UNIVERSITY OF EDUCATION, WINNEBA

PUBLIC JUNIOR HIGH SCHOOL MATHEMATICS TEACHERS' CONCEPTIONS OF THE PURPOSE AND PRACTICE OF ASSESSMENT IN BONGO DISTRICT OF GHANA

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DECLARATION

Student's Declaration

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

Signature.....

Date.....

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines for supervision of thesis as laid down by the University of Education, Winneba.

Prof. Michael Johnson Nabie (PhD) (Principal Supervisor)

Signature: .....

Date: .....

Mr. Nixon Saba Adzifome **(Co-Supervisor)**

Signature: .....

Date: .....

DEDICATION

This work is dedicated to my late mother, Stella Anamoo Azuure. Sadly, she could not enjoy the expected fruits of her toil on earth due to her early demise.

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ABSTRACT

The study investigated public school junior high mathematics teachers' conceptions of assessment and their practices of it. It intended to find the extent to which the teachers' conceptions of the assessment practices reflect assessment for learning, assessment as learning and assessment of learning. It also put to bear the assessment tools that the teachers use in assessing mathematics learning outcomes. The study employed the concurrent triangulation mixed research design within the pragmatist world view. Using a multistage sampling procedure, a sample size of 58 public junior high school mathematics teachers was used to collect questionnaire data. Out of this, 6 teachers were purposively selected for interview and 7 teachers were also purposively selected for observation data. The questionnaire data were analysed using the Statistical Package for Service Solution version 25 (IBM version 25). Descriptive statistics such as frequencies and percentages were used for the item-by-item analysis of the questionnaire. The observation was also manually calculated using frequencies and percentages. Again, thematic analysis was used to analyze interview data. Findings from the study emerged that the mathematics teachers conceptions of assessment practices highly reflect assessment of learning (83.9%) and assessment for learning (81.7%). The qualitative results failed to confirm the teachers conception of assessment as learning. The study also revealed that the mathematics teachers used more traditional assessment tools than alternative assessment tools through the exploration whereas the quantitative results provided contrary results. The study again discovered that the mathematics teachers use class tests, written exercises, homework, examinations, oral questioning, project work and observations as mathematics assessment tools for assessing learning outcomes in their classrooms. It was uncovered that teachers centre their assessment processes on gathering of data and offering feedback. It is therefore recommended that the heads of the junior high schools and the Bongo Directorate of Education should organise in-service training for mathematics teachers on assessment as learning and the stages of mathematics assessment process.

CHAPTER ONE

INTRODUCTION

1.0 Overview

This chapter comprises the background to the study, statement of the problem, purpose of the study, the research objectives, research questions, significance of the study, scope of the study and organisation of the whole study.

1.1 Background to the Study

A practice that involves the collection and keeping of data for institutions, organisations and even societies to compare events from time to time and measure performance is a good idea and needs to be maintained. Assessments of learning outcomes in mathematics deal with such issues of collecting, using and keeping data for various purposes. According to Baehr (2005), assessment is the act of examining and offering feedback about learners' knowledge, skills, attitudes and work product so as to increase learning intentions and achievements. Ajayi (2018) also defined assessment as a progressive and systematic process of gathering, analyzing and interpreting data. This interpreted information is then used to determine how well pupils' performances match expectations or standards and also used for other decisions concerning learning. It signifies that, the whole process of using several tools of assessment to gather information about the learning process so as to take an informed decision concerning learning describes assessment.

As assessment is conceived an essential activity in the classroom (Oduro, 2015), its usefulness can obviously not be overemphasized in mathematics. Mathematics education aims at instilling a sense of personal achievement and encourages the learning of mathematics towards creativity and in real-life situations. At the basic education level, mathematics provides building blocks for children who wish to pursue

mathematics related courses do so (Ministry of education, 2012). Stakeholders in mathematics education usually use assessment to determine whether learning expectations can be demonstrated by learners or not. The importance of assessment has not only been underscored by the Ghanaian mathematics curriculum but also there is sufficient literature that attest to the fact that assessment is very useful in enhancing learning especially in the classroom (Hattie &Timperley, 2007).

Many assessment specialists therefore insist that to improve learning outcomes, much seriousness must be attached to class-based assessment (Staginess & Chapels, 2005). It is in line with this that the old form of continuous assessment in the Ghanaian basic schools was modified by the Ministry of Education into the school based assessment (SBA) to suit the current authentic needs of mathematics education. The intention of the school based assessment (SBA) is to offer opportunities for pupils to demonstrate critical and productive thinking, to apply their knowledge to varied real life situations in the case of mathematics and to offer educational institutions within the basic education settings the opportunity to ensure that all the domains of education and training of the educand are taken into consideration (Ministry of Education, 2011).

In life, every good course is driven by a purpose. For assessment to be effective in mathematics, teachers have to completely comprehend the intended learning outcomes and reasons for implementing assessment strategies before they can assess their pupils effectively (Oduro, 2015). Teachers' assessment practices can therefore be informed by their conceptions of assessment. This could eventually influence the effectiveness of their practice (Yan, 2014).

In carrying out educational assessment with the right purpose in mind, its effectiveness will be demonstrated through the use of multiple assessment tools (William, 2011). This should not only be noticed at the end of a course, topic or term but also during the instructional process. Multiple assessments will possibly give teachers the opportunity and time to alter assessment to fit the context of the learning environment.

Assessment techniques such as exercises quizzes, class assignments, essays, project work and other teacher-created assessment tools are recommended for use in the Ghanaian basic school mathematics classrooms to enhance learning (Ministry of education, 2012). The role of mathematics in logic and real world problem solving therefore makes it necessary to incorporate varied assessment tools in assessing learning outcomes (Ministry of Education, 2012). Learners' engagement in assessment tasks will give them the chance to demonstrate their skills and understanding. Assessments therefore ensure learners' self-reflection and also give teachers the chance to measure pupils' achievement of what is learned (Western and Northern Canadian Protocol for Collaboration in Education, 2006). It is therefore not out of place that the Ghanaian curriculum has provided a space for assessment at all levels within the educational sector. Mathematics teachers are expected to plan their lessons taking into consideration how assessment should be done to build the competencies and the knowledge that pupils gain right from the primary school level (Ministry of Education, 2012).

In the researchers' course of duty as a head teacher in two junior high schools in Bongo district of the Upper East of Ghana it was observed that teachers appear to have a casual approach to assessment. They also appear to depend on past examination questions in the assessment process to the neglect of contextualizing assessment. This

situation can lead to students' poor performance because the learners can focus their attention only on aspects touted to be important relative to examinations. If those aspects also fail to reflect as expected in the examinations, the students are likely to fail woefully.

A report by the Bongo District Assembly (2016) indicated that the Basic Examination Certificate Examination performance from 2013 to 2015 was below 25%. In connection with this, many of District Directors of Education who worked in the district education directorate from 2009 to 2017 initiated actions to allow external commercial examination bodies to set examination test items for use at the end of each school term. The efforts of these examination bodies were intended to complement the teachers' assessments with the view to arrest the poor students' achievements in mathematics in the district. It is however not clear whether the mathematics teachers' conceptions of assessment and practices of assessment are contributory factors to the low students' achievement in mathematics in the district or not. This study was then formulated to explore the public junior high mathematics' teachers' conceptions of the purpose of assessment and assessment practices in Bongo district.

1.2 Statement of the Problem

Mathematics assessment like any form of educational assessment is interlinked with instruction and also aims at enhancing learning. There is therefore the need that assessments make use of varied assessment tools to cater for individual differences in the classroom. It is however worrying that teachers tend to have a casual approach to assessment (Kurebwa, 2012). Research studies conducted in Ghana revealed that mathematics teachers employ more of the traditional assessment practices than the alternative assessment practices (Hattori & Saba, 2008; Oduro, 2015; Nabie, Akayuure & Sofo, 2013). Teachers' over reliance on the highly structured traditional assessment

is an indication that the teachers either lack a clear purpose of contemporary assessment, they have limited understanding on the use of multiple assessment tools or both.

Again it seemed mathematics teachers in the Bongo district set test items to mimic the Basic Education Certificate Examination (BECE) test items. The employment of assessment practices to mimic past examination questions defy the principle of assessment in using variety of assessment tools to address the individual needs of learners (McMillan, 2000). It breeds an environment where transmission of learning is highly structured and only favors instrumental learning (Evidence for Policy, Practice Information(EPPI) and Coordinating Center, 2002).

Notwithstanding the assertion above, the researcher sighted no study conducted in the Bongo District that explored public junior high school mathematics teachers' conceptions of the purpose of assessment and assessment practices.

1.3 Purpose of the Study

The study specifically sought to explore public junior high school mathematics teachers' conceptions of the purpose and practices of assessment. This enabled the researcher to relate the teachers' conceptions of assessment practices to the purpose of assessment.

1.4 Research Objectives

The objectives of the study were to:

1. Explore public junior high school mathematics teachers' conceptions of the purpose of assessment in the Bongo District of Ghana.
2. Explore the assessment tools that public junior high school mathematics teachers use to assess learning outcomes in class rooms in the Bongo District of Ghana.

3. Find out how the public junior high school mathematics teachers in the Bongo District assess their pupils in classrooms in the Bongo District of Ghana.
4. Determine the extent to which the public junior high school mathematics teachers' conceptions of assessment practices in Bongo District reflect the purpose of assessment.

1.5 Research Questions

The following research questions guided the study.

1. What are the public junior high school mathematics teachers' conceptions of the purpose of assessment in the Bongo District of Ghana?
2. What assessment tools do the public junior high school mathematics teachers of the Bongo District use to assess pupils' learning outcomes?
3. How do the public junior high mathematics teachers in Bongo District assess their pupils in Bongo District of Ghana?
4. To what extent do the public junior high school mathematics teachers' conceptions of assessment practices in Bongo District reflect in the purpose of assessment?

1.6 Significance of the Study

There are several personalities and institutions to which the findings of this study will be beneficial. Mathematics teachers, the Bongo district education directorate, curriculum developers and subsequent researchers could rely on the findings of the study for numerous uses.

First, the study portrayed the mathematics teachers' conceptions of the purpose of assessment. This could be used by heads of schools and circuit supervisors to guide teachers appropriately in the course of duty and to organise school-based, circuit based

in-service training for the public junior high school mathematics teachers

Second, the study will provide information on the extent to which mathematics teachers of Bongo District contextualize and inter-relate the purpose of assessment alongside with the tools of assessing students. Since mathematics is meant to solve real-world societal needs of the learners, the application of the subject matter learned also calls for a need to contextualize assessment. It will therefore ensure that assessment does not appear alien to the learners. By inter-relating the purpose of assessment and tools of assessment in a way the teachers should be able to determine which assessment tool is most appropriate for which purpose. For instance, mathematics teachers should be able to discriminate the assessment tools appropriate for traditional assessment practices or authentic assessment practices. It should however be noted that there is no particular assessment tool that is rigidly exclusive for a particular assessment practice but its choice depends on the purpose.

Third, the study would provide information to the Bongo District Directorate of Education as a whole to enable them to develop better assessment guidelines for classroom teachers and organise in-service training to update the teachers' knowledge of assessment practices.

Fourth, one other usefulness of the findings of this study is that it will add knowledge to the already existing literature in educational assessment. Literature on educational assessment is already in existence. The findings of this study will as well add to the archives of already existing knowledge on assessment.

Fifth, the study would provide useful information to curriculum developers to enable them take appropriate curriculum decisions regarding mathematics assessment.

1.7 Delimitation

This study was delimited to the purpose of assessment from the mathematics teaches' perspective, the tools used by mathematics teachers in assessing their students learning outcomes, the assessment process and the extent to which mathematics teachers' conceptions of assessment practices reflect the purpose of assessment. The study is also limited to only public Junior High School mathematics teachers in the Bongo district, Ghana.

