 4.2, majority of the respondents (245 representing 89.7%, 212 representing 77.7%, and 206 representing 75.5%) agreed to the items 4 (I think assessment should be developed based on clearly defined course objectives), 5 (I think teachers should be able to design a table of specifications to plan assessments before lesson) and 6 (I believe teachers should communicate objectives of a topic to the learners at the start of a lesson). These same items attracted some amount of disagreement from the respondents. That is 9 representing 3.3%, 20 representing 7.3% and 40 representing 14.7% disagreed with items 4, 5 and 6 respectively. Finally, the item mean score for item 4 is 3.9 (0.4), that of item 5 is 3.7 (0.6) and item 6 mean score is 3.6 (0.7).

Significantly, a large number of the respondents (253 representing 92.7%) agreed to item 8 that, 'teachers should administer multiple choice questions, short and

medium answer problems'. This item (item 8) had few of the respondents (11 representing 4.0%) disagreed and yet fewer (9 representing 3.3%) were undecided. Subsequently indicator 8 attracted a mean rating of 8.9 (0.4). Additionally, 84.2 % (n = 230) of the participants agreed that teachers should follow required procedures (time limit, no hints) when administering assessments (item 9). This item therefore had a means score of 3.8 (0.6). Interestingly, item 7 (I think teachers should be able to recognize unethical, illegal, and other inappropriate assessment tools and methods) barely had respondents (152 representing 55.7%) agreeing. 89 representing 32.6% of the respondents disagreed while 32 representing 11.7% were undecided. All of these items were under the Implementation of Assessment sub-scale and its mean score was 10.9 (1.24). Among the sub-scale means scores, the implementation subscale value was the least and the mean of means value (13.1) way very much above it. The implication is that majority of the respondents negatively perceived the implementing stage of classroom assessment.

Furthermore, the four sub-scale (Marking and Interpreting of Assessment) had an overall mean scores of 13.4 (1.45). This seems to suggest that majority of the respondents had neutral perception of marking and interpreting classroom assessment practices. All the indicators (11, 12 and 13) under this sub-scale, except indicator 10 which was negatively worded, had majority (216 representing 79.1%, 206 representing 75.5% and 184 representing 67.4% respectively) of the respondents agreeing to them. It is worth noting that, 20.9 % (n = 57) disagreed that students should serve as peer-assessors and self-assessors during assessment (indicator 13). Indicator 10 had majority (67%, n = 184)

of the respondents disagreeing to the statement that teachers should incorporate classroom behavior, effort, attitude and motivation in the calculation of grades.

Out of the 273 participants, 80.2% (n = 219) agreed that Basic School mathematics teachers should be able to calculate and interpret central tendency and variability for teacher-made tests (item 14). This item had a mean score of 3.8 (0.5). For item 16, 93.4% (n = 255) of the participants agreed that teachers should use assessment results when making academic decisions such as placement and promotion. This shows that these teachers have positive perception about the use classroom assessment and as such the item mean score (3.9, SD= 0.4) was higher than the item mean of means score (3.6). The respondents were also significantly in agreement with the last two items on the sub-scale (Reporting and Using Assessment results). For example, item 17 (I think teachers should be able to provide written and oral feedback to students) had 265 representing 97.1% of the respondents agreeing. In like manner, item 18 (I believe teachers should be able to communicate classroom assessment results to students, parent and educators) also saw unanimous endorsement (92.7%, n = 253) from the respondents. Among all the sub-scale on Teachers' Perception of Classroom Assessment scale, the Reporting and Using of Assessment results had the highest sub-scale mean (19.0, SD = 1.38) which was more than the sub-scale mean of means (13.1). This shows that majority of the respondents had high positive perception toward the individual items which translated into positive perception of the sub-scale under consideration.

Research Question 2: To what extent do Upper Primary mathematics teachers' perceptions of classroom assessment differ from that of their counterparts in the Junior High School mathematics classroom?

To answer this question, an independent samples t-test was conducted to compare mean scores. The test was meant to identify whether the mean scores for Basic school mathematics teachers' perceptions of classroom assessment differ with respect to their class level (Upper Primary and Junior High School). Table 4.3 presents the results of the t-test analysis.

Table 4.3: Independent-samples t-test of Basic school teachers' perceptions of classroom assessment.

	Class Level	N	Mean	Std. Deviation	df	t	sig.
Planning	Upper Primary	194	11.13	1.20	271	2.6	0.01
	Junior High School	79	10.71	1.27			
Designing	Upper Primary	194	11.15	1.13	271	-0.5	0.63
	Junior High School	79	11.23	1.17			
Implementing	Upper Primary	194	10.86	1.31	271	-0.2	0.82
	Junior High School	79	10.90	1.05			
Marking and Interpreting	Upper Primary	194	13.29	1.54	271	-1.1	0.26
	Junior High School	79	13.51	1.19			
Reporting and Using	Upper Primary	194	18.98	1.48	271	-0.6	0.55
	Junior High School	79	19.09	1.13			

Source: Field Data - Questionnaire (May, 2015)

The results in Table 4.3 indicate that participants in the Upper Primary Schools (M = 11.13, SD = 1.20) had more positive perceptions of Planning Classroom Assessment than participants in the Junior High School (M = 10.71, SD =1.27) mathematics classroom. The difference was statistically significant $t(271) = 2.6, p < 0.05$.

The results in Table 4.3 however show that, on the average mathematics teachers in the Junior High School classroom had positive perceptions on the other sub-scales of classroom assessment than their counterparts in the Upper Primary classroom. For example the results indicate that, Junior High School teachers had a mean score of 11.23 (SD = 1.17) on the Designing Assessment sub-scale while teachers in the Upper Primary classroom had a mean score of 11.15 (SD = 1.13). The difference was however not significant $t(271)$ = -0.5, $p > 0.05$; this was because the magnitude of the effect size was very small (η^2 = 0.03). Expressed as a percentage, the eta square indicates that only 3% of the variance in the Designing Assessment is explained by class level of teaching (Upper Primary or Junior High School). It is further evident in Table 4.3 that, Junior High School teachers (M =10.90, SD = 1.05) had a high mean score on Implementing of Assessment than mathematics teachers in the Upper Primary classroom (M = 10.86, SD = 1.31). The difference in the mean scores were also however not statistically significant $t(271)$ = -0.2, $p > 0.05$. The difference was not significant because the magnitude in the means was small (η^2 = 0.01). Expressed as a percentage, only 1% of the variance in Implementing Assessment is explained by class level. Additionally, Upper Primary school teachers (M = 13.29, SD = 1.54) had a low mean score on Marking and Interpreting Assessment than their counterparts in the Junior High School classroom (M = 13.51, SD = 1.19). This

difference was also not significant $t(271) = -1.1$, $p > 0.05$; however it did represent an effect size of 0.02. The eta squared expressed in percentage indicates that only 2% of the total variance in Marking and Interpreting Assessment is explained by class level. Finally, Junior High School teachers ($M = 19.09$, $SD = 1.13$) had a high mean score on Reporting and Using Assessment than teachers in the Upper Primary classroom ($M = 18.98$, $SD = 1.48$). There was no significant difference in the scores of Junior High School and Upper Primary school teacher [$t(271) = -0.6$, $p > 0.05$]. The degree of the difference in the means was very small (eta squared = 0.04). This eta squared expressed as a percentage shows that 4% of the variance in Reporting and Using Assessment is explained by class level.

Research Question 3: What assessment tools and methods do Upper Primary and Junior High School mathematics teachers use in assessing learners in the Gomoa East District?

The purpose of this research question was to give participant the opportunity to rate the extent to which they use some of the mentioned tools and methods of assessment in the mathematics classroom. These tools and methods were listed under two broad paradigms: Traditional and Alternative Assessment. The traditional assessment construct had 3 items (class test, class exercises and oral questions) while the alternative assessment construct had 7 items (choice board, interview, oral presentation, investigative task, portfolio assessment, performance task and project work). Frequencies, percentages, mean rating and their standard deviations were used to analyze

the data set on tools and methods classroom teachers use in assessing their students. The results are presented in Table 4.4.

Table 4.4: Frequencies, Percentages, Mean Rating and their Standard Deviation of assessment tools and methods. (n = 273).

No.	Statement	N. U. (%)	S. U. (%)	U. Occ. (%)	U. O. (%)	U. V. O. (%)	*M* (*SD*)
1	**Class Test**	0 (0)	6 (2.2)	75 (27.5)	143 (52.4)	48 (17.6)	**3.9 (0.7)**
2	**Class Exercise**	1 (0.4)	0 (0)	3 (1.1)	24 (8.8)	245 (89.7)	**4.9 (0.4)**
3	**Oral Questions**	2 (0.7)	7 (2.6)	25 (9.2)	68 (24.9)	171 (62.6)	**4.5 (0.8)**
4	**Choice Board**	77 (28.2)	52 (19.0)	60 (22.0)	59 (21.6)	25 (9.2)	**2.6 (1.3)**
5	**Interview**	49 (17.9)	54 (19.8)	120 (44.0)	35 (12.8)	15 (5.5)	**2.7 (1.1)**
6	**Oral Presentations**	19 (7.0)	40 (14.7)	74 (27.1)	88 (32.2)	52 (19.0)	**3.4 (1.2)**
7	**Investigative task**	37 (13.6)	29 (10.6)	77 (28.2)	97 (35.5)	33 (12.1)	**3.2 (1.2)**
8	**Portfolio Assessment**	48 (17.6)	60 (22.0)	90 (33.0)	57 (20.9)	18 (6.6)	**2.8 (1.2)**
9	**Performance Tasks**	15 (5.5)	28 (10.3)	77 (28.2)	110 (40.3)	43 (15.8)	**3.5 (1.1)**
10	**Project Work**	25 (9.2)	43 (15.8)	124 (45.4)	65 (23.8)	16 (5.9)	**3.0 (1.0)**

Source: Field Data - Questionnaire (May, 2015).