1.8 Limitations of the Study

The findings of this research were not arrived on a silver platter, neither could the researcher boast that the study was conducted perfectly with excellent findings arrived at. There are still some imperfections that bedevil the study.

As the study area is characterized by distances of the junior high schools further from one another within a large land mass of few road accessible areas, the researcher could not embark upon the census survey that was planned earlier for the quantitative data within the limited period. The researcher rather resorted to the use of multistage sampling procedure with a small sample size of 58 teachers. This in a normal circumstance will reduce the level of confidence of the sampling or higher precision of the sampling intended earlier.

1.9 Definition of Terms

Circuits: A cluster of schools under one supervisor called a circuit supervisor within an Educational Directorate in Ghanaian basic education service.

Class Assessment Task (CAT): This is the sub-division of the SBA into student's tasks known as class assessment tasks (CAT).

Ghana Education Service (GES): The Government department responsible for the

Educational Sector issues.

Junior High School (JHS): The stage within the Ghanaian basic educational system from grade seven (7) to grade nine (9).

School based assessment (SBA): A new Ghanaian standardized assessment form employed to reduce burden on teachers and offer a more effective way to assess pupils on a relative similar learning outcome of the curriculum nation-wide but administered in schools by regular teachers of learners.

1.10 Organisation of the Study

This study is organised into five chapters with each chapter devoted to each aspect of the research. Chapter One is made of introduction and covers background to the study, statement of the problem, research objectives, research questions, significance of the study, delimitation, limitation, definition of terms and organisation of the study. Chapter Two has review of related literature as its main caption. This includes empirical framework, the concept of assessment, purpose of assessment, teachers' conception of assessment purpose, mode of assessment, type of assessment practices, the assessment process, the relationship between assessment conceptions of the purpose of assessment and assessment tools used in practice, validity, reliability and conceptual framework. Chapter Three contains the methodology of the study. The research paradigms: the epistemological and ontological position of the study, research design, population, sampling procedures, methods for collecting data and data analysis plan are all in this chapter. Chapter Four has presentation and analysis of data, discussion of findings as its components and finally chapter Five comprises summary of findings, conclusions and recommendations.

10.11 Summary of Chapter One

Introduction is seen as the caption of this chapter. The chapter elaborated on the background to the study using appropriate literature. Statement of the problem, purpose of the study with the corresponding research questions. Delimitations, limitations and organisation of the study were also dealt with.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.0 Overview

This chapter reviews literature related to the study. It presents, the evolution of assessment paradigms, empirical review and conceptual reviews that were conducted for the study. It also describes the general concepts in mathematics educational assessment, conceptions of the purpose of assessment, mathematics teachers' use of assessment tools and the assessment process relative to mathematics education.

2.1 The Evolution of Assessment Paradigms

Classroom assessment progressed from the psychometric paradigm, educational measurement currently to educational assessment (Lynch, 2001). Mathematics education would appear to be incomplete if these paradigms are not clarified for teachers' understanding and subsequent use. Some aspects of those paradigms can be appropriated by mathematics teachers at any time the mathematics educators deem it fit for use.

First among the mathematics assessment paradigms in the development of assessment is the psychometric testing paradigm. The psychometric testing paradigm in mathematics education came to existence at the era when education also began (Kerebwa, 2012). The author added that Psychometric paradigm makes use of standardized multiple choice testing to measure learners' achievements. The position of this paradigm is based on ranking and comparison as they assume the positivists' epistemological stance with the belief that learners' achievement can be objectively quantified (Scherer, 2015). The author further argued that psychometric paradigm tests to measure the intellect, talent and achievement. Rudder and Schafer (2002) advanced that the goal of assessment in the thinking of this world view is to teach by transmitting

the truths in the curriculum and assess to ascertain whether the learners' have acquired those realities. The interpretation of scores is related to normed referenced grading, measurement and facts could therefore be restricted to a particular learning trait (Gibbs, 1994).

Second, educational measurement is one other assessment paradigms in relation to the development of mathematics assessment. Educational measurement is a system that makes use of individually assigned scores of learners and also use such measurements to regularly ascertain the strengths and weakness of the learners (Gibbs, 1994). Woods (1980) as cited in Kerebwa (2012) identified the following as features of educational measurement:

1. Seeks personal achievement as opposed to comparison with others.
2. Tests for learners' competence as opposed to intelligence.
3. Occurs in a comparatively uncontrolled environment and may sometimes produce inauthentic outcomes.
4. When rules and regulation characteristics of testing are not strictly enforced, measurement becomes effective.
5. Can sometimes rank learners to look for the best.

Third, the present stage of mathematics educational assessment is shifted to educational assessment (Lynch, 2001). Once educational reforms changed from the norm referenced form of assessment to criterion referenced form of assessment, the reliability of measurement paradigm and the psychometric paradigm became somehow obsolete (Rudner & Schafer, 2002). This paradigm is much more related to the classroom assessment practices and draws much inspiration from the cognitivist, constructivist and the socio-cultural views of learning (Suurtamm et al., 2016). Hence educational assessment appears to be the order of the day. Educational assessment looks

for detailed and worthy justification of learners' ability through the use of multiple assessment tools and also seeks detailed proficiency of learning (Thompson & Kaur, 2011). Assessment should therefore be used to enhance learning and consider the characteristic ways learners may pass through to learn (William, 2011).

2.2 Empirical Review of the Conceptions of Assessment and Assessment Practices in Mathematics Education

Suurtamm, Koch and Arden (2010) conducted a study on mathematics teachers' assessment practices within Canadian (Ontario) context. The study observed the bearing of teachers' collaboration and belief in supporting the emerging assessment practices. The results from the questionnaire sought to find out the mathematics teachers' level of comfort in using varied assessment tools. 91% of the teachers indicated that they were somehow comfortable with the use of assessment tools within the thinking of the alternative paradigm . However, results from the study's observation revealed that the teachers engaged heavily in using tests and quizzes to assess learners. The conclusion was that teachers make use of traditional assessment practices to the neglect of alternative assessment practice. The study also recommended the infusion of alternative and new mathematics thinking by mathematics teachers in their practices.

Another study conducted by Andrade (2000) sought to compare elementary and high school teachers' use of rubrics to learning objectives. The study established that rubrics were not always congruent with the learning goals. That the structure of rubrics were always vague whiles challenge to learning was often not visible.

Amua-Sekyi (2016) also conducted another study among Ghanaian tutors and students in three colleges of education to find out their experiences. The study employed focal group discussion. One of the findings reached was that the teachers'

role in nurturing evaluative thinking did not reflect in teaching, learning and assessment.

Hatorri and Saba (2008) compared Ghanaian and Japanese primary school mathematics assessments. The study used the National Council of Teachers of Mathematics standard as a yardstick for making the comparison. The intent of the study was to find out if there were similarities or differences in the mathematics teachers' practices between the two countries per the National Council of Teachers' of Mathematics standard. Using a case study design and a sample of eight Japanese and three Ghanaian mathematics lessons, the study revealed that the Japanese mathematics lessons were more aligned to the National Council of Teachers' of Mathematics (NCTM) standard than their Ghanaian counterparts. Hence, the Ghanaian mathematics teachers engaged more in traditional assessment practices than their Japanese partners whiles the Japanese teachers also involved more in the alternative assessment practices than the traditional assessment practices.

Nabie, Akayuure and Sofo (2013) investigated Ghanaian mathematics teachers' assessment practices. Their study was centered on the teachers' integration of problem solving in classroom assessment. The outcome of their study disclosed that majority of the Ghanaian mathematics teachers (62.65%) used traditional assessment practices. The study also uncovered that three major limitations: curriculum-related, student-related and teacher-related factors hindered the teachers from integrating investigations and problem solving in mathematics.

Oduro (2015) conducted a study using a case study which explored Ghanaian mathematics assessment practices in the classrooms. In the study, it was revealed that the mathematics teachers hold varied perceptions of assessment practices but mainly perceive assessment as testing. It was also noticed that both formal and informal assessment were practised by the mathematics teachers whiles the teachers' perceptions

also consistently influence their practices in teaching mathematics.

In a similar view, Barnes, Fives and Dacey (2017) investigated one hundred and seventy-nine (179) United States teachers' conceptions of the purpose of assessment. Using exploratory factory analysis, they concluded that teachers can hold varied views about assessment at the same time. To them the varied views held by the teachers may also influence the teachers' willingness to or not to engage in continuous professional development.

2.3 The Concept of Assessment

The term assessment emanates from a Latin word 'assidere' which connotes 'sitting down with or sitting beside' (James, 2015). The implication from the authors' perspective is that assessment has to be done with and for the learner as opposed to the learner. The concept focuses on the engagement between the assessor and the assessed so that relationship will be reached between how one views issues and how those issues really exist.

In defining assessment, Linn and Gronlund (1995) conceptualized it to involve the use of a repertoire of procedures to obtain information on learning and take decisions concerning the learning process. The view of Ajayi (2018) in describing assessment was also presented as a progressive and systematic process of gathering, analyzing and interpreting information in learning to determine how well pupils' performance match expectations, standards and hence use such evidences for decisions concerning learning. In a similar vein, Nitko and Brookhart (2014) described assessment as a process in which information about learners is collected to take appropriate decisions about learning, curriculum, program and school practices. Griffin, Gillis, Keating and Tennessee (2000) emphasized that assessment provides precise and clear estimates of students performance to enables teachers appropriately take decisions

concerning their students' learning. Another definition of assessment by National Council for Curriculum and Assessment (NCCA) (2004) viewed assessment as a process of gathering, recording, interpreting and making use of data gathered about learners' progress and achievement to build the learners' knowledge, skills and concepts. Assessment could therefore be seen as a process in which several tools of assessment like quizzes, observations, anecdotal, portfolios are used as means of interaction between the teacher(s) and the learner(s) to gather information and take a fitting decisions about learning process.

2.3.1 Formative Assessment

According to Black and William (2003) formative assessment is the regularly noticed, interactive process which involves more of the teacher improvised activities in the class. Assessment becomes formative if feedback in the assessment process is used to adapt the teaching process to meet the pupils' learning needs (William, 2011). Formative assessment is a general means of identifying learners' understanding, misconceptions and mistakes of certain skills and subjects as teaching and learning is in progress (William, 2011). I personally consider William' position here as the aspect of formative assessment that seeks to diagnose learning. Another definition by Ghaica (2016) citing Anglo & Cross (1993) explained that formative assessment is generally geared towards instructional adjustment since teachers use it to find out whether pupils grasps the actual areas and skills that are being learned. Formative assessment therefore provides information on what, how and how much learners are learning.

According to McMillian (2000) formative assessment could be put into major aspects as indicated below:

1. Data is gathered about the on-going learning process and used for decision making about the learning.

2. Evidence is evaluated relative to progress towards the learning goals.
3. Pupils are conscious of the learning goals and prepare appropriately towards the next set of actions to take.
4. The formative assessment process is cyclical and continuous.
5. No ultimate judgment is involved except the judgment of how to assist the learner take the next step in learning .

Formative assessment could also be either formal or informal (McAlpine, 2002). The informal methods are the none-planned and spontaneously used whiles formal formative assessments are the consciously planned and regularly used in classroom. Formal assessments are curriculum embedded, fore-planned that provides evidence of pupils' learning (Al Hareth & Al Dighrir, 2014). The authors also cited Van, Michaud, Cerner, Ireland, Rybnik and Potter (2007) to advance that formative assessment has written, oral, product and performance components. Specific examples of formative assessment that arise spontaneously in schools could be found in question-and-answer sessions, informal discussions, verbal quizzes, daily checking during in-classroom discussion aimed at guiding learners' advancement and understanding of intended learning tasks (Shirley & Irving, 2015; Tomlinson & Moon, 2014). Agreeing with this assertion, other authorities of assessment also expressed their views that formative assessments can take form in diverse ways (Yorker, 2003; Yin, Tomita & Shave son, 2014) such as in the systematic use of checklists to monitor students' growth in knowledge, skills and verbal presentations (Yin, Tomita & Shavelson, 2014).

2.3.2 Diagnostic Assessment

The concept diagnostic assessment is surrounded by the controversy that it is embedded in formative assessment and can therefore not be an independent form of

assessment . Others also argue differently that it is a unique concept of its own because it possesses some special features on its own different to be categorized as one of the modes of assessment (Mussey, 2009). Diagnostic assessment recognizes learners' existing knowledge of a discipline, their skills and ability. According to McMunn and Butler (2011), diagnostic assessment is a means of discovering learners' strengths, weakness, knowledge and skills with a primary purpose of remediation. Wiggins and McTighe (2007) affirmed their position but also added that diagnostic assessment is a means of checking prior knowledge, skills and examination of interests.

2.3.3 Summative Assessment

According to Black and William (1998), it is this mode of assessment that appears to be the most prevalent in schools. It is used by teachers to measure the subject matter learned by students at the terminal point of a course or unit (Suskie, 2009). It makes use of formal assessment approaches to ascertain whether learners have acquired knowledge, skills, understanding and behaviors that are intended to be achieved (Suskie, 2009).

Harlen (2008) also posited that summative assessment has specific noticeable characteristics such as:

1. A non-cyclical process. The implication is that summative assessment could be a one shot activity but not a continual process.
2. Interpretation of evidence in accordance with publicly known criteria. Unlike the formative assessment which may be borne out of the teachers' ingenuity in class interaction, summative assessment is more structured.
3. Evaluation is reported in levels which is also featured by quality assurance measures .

4. Learners are limited with respect to the performance of their roles in the assessment process since those roles are relatively pre-determined.

Gipps and Caroline (2015) used the terminologies, 'summing-up' and 'checking-up' to describe summative mode of assessment. They associated 'summing up' with the accumulation of evidence which was originally formative to represent the overall achievement of the learner whiles 'checking up' has to do with assessment tasks administered at the terminal point of learning. Their terminologies indeed play a major role in illuminating the seeming complexity of this mode of assessment. This is because it lays to rest the use of the School based assessment (SBA) as part of grading learners in the Ghanaian basic schools as summing up whiles the Basic Education Examination (BECE) itself is considered checking up.

Stockwell (2017) saw the scope of summative assessment to cover all detailed topics from beginning to the terminal point of a course or a program. It traditionally occurs at the end of a teaching cycle. Summative assessments are purported to record and report the overall achievements of learners (Herman & Choi, 2008). It aims at finding out whether institutional and instructional goals have been realized relative to the curriculum. Summative assessment involves the appropriation of what is planned and the use of assessment results for institutional purpose. Educational institutions, ministries or departments make use of summative mode of assessments for accountability and quality control educational purpose. This is done through academic achievement records (Black & William, 1998).

Since summative assessment is useful for certification, promotion and ranking purposes, it would have a direct bearing to institutional intentions and efforts (Nitko & Brookhart, 2014). The intentions of awarding institutions could therefore influence how teachers carry out the summative assessments with their educants.

2.3.4 Ipsative Assessment

Ipsative assessment involves the comparison of a pupil's performance to his or her previous performance. Such comparison could be within a similar learning domain or different domains but of the same learner(s). It compares how well a learner has achieved to his or her previous achievement in a similar educational domain or different domain of the same learner (Kurebwa, 2012 citing Rowtree, 1987). Mcmillan and Harlin (2008) insisted that ipsative assessment assists learners as they set personal targets and regulate their learning.

2.4.5 Norm-referenced Assessment

Norm-referenced assessment is a system of assessment designed to provide a measure of learners' performance compared with the performance of their cohorts (Linn & Gronlund, 2000). The performance of the of individual learners are compared with the performance of their peers or with other groups such as a year group or class. In terms of achievement, norm-referenced is used to establish rank order (Freeman & Lewis, 1998). This mode of assessment however receives several backlashes as to whether it really caters for the subject-matter needs of learners.

2.3.6 Criterion Referenced Assessment

Criterion referenced assessment appraises the intended learning outcomes with the view of obtaining knowledge and skills expected of each learner to be exhibited (Linn & Gronlund, 2000). Learners' achievements are measured against designated criteria. Agreeing with this earlier view, Nitko and Brookhart (2014) also added that the designated criterion measured against in this form of assessment is academic standards or curriculum.

2.4 Principles of a Good Assessment

McMillan (2000) enumerated and explained some of fundamental principles that provide knowledge, skills of assessment to ensure good educational assessment practices. These principles are discussed follows:

1. Good assessment practices promote professionalism. The values worth considering here include appropriate test construction, scoring, grading, interpretation and creation of rubrics. The implication is that any practice that may be put across in the name of assessment but not a consistent and efficient practice should be discouraged whiles proficiency in assessment should also be encouraged.
2. Assessment is based on separate but related principles of measurement, evidence and evaluation. Understanding the differences in the degree to which a learner possess specific learning behaviors by measuring (assigning scores) to commensurate the degree to which the learner possesses such ability and the interpretation (evaluation) of the scores will be very useful for educational assessors. It is also necessary to understand essential concepts such as reliability, validity, grade determinations determination, the strengths and weaknesses of learners and other appropriate decisions relative to assessment. This includes what Shepard (2000) as cited in McMillan (2000) postulated by describing it as the means of ensuring a systematic education. It ensures appropriate interpretation in order to arrive at an appropriate decision.
3. Assessment decisions are influenced by sources of overlapping concepts and contradictions. McMillan (2000) explained that the purpose for which assessment is conducted, use of assessment results and demands in assessment become the source of tension for teachers and administrators in their decision

related to assessment. McMillan and Nash (2000) categorized some circumstances that serve as sources of tension for educational assessment. Some of these are :

> "*learning versus auditing, formative versus summative assessment, criterion referenced versus norm referenced, valued-added versus absolute standards, traditional assessment versus alternative assessment, authentic versus contrived, speeded test versus power test and standardized test versus decision test'(p. 2).*

4. Assessment induces learning. Black and William synthesized over 250 studies and concluded that classroom assessment enhances learning (Western and Northern Canadian Protocol for Collaboration in Education, 2006). Assessment feedback is offered to learners to adjust their learning whiles teachers use the feedback to alter their teaching to promote learning. The provision of feedback to parents also enables them offer support in any form to ensure that learning is promoted.
5. Assess contains error. The determination of reliability in assessment is an indication that assessment should not be thought of as being without error. It is therefore necessary and critical that concepts such as reliability coefficient, standard error, measurement of confidence intervals and standard of settings are all understood by educators.
6. Assessment enhances instruction. Shepard (2000) expressed that there is a need for educators to be aware that assessment and instructions are interwoven. The notion1 is that, assessment results from formative assessment tools provide feedback for the teachers to know what learner can do, understand what their weakness are. Summative assessment feedback can offer scores that enables teachers to also know the strengths and weaknesses of learners.

7. Good assessment is valid. Assessment should measure what it intends to measure. Both intended and unintended consequences of assessment have to also be examined (McMillan, 2000).
8. Good assessment is fair and ethical. Fairness of assessment has to do with equitable treatment to ensure quality of assessment. The totality of the right and responsibility of the learner has to be taken into consideration. McMillan (2000) argued that the conventional elements that come to play here include students' knowledge of the learning expectations, what to be assessed with scoring criteria, nurturing of prerequisite knowledge and the avoidance of labeling.
9. Good assessment makes use of multiple methods. Assessment becomes good with minimal errors when it makes good use of multiple assessment tools. This will ensure that a complete ability of the learner is included in the assessment process.
10. Good assessment is efficient and flexible. Considering the material and financial resources, teachers' capability and time, assessment has to ensure that all these resources are maximized. This is done by balancing the need for variety of assessment approaches.
11. Good assessment appropriate incorporates technology. As a result of technological advancement, teachers and administrators should be able to appropriately incorporate technology into the analysis, interpretation, reporting of assessment results. This ensures adequacy and fairness especially in situations where there are more complex reporting tasks.

2.5 The Purpose of Assessment in Mathematics

School assessment is a universal practice across all spheres of education. As every good idea in conceived and guided by a purpose (Ghaicha, 2016), the classroom

assessment practice can possibly not be an exemption. This is so because the purpose directs everything (McAlphine, 2002). It is the purpose that determines the type of assessment to be carried out and the approach to use. According to Nitko and Brookhart (2014), classroom assessment is meant for several decisions that are broadly viewed in four levels as indicated in Figure 2.1.

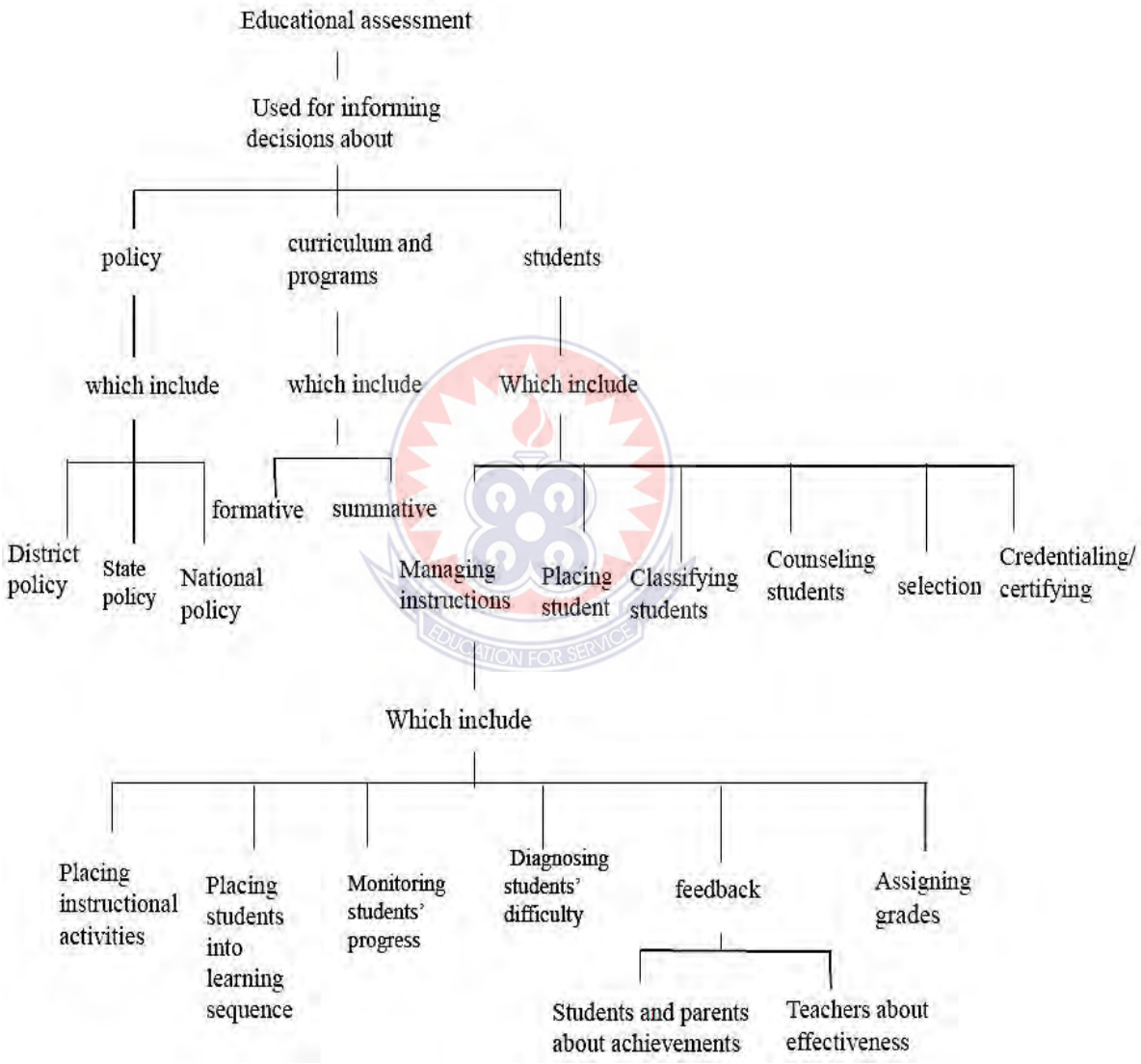

Figure 2.1: Educational Assessment Decisions.
Source: Nitko & Brookhart (2014).