KEY: **No.** = Number, **N. U.** = Not Used, **S. U.** = Seldom Used, **U. Occ.** = Used Occasionally, **U. O.** = Used Often, **U. V. O.** = Used Very Often, **(%)** = Percentage, ***M*** = Mean, ***SD*** = Std. Deviation

The responses of the respondents are presented in Table 4.4 using descriptive statistics. From Table 4.4, the items mean scores ranges from 2.6 (1.3) to 4.9 (0.4). While the frequencies and percentages of the respondents ranged from 0 (0%) to 245 (89.7%). Table 4.4 shows that out of the 10 items that the teachers responded to, only three of these had a mean score higher than the mean of means score (3.5). These items include class test (M = 3.9, SD = 0.7), classroom exercises (M = 4.9, SD = 0.4), and oral

questions (M = 4.5, SD = 0.8). These three items had high mean scores because more than half (70% or more) of the respondent indicated they used these tools and methods often or very often. One item (performance tasks) had a mean score (3.5) equal to the item mean of means score (3.5). This tool in the view of the respondents was neither over utilized nor underutilized.

Table 4.4 further shows that 5 items had a mean score less than the item mean of means score (3.5). The items include oral presentations (M = 3.4, SD = 1.2), investigative task (M = 3.2, SD = 1.2), portfolio assessment (M = 2.8, SD = 1.2), interview (M = 2.7, SD = 1.1) and choice board (M = 2.6, SD = 1.3). These items' mean scores were less because majority of the respondents indicated that they occasional, seldom, or do not at all use these assessment tools.

Research Question 4: To what extent do Upper Primary and Junior High School mathematics teachers' perceptions of classroom assessment relate to their current assessment practices?

The purpose of this research question was to find out if there exist any significant relationship between Basic school mathematics teachers' perceptions of classroom assessment and their current assessment practices. To answer this question, a bivariate correlational analysis using Pearson product-moment correlation was conducted on the data set (Perceptions and Practices of assessment). Preliminary analysis were preformed to ensure no violation of the assumptions of normality, linearity and homoscedasticity. The results are presented in the correlational matrix Table 4.5.

Table 4.5: Bivariate Correlation matrix of Perceptions and Practices of Classroom Assessment

			(*A*) Perceptions					(*B*) Practices				
	Sub-scale	**N**	**1**	**2**	**3**	**4**	**5**	**I**	**II**	**III**	**IV**	**V**
	Planning	**1**	**1**									
	Designing	**2**	.18**	**1**								
A	Implementing	**3**	.09	.17**	**1**							
	Marking	**4**	.04	.23**	.15*	**1**						
	Reporting	**5**	.19**	.39**	.43**	.24**	**1**					
	Planning	**I**	.49**	.16**	.04	.09	.25**	**1**				
	Designing	**II**	.13*	.57**	-.02	.13*	.28**	.43**	**1**			
B	Implementing	**III**	.11	.18**	.61**	.12*	.49**	.33**	.42**	**1**		
	Marking	**IV**	.12*	.18**	.08	.58**	.23**	.39**	.58**	.41**	**1**	
	Reporting	**V**	.08	.25**	.14*	.11	.64**	.39**	.49**	.55**	.61**	**1**

Source: Field Data - Questionnaire (May, 2015)

***p* < 0.05 level (2-tailed). ****p* < 0.01 level (2-tailed).**

Results in Table 4.5 show that there is a significant positive correlation among teachers' perceptions of classroom assessment (Planning, Designing, Implementing, Marking and Reporting) and their current assessment practices (Planning, Designing, Implementing, Marking and Reporting). Table 4.5 indicates that there was a moderate positive correlation between teachers' perceptions and practices of planning classroom assessment (r = .49, n = 273, p < 0.01). The coefficient of determination (R^2) = 0.24. It therefore suggests that teachers' perception of planning assessment helps to explain about 24% of the variance in teachers' practices of planning classroom assessment. The coefficient of determination, (R^2) according to Field (2009) is a measure of the amount of variability in one variable that is shared by the other. Field suggests that the R^2 value can be converted or express in percentage form by multiplying the coefficient of

determination by 100. He however cautioned that direct conclusions about causality from a correlation based on the coefficient of determination, (R^2) value cannot be made.

Furthermore, there was a strong positive correlation between mathematics teachers' perceptions of designing classroom assessment and their practices relating to designing classroom assessment (r = .57, n = 273, p < 0.01). The magnitude of the relationship between the means of these two variables was large (R^2 = 0.33). Thus, when the coefficient of determinate is expressed as percentage, it shows that 33% of the variance in teachers' practices of designing classroom assessment is explained by their perception of designing classroom assessment.

Additionally, results in Table 4.5 show that there was a strong significant positive relationship between teachers' perceptions of implementing classroom assessment and their procedures of implementing assessment in the classroom (r = .61, n = 273, p < 0.01). The R^2 (coefficient determinant) = 0.37. When the R^2 is expressed as a percentage, it can be observed that almost 37% of the total variance in practicing implementing classroom assessment is explained by teachers' perceptions of implementing assessment in the classroom.

Moreover, teachers' perceptions of marking assessment was significantly correlating strongly (r = .58, n = 273, p < 0.01) with their practicing of marking in the classroom. The coefficient of determinant which explain the magnitude of the relationship between the two variables was large (R^2 = 0.34). Thus 34% of the variance in teachers' marking in the classroom is explained by their perceptions of marking classroom assessment.

Finally, results from Table 4.5 point out that there was a strong positive significant correlation (r = .64, n = 273, p < 0.01) between teachers' perceptions of reporting and using classroom assessment results and their act of reporting classroom assessment results to students, school authorities, parents and other educational stakeholders and using the results in making instructional decision. The scale of the relationship between these two variables was very large as it recorded a coefficient determinant of (R^2) 0.41. When this R^2 is expressed in percentage wise, it shows that about 41% of the total variance in practicing reporting and using assessment results is described by mathematics teachers' perceptions of reporting and using classroom assessment results.

Research Question 5: How do Gomoa East District Basic School mathematics teachers practice assessment in the mathematics classroom?

Participants were required to rate their classroom assessment practices based on the following constructs/sub-scales:

1. Planning
2. Designing
3. Implementing
4. Marking and Interpreting
5. Reporting and Using.

The purpose of this research question was to find out how mathematics teachers practices classroom assessment in their various schools. Descriptive statistics such as mean scores and standard deviations were used in analyzing the data set. The analysis

was conducted based on Gomoa East District teachers' class level (Upper Primary and Junior High School). The findings of the analysis is presented in Table 4.6.

Table 4.6: Mean scores and their Standard Deviations of Mathematics Teachers' Assessment Practices.

Class Level	Sub-scales	N	Mean	Std. Deviation
Upper Primary	Planning	194	**13.0**	1.7
	Designing	194	**11.0**	2.6
	Implementing	194	**11.0**	2.7
	Marking and Interpreting	194	**14.0**	3.3
	Reporting and Using.	194	**19.2**	3.1
Junior High School	Planning	79	**12.4**	1.4
	Designing	79	**11.0**	2.4
	Implementing	79	**11.0**	2.2
	Marking and Interpreting	79	**14.0**	3.0
	Reporting and Using.	79	**19.0**	3.5

Source: Field Data - Questionnaire (May, 2015)

The research results in Table 4.6, reveal that reporting assessment results sub-scale attracted the highest mean score rating (M = 19.2, SD = 3.1) from the upper primary mathematics teachers. This mean score was above the mean of means score (13.7). This is an indications that most of upper primary mathematics teachers in the Gomoa East District' assessment practices with regard to reporting assessment results is above average performance. Some of the constituent of the reporting assessment results sub-scale on which upper primary schools teachers performed above average include: 'I provide written and oral feedback to students' (M = 4.4, SD = 0.70) and 'I use assessment results when making decisions (e.g., placement, promotion) about individual students and

evaluating class improvement' (M = 4.3, SD = 0.95). The second most rated classroom assessment practices sub-scale by the upper primary mathematics teachers was the marking and interpreting of assessment. This sub-scale attracted a mean score of 14.0 (SD = 3.3) from the upper primary school teachers and it was slightly above the mean of means score (13.7). The items that were under this construct which the teachers indicated that they were practicing above average include: 'I use criteria-referenced grading model' (M = 3.5, SD = 0.9) and 'I assess group hands-on activities' (M = 3.59, SD = 1.0). Slightly below the mean of means score (13.7) was 13.0 (SD = 1.7) a means score rating from upper primary teachers for planning classroom assessment practices. This suggest that most of the teachers' practices in terms of planning classroom assessment was an average performance. Finally, upper primary schools teachers rated two sub-scales (Designing M = 11.0, SD = 2.6 and Implementing assessment M = 11.0, SD = 2.7) below the mean of means score (13.7) which indicates that these two practices were below average performance. Samples of the items that were under rated, which were however the focus of these two sub-scales include: 'I develop assessment that help students to develop, practice, and become comfortable with reflection, and critical analyst of their learning' (M = 2.5, SD = 0.8) and 'I communicate objectives of a topic to the learners at the start a lesson' (M = 2.6, SD = 1.3)