From the diagrammatic representation of educational assessment decisions in Figure 2.1, the decisions are presented in levels. The first level serves as a point for all

other decisions to also be linked up to the forth level of decision making.

The first level of decisions falls within the domain of the curriculum, policy formulations and decisions about students' learning. These three constitute the foundation of educational decisions. This is where government uses assessment results for decisions on the formulation of policies. Curriculum planners also take decisions relative to assessment whiles educational institutions also use assessment results to take decisions related to students' learning.

In the second stage or level, decisions extended down from policies could be within the national level, state level for countries which practice such system of governance or within the district level policies. Decisions about curriculum would also be either formative or summative with the second level. The other decisions related to students learning within the second level of assessment decisions are for managing instructions, placement of learners, classifying learners, counseling learners, selection purposes and issuing of certificates to learners upon completion.

The third stage of assessment decisions is related to managing instructions as an extension from decisions related to students' learning. Decisions here are related to instructional decisions, placement of learners into the learning sequence, monitoring the advancement of learning, provision of feedback, diagnosing learning difficulty and for assigning grades.

The forth level or stage is only associated with the provision of feedback. Feedback about learning outcomes is normally given to learners and parents about learners' achievement and for teachers to also determine the effectiveness of their instructional methods.

A similar position was espoused by Newton (2007) affirming the position that other purpose of assessment could be for monitoring and modifying the teaching

process. This is useful for determining the appropriate instructional interventions as well as providing feedback to students and their parents about the state of learning. This state of learning is relative to curriculum outcomes. Gipps and Stobart (1993) also enumerated the purposes of assessment to be situated within the following practices:

1. Diagnosing the strengths and weaknesses of learners.
2. Screening. This has to do with the location of individual differences so that those in need of special attention will be catered for.
3. Record keeping. Keeping of records has to do with putting safe the scores of learners' progress from one grade to the other.
4. Feedback. The provision of information that spells out the state of success of learners is one of the features worth considering.
5. Provision of certificates. One other purpose for which assessment should be undertaken is certification of candidates. Certificates are means of authenticating that learners have really completed a certain stage of learning successfully.
6. Selection: This purpose is also counted as one of the reasons that necessitate assessment. Selection has to do with the act of choosing from a group to pursue a course in a higher learning or streams within the same institution.

Another identified four-purpose category of assessment also been articulated by Airasian (2000). The author enumerated them as: administrative, informative, motivational and guidance purposes. Educational institutions need feedback from assessment results to take suitable decisions and for other record purpose. In terms of record purpose, the learners' achievements are communicated to the appropriate stake holders to put ideas and resources together in order to enhance learning. Motivation comes about as learners anticipate high grades and put more efforts to achieve them.

Finally, grades are used as means of guiding learners and their parents on the appropriate courses to choose for learners as they move to higher stages in learning.

The Ghanaian basic education mathematics curriculum highlighted some general characteristics of its class-based assessment to include periodic collection of assessment information, the use of variety of assessment tools, the inclusion of more complex thinking skills in the assessment program, teacher assistance and the emphasis on student-centered learning (Ministry of Education, 2011). It further spelled out the main aim for which school-based assessment are designed to meet the following expectations:

1. Ensure that students' academic performances are based on both internal and external administered assessment instruments.
2. Offer the educational institutions the opportunity to ensure that all the domains of education and training of the educand are taken into consideration.
3. Offer opportunities for learners to demonstrate the quality of their learning in and out of school. (Ministry of Education, 2011).

These numerous intentions and use of assessment results have positioned assessment such that no one form of assessment can suit all the possible purposes and provide appropriate feedbacks (Wragg, 2001). The Western and Northern Canadian protocol for collaborating in education (WNCPCE)(2006) has therefore summed up all these many purposes into three categories: assessment for learning, assessment as learning and assessment of learning. It is consequently becoming clear that the propositions of the many intentions for the use of assessment results are rather making the issue complex. The Western and Northern Canadian protocol for collaborating in education's (WNCPCE) position appears quite a very good initiative which could help address such controversies when properly understood.

2.5.1 Assessment for Learning in Mathematics

Assessment for learning is designed to provide information that could be used to alter teaching and enhance learning. It is also of the notion that pupils learn in idiosyncratic ways. (Western and Northern Canadian protocol for collaborating in education (WNCPCE), 2006). Therefore there are possible predictable learning pathways that learners could follow.

Stiggins, Arter, Chappuis and Chappuis (2005) suggested a seven concept strategy of assessment for learning to comprise:

Offering learners with unambiguous and simple to understand benchmarks of the learning intentions.

1. Using illustrations which are replicas of strong and weak work.
2. Providing instant descriptive responses to learners.
3. Leading learners in self-assessment and in setting learning targets.
4. Designing lessons that emphasize on learning targets with one quality target at a time.
5. Teaching learners dedicated or persistent revision.
6. Involving learners in self-reflection, whiles keeping trajectory of their learning and that learners should as well share what is learned with their peers.

This strategy looks good but in the case of the Ghanaian assessment system, the idea of using strong and weak models as examples appears not popular or even seems not to be in existent within the junior high schools.

Hattie and Timperley (2007) conceptualized assessment for learning to include seeking and interpreting evidence to know "where learners are going", "where they are now" and "how to get to where they are going". It is also echoed by William and Thomson (2008) spelling out that assessment will enhance learning if it involves

teachers and learners in the three questions asked by Hattie and Timperley with seven big ideas as illustrated in Table 2.1.

	Where I am going?	**Where I am now?**	**How will I get there?**
Teacher	Simplifying and sharing learning targets and success criteria with learners	Initiating efficient interactions to enhance learning	Presenting feedback that provokes learning
Peer	Understanding and sharing learning intentions and success criteria	Stimulating learners as resource persons to one another.	
Learner	Understanding learning targets and success criteria	Activating learners as custodians of their learning	

Source: Components of assessment for learning (Adapted from William, 2013 p.16).

From the illustration, assessment for learning is appropriated by means of the interactions of the teacher, learners and peers of learners. It is viewed as a collective interaction within the strategy among the agents of learning (William, 2011). Therefore, there is students' involvement in the development and implementation of the assessment process (Davis, 2000).

Learning goals have to be clarified, understood and shared with learners. It is the teachers' prime role that he or she has to play in clarifying learning intentions and sharing the standards for success with the learners. Learners' peers have to also play this similar role of the teacher except that those peers of learners have no or little expertise as compared to the teachers. Learners themselves individually will have to also understand such learning intentions and the success criteria that is shared with them. All these are to ensure a focused direction in order to enhance learning.

Another set of actions that also needs to be carried out include interactions that will induce effective classroom communications, motivating learners as resource persons to one another and playing their roles as caretakers of their own learning. That is also meant to elicit an active learning state in the classrooms.

Finally, in the provision of feedback (William, 2013), the learners roles as custodians of their own learning and also as resource persons to one another is in that the learners have to own their learning and also guide one another in the learning process respectively.

A similar position of describing assessment for learning has been expressed by the Western and Northern Canadian protocol for collaboration in education (WNCPCE) (2006) arguing that the responsibilities of a teacher as one of the main players in assessment for learning include the follows strategies.

1. Associating teaching with the intended learning outcomes.
2. Recognizing real-world learning ideas.
3. Opting for appropriate learning materials and adapting them for the right purpose.
4. Designing differentiated teaching and learning as well as providing opportunities to help the individual student move forward in learning.
5. Providing immediate feedback and directions to students.

Motivation and enhancement of learning are also paramount in assessment for learning. Assessment for learning is therefore based on frequent, open and the on-going communication among the teacher, learners and parents so that they can pull ideas and resources together to enhance learning.

According to Willaim (2011) citing Bennet (2009), the term assessment for learning is sometimes used interchangeably for formative assessment. From the authors

view, this results in definition burden. The author also explained that formative assessment is prone to various interpretations and therefore relates to the function assessment actually plays. William further added that assessment for learning deals with the interpretation of evidence by the teachers and pupils to determine "where they are going", "where they are" and "how to get to where they are going" related to their learning.

2.5.2 Assessment as Learning in Mathematics

Assessment as learning deals with the metacognitive domain of assessment. It gives learners the chance to individually reflect on their own learning (WNCPCE, 2006). This purpose of assessment has the notion that learners' interactions with their environment give them the chance to restructure their thinking. It is also of the conviction that learners are capable of being flexible, adaptable and independent of making appropriate learning decision. Teachers are hence charged to assess learning that has to do with:

1. Modeling and teaching the skills of self-assessment.
2. Guiding learning by setting appropriate goals.
3. Working with students to formulate specific content of appropriate practices.
4. Guiding learning in developing self-monitoring mechanism or feedback to authenticate their thinking.
5. Providing regular and challenging opportunities that will intend build learners to take chances under an available support (Western and Northern Canadian protocol for collaboration in Education (WNCPCE), 2006).

2.5.3 Assessment of Learning in Mathematics

This purpose of assessment comes to reality by making use of a set of assessment strategies designed to satisfy proficiency of learning. It is meant to confirm what students know, understand and can do relative to curriculum outcome (National Council of Teachers of Mathematics, 2000). According to NCCA (2007) assessment of learning includes the following enumerated strategies:

1. Reviewing learners assessed task for a term and passing ultimate judgment about it in view of the designed content and subsequently the assigned grades.
2. Administrating standardized test and making analysis to rank pupils.
3. Portfolio review of learners in a year and making evaluation and to grade learners after discussing with them.

Suskie (2009) also theorized some steps worth considering when engaging in assessment of learning. These steps are:

1. Set up clear measurement needs.
2. Set clear rules for teacher and learner in gathering analyzing and interpreting results.
3. Use results to plan a well-organised achievement of learning.

The author's position implies that assessment of learning is product oriented. It focuses much on academic achievement which may fit well into Ghanaian educational system. Sukie's position situates assessment of learning to be one which is centered on the product rather than the process. It is in line with this idea that Al Hareth and Al Dighrir (2014) also underscored by explaining that assessment of learning has an ultimate objective of optimizing learning.

The Manitoba Education (2006) generally viewed educational assessment with a purpose in mind to be explained with the aid of certain interrogatives. These

interrogatives are “why”, “what” and “how” to assess. In the case of assessment for, as and of learning, the issues are elaborated under each interrogative below.

The Rational for Assessing Pupils in Mathematics

Assessment for learning is done in the classroom to give teachers the opportunity to determine the subsequent steps to take in order to advance students’ learning. The main reason here is to enhance learning rather than ranking or certifying students.

In the case of assessment as learning, the pupils need to be individually given the chance to personally reflect on their learning. Assessment as learning enables assessors to obtain rich and detailed information about how the students themselves are progressing in shaping their habits, mind and skills to scrutinize and confront learning. (Western and Northern Canadian Protocol for Collaboration in Education, 2006).

The reasons for the formulation of assessment of learning are to measure, certify, give credentials and report students’ levels in ranking. These measures are taken in relation to the curriculum.

Elements of Assessing Learning Outcomes in Mathematics Education

It is the individual learning needs and growth which are the main focus in assessment for learning. Learners have varied learning needs different from their counterparts. Such needs have to be taken care of independently. Assessment should therefore be devised to cater for such needs of the learners. For instance, provision of appropriate materials, creation of the enabling environment as well as other means of differentiating assessment takes into account assessment for learning purpose.

With assessment as learning, what needs to be assessed would be the thinking of the learners and strategies that they use to encounter learning. Learners’ personal

goal setting efforts that they use in stimulating, regulating and improving learning should be the focus on what to assess.

The aspects needed to be considered in assessment of learning include tasking learners to demonstrate complexity in learning. These complexities come to bare through application of key concepts, knowledge, skills, and attitudes (Western and Northern Canadian Protocol for Collaboration in Education, 2006)

Assessment Methods used in Assessing Learning Outcomes to Clarify the Purpose of Assessment in Mathematics

Diverse techniques of assessment that will make learners' abilities and understanding clear seeks to satisfy the assessment for learning purpose. Teachers make use of on-going tool such as class exercise and questioning during normal classroom instru1ction and practices to enable the learners think through and express their thinking clearly via writing or other means of communications.

Assessment as learning purpose also uses varied assessment methods in different modes that seeks to induce learners' self-reflective and their challenge towards learning. Learners need to be made aware of the ways they may use to monitor their own learning.

The assessment tools worth applying to the assessment of learning purpose are mainly tests, examination and other product oriented tools. These assessment tools would allow the learners exhibit variety of products and demonstration of learning (Dikli, 2003).

Ensuring Quality Assessment in Mathematics

In ensuring quality assessment, there is the need to provide precise and detailed observation, interpretation and notes of descriptive feedback in assessment (Willam,

2013). Mathematics teachers have to use variety of assessment techniques in multiple contexts. Teachers have to also provide accurate and detailed records that portrays each learning pathways of the individual learner (William, 2011).

In achieving assessment as learning purpose, learners are to be exposed to the appropriate tools of learning. They are also supposed to be up to task of accruing ample evidence in order to take reasonable decision of what they find confusing or understandable (Western and Northern Canadian Protocol for Collaboration in Education, 2006).

In ensuring quality in assessment of learning, learners' ability should be based on a rigorous, reliable, valid, and equitable process. Reliability in assessment of learning talks of how accurate, consistent and bias free the assessment result could be (Linn & Gronlund, 2000).

Uses of Mathematics Assessment Results

It is prudent that assessors afford learners and parents with detailed descriptive feedback of learning with the aim of furthering learning and providing support to learning. This is towards addressing assessment for learning purpose in mathematics.

Information intended to be used for assessment as learning purpose include those that take place in varied assessment methods and in different modes meant to provoke learners' metacognitive process (Manitoba Education, 2006). The provision of descriptive feedback for learners to independently develop is an essential component in assessment as learning. The creation of avenues for teachers and learners to also discuss on alternative ways to enhance learning should also be considered critical (Western and Northern Canadian Protocol for Collaboration in Education, 2006).

The use of assessment results for certification, promotion, placement and indication of learners' ranks toes the lane of assessment of learning (Dzakadzie, 2017).

The position of Manitoba Education (2006) therefore implies that the purpose is not only in the 'why' but also in the 'what' and 'how' to engage assessment holistically in order to enhance learning. These three issues are what the purpose of assessment reliably revolves around.

2.5.2 Mathematics Teachers' Conceptions of the purpose of Assessment

The term conception describes a general and usual explicit knowledge of a person regarding a phenomenon (Brown, 2008). It comprises ideas, values, and attitudes, meaning beliefs, preferences, mental images and proportions (Barnes, Fives & Dicey, 2017). Similar explanation has been given by Garvin, Brown and Ago (2015) regarding teachers' conceptions of assessment to encompass values, beliefs, purpose and understanding of the assessment processes and practices. In mathematics educational assessment, conceptions of it therefore includes how learning is examined, tested, evaluated or assessed. Similarity of values, structure and function of an occurrence across places, time, locations and cultures is likely to meet similar conceptions across on the phenomena (Gravin, Brown & Gao, 2015). There are also numerous factors that affect assessment in the classroom. Teachers' belief and the goals towards assessment could be seen important among such factors.

2.6 Assessment Tools in Mathematics

According to the Western and Northern Canadian Protocol for Collaboration in Education (2006) educational assessment tools that are used in assessing learners should be fetched from numerous sources so that they can involve those tools which can collect data, tools that interpret data, tools that record data and tools that communicate the data gathered. Their argument is appropriately laudable in my view. From their perspective, assessment tools such as questioning, observation, homework,

project, quizzes test and examination are for gathering data. Assessment tools such as checklist, self and peer assessment, rubrics and reflective journals are for interpreting data. Anecdotal records, portfolio and students profiles are those that are meant for record keeping. Report cards, parent-students-teachers conferences, demonstrations and presentations are methods by which the information of assessment can be communicated. All these according to their view should be done in accordance with the purpose, methods and use of results. The ministry of Education (2012) also added that when developing mathematics assessment in the Ghanaian educational certain, it should be done to cover all important specific objects taught and as well include application of the knowledge to real life situation.

2.6.1 Traditional Mathematics Assessment Tools and Practices

According to Dikli (2003) citing Bailey (1998), traditional assessments comprise the indirect and unauthentic form of assessments. The author explained that traditional assessment tools include all forms of tests; which are the easy type, short answer objectives tests, multiple choice objective tests and the true or false objective tests. These types of assessments seem to be fast, economical, conventionally acceptable, decontextualized and may not provide feedback. Law and Eckes (1995) also underscored the fact that traditional assessment tools are the single-occasioned tests that measure what the learner can exhibit at a specific time. This seems to fail measuring the progress of learning. Traditional assessment tools often concentrate on the ability of learners to recall facts. Ghanaian mathematics teachers could make use of some of such tools such as tests, examinations and quizzes (Ministry of education, 2012).

2.6.2 Alternative Mathematics Assessment Tools and Practices

Alternative assessment tools assess high profile dimensions of learning (Dikli, 2003).The activities involved here deal with growth and progress of learners in the process of performing learning tasks. The authors emphasized that several opportunities are often provided for students to demonstrate what they can do at another time. If they fail at a time, a different opportunity is provided for them to perform the task in another way. Many of the assessment tools such as observation, portfolio and projects are applied in performing such tasks. Alternative assessment allow learners to exhibit what they know understand and can do using multiple intelligence (Dikli, 2003). The appropriation of this assessment practice is clearly seen in the Ghanaian mathematics curriculum where it recommends the school based assessment to mathematics teachers. This will enable the teachers to assess critical thinking and real world problem solving skills. The curriculum encourages that mathematics teachers should assess more of the high order profile dimension of learning. This will enable learners explore the mathematics ideas in their environment (Ghana Education Service, 2012).

2.7 The Process of Assessment Mathematics

The National Council of Teachers of Mathematics [NCTM] (1995) as cited in Buhagiar (2006) described mathematics assessment process to be a cyclic-interactive system made of different stages of planning activities, gathering evidence, interpreting evidence and using results. Ghanaian mathematics teachers are also expected to plan, gather, interpret and use their assessment for varied purposes. Such purposes are likely to be within the domain of knowledge and beliefs of the teachers who engage in such assessments (Vingsle , 2014).

2.7.1 Phase of Planning Activity

As classroom assessment is intertwined with instruction and learning, teachers often need feedback from assessment results in order to determine what to do and move learning (Ministry of Education, 2012). The ultimate goal in this stage is to gather information which consciously clarifies the learning goal towards the end. It is to ensure that students are appropriately guided by the learning intentions. Planning seeks to find the kind of information needed and the mode of performance to be demonstrated by learners (Buhagiar, 2006).

In planning, teachers determine whether assessment activities will involve prior tasks, embedded tasks or mastery tasks. As learners are to be co-constructors of assessment rather than consumers of it (Sadler, 1989), teachers should therefore, involve learners from planning and through the whole assessment process. According to Black (1998) the new paradigm of assessment encourages teachers' collaboration as part of assessment for learning. It will also not be out of place agreeing with Torrance and Pryor (1998) who find collaborative planning of assessment by teachers as a laudable one that can be positioned within the authentic paradigm of assessment. This possibly ensures that quality of the assessment process is met. It is rather the solo planning of assessment by teachers that may be vulnerable to inconsistencies and errors. The planning will also spell out the purpose for which the assessment is design: whether it is for internal or external purposes.

2.7.2 The Phase of Gathering Evidence

The accumulation of evidence in the learning process gives a holistic view about the state of learners' achievement. The evidence gathering process makes use of assessment tools that are either pre-planned or rise spontaneously in the cause of teacher-student interaction. Buhagiar (2006) posited that the evidence gathering

process includes the use of observations, written and oral communications, assessment tasks and class tests. I personally agree with this argument except to add that the oral communication as mentioned could also be in the form of classroom questioning because other means of reporting assessment results could not be the tools found in that category of gathering data. Questioning should not only seek to find the recall ability of the learners but also to find the self-expression and challenging learners to develop their thinking skills.

Torrance and Pryor (1998) however admonished that teachers should try and treat the answers to the questions as problem-free source to instructional decisions. Black (1998) also stressed that teachers should allow learners ample thinking time so that emphasis will not be placed on speed to the detriment of the learning process.

In using testing to gather data, Ellis (2001) argued that testing remains synonymous to education and that majority of teachers use it in assessing their learners. Other assessment specialists also argued in favor of the assertion that testing belong to the rational assessment rhetoric and may not be appropriate for collecting sufficient and true evidence of learners (Black, 1998). However, the new constructivists theory conceptualized that appropriate testing relative to their philosophy should show what students know, can do, hence, it can therefore facilitate good learning (Glaser, 1990). Buhagiar (2006) contended this view by explaining that it is challenging to quality assessment when teachers construct test items to mimic the examinations used in certifying achievement. The author was quick to add that other creative assessment tasks by teachers could also be devised as means of gathering data to assess learning.

2.7.3 The Phase of Interpreting Evidence

Meanings have to be deduced from collected assessment data so that decisions about the data will be taken. This is done via the examination of the data so that

appropriate decisions can be reached (Buhagiar, 2006). The interpretation of such information needs time, skills and collaboration with other teachers in order to effectively take such meaningful decisions (Buhagiar, 2006 citing Watson, 2001)

2.7.4 The Phase of Using the Evidence

Scrutinized or interpreted assessment data has to be put to use. This is so because 'assessments are governed by purpose, functions and uses' (Ghaica, 2016 p. 214) to which they are constructed. Some major uses of assessment are for instructional decisions, feedback and grading (Nitko & Brookhart, 2014). Buhagiar (2006), citing Airasian (2000) advanced that assessment could be put to multiple uses that include informing educational agents about achievement of learners, for motivating the learners and for assigning grades to learners. In support of this view, Nitko and Brookhart (2014) catalogued assessment decisions into three main categories: Decisions about policies, decisions about curriculum and programs and decisions about students' learning. They further explained that some sub-decisions such as managing instruction, placing learners into programs, classifying students, counseling and guiding students, selecting and certifying students could all be put under the umbrella of using the information to take decisions about the learner.

2.8 Quality Control in Assessment Process in Mathematics Education

Assessment results serve a variety of purposes for schools, students and all the educational sectors (Nitko & Brookhart, 2014). Regardless of the type of and tools of assessment, the use of its results, assessment should also be seen to pass a certain test in order to ensure quality and confidence in the assessment process. Such measures of quality assurance are validity and reliability (Gronlund, 1985).

2.8.1 Validity in Mathematics Assessment

Validity is the extent to which assessment tools measure what they supposed to measure. It deals with appropriateness of assessment results (Gronlund, 1985). A similar definition by Alonge (1985) also stressed that validity of assessment instruments, say test is the appropriateness of the test in measuring what it intends measuring. It is a general concept that examines how well inferences could be arrived at from assessment results. American Educational Research Association [AERA] (2000) also posited that the degree to which evidence gathered is used to support the interpretation of assessment results describes validity. It is a general concept based on the gathering of evidence to authenticate the interpretation of assessment results. Validity is ascertained by comparing assessment tasks to descriptive task domain, by comparing scores with other measures other than the assessment results. It is done by establishing the meaning of scores whiles controlling other determinants that have the possibility of influencing performance (Gronlund, 1985).