Junior High School mathematics teachers were also given the opportunity to rate their classroom assessment practices. The results are also presented in Table 4.6. From Table 4.6, it is clear that majority of the Junior High School teachers, practiced reporting and using assessment results better than any other sub-scale of assessment practices. This was revealed when the respondents rated the practiced reporting and using assessment

results highest (M = 19.0, SD = 3.5) and this rating was higher than the mean of means score (13.5). The sub-scale means score was high because constituent items such as: 'I use assessment results when making decisions (e.g., placement, promotion) about individual students and evaluating class improvement' (M = 4.1, SD = 1.0) and 'I provide written and oral feedback to students' (M = 4.2, SD = 0.8) were rated high. The Junior High School teachers also, like their counterpart at the upper primary schools, rated the marking and interpreting assessment practices slightly above (M = 14.0, SD = 3.0) the group mean of means score (13.5). The inferences here is that, the Junior High School teachers are of the view that their classroom assessment practices in terms of marking and interpreting is above average. Finally, the Junior High School teacher rated three sub-scale of classroom assessment practices low. These three sub-scales include planning assessment (M = 12.0, SD = 1.4), designing assessment (M = 11.0, SD = 2.4) and implementing assessment (M = 11.0, SD = 2.2). All of these sub-scale mean scores were less than the mean of means score (13.5). This indicates that most of the Junior High School mathematics teachers are of the view that their classroom assessment practices in terms of planning, designing and implementing classroom assessment was below average. When the respondents were requested to indicate how they plan assessment, majority of them indicated that they develop assessments that prepare students for standardized examination (M = 4.4, SD = 0.7). Minority of the respondents also indicated that they designed a table of specifications to plan assessments before every lesson (M = 2.1, SD = 0.9). Minority of Junior High School teachers also indicate that they communicated objectives of a topic to the learners at the start a lesson (M = 2.4, SD = 0.8).

4.5 Section B: Interview Data Results

The aim of this section was to use semi-structured interview to collect qualitative data to help explain in greater depth the issues that were emerging from the quantitative phase (teachers' perceptions and practices of assessment) of this research. The interview was conducted on ten upper primary and Junior High School teachers. These interviewees were selected from the 273 teachers who responded to the questionnaire instrument. Although the number of participants in this qualitative phase was small (n = 10), Cohen, Manion, and Morrison (2007) opines that this is not unusual in qualitative studies. The themes around which the qualitative data (interview) was collected were:

1. Upper primary and Junior High School mathematics teachers' perceptions of planning classroom assessment.
2. Upper primary and Junior High School mathematics teachers' perceptions of designing classroom assessment.
3. Upper primary and Junior High School mathematics teachers' perceptions and practices of implementing classroom assessment.
4. Upper primary and Junior High School mathematics teachers' perceptions and practices of marking and interpreting assessment results.

The abbreviation *UPT* followed by a number in the write up is an identity of upper primary school teacher respondent while *JHST* followed by a number in the write up is an identity of a Junior High School mathematics teacher respondent. For example, *UPT 1* means first upper primary school teacher interviewee and *JHST 2* means second Junior High School teacher interviewee.

4.5.1: Upper primary and Junior High School mathematics teachers' perceptions of classroom assessment

As a follow up on mathematics teachers' perceptions of planning classroom assessment, ten upper primary and Junior High School teachers were interviewed on the following questions:

Question: What in your view, is classroom assessment?

This question was meant to solicit for respondents' views about classroom assessment in general. It was evident from the responses that majority of the interviewees perceived classroom assessment generally as an instrument that sever summative purposes. The following excerpts are some of the responses participants gave to the question:

> *Classroom assessment is emmm measuring the extent of a pupil's achievement or the…emm the subject the level of the subject that is the extent to which a pupil has been able to understand whatever is taught in the classroom* (*JHST 1*, Interviewed data, 2015).
>
> *To me classroom assessment has to do with appraising the child's performance and everything he/she does. That is why it is class work, like assignments that I give them. But the collective output of the child in the class is what I term as classroom assessment*. (*UPT 3*, Interview data, 2015)

The next question the researcher asked with the intention of further understanding the teachers' perception of assessment was 'Do you assess pupils/students in your mathematics classroom? And how often?' The responses to this question indicated that all the teachers assess their learners. However, the timing of the assessment was the point of divergence with the purpose of classroom assessment. The following excerpts are the viewpoints of teachers about how often they assess their learners:

> *Oh almost all lessons. You know we have evaluation section in the lesson not so…….so when the lesson is over, I put exercise or test on the board for the students to do. And I ask questions when I am teaching.* (*JHST 4*, Interview data, 2015).

When it came to the turn of upper primary teachers, they also responded as follows:

> *You know after every lesson, we do…I do the oral or written assessment for them. In terms of exercises, or call one or two of them to come forward and then explain what has been taught, not to my understanding but basically to the understanding of colleagues in the classroom.* (*UPT 5*, Interview data, 2015).

One also stated that:

> *After very lesson, they are given a few questions to answer. So we assess them. Very two weeks to they take a class test. (UPT 2, Interview data, 2015).*

The researcher at this stage finally asked the participants a direct question 'What in your view is the purpose of classroom assessment?' The main viewpoints of the participants are presented in the following abstracts:

> *……is for decision making to take a decision. The decision could be either for placement or re-enforcement of the same topic. So whenever there is assessment, either as in placement were to place the child. Is the child supposed to go forward? Does the child need remedial? Does the child need any special attention? I believe that assessment is for decision making.* (*JHST 3*, Interview data, 2015).

These teachers, counterparts in the upper primary schools were also of the following opinion:

> *……purpose is to know as to whether what the teacher has taught the pupils, they have been able to understand them more or less assimilate. Whether whatever you have been able to teach them they have been able to understand well. And is to whether the teacher has been able to cover em….what he intended teaching the pupils I think that's what the purpose of classroom assessment is. (UPT 1,* Interview data, 2015).

Inferences from the excerpts above shows that, most of the teachers perceived classroom assessment not as formative purposes but rather as summative. For example the definitions, the frequency and timing of assessment and answers to the last question on the purpose of assessment suggest that teachers' perceptions of assessment is that of summative.

4.5.2 Gomoa East Districts Basic school teachers' perceptions of designing classroom assessment

The next perception on which mathematics teachers view were solicited during the interview segment was on how they design classroom assessment. The purpose was to confirm or refute the results from the quantitative data and to give voice to the respondents to explain their position. The teachers were therefore taken through few questions in order to understand their perceptions.

Question: Have you heard of the Bloom's Taxonomy?

One of the tools that is critical at the designing stage of classroom assessment is the Bloom's Taxonomy. Majority of the respondents when asked indicated that they have heard of Bloom's Taxonomy before. However, when given the opportunity to explain, only three of them were able to try an explanation. For example:

> *I think em...what I know about Bloom's Taxonomy is…….for example we have the lowest level being knowledge, acquiring the knowledge and the child must be able to…apply, I think application, knowledge, application, and then it boils down to analysis. That what I know about it.* (*UPT 4, Interview data, 2015*)

However, the other teachers were mostly stating that:

> *I have heard of it but it's been a long time so I have kind of forgotten* (*JHST 3,* Interview data, 2015)

The teachers were subsequently asked about another important tool which is inevitable during the designing stage of assessment. The Table of Specification. Some of the respondents said they have not heard of it before, others answered in the affirmative and yet others were of the view that, '*I have heard of it but it's been a long time, that's why'* (*JHST 4,* Interview data, 2015).Those that claim they have heard of it were asked if they used it in the design of their assessment instruments. They gave the following responses:

> *Sometimes I do, yes sometimes I do. But I do use it more in setting my examination questions* (*JHST 3,* Interview data, 2015).

Yet another said that:

> *Yes I do use it when we are setting questions. (**Researcher: Can you describe how you use it?**) Is like is you group…..when you take a subject and then develop sub-topics that you taught or you were able to cover within a particular time or particular term and then you, you weigh it em..and you assign a particular specific number of questions you will wont to ask from …..in each particular topic….under each particular topic. At least you know this topic….is broader than this one so err….I need to ask questions…..and then you will base it on the the….Bloom's Taxonomy tooo, application or knowledge base. So definitely you take all these in to considerations as whether….you ask more knowledge based questions or application depending on the class and knowledge based depending on the class. And that's what we do.* (*UPT 1,* Interview data, 2015)

The interview results turns to indicate that upper primary and Junior High School mathematics teachers do not have positive perceptions about designing classroom assessment. This goes to confirm the questionnaire results.

4.5.3 Mathematics teachers' perceptions and practices of implementation classroom assessment

Mathematics teachers' perceptions of implementing classroom assessment have the tendency of influencing teachers' assessment practices. Consequently, teachers were given the opportunity to voice their perceptions about teachers' and students' roles in assessment implementation and the tools and method they think should be employed at this stage.

The first question that the participants were asked during this section was, 'What tools and methods do you think should be used in assessing students?' The respondents were mostly given answers that were within the traditional methods of assessment range as expressed below:

> *I mostly think we should use, assignments, exercises, tests and sometimes projects* (*JHST 3,* Interview data, 2015).

Another colleague was of the view that:

> *....the method, the method at times, you see at times, apart from the written question may be you set objectives question, a times to essay questions, a times to it can be verbal, verbal as well.* (*UPT 1,* Interview data, 2015)

The next question was 'What in your view should be the role of students and teachers at the implementation stage of classroom assessment?'