2.8.2 Reliability in Mathematics Assessment

Reliability describes the consistency of measurement or evaluation results (Gronlund, 1985). It indicates how trustworthy assessment results could be (Gronlund, 1985). John (2015) citing Jan (2001) also conceptualized reliability as the repeatability, stability, reproducibility and dependability. When assessments are reliable, the results obtained from say two or more tools of such assessments become similar provided they measure similar concepts. According to the WNCPCE (2006) the ways by which reliability can also be fostered should include using variety of assessment tasks and also ensuring that students demonstrate multiple ways of learning.

2.9 Relationship between Assessment Practices and the Purpose of Assessment in Mathematics Education

Opre (2010) argued that teachers' conceptions influence their choice of professional engagement relative to classroom assessment of learners. Since assessments within the educational spheres and for that matter mathematics education are done to serve peculiar intentions (Pelligrino, Chudowsky & Glaser, 2001), teachers would therefore have to engage in the appropriate assessment practices to meet those intended purposes. The Ghanaian mathematics syllabus entreats mathematics teachers to design assessment tools not to test the lower learning dimension but also complex thinking skills . The usability of the data therefore determines the kind of data to be generated. Teachers, who are assessment literates can therefore transform such data to the appropriate practices which can accurately reflect the students' learning (Ghaica, 2016). For instance, those who believed that learning goals can be an influencing factor to induce productive learning (Goos, 2013) will design assessment strategies to scaffold learning and meet their beliefs (Shepard, 2005). They would also clarify and share those goals with their learners.

Besides, teachers who also conceive assessment to be for large scale, normed referenced as well as for meeting national standards, to a large extent will opt for traditional assessments whiles those who conceive assessment to focus on valued learning outcome to advancing learning would largely engage in alternative assessment practices (Popham, 2003).

As there is also a growing revolution towards a balanced assessment strategies, school based assessment is therefore deemed appropriate in providing more elaborative information of the individual learners which can be used to enhance learning. This should then be blended with assessment that measures knowledge (Cutlip, 2003).

Teachers who also conceive this balanced system of assessment would not solely rely on either assessment practices but will apply both traditional and alternative practices appropriately to arrive at the required purpose for designing such assessments (Cromey & Hanson, 2000).

Subsequently, when teachers alter their conceptions, there is a likelihood of a corresponding change in their choice of assessment methods. This view was also underscored by Vandeyar and Killen (2007) emphasizing that teachers' assessment practices are directly related to the varied conceptions that they may hold about such practices. The purpose for which a teacher engages in assessing his or her learners could therefore serve as a 'director of assessment practice'.

2.10 Conceptual Framework

The purpose of assessment per the 21st century understanding are mainly assessment for learning, assessment as learning and assessment of learning (Western and Northern Canadian Protocol for Collaboration in Education, 2006). Early assessment authorities regarded assessment for learning and assessment as formative assessment whiles assessment of learning was known as summative assessment (Bennet, 2009). Bennett however argued that this poses definition burden and rather simplistic. The diagnostic assessment is also contended as embedded in the formative assessment whiles others think it is a district mode of its kind (Mussawy, 2009). Nevertheless, all these terminologies formative, summative and diagnostic assessment are considered forms or modes of assessment (William, 2013). To conclude in agreement with Bennett (2009), assessment for learning, assessment as learning and assessment of learning are considered the purpose of assessment.

Assessing learning outcomes in mathematics are not done in vain but are guided by varied purposes (McAlpine, 2002). These purposes are categorized into assessment

for learning, assessment as learning and assessment of learning. It is also the purpose that will determine the assessment practices to use in assessing learning outcomes. These assessment practices can also be grouped into traditional assessment practices and alternative assessment practices. The alternative assessment practices will be used largely to cater for assessment for learning and as learning purpose whiles traditional assessment practices will largely address the assessment of learning purpose. It should however be noted that in practice, some assessment tools originally meant for either traditional assessment practices or alternative assessment practice can also be used the for the other but depending on the ingenuity of the assessor. All these conceptions also guide the mathematics teachers' assessment process from planning, gathering data, interpreting evidence to using the result and the components of the assessment process are also interrelated and in a cyclical process (Buhagiar, 2006: McAlphine, 2002). Figure 2.1 depicts the conceptual framework that has been described, relating the conceptions of the purpose of assessment and how it relations to the assessment practices in mathematics. The mono-directional arrow denotes that the concept is guided by another whiles the bidirectional arrow denotes the interrelatedness of the concepts.

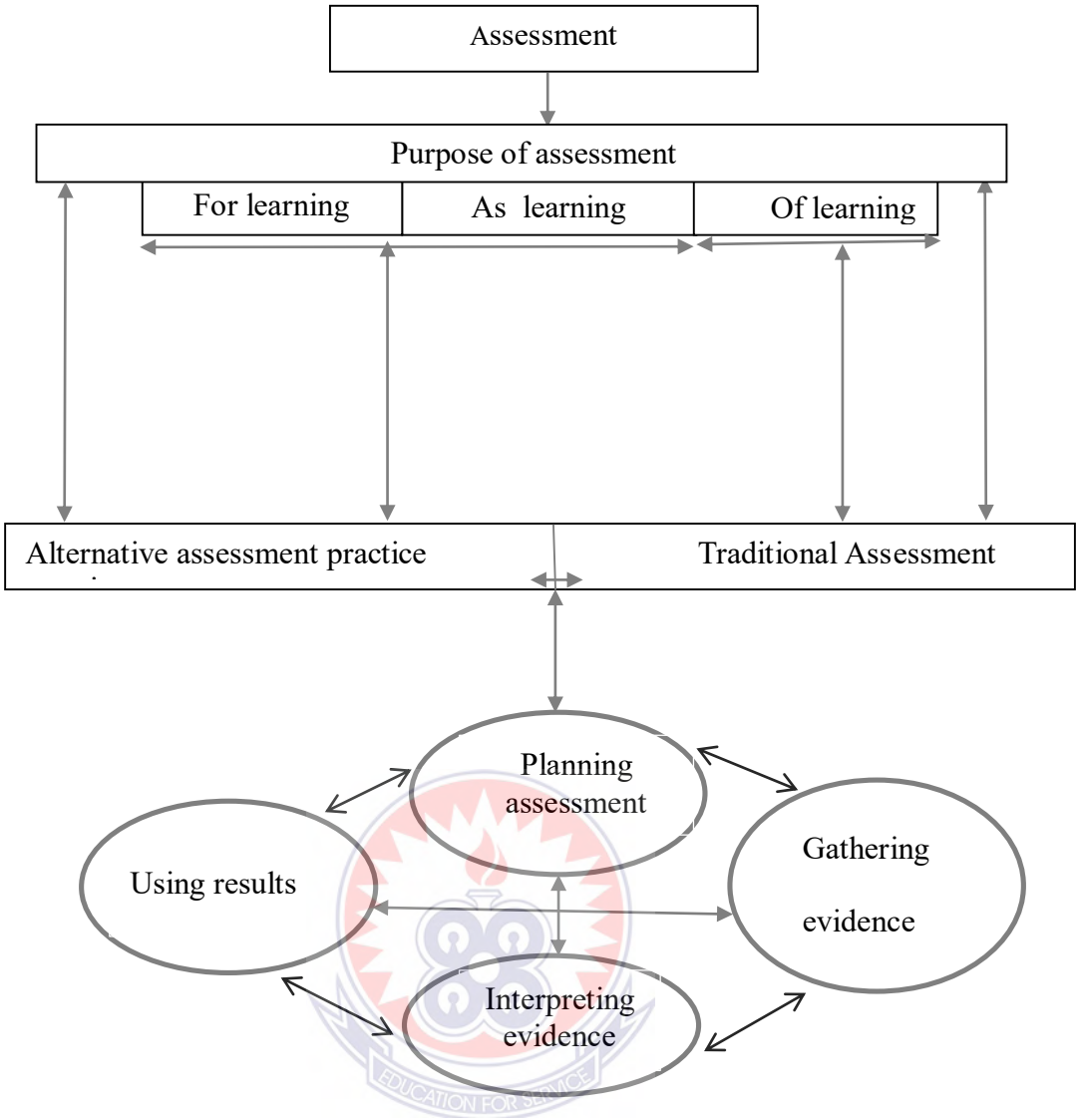

Figure 2.2: Conceptual framework

Source: Junpeng, 2012 p.1967).

2.11 Summary of Literature Review

Review of related literature discussed the paradigm shift of assessment from psychometric paradigm, measurement paradigm to educational assessment paradigm. Empirical and conceptual frameworks were also elaborated. The concept assessment, types of assessment and purpose of assessment were also examined. The final elements that were also deliberated upon were mathematics assessment tools, alternative and traditional assessment practices and mathematics teachers' conceptions of the purpose of assessment.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter presents the methodology of the study. A research methodology describes the detailed procedure that is meant to be followed in carrying out an inquiry (Amedehe & Gyimah, 2014). The specific constituents of the methodology in this study are the research approach, the philosophical underpinnings, the research design, population, sample and sampling procedure, research instruments, validity and reliability, data collection procedure, data analysis and ethical considerations.

3.1 Research Design

An action plan meant to answer the research questions presented by a researcher in a study describes a research design (Easterby-Smith, Thorpe & Jackson, 2012). Kumar (2011) conceptualized a research design as a plan of inquiry to obtain answers to research questions. According to Creswell (2014), there are three fundamental mixed research designs: Convergent parallel mixed methods, exploratory sequential mixed methods and explanatory sequential mixed methods. The specific research design that was used in this study is the concurrent triangulation mixed research design. Creswell (2014) calls this same design a convergent parallel mixed design. Drawing inspiration from Johnson, Onwuegbuzie, Lisa and Turner (2007) the choice of the design enabled data validation or affirmation through triangulation to richly develop, analyze data and explain inconsistencies that might arise from the qualitative and quantitative positions. Concurrent triangulation research design otherwise known as parallel mixed research design by Creswell was used to combine the structured questionnaire with qualitative interview and observation data in order to present a complete understanding of the

situation at hand (Creswell, 2014). The newly emerging concepts: assessment for, assessment as and assessment of learning were explored and understood together with that of assessment practices of the mathematics teachers. In concurrent mixed design, both qualitative and quantitative data are collected approximately at the same time, compared and interpreted on similar or comparable constructs on a single study. The merger of findings of the qualitative and quantitative data could take place in either the interpretation or the analysis state (Creswell, Clark, Gutmann & Hanson, 2003). To the authors, priorities for quantitative and qualitative data are supposed to be the same but it may not be possible since the use of one form of data could override the other in real practice. Creswell and Garrett (2008) further maintained that is it suitable approaching new emerging concepts with mixed research approaches.

The framework of parallel mixed research design is illustrated in the figure 3.1.