In implementing assessment, students are expected to take active roles and the teachers' role as sole implementer is transformed to a guide and facilitator. The Gomoa East District mathematics teachers' perceptions on these roles were collected. While some of the teachers said they did not know the role students should play, others were of the view that, students should maintain their traditional role in the implementation of

assessment. In the traditional assessment, students sit quietly and respond to written tasks or oral questions individually. The piece below expresses these perceptions:

> *I think the students should prepare adequately, by that I mean learn before coming to the class. The teacher will make sure that they are all seated. He either shares the questions or writs it on the board the pupils to copy. The students on the other hand are supposed to sit quietly and answer the questions. Comportment should be on the parts of the students.* (*JHST 3,* Interview data, 2015)

One other teacher was of the view that

> *…role of the students……at the implementation stage of the assessment? Woow, I can't see any role now.* (*JHST 1,* Interview data, 2015)

When it came to the role of teachers, most of the respondents were of the view that, the teacher should be mostly the one at the center of the whole implementation stage of assessment. This was well captured in the excerpts below:

> *I think with assessment, everything has to do with the teacher. Most of the things is all boils down to the teacher. Because it is the teacher who intend assessing the extent of achievement or emmmm….as to whether the pupils can execute a particular task very well. So everything is with the teacher. He is going to prepare the tools…..he is going to sorry design, he is going to come out with the tools and he is going to monitor the whole process. The teacher, the teacher……at the end of the day he is going to score, he is going to score. Almost everything is his, just a little something small from the students.* (*UPT 1,* Interview data, 2015).

It is evident from the interview results that the teachers perceived the teacher as the finally authority when it came to implementing classroom assessment. To them the teacher should be the only active person during the implementation stage of assessment.

The results also indicates that the teachers are of the view that student should be passive participants during assessment implementation.

4.5.4 Upper primary and Junior High School teachers' perceptions and practices of marking and interpreting assessment results

This stage of classrooms assessment has over the years evolved significantly. For instances assessment expects are of the view that, students should take active role during the marking phase of assessment. This therefore reduces the domineering role of the teacher to a more acceptable role of a guide and facilitator. However, the results from the quantitative data indicated that majority of the teachers had negative perceptions towards marking classroom assessment. This simply means that, the teachers were strongly of the view that marking should remain alien to the students as has been the norm. Generally, students are not expected to participate in the marking process. To this end, excerpts of the respondents' comment summarizes this perceptions of the teachers about the role of both the teacher and the student during the marking stage of assessment:

> *At the marking stage???? At the marking…woooow……that is, well is it the scoring? Hm…..marking…..I know for marking….purely got to do with the teacher. I think everything got to do with the teacher, because you the teacher you, you am not saying you are the fountain of knowledge or the reservoir of all the knowledge but at least, you have much knowledge you have more much knowledge, so you are assessing the pupils so…is the…..the pupils are that stage will not be certain of even what he/she provided…because you are assessing. If anything if the pupils will be every sure of whatever he/she provided after the scoring. So I don't think the pupils can come in with the marking or the scoring or anything is purely the teacher. Because the teacher will come out with the marking scheme and he is going to mark.* (*UPT 1,* Interview data, 2015)

Another teacher also commented as follows

> *…….But marking em….assessment is purely duty of the teacher. So people will say that, students should be given the chance to mark the main exercises but I*

think that, being objective and on a more professional level, I think the teachers should mark all test, exercise and home works. (*JHST 3,* Interview data, 2015)

The data indicates that students are generally not expected to participate in the marking process by their teachers. Instead they the teachers are expected to do all the marking. The interviewees were therefore surprised when asked about the role student were expected to play during the marking stage of the assessment processes.

4.6 Section C: Lesson Observation Results

Observation was necessary in this study because there was the need to follow up to see how Gomoa East District mathematics teachers practice assessment in real classroom sitting. A total of four mathematics teachers were sampled for the classroom observation. The sample was made up of two upper primary and two Junior High School mathematics teachers. In order to maintain confidentiality in this study, the researcher used a pseudonym for each of the participant. Each teacher was observed once and the participants were allowed to select and design their own lesson. Each observed lesson lasted for about 70 minutes. The Classroom Assessment Lesson Observation Protocol (CALOP) was used to observe each of the four mathematics classroom teachers. A brief description of all the teachers and their classroom coupled with a general description of the lessons observed were given. This was followed by a matrix of assessment practices use by upper primary and Junior High School mathematics teachers in the classroom. The proceedings of the observations are presented as follows:

Upper Primary Teacher 1 (Madam Mary [*pseudonym*])

Madam Mary had Diploma in Education holder and teaches class four. Her age as between 25 – 30 years. She had a teaching experience of seven years. Like all upper primary teachers, she teaches all subjects on the time table. Madam Marys' class was made up of 45 pupils (26 boy and 19 girls) and she has been teaching mathematics to class four pupils for the last five years of her teaching experience. Her classroom was to some extent spacious and had a dual-type desk. The classroom arrangement inhibited small group formation, but promoted pupils working in pairs. Her class was sparsely equipped with teaching and learning resources as at the time of the research. There were no charts on the classroom walls and Madam Mary mostly relied on the chalk and chalk board in order to communicate and demonstrate a concept. During the lesson, her pupils' were mostly engaged as a whole group in the same activities at the same time. The pupils were also mostly listening to a presentation from Madam Mary, which included extensive procedural instruction, demonstration and lecture. The process was however interspersed with some informal contributions from the pupils like answering oral questions. The lesson which was observed was on Collecting and Handling Data.

Upper Primary Teacher 2 (Sir Joe [*pseudonym*])

Sir Joe was a seventeen years experienced class six teacher, who holds a Bachelor of Education certificate in Basic Education from the University of Education, Winneba. He fall within the 41-50 year group and has been teaching class six for the last nine years of his teaching experience. He, like Madam Mary, has been teaching all the subjects on his class time table, including mathematics. Sir Joe has participated in a number of in-

service training which was organized by both his old and new district. The class in which Sir Joe was teaching was somehow spacious enough to accommodate the 37 pupils (21 boy and 16 girls) who were present on the observation day. The pupils were seated in pairs on a dual-type dusk in a traditional classroom sitting arrangement. The seating arrangement inhibited quick formation of small group for discussion and therefore the class activities were structured as a whole group, pair or as individual. The entire were also engaged in the same activity at the same time. Sir Joe mostly structure his lessons such that he was the main presenter while his pupils listened. The lesson observed on was Measurement of Area (Area of a Rectangle).

JHS Teacher I (Madam Sarah [*pseudonym*])

Madam Sarah was a Certificate 'A' professional teacher from one of the nation's Colleges of Education. She has been teaching for about 20 years and has participated in a few in-service training. She is within the 41-50 year age range and was the only teacher who was teaching mathematics at the Junior High School section of her school. As at the time of the observation, her class was made up of 60 (44 boys and 16 girls) Junior High School 1 students. Madam Sarah on the day of the observation was teaching Statistics and Probability (Sub-topic: Frequency). The classroom had no enough space as it was overcrowded with students. This inhibited the free follow of engagement between the teacher and the class and among the students. As a result, Madam Sarah mostly structured her classroom activities to include the whole class and individuals. The students were mostly engaged in the same activity at the same time. Her lesson delivery mode was

mainly lecture and demonstration. This class had a chart showing some basic geometric shapes on the wall.

JHS Teacher II (Sir Frank [*pseudonym*])

Sir Frank was a graduate teacher. He holds a Bachelor of Education (B. Ed) in Basic Education. He has been teaching mathematics for 10 years and he is in between the 41 – 50 year age range. Sir Frank has been teaching mathematics for the past 10 years in the Junior High School. The topic on the day of observation was Surface Area and Volume. The number on roll on the day of the observation was 27 (17 boys and 10 girls) students. The classroom had well spacious to contain all the students who were present on the day. Dual and mono-type dusk were mixed up in the class, with some not been occupied by students. The class size and the space in the room could easily facilitate interactions among the class. Teaching and learning resources were however not visible. For example no chart or manipulative was in sight as at of the time of the observation. Major ways by which students' activities was structure was through the whole class engagement and the entire class was engaged in the same activity at the same time. The major role which the students played during the lesson were mostly responding chorus answers, clapping and copying examples from the chalk board.

The researcher after gathering general information observed and ticked any assessment activity practiced by the teacher in the process of lesson delivery. The matrix of assessment practices used by teachers is shown in Table 4.7.

Table 4.7 Matrix of Assessment Practices used by Upper Primary and Junior High School mathematics teachers in the classroom.