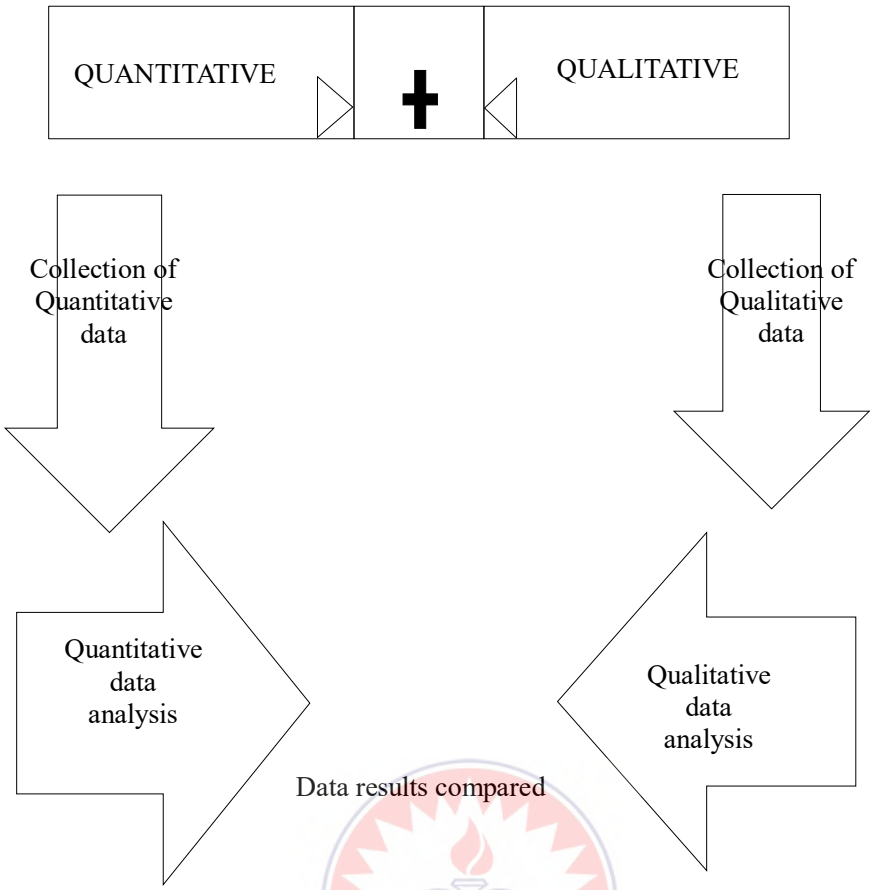

Figure 3.1: Elaborated Visualisation of the Concurrent Triangulation Mixed Method

Source: Creswell, Clark, Gutmann & Hanson (2003).

The plus (+) sign represent a simultaneous collection of both quantitative and qualitative data while the direction arrows show the direction of steps to follow in order to reach data convergence stage (Creswell and Clark, as cited in Santos, Erdmann, Meirelles, Lanzoni, Cunha & Ross , 2017).

The study adopted the principles and position of the mixed method approach under the pragmatist paradigm. Pragmatism is a philosophical underpinning which concentrates on the authentic outcome of research rather than engaging in the paradigm wars. This philosophy does this by combining both constructivism and positivism stance to providing solutions to research problems (Tashakkori & Teddlie, 1998). A research approach is also the style or method employed in the research study (Rahi,

2017). It describes the whole plans and procedures for a study which include the philosophical assumptions, data collections and analysis (Creswell, 2014). The main research approaches predominantly method used in contemporize studies are qualitative approach, quantitative approach and the mixed method approach Creswell, 2014). Creswell however added that the mixed method approach stands in a continuum between the qualitative and quantitative approaches. Rahi (2017) on his part argued that quantitative and qualitative methods are the most dominant methods. Tashakkori and Teddlie (2008) claimed that mixed research approaches are the predominant styles several researchers confront their studies with.

Mixed method research is an approach of investigation which makes use of the gathering of both quantitative and qualitative facts, incorporating those forms of data and making use of different but suitable designs that may involve philosophical assumptions and theoretical framework (Creswell, 2014).

The researcher chose the mixed research approach to merge both quantitative and qualitative data in the study in order to off-set the integral weaknesses of either the quantitative or qualitative data. The mixed method approach was chosen because it resides with the notion that all approaches have biases, weaknesses and gathering of data from qualitative and quantitative sources will neutralize such limitations without aligning the position of the study to the paradigm wars (Rahi, 2017).

3.2 Research Setting

Bongo district was created under LI 1446 in 1988 from the then Bolga district (Bongo District Assembly, 2016). Is it located at the northern part of Upper East Region, Ghana. Bongo district shares boarder south-east to Nabdam District, south to Bolga municipality, west to Kasina-Nankana East, south-east to Bolga-East and north to neighboring Burkina Faso. The district also lies between longitude 0.45°W and latitude

10.09° N to 11.09°. It also has a land area of 459.5 square kilometers (Bongo District Assembly, 2016). The district lies within the Onchocerciasis Free Zone. Figure 3.2 is a map locating Bongo per the descriptions given.

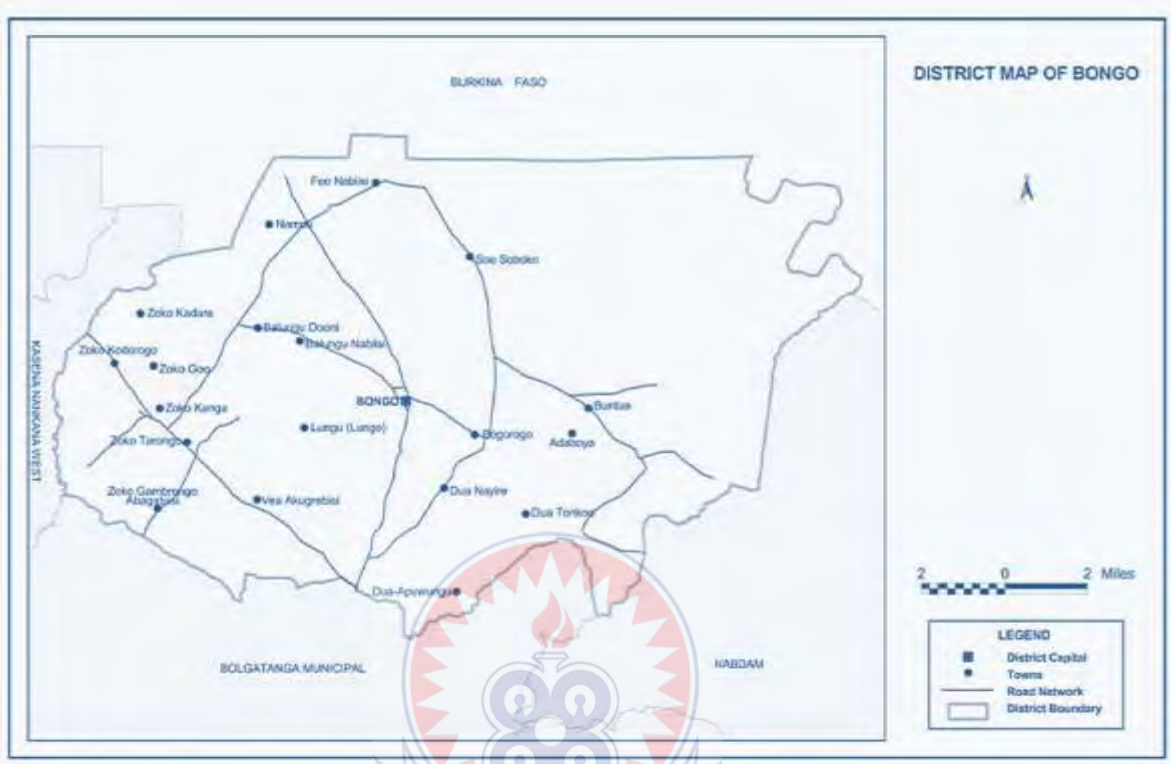

Figure 3.2: A Map of Bongo District

Source: Ghana Statistical Service (2014).

According to the Ghana Statistical Service (2014), the population of the district is about 84,545 comprising 40,084 males and 44,461 females. Bongo district is also comprised of thirty-six communities within seven area councils (Bongo District Assembly, 2016) under the district assembly's administration.

Some major economic activities for the indigents in the area are farming, weaving, Shea butter extraction, trading of fowls and guinea fowls, pito brewing, alcoholic beverage retailing, rice parboiling and petty trading (Bongo District Assembly, 2016). The district currently has six senior high schools. Four of these schools are state governed and the other three being community day senior high not yet

under government management. It is 56 public junior high schools with three other private junior high schools in the district that possibly feed those senior high schools with students.

3.3 Population

The study population comprised all public junior high school mathematics teachers who teach in Bongo District of the Upper East Region, Ghana. The size of the population emanated from all the fifty-six (56) public junior high schools within ten circuits in the district. The size of the study population was ninety-three (N= 93) mathematics teachers, comprising eighty-four males and nine females. The target population was therefore the 93 public junior high school mathematics teachers. The details of the population distributions are illustrated in the table below.

Table 3.1: Population Distribution of Public Junior High Schools Mathematics Teachers in Bongo District

	Circuits within Bongo District										
Population' Composition	**Central**	**East**	**West**	**North**	**South**	**CE**	**SE**	**NW**	**NE**	**NNE**	**T**
Male	12	7	7	7	12	5	10	8	6	10	84
Female	1	2	0	1	0	2	0	2	0	1	9
Total	**13**	**9**	**7**	**8**	**12**	**7**	**8**	**10**	**6**	**11**	**93**

Source: Field data (2019)

3.5 Sample Size

The sample size comprised fifty-eight (n=58) public junior high school mathematics teachers of Bongo district of the Upper East Region, Ghana. The sample was also made up of fifty-two (52) males and six (6) females. A sample size of thirty is embraced as the minimum and acceptable number of cases for research studies and that this number can be used by a researcher for statistical analysis (Cohen, Manion & Marrison, 2007). To the authors, the larger the sample size, the better reliability is

enhanced and that statistical analyses by sophisticated computer programs become workable with the minimum of thirty sample size. According to Yamane (1967), sample from a population could be estimated appropriately using the formula below:

$$n = \frac{N}{1+N(e)^2}$$

where n = sample size, N= the size of the population and e = The sample error or level of precision. Using the study population of 93 teachers and sample error of 10% chosen arbitrarily, the sample could be appropriately estimated as

$$\frac{93}{1+93(0.1)^2}$$

$$=48.187$$

= 48 teachers approximately.

However, in using the multistage sampling procedure, the sample size has a higher confidence level than Yamane's estimation with sample error of 10% since the sample via multistage sampling from the same population is 58 which is more than 48. Details of the study sample is illustrated in Table 3.2.

Table 3.2: The Sample Distribution of Public Junior High School Mathematics' Teachers in Bongo **District**

	Circuits within Bongo district										
Participants	**Central**	**East**	**West**	**North**	**South**	**CE**	**SE**	**NW**	**NE**	**NNE**	**T**
Male	5	7	4	3	6	5	6	8	4	4	52
Female	1	1	0	1	0	2	0	1	1	0	6
Total	**6**	**8**	**4**	**4**	**6**	**7**	**6**	**9**	**9**	**4**	**58**

Source: Field data (2019)

3.6 Sampling Procedure

The sampling technique that was adopted for selecting participants in this study was multistage sampling technique for quantitative data. Multistage sampling procedure is a sampling procedure in which varied sampling procedures are combined as a unit sampling procedure (Rahi, 2017). Making use of the multistage sampling procedure for this study, the researcher first used census survey to involve all the ten circuits in Bongo district. Simple random sampling procedure was employed to select three public junior high schools from each circuit and finally census survey was also employed to involve all the mathematics teachers in the three selected junior high schools within every circuit. Purposive sampling procedure was also used to select six mathematics teachers for the interview and seven teachers for observation.

3.7 Research Instruments

The research instruments that were used in this study were structured questionnaire, non-participant observations and a semi-structured interview.

3.7.1 Structured Questionnaire

The researcher used the Likert-scale type of closed ended questionnaire to explore public school mathematics teachers' conceptions of the purpose of assessment and the assessment tools that they conceive using. The number of questions that constituted the questionnaire were twenty-six. The first thirteen items sought to collect information assessment tools whiles the last thirteen also sought to collect data on the teachers' conceptions of the purpose of assessment. This set of questionnaire were self-administered on the sampled fifty-eight (58) public junior school mathematics teachers in Bongo District. According to Cohen, et al (2007), this type of questionnaire is appropriate and useful for quantitative data collection.