No	Statement	T1	T2	T I	T II
1	Communicate objectives of a topic to the learners at the start a lesson	1	1	3	1
2	The design of the lesson allowed the teacher to monitor students' progress	2	2	2	2
3	Teacher uses traditional methods of assessment such as oral questioning and exercise	4	4	4	4
4	Chose and vary alternative assessment tools and methods for instructional decisions	1	1	1	1
5	Use problems which arise from school context or which relate to students' experiences	3	1	3	1
6	Teacher probed students' reasoning.	1	1	1	1
7	The design of the lesson incorporated tasks, roles, and interactions consistent with investigative mathematics.	2	1	2	1
8	The teacher encouraged students to talk and share ideas.	1	1	1	1
9	Students were given immediate feedback when they needed directions to proceed.	2	2	2	2
10	Students serve as peer-assessors and self-assessors during assessment	2	2	2	2
11	The teacher's questioning strategies were likely to enhance the development of student problem solving (e.g., emphasized higher order questions, identified prior conceptions and misconceptions).	1	1	1	1
12	Students had chance to ask questions.	1	1	1	1
13	Teacher was able to identify students who had difficulty in understanding the main ideas of the lesson	1	1	1	1
14	Students were asked to present their solutions to the whole class as individuals or in groups	1	1	1	1

Source: Field Data – Observational Guide (May, 2015)

Key: 1 = Not at all, **2 = Some Evidence, 3 = Clear Evidence, 4 = To greater extent**

T1= Madam Mary, T2= Sir Joe, T II= Madam Sarah and T II= Sir Frank

Table 4.7 shows the overall ratings of all the participants during the lesson observation. The rating ranged from 1 (not at all) to 4 (to a greater extent). From Table 4.7, all teachers, expect Madam Sarah, were rated 1 on the first indicator (Communicate objectives of a topic to the learners at the start a lesson). This means that only Madam Sarah was able to communicate the objective of the lesson to her class at the start of the lesson. The second indicator sought to find out the extent to which participants were monitoring the progress of the students during lesson. All the teachers scored 2 on the

rating scale. There was evident of teachers monitoring their students by asking the whole class questions such as "*Class Do you understand*" to which the class will respond "*Yes sir or madam*" (as the case may be). Generally, the teachers had good rating (4) on indicator 3 (Teacher uses traditional methods of assessment such as oral questioning and exercise). This suggests that the teachers were mostly relying on traditional method of assessment. For example the researcher observed that, oral questioning, exercises and home works were the main means by which the various classes were assessed. Item 4 (Chose and vary alternative assessment tools and methods for instructional decisions) also saw all the teachers been rated 1. The two female teachers (Madam Mary and Madam Sarah) were rated 3rd on the 5th item whereas their male counterparts were rated 1. Madam Sarah for example use Ludo as a TLM for teaching frequency and this encouraged her students to participate in the lesson. Madam Mary on the other hand, during the lesson on collecting and handling of data, called upon the pupils to come forward based on their days of birth and this brought enthusiasm in the class. Items 6 and 8 had bad rating (1). This was because all the teachers mostly asked recall questions and there were no questions meant to follow up on answers a student had provided. The teachers also did not give room for students to talk and share ideas on the concepts or questions under discussion. All the teachers were once more rated 2 on indicators 9 and 10. The only evidence available to the researcher was that, the teachers mostly responded "*No you are wrong*" to a student who gave an incorrect answer. There was no further feedback to give direction to the student in question. On item 10 the only time the students served as peer-assessors was when the class was ask "*Is he/she correct?*" to which they will respond "*No sir/madam*" (as the case may be). Indicators 11 to 14

attracted a rating of 1 for each participant. For example on item 13, teachers were expected to identify students who had difficulty in understanding the main idea of a concept. However, all the teachers did not pause to ask the students if they had any difficulty. The only time the teachers were close was when they will ask the whole class "*Do you understand?*" to which the class in a chorus form will answer "*Yes sir/ madam*" (as the case may be).

It can be deduced from the above responses that the

4.7 Section D: Discussion of Findings

This study made an attempt to sequentially explain Central Regional Basic Schools' mathematics teachers' perceptions and practices of classroom assessment and the tools they employ in assessing learners. Understanding teachers' perceptions and practices in classroom assessment provides insights into how such perceptions and practices may influence policy recommendations (Susuwele-Banda, 2005) and students' learning. Quantitative results from the questionnaire was first presented. This was followed by qualitative results from both the semi-structured interview schedule and the observational guide.

In research question one (1) Basic School mathematics teachers' perceptions on the various stages of classroom assessment was investigated. The quantitative results reveal that majority of the teachers' had negative perception of the planning stage of classroom assessment. The mean score value for this sub-scale was 11.0 (1.24) (see Table 4.2) which is less than the mean of means score (13.1). The indication is that majority of the teachers generally perceived classroom assessment as serving summative purposes.

This was very much evident during the interview section. Most of the respondents, thought of assessment as a tool used for measuring students' achievement or a tool used to appraise students' performance. Some of the respondents indicated that they assess mostly after very lesson, weekly or monthly, while others indicated that they call on students to answer questions orally. Finally, when respondents were asked about their view of the purpose of assessment, some of the teachers indicated that assessment was used for decision making like placement and promotion, others said it was a way of checking if one has been able to cover the topic or sub-topic he/she set to teach. Although all the examples mentioned above are purposes of classroom assessment, these are summative in nature (Susuwele-Banda, 2005). The findings on the teachers' perceptions of the purpose of assessment was in line with literature. Research (Leung, 2005) reveal that China was the first country in the world (587 A. D.) to have introduced assessment. The sole function of assessment to them then was for selective purposes (Leung, 2005). The selective and other traditional functions, according to Mohamad (2009), have served summative purposes over the last few decades in our classroom. Morgan and Watson (2002) found that the summative purpose is still active in the 21st century classroom because most teachers view classroom assessment as an added requirement to their teaching job and not as a tool to improve their teaching. Susuwele-Banda (2005) opines that, teachers who perceive classroom assessment as summative fail to understand the learning potentials and difficulties experienced by their students during the learning process. Alternatively therefore, researchers have proposed that classroom assessment should be used to serve formative purposes in order to promote learning (Australian Association of Mathematics Teachers, 2008). Leung (2005) claims that even China with

its long tradition of examination culture has acknowledged the importance of assessments that serve formative purposes (An, 2004). It is therefore important for our classroom teachers to perceive assessment as formative instead of summative to achieve the objectives of classroom assessment.

The second stage of assessment on which teachers' perceptions were investigated was on the designing phase. The overall mean score value on this subscale during the quantitative data analysis was 11.2 (1.14) (see Table 4.2). This finding suggests that generally upper primary and Junior High School teachers had negative perception on the designing phase of classroom assessment. Negative perception here implies that, the teachers in this study did not appreciate modern approaches of developing assessment instruments. Data gathered on the respondents during the interview section indicated that most of the respondents did not know about some of the tools used in designing assessment however they said it was good to design assessment instruments as a teacher before teaching. It was also evident during the interview that the teachers were of the view that instructional objectives should be stated at the beginning of a lesson. However, when it came to classroom observation only one teacher stated the objective. In an extensive review of the trends of mathematics teaching and learning research, Niss (2007) found that frequently assessment instruments hold limited scope of the content and assess low level competencies. This was as a result of teachers' failure to use the basic assessment design tools. In a comparative study on mathematics assessment and teaching practice among 14 year old students in the USA, England and Wales, Firestone, Winter, and Fitz (2000) found that many of the tests were not well-written, and typically focused on repetition of learned procedures using small sets of problems. For this reason,

teachers must have a good perception of how to design assessment and construct specific, measurable, attainable, realistic, and student-centered instructional objectives (Gronlund & Waugh, 2009; Reynolds, Livingston, & Willson, 2009).

The quantitative results in research question 1 further suggests that, Gomoa East District mathematics teachers' had negative perception about implementing classroom assessment. This sub-scale attracted a means score value of 10.9 (1.24) (see Table 4.2) which was less than the mean of means score (13.1). This implies that most of the teachers were still holding on to the traditional view of implementing classroom assessment. The findings from the qualitative data also reveal the following:

1. Majority of the interviewees perceived classroom assessment tools and method as the traditional paper and pen and oral questions.
2. The interviewees did not see the any major role students must play at the implementation stage of assessment, except for the students to sit quietly and answer questions independently.
3. It was also evident during the interview section that, the respondents were of the view that the classroom teacher was the center and the only active participant during the implementation stage of assessment.

These finding is consistent with earlier studies carried out in different countries (Ohlsen, 2007; Watt, 2005) which revealed that, in general mathematics teachers often rely heavily, or exclusively, on oral questioning and written approaches, typically via testing and classroom exercise for classroom assessment. Literature (Mohamad, 2009) further shows that in the traditional assessment practice, the convention is that teachers are invigilators at the implementation stage of assessment, while students sit quietly

responding to written questions or tasks individually. However, in recent years researchers (Clarke, Goos, & Morony, 2007; Department of Education and Early Childhood Development, 2006; Watt, 2005) have advocated for assessment practice, especially when alternative assessment methods are utilised, and when there is a change in the role of teacher.

Teachers' perceptions on marking classroom assessment were also investigated. The quantitative results indicated that, most of the respondents maintained a neutral perception of classroom assessment when it came to marking stage. This sub-scale attracted a means score of 13.4 (1.45) (see Table 4.2) which was around to the mean of means score value (13.1). The results show that, majority of the respondents had some perceptions which were related to the traditional assessment practices. At the same time the respondents possessed perceptions which were related to alternative assessment practices. The quantitative results was in congruence with the qualitative findings. During the interview section the respondents indicated that they did not regard students as assessors or co-assessors, they however pointed out that teachers must undertake most of the activities at the marking stage. It is important for teachers to understand that in the new assessment culture, students have two major roles during the marking stage. Both roles are known as peer-assessor and self-assessor on their learning process (Elwood & Klenowski, 2002). This is essential because according to Stiggins (2002), students who engaged in regular self-assessment during the marking stage of assessment, with criteria and standards held constant, will be able to watch their progress over time, and thus feel in charge of their own success. Additionally, Natriello (1987) (as cited in Mohamad, 2009) proposed that instead of teachers directly marking the work, they could sample

work and appraise the performance based on the pre-determined criteria and standards. The collected samples can become valuable exemplars for analysis.

Finally quantitative results on question one revealed that majority of the respondents had positive perception (M = 19.0, SD = 1.38) (see Table 4.2) on the reporting stage of classroom assessment. This was because the sub-scale means score was more than the mean of means score (13.1). The implication of this quantitative result implies that, Gomoa East District teachers are able to report on students' achievement. This findings were in line with Susuwele-Banda (2005) study. In his study six participants were also asked to indicate the type of feedback they provide to students based on their assessment. Responses given included: clapping hands for the students, praising the students, giving the students grades such as 70/100, displaying assessment results for everybody to see, and reviewing students' work with the students.

The next research question (2) intended to find out if there was any significant differences existed between upper primary mathematics teachers' perceptions of classroom assessment and the perceptions of their colleagues in the Junior High School mathematics classroom. The t-test results indicated that expect on planning assessment sub-scale which had significant difference between the two class levels (Upper Primary and Junior High School), all the other subscales did not record any significant differences between the two class levels. This result is supported by Zhang and Burry-Stock (2003) study, which concluded that teachers with varying characteristics such as teaching level and subject taught may to an extent explain varying results in assessment practices. The results also coincide with a study by Koloi-Keaikitse (2012) asserted that there were

varying degree of differences in the perceptions of classroom assessment among lower, middle and upper primary school teachers.

The research question that focused on assessment methods and tools used by teachers to assess their students in the Gomoa East District was central to this research. Results from both quantitative and qualitative data on question 3 revealed that Gomoa East District teachers had limited tools and methods of assessing their students. These teachers mainly used exercises, oral questions and tests to assess their students. Although teachers gave individual exercises toward the end of every lesson, the exercises were given to the students to practice and consolidate what the teacher had just demonstrated. This kind of approach encourages memorization of procedures and processes. This results concur with findings reported by other researcher Susuwele-Banda (2005). The results, in his study indicated that most of respondents used traditional assessment tools and method such as test, exercises and oral questions. Susuwele-Banda citing Fennema and Romberg (2001) recommended that teachers need to use different strategies to monitor students' progress in mathematics. Strategies such as journal writing, learning logs, probing questions, observation, clinical interview, and thinking aloud may help teachers to understand the mental processes that students engage in as they solve mathematics problems. That the 21st century teachers should know little of the alternative tools and hardly use them is a manifestation of inherent instructional and assessment challenge in our educational sector (Nabie & Nantomah, 2012).

Findings from question 4 indicated that, the respondents' perceptions of classroom assessment had influence on their classroom assessment practices. The correlational results indicated that there were strong and moderate positive correlation

between teachers' perceptions (planning, designing, implementing, marking and reporting) and practices (planning, designing, implementing, marking and reporting) of classroom assessment practices respectively. The findings support previous findings by Meece, Anderman and Anderman (2006) who found that teachers' perceptions of classroom assessment affected their classroom assessment practices. According to literature it is clear that teachers' beliefs influence their instructional behaviour (Yates, 2006). Yates, citing a number of studies asserted further that, it is clear in scholastic work that teacher beliefs are robust, resistant to change, serve as filters for new knowledge, and act as barriers to changes in teaching practices. Furthermore, teachers' beliefs can either facilitate or inhibit curriculum reform (Yates, 2006).

The quantitative findings from questions 5 revealed that majority of the respondents' assessment practices in relation to planning, designing, and implementing were below average while the marking and reporting assessment practices were above average. There was no difference between upper primary and Junior High School teachers' ways of practicing and implementing assessment. That is the findings were reported among upper primary and Junior High School mathematics teachers. Results from the lesson observation also revealed that the teachers asked low-level questions and called for choral responses from the students. Teacher-centered approaches were predominant. On average students worked only the last ten to fifteen minutes of the lessons duration. There were cases when a teacher took twenty minutes to work out two examples on the chalkboard. The problems given were generally oral and the few written questions were meant for practice. The students were not given timely and immediate feedback to their responses. The quantitative finding of this research was contrary to

Lekoko and Koloi (2007) findings. However, the observation data confirmed their research findings. Lekoko and Koloi (2007) findings conducted survey with pre-service teachers who enrolled in education classes at the University of Botswana. The purpose of this study was to explore students' perceptions regarding the correlation of teacher's feedback and the grades that teachers award to students. Students revealed some experiences regarding how their work is graded and the nature of feedback they receive from their lecturers. This study showed that when lecturers grade students' work they did not provide adequate comments that could help students understand where they went wrong, teachers gave low marks that are not accounted for in terms of what and how the teacher arrived at the marks, there was no reconciliation of marks and comments accompanying them, and teachers made ticks that were incompatible with the marks given.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

The purpose of this sequential explanatory mixed method study was to describe Upper Primary and Junior High School mathematics teachers' perceptions and practices of classroom assessment in the Gomoa East District in the Central Region of Ghana. It further explored tools and methods these mathematics teachers use in assessing their learners. The study adopted Mohamad's (2009) conceptual framework of classroom assessment (Assessment Process). The target population for this study was all upper primary and Junior High School mathematics teaching in the Central Region of Ghana. The accessible population on the other hand consisted of all 289 upper primary and Junior High School mathematics teachers in the Gomoa East District. However, a total of 273 consented teachers completed and returned their questionnaire (Upper Primary = 194 and Junior High School = 79). The instruments used in this study were, Classroom Assessment Conception Instrument (CACI) (questionnaire), semi-structured interview guide and Classroom Assessment Lesson Observation Protocol (CALOP) (Observation Check List).

The study was guided by the following research questions:

1) What are Upper Primary and Junior High School mathematics teachers' perceptions of classroom assessment in the Gomoa East District?

2) To what extent do Upper Primary mathematics teachers' perceptions of classroom assessment differ from that of their counterparts in the Junior High School mathematics classroom?

3) What assessment methods and tools do Upper Primary and Junior High School mathematics teachers use in assessing learners in the Gomoa East District?

4) To what extent do Upper Primary and Junior High School mathematics teachers' perceptions of classroom assessment relate to their current assessment practices?

5) How do Gomoa East District Basic School mathematics teachers practice assessment in the mathematics classroom?

A survey was first conducted to explore the respondents' perceptions of classroom assessment, the difference that exist between upper primary and Junior High School teachers' perceptions of classroom assessment, the tools and methods the respondents use in assessing their student, the relationship that exist between teachers' perceptions and practices of classroom assessment and how Gomoa East District mathematics teachers practice classroom assessment. Descriptive statistics (frequencies, percentages, means scores and standard deviations), independent-sample t-test, and Pearson product-moment correlation were the quantitative analytical tools used in analyzing the quantitative data. Quantitative data was the grounding for this study. Using the data obtained in the quantitative phase, in-depth interviews and lesson observations were employed to explore areas identified in the quantitative findings. Thematic analysis and in-depth interviews were undertaken on the qualitative data.

5.2 Summary of Key Findings

5.2.1 ***Research Question 1:*** What are Upper Primary and Junior High School mathematics teachers' perceptions of classroom assessment in the Gomoa East District?

It was found in this study that majority of the respondents perceived classroom assessment as. The study revealed that:

a. Majority of the teacher respondents generally perceived classroom assessment as a tool used for serving summative purposes.

b. Most of the participants did not appreciate the 21st century ways and means of designing desirable classroom assessment instruments which have the potential of promoting critical and logical thinking, problem-solving strategies among others.

c. Presenting assessment at the prerogative of the teacher and students remaining inactive at the implementation stage of classroom assessment were the perceptions of majority of the respondents.

d. The participants had a split view on the marking stage of classroom assessment. Most of them did not appreciate the evolving active role of students in marking assessment. The perceptions of the respondents on the teachers' role during the marking stage were in congruence with desirable assessment practices.

e. Interestingly, the participants' perceptions on reporting assessment results to students, and educational stakeholders were in line with desirable classroom assessment practices

5.2.2 ***Research Question 2:*** To what extent do Upper Primary mathematics teachers' perceptions of classroom assessment differ from that of their counterparts in the Junior High School mathematics classroom?

The independent-sampled t-test turns to suggest that

- **a.** Upper primary teachers' perception of planning classroom assessment differed significantly from the perception of the colleagues in the Junior High School classroom.
- **b.** There was no significant deference between upper primary and Junior High School teachers' perception of designing, implementing, marking and reporting of classroom assessment
- **c.** The means score values of the Junior High School teachers' perceptions on designing, implementing, marking and reporting of classroom assessment were higher than their colleges in the upper primary classroom.

5.2.3 Research Question 3: What assessment methods and tools do Upper Primary and Junior High School mathematics teachers use in assessing learners in the Gomoa East District?

The findings in research question 3 indicated that:

- **a.** Majority of the teachers use traditional assessment tools and methods such as: oral questioning, class exercises, test, and assignments in assessing their students.
- **b.** Most of the teachers did not use alternative assessment tools such as performance task, interview, and so on in assessing their learners. However, mathematics

students are expected to devise problem-solving strategies; to identify conceptual similarities in different situations and to work productively with others.

5.2.4 ***Research Question 4:*** To what extent do Upper Primary and Junior High School mathematics teachers' perceptions of classroom assessment relate to their current assessment practices?

The Pearson product-moment correlational analysis revealed that:

a. There was a moderate positive correlation between teachers' perceptions and practices of planning classroom assessment. Coefficient determinant suggested that teachers' perception of planning assessment helps explain about 24% of the variance in teachers' practices of planning classroom assessment.

b. Additionally, there was a strong positive correlation between mathematics teachers' perceptions and practices of designing classroom assessment. The coefficient of determinate expressed as percentage, shows that 33% of the variance in teachers' practices of designing classroom assessment is explained by their perception of designing classroom assessment.

c. Further, there was a strong significant positive relationship between teachers' perceptions and practices of implementing classroom assessment. When the R^2 is expressed as a percentage, it can be observed that almost 37% of the total variance in practicing implementing classroom assessment is explained by teachers' perceptions of implementing assessment in the classroom.

d. More so, teachers' perceptions of marking assessment was significantly strongly correlating with their practicing of marking in the classroom. The coefficient of

determinant which explain the magnitude of the relationship between the two variables was large (R^2 = 0.34). Thus, 34% of the variance in teachers' marking in the classroom is explained by their perceptions of marking classroom assessment.

e. Finally, there was a strong positive significant correlation between teachers' perceptions reporting and using classroom assessment results and their act of reporting classroom assessment results to educational stakeholders and using the results in making instructional decision. The R^2 expressed as a percentage, shows that about 41% of the total variance in practicing reporting and using assessment results is described by mathematics teachers' perceptions of reporting and using classroom assessment results.

5.2.5 ***Research Question 5:*** How do Gomoa East District Basic School mathematics teachers practice assessment in the mathematics classroom?

The study revealed that majority of the participants:

a. In the J Junior High School classroom could not plan classroom assessment that would serve formative purposes. However, their colleagues in the upper primary classroom were to some extent able to plan assessment that served formative purposes.

b. Were unable to design assessment instruments. For example, assessment tools, such as Table of Specification, were not used mostly in developing task and questions. Hidden and arbitrary assessment criteria and standards were also acceptable as part of classroom assessment culture.

c. Relied heavily on traditional means of implementing classroom assessment. Such as teachers serving as invigilators and students sitting quietly and answering questions independently.

d. Were to some extent able to marking and interpret students' assessment outputs in the classroom. However, the role of students did not change from the passive actors during the implementation stage during the respondents' assessment practices.

e. Were able to report students' achievements to the students, educational authorities, and other stakeholders in order for to make meaningful decision.

5.3 Educational Implications of the Study for Mathematics Teaching

The findings made so far from the study suggest several important educational implications. Firstly, results of this study revealed that majority of upper primary and Junior High School mathematics teachers' perceived planning, designing and implementing classroom assessment in the light of serving summative purposes. On the other hand the findings revealed that the respondents viewed the reporting stage of assessment as that which must serve formative functions. The implication for these findings are important not only for school administrated, but other educational stakeholders and the research community. Understanding the perceptions teachers bring to the classroom to guide their assessment practices, can inform policy decision and directions. For instance, if teachers perceive assessment as a tool which is used for confirming what students know and can do, they can be encouraged to use assessment

rather as a tool which helps students to develop, practice and become comfortable with logical and critical thinking, reflection and critical analyst of their learning.

Additional educational authorities' understanding of teachers' perceptions about planning, designing, implementing, marking and reporting could inform classroom assessment practices. This could be done by helping the teacher to design and implement assessment task that are interesting and challenging for their students. The teachers can also be helped in choosing and implementing alternative assessment tools such as interview, think-pair-share, choice board among other in the mathematics classroom. Culturing teachers to understand as peer-assessor or self-assessor may also be a fell out of this study.

The understanding shown in this study about the significant relationship that exist between the respondents' perceptions and practices of assessment can be of critical help to educational stakeholders. Yates (2006), citing a number of studies asserted that, what is clear in scholastic work is that teacher beliefs are robust, resistant to change, serve as filters for new knowledge, and act as barriers to changes in teaching practices. Furthermore, Yates, found that teachers' beliefs can either facilitate or inhibit curriculum reform. This result can therefore serve as a framework for identifying some critical solutions which can be used to remediate teachers' perception of classroom assessment in order to help improve teachers' assessment practices. For example if the Central Regional or Gomoa East District educational directorate needs to develop teacher assessment support system, that can be possible with the help of this study.

The results in this study revealed that both upper primary and Junior High School mathematics teachers need to be exposed to devise alternative tools and methods of

classroom assessment. The importance inherent in alternative assessment tools are enormous. For example Watt (2005) asserted that, alternative assessment helps student to work productively with others, co-ordinate individual efforts to achieve a group goal, devise problem-solving strategies among others. Therefore, educational authorities who plan professional development programs may use this finding in training teachers on how to develop contextual alternative assessment tools and methods.

5.4 Recommendation

From the summary of the major findings of this study, it is recommended that

a. School authorities in the Gomoa East District should develop collaborative and mentoring programs that will help new and old teachers to develop and maintain perceptions of classroom assessment that promote learning among students.

b. School administrators in the Gomoa East District should work with other stakeholders to ensure that teachers are sent for in-service training or workshops in assessment on a regular basis to upgrade their knowledge and address any undesirable perceptions about classroom assessment.

c. Ghana Education Service in the Gomoa East District should ensure that teachers go for further training and take more courses in assessment to improve their skill and use of desirable classroom assessment practices. It is also essential to identify classroom assessment approaches and specific practices considered desirable for various teaching level.

d. Teacher educators should analyze content of assessment courses and work towards matching teachers' classroom assessment needs with training.

e. The Ghana Education Service and the Ministry of Education should re-examine the type of instruments that are suitable for assessing students at the various levels of our educational system and produce textbooks to that effect. The textbooks should be accompanied with materials especially those that cannot be improvised.

f. The Ministry of Education should set standards for the recruitment of new mathematics teacher. These standards should include practical knowledge in the use of modern day assessment tools and methods of assessment so that Colleges of Education and teacher training Universities will take the necessary steps to train their pre-service teachers in that regard.

5.5 Conclusion

The purpose of the study was to explore Upper Primary and Junior High School mathematics teachers' perceptions and practices of classroom assessment in the Gomoa East District in the Central Region of Ghana. It further sought to gain an in-depth understanding of the methods and tools teachers use to assess their students in the mathematics classroom. This study brought to light some of the perceptions Gomoa East District mathematics teachers held about classroom assessment and the implications such perceptions have on promoting learning among students in the 21st century classroom. For instance it was revealed in the study that, majority of Upper Primary and Junior High School mathematics teachers perceived classroom assessment (planning, designing and implementing) as a tool for serving summative purposes. However, good classroom assessment practices existed among the teachers when it came to marking and reporting

assessment. Recommendations have been made to educational stakeholders in the Gomoa East District based on this findings.

The study also revealed that majority of the respondents used traditional assessment tools such as oral questioning, class exercises and test in assessing their students. The study has showed that these tools were used to consolidate what teachers have taught. The identified tools have been found to encourage memorization of procedures and processes and did not promote critical and logical thinking skills in students (Susuwele-Banda, 2005). The study further established that there was a positive relationship between mathematics teachers' perceptions and practices of classroom assessment. The study therefore recommends that regular in-service training and refresher courses be organized to help teachers develop and maintain desirable perceptions of classroom assessment.

5.6 Suggestions for further research

The educational implications of the findings of this study calls for further research in the area of classroom assessment. The following are recommended for further research:

1. It is suggested that a similar study be conducted in other districts in the Central Region and other region in Ghana. This would provide a basis for more generalization of conclusions to be arrived at about upper primary and Junior High School mathematics teachers' perceptions and practices of classroom assessment.

2. It is also suggested that a comparative study be conducted to investigate the various factors contributing to mathematics teachers' positive and negative perception of classroom assessment. This study has established that there are differences between upper primary and Junior High School mathematics teachers' perceptions of assessment. It would therefore important to establish the various factors contributing to the various perceptions and how they are affecting practices.
3. It is finally suggested that an investigating into pre-service teachers' knowledge and perceptions of classroom assessment be conducted. A study would help Ghana Education Service and the Ministry of Education to address the problem from the foundation. The study would also help to establish the source of the problem.

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APPENDIX A

UNIVERSITY OF EDUCATION, WINNEBA

DEPARTMENT OF BASIC EDUCATION

SELF-ADMINISTER QUESTIONNAIRE ON:

EXPLORING UPPER PRIMARY [UP] AND JUNIOR HIGH SCHOOL [JHS] MATHEMATICS TEACHERS' PERCEPTIONS AND PRACTICES OF CLASSROOM ASSESSMENT.

Thank you for taking time off to complete this questionnaire. The researcher is an M.Phil. student in the Department of Basic Education, University of Education, Winneba. This questionnaire is not meant to assess you. Instead, it seeks to elicit information on basic school mathematics teachers' perceptions and practices of classroom assessment in the region. The information you will provide will be useful in our collective attempt to improve teaching, learning and assessment in our basic schools. During this study, high ethical standards will be maintained to ensure that no harm is caused to you as a person or the information you will freely give. Therefore do well to provide an honest response to each of the following items. **Your name and other personal identifications are not required and will not at any point in time be associated with your responses. Once again, the confidentiality of your responses is highly assured.**

Thank you for your time, patience and participation

SECTION A - BACKGROUND INFORMATION

Please tick [√] in the appropriate space provided below and supply answers where required. If you want to change an item you have already ticked, put a cross [×] over the selected item and tick the new item.

1. Gender
- **a.** Male [ ]
- **b.** Female [ ]

2. Age
- **a.** 20 - 30 [ ]
- **b.** 31 - 40 [ ]
- **c.** 41 - 50 [ ]
- **d.** 51 and above [ ]

3. Professional Qualification
- **a.** Cert A [ ]
- **b.** Diploma [ ]
- **c.** Bachelor's Degree [ ]
- **d.** Master's Degree [ ]
- **e.** Others [ ]
- **f.** Specify……

4. How long have you been teaching?
- **a.** 1 – 5 year(s) [ ]
- **b.** 6 – 10 years [ ]
- **c.** 11 – 15 years [ ]
- **d.** 16 – 20 years [ ]
- **e.** 21 years and above [ ]

5. How long have you been teaching mathematics?……

6. At what class are you teaching mathematics at this school?.....

7. Which of the following best describes your training in assessing student learning? (**Choose ALL that apply**)

a. I received no training in assessment, tests, and measurement of student learning. [ ]

b. Assessment, tests, and measurement were included in a course covering other topics.[ ]

c. I took a course dedicated to assessment, tests, and measurement of student learning. [ ]

d. I received in-service/workshop training in assessment, tests, and measurement. [ ]

SECTION B: TEACHER'S PERCEPTION OF CLASSROOM ASSESSMENT

Directions: For each statement below use the following key to indicate how you respond to the statement regarding your perceptions of classroom assessment. Please check '√'in the appropriate box**.** . If you want to change an item you have already ticked, put a cross [×] over the selected item and tick the new item.

Rating Scale: Strongly Disagree (SD = 1), Disagree (D = 2), Undecided (U = 3), Agree (A = 4), Strongly Agree (SA = 5)

No	Statement	SD	D	U	A	SA
1	The purpose of classroom assessment is to determine whether students have mastered learning objectives					
2	The purpose of classroom assessment is to determine student grades.					
3	The purpose of classroom assessment is to help students develop, practice, and become comfortable with reflection.					
4	Assessment should be Developed based on clearly defined course objectives.					
5	Design a table of specifications to plan assessments before lesson.					
6	Teachers should communicate objectives of a topic to the learners at the start of a lesson					
7	Teachers should recognize unethical, illegal, and other inappropriate assessment tools and methods.					
8	Teachers should administer multiple choice questions, short and medium answer problems					
9	Teacher should follow required procedures (time limit, no hints) when administering assessment.					
10	Teachers should incorporate classroom behavior, effort, attitude and motivation in the calculation of grades.					
11	Use criteria-referenced grading model.					
12	Construct a model answer for scoring oral presentation and essay questions.					
13	Students should serve as peer-assessors and self-assessors during assessment					
14	Calculate and interpreting central tendency and variability for teacher-made tests.					
15	Conduct item analysis (i.e., difficulty and discrimination indices) for teacher-made tests.					
16	Use assessment results when making decisions (e.g., placement, promotion) about individual students and evaluating class improvement.					
17	Provide written and oral feedback to students.					
18	Communicate classroom assessment results to students, parent and educators.					

SECTION C: ASSESSMENT TOOLS AND METHODS

Directions: For each item below please use the following scale to indicate how often you use the assessment tools and methods as described by each item. Please tick '√' in the appropriate box.

Rating Scale: Not Used (NU = 1), Seldom Used (SU = 2), Used Occasionally (UOcc = 3), Used Often (UO = 4), Used Very Often (UVO = 5)

No	Statement	NU	SU	UO	UO	UVO
1	Class Test					
2	Class Exercise					
3	Oral Questions					
4	Choice Board					
5	Interview					
6	Oral Presentations					
7	Investigative task					
8	Portfolios Assessment					
9	Performance Tasks					
10	Project Work					

SECTION D: TEACHERS' CLASSROOM ASSESSMENT PRACTICES

Directions: For each statement below please use the following scale to indicate how often you used the assessment practice described by each item. Please tick '√' in the appropriate box Please check '√'in the appropriate box. . If you want to change an item you have already ticked, put a cross [×] over the selected item and tick the new item.

Rating Scale: Never (NV = 1), Seldom (SD = 2), Sometimes (ST = 3), Frequently (FQ = 4), Always (AL = 5)

No	Statement	NV	SD	ST	FQ	AL
1	I develop assessment that help students to develop, practice, and become comfortable with reflection, and critical analyst of their learning.					
2	I develop assessment that confirms what students know and can do					
3	I develop assessments that prepare students for standardized examination.					
4	I design a table of specifications to plan assessments before every lesson.					

Rating Scale: Never (NV = 1), Seldom (SD = 2), Sometimes (ST = 3), Frequently (FQ = 4), Always (AL = 5)

No	Statement	NV	SD	ST	FQ	AL
5	I communicate objectives of a topic to the learners at the start a lesson					
6	I design an assessment instrument that measures the exact domain					
7	I recognize unethical, illegal, and other inappropriate assessment methods when assessing.					
8	I administer multiple choice questions, short and medium answer problem					
9	I follow required procedures (time limit, no hints, no interpretation) when administering assessment.					
10	I use criteria-referenced grading model.					
11	I construct a model answer for scoring oral presentation essay questions.					
12	I assess group hands-on activities.					
13	I allow students to serve as peer-assessors and self-assessors during assessment					
14	I calculate and interpret central tendency and variability for teacher-made tests.					
15	I conduct item analysis (i.e., difficulty and discrimination indices) for teacher-made tests.					
16	I use assessment results when making decisions (e.g., placement, promotion) about individual students and evaluating class improvement.					
17	I provide written and oral feedback to students.					
18	I communicate classroom assessment results to students, parent and educators.					

Thank you for your time, patience and participation!!!

APPENDIX B

INTERVIEW SCHEDULE GUIDE

SECTION A - BACKGROUND INFORMATION

4. Gender
- **c.** Male [ ]
- **d.** Female [ ]

5. Age
- **e.** 20 - 30 [ ]
- **f.** 31 - 40 [ ]
- **g.** 41 - 50 [ ]
- **h.** 51 and above [ ]

6. Academic Qualification
- **g.** Cert A [ ]
- **h.** Diploma [ ]
- **i.** Bachelor's Degree [ ]
- **j.** Master's Degree [ ]
- **k.** Others [ ] Specify……

4. How long have you been teaching?
- **f.** 1 – 5 year(s) [ ]
- **g.** 6 – 10 years [ ]
- **h.** 11 – 15 years [ ]
- **i.** 16 – 20 years [ ]
- **j.** 21 years and above [ ]

8. How long have you been teaching **Mathematics**?……

9. At what class are you teaching mathematics in your school?.....

SECTION B

Question 1: What in your view, is classroom assessment?

Question 2: Do you assess pupils/students in your mathematics classroom? And how often?

Question 3: What in your view is the purpose of classroom assessment?

Question 4a: Have you heard of Bloom's Taxonomy?

4b: If yes, can you describe it in your own words?

Question 5a: Do you know anything about Table of Specification?

5b: If you do, do you use it to design your assessment tools before classroom lessons?

Question 6: Do you believe that we as teachers should communicate the objectives of a lesson to the class before we start teaching?

6b: Why?

Question 7: What tools and methods do you use in assessing your students?

Question 8: What in your view should be the role of students at the implementation stage of classroom assessment?

Question 9: What in your view should be the role of students at the marking stage of classroom assessment?

Question 10: After the marking and scoring, how do you communicate the outcome of the assessment process to the students, school, and the parents of your students?

APPENDIX C

Lesson Observation Protocol

Date and Day ……..

School's I. D.……..…...

Class……..……

Topic…….

Teachers' gender……...

Number on Roll …… Boys…… Girls……..

Time of observation……Start……End…….

A. Classroom Context: Rate the adequacy of the physical environment.

1. Classroom space: 1 2 3 4 5

Crowded — Adequate space

Comments……

……

2. Classroom resources: 1 2 3 4 5

Sparsely equipped — Rich in resources

Comments……

……

……

3. Room arrangement: 1 2 3 4 5

Inhibited interaction — Facilitated interaction

Comments……

……

……

……

B. Major way(s) in which student activities were structured.

☐ As a whole group	☐ As small groups	☐ As pairs	☐ As individuals

Comments (estimate time spent on each)

……

……

……

C. Major way(s) in which students engaged in class activities.

☐ Entire class was engaged in the same activities at the same time

☐ Groups of students were engaged in different activities at the same time.

Comments……

……

……

……

……

D. Major activities of students in the lesson.

☐ 1. Listened to a presentation:

☐ a. By teacher (would include: demonstration, lectures, extensive procedural instruction).

☐ b. By student (would include informal, as well as formal, presentations of their work).

☐ c. By guest speaker/ "expert" serving as a resource person.

Comments……

……

……

……

……

Rating Scale: 1 = Not at all, 2 = Some evidence, 3 = Clear evidence, 4 = To greater extent

No	Statement	1	2	3	4
1	Communicate objectives of a topic to the learners at the start a lesson				
2	The design of the lesson allowed the teacher to monitor students' progress				
3	Teacher uses traditional methods of assessment such as oral questioning and exercise				
4	Chose and vary alternative assessment tools and methods for instructional decisions				
5	Use problems which arise from school context or which relate to students' experiences				
6	Teacher probed students' reasoning.				
7	The design of the lesson incorporated tasks, roles, and interactions consistent with investigative mathematics.				
8	The teacher encouraged students to talk and share ideas.				
9	Students were given immediate feedback when they needed directions to proceed.				
10	Students serve as peer-assessors and self-assessors during assessment				
11	The teacher's questioning strategies were likely to enhance the development of student problem solving (e.g., emphasized higher order questions, identified prior conceptions and misconceptions).				
12	Students had chance to ask questions.				
13	Teacher was able to identify students who had difficulty in understanding the main ideas of the lesson				
14	Students were asked to present their solutions to the whole class as individuals or in groups				

APPENDIX D

APPENDIX E

APPENDIX F

TEACHERS' PERCEPTIONS OF CLASSROOM ASSESSMENT (Sub-Scale)

Case Processing Summary

		N	%
Cases	Valid	51	98.1
	Excluded[a]	1	1.9
	Total	52	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.746	27

APPENDIX G

ASSESSMENT TOOLS AND METHODS (Sub-Scale)

Case Processing Summary

		N	%
Cases	Valid	52	100.0
	Excluded[a]	0	.0
	Total	52	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.784	13

APPENDIX H

TEACHERS' ASSESSMENT PRACTICES (Sub-Scale)

Case Processing Summary

		N	%
Cases	Valid	52	100.0
	Excluded[a]	0	.0
	Total	52	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.873	27

APPENDIX I

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.517
Bartlett's Test of Sphericity	Approx. Chi-Square	743.924
	Df	351
	Sig.	.000

APPENDIX J