3.7.2 Semi-Structured Interview Guide

The category of interview guide that was used as instrument for collecting the qualitative data to ascertain the intent of the study was semi-structured. According to Creswell (2014), qualitative interview may be unstructured or semi-structured. Kumar (2011) also argued that structured interview provides uniform information and ensures comparability of data. The researcher constructed a pre-planned semi-structured interview guide made of five opened ended questions. The researcher personally conducted the interview among six purposefully selected mathematics teachers in the Bongo District in the Upper East Region, Ghana. The interview gave the mathematics teachers the opportunity to give from their perspective the purpose for which they assess their pupils, what choice of mathematics assessment tools they make and how they assess the learners whom they teach. How they assess their learners was the aspect that sought to find out the assessment process or cycle that the teachers may follow in assessing their learners.

3.7.3 Non-participant Observation

With observation as a method of gathering research information, it is used to elicit information that the researched participants are not aware of or they are rather not cooperating with the researcher (Kumar, 2011). The author further argued that observation could be sub-categorized into participant and non-participant observations. It is the later that was adopted for this study to the assessment functions played by public junior high mathematics teachers in Bongo district of Ghana when assessing learners. Seven public mathematics teachers were purposively selected for this observation. The observation used was also a structured type with rating scale of whether the observed elements were present or not present. If the elements were present the researcher gives a tick (√) and when it was not observed present the researcher

assigned a cross (X). The duration of each observation was 70 minutes each. The number of items that guided the observations were eleven based on the classroom assessment process of sub-headings: Evidence of planning, evidence of gathering data, evidence of interpretation of data and evidence of the using results. Cohen et al (2007) explained that complete non-participant observations are appropriate techniques for researchers' use where the researchers need to take caution and ensure that they do not fall into the temptation of offering contributions. It is against this background that the researcher chose the non-participant observation. It was intended to corroborate the interview data to arrive at a confirmed position of how the public JHS mathematics teachers engage in the classroom assessment process.

3.8 Validity

The degree to which a research instrument actually measures what it intends measuring describes validity (Kumar, 2011). It is the extent to which research methods measure what they profess to measure by affecting the authenticity of the research instrument (Vanderstoep & Johnston, 2009). So it is out of validity that a researcher is able to determine what he or she decides to measure (Smith 1991 as cited in Kumar, 2011). Low level of honesty in a study poses a high threat of making that study invalid whiles high level of honesty makes validity of the study held in high esteem. Validity justifies the correlation between the research instrument and the evidence reached in a study. This is purported to cover all the domains that the study intends to cover and as much ensure that the individual items in the research instruments actually relate to the subject matter of the study (Cohen, et al, 2007). Face and content validity were therefore ascertained by expert scrutiny. The researcher's supervisors examined the research instruments to ensure that such items really had a bearing to the objectives and also covered the major themes that appeared in the study's research questions.

3.9 Reliability

The reliability of the questionnaire was ascertained via the pre-testing of the instruments and calculation of the Cronbach's alpha. This was calculated based on the twenty(n= 20) public junior high school mathematics teachers in Bolga municipality to which the questionnaire were administered for pre-testing . The junior high schools nearer to the Bongo District were selected and the questionnaire administered to the mathematics teachers in those schools. The table 3.3 illustrates the reliability test for the various sections and constructs in the questionnaire.

Table 3.3: Cronbach's Alpha for the Conceptions of the Purpose of Assessment

Factor	Cronbach's alpha	No. of items
Assessment for learning	0.724	5
Assessment as learning	0.692	4
Assessment of learning	0.734	6
Total	**0.863**	**13**

Source: Pre-testing data (2019).

The questionnaire items on the conceptions of the purpose of assessment were thirteen, made of assessment for learning, assessment as learning and assessment of learning conceptions. Out of the thirteen, two of the items could perform the function of assessment as learning and assessment for learning at the same time. "Assessment is done to cater for the individual learning needs' and 'assessment is design for learners to think about their own learning'. This made the calculation of the Cronbach' appear as if they were fifteen. When the number of duplicated items was taken out of the fifteen, the exact number of items was realized. The Cronbach's alpha for the individual constructs; assessment for learning, as learning and of learning calculated were 0.724, 0.692 and 0.734 respectively. The overall reliability coefficient for that part of the questionnaire on the conceptions of the purpose of assessment was also 0.863.

On the part of assessment tools, the alternative assessment tools and traditional tools' measures of reliability were also calculated for the individual constructs and also for that whole section of the questionnaire. Details are illustrated in Table 3.4 . Comparing the values obtained with the acceptable reliability, Zaiontz (2016) argued that reliability coefficient which ranges between 0.70 and 0.95 is sufficient to establish reliability. Tan (2009) also asserted that the reliability coefficient of 0.50-0.70 is moderate and acceptable for estimating consistency of a research instrument.

Table 3.4 : Reliability Coefficient on the Use of Assessment Tools

Factor	Cronbach's alpha	No. of items
Traditional assessment tools	0 .791	5
Alternative assessment tools	0.764	8
Total	**0 .866**	**13**

Cronbach's alpha calculation from pre-testing data (2019).

3.10 Pre-Testing

Pre-testing of research instruments is a good practice that can uncover contradictions and inefficiencies in a study so that those contradictions are addressed (Alumode, 2011). Pre-testing of the structured questionnaire was conducted within ten junior high schools in Bolga East and to twenty (n=20) public junior high mathematics teachers. This site is having a relatively same environmental and teacher characteristics as that of Bongo district. The data was analyzed using the SPPS to calculate for Cronbach's alpha. The reliability coefficient for the individual constructs; alternative, traditional assessment tools for part two and assessment for, as and of learning for part three. The overall reliability coefficient of each section of the instrument, that is use of assessment tools and the conceptions of the purpose of assessment were also computed. The summaries of the computation is illustrated in Tables 3.3 and 3.4.

3.11 Trustworthiness of Qualitative Research Instruments

In order to ascertain parallel validity and reliability of interview and observation data, the researcher adopted Guma and Lincoln's four criteria for ensuring parallel validity and reliability in qualitative studies. According to Shenton (2004), these four indicators are credibility, transferability, dependability and conformability. Guma and Lincolm (1994) as cited in Kumar (2011) explained that these concepts are closely associated with validity and reliability in qualitative studies. In comparing such indicators in qualitative research to quantitative research, Kumar (2011) cited Trochim and Donnelly (2007) to advance that internal validity, external validity, reliability and objectivity of the quantitative researchers' position are respectively matched with credibility, transferability, dependability and conformability of the qualitative researchers' view point.

3.11.1 Credibility

Another strategy that was also employed to ensure credibility was also through frequent debriefing between the researcher and his supervisors. Both the principal and the co-supervisors' directives were factored into shaping the work accordingly. The researcher ensured that after the interviews, tapes were played for respondents to confirm that it was actually what they said. Examination of previous findings were also done as well to support credibility.

3.11.2 Transferability

Transferability describes the intensity to which findings from a study can be replicated or generalized (Shenton, 2004; Trochim and Donnelly, 2007 as cited in Kumar, 2011). Several efforts were also taken to ensure that the transferability of the instruments were realized. The researcher tried as much as possible to obtain field data

sufficient enough to make other readers understand the situation on the ground such that those people could convey the situation at the study site to similar settings. The implication is that if the same study is done with same method and the same sample, the study should also produce a relative similar results (Shenton, 2004). To support the achievement of this vision, a description of the research design alongside a detailed scope of the study were outlined.

3.11.3 Dependability

Research authorities argued that it is hard distinguishing dependability from creditability (Shenton, 2004). Others however are of the notion that dependability from qualitative school of thought is comparable to reliability in the quantitative studies (Kumar, 2011). The researcher therefore kept detailed records of the observation and interview process to allow comparison.

3.11.4 Confirmability

The researcher used multiple methods in the study for the purpose of triangulating findings and to ascertain conformability of the qualitative study. The findings from questionnaire, observation and interview were incorporated into a unitary set of findings. These strategies were also complemented by detailed methodological description to allow other readers appreciate (Shenton, 2004) how the concepts emerging from the data could be congruent . Confirmablity seeks to portray how parallel objective the quantitate instrument could (Kumar, 2011). Triangulation of the observation and interview data was also used.

3.12 Procedure for Data Collection

First visit was made to the various schools to introduce myself to the school heads and the various mathematics teachers and as well scheduled with them the days

and times for the data collection. Days and times for the data collections were agreed upon between the researcher and the researched participants. The purpose of the data collection was also explained to the researched. The researcher's subsequent visits were for the administration of questionnaire, conducting the interview and observing teachers in classrooms. The collection of completed questionnaires and the finishing up with those who were unable to honor their dates as initially scheduled were also taken care of within this period. All participants competed questionnaires and the questionnaires were collected within the two days to each teacher. The six teachers were interviewed and subsequently the seven were observed.

3.12.1 Semi-structured Interview

A semi-structured interview guide was employed in the data collection process. The mathematics teachers were interviewed on one-to-one basis.

The content of the interview was centered on the conceptions of assessment, the assessment tools that the teachers profess to use and how the mathematics teachers assess their students. All these were based on the themes emanating from the research questions.

3.12.2 Structured Questionnaire

Closed ended questionnaire, the Likert Scale type was used. Two set of items; the first set of 13 items on the extent to which mathematics teachers' use or do not use assessment tools while the second 13 set of items also focused on the mathematics teachers' conceptions of the purpose of assessment. Directives in the questionnaire were explained to the participants before they started answering.

3.12.3 Non-participant Observation

A non-participant but semi-structured observation was conducted personally by the searcher. The public mathematics teachers' assessment process were observed based on how they planned assessment, gathered data, interpreted data and used results of the assessment. This was to find how the mathematics teachers engage in the classroom assessment process. The observation was to find out how evidence of the conceptions mentioned, reflected in the mathematics teachers' classroom assessment process. Seven mathematics teachers were observed based on eleven elements of classroom assessment process. 'Observed' or 'not observed' were the keys for the scoring guides in the checklist and the observer did tick against each appropriately. Field notes were also taken alongside. The time that was used in observing each participant was 70 minutes.

3.13.0 Data Analysis

Descriptive statistics, mainly frequencies and percentages, as well as the qualitative analysis of interview were analyzed for data corroboration.

3.13.1 Analysis of Questionnaire Results

With the structured questionnaire, descriptive statistics were computed to obtain the frequencies and percentages with the aid of Statistical Product for Service Solutions (IMB SPSS, version 25) software for the parts two and three aspect of the questionnaire. Strongly disagree and disagree in the Likert-type scale in part three were merged together whiles strongly agree and agree were also merged together. For part three of section A, never and seldom were merged together whiles sometimes and often were also merged. All these were done for the purpose of easy analysis and discussions. The Statistical Product for Service Solutions (IBM SPSS, version 25) was also used to

understand the demographic information of participants.

3.13.2 Analysis of Interview Results

The data collected from the mathematics teachers were individually analyzed relative to the sub-themes and research questions in the study. This inquired from the teachers their conceptions of assessment, the assessment tools they profess to use, how mathematics teachers assess learners from planning, gathering data, interpreting the evidence and using the results. The interview data was recorded, transcribed, coded and analyzed using themes relative to the research questions. Data collected through the interview was used to validate the teachers' responses from the questionnaire.

3.13.3 Analysis of Observation Results

The observed elements as 'present' or 'not present' aspects of the eleven items of the observation were analyzed using simple frequencies and percentages to further cross valid the interview data and understand how the mathematics teachers assess their pupils in Bongo district. Field notes from the observation were also used to explain some actions that the teachers took with learners in the process of assessing their learners.

3.14 Ethical Consideration

Ethical issues such as seeking informed consent, avoiding bias, avoiding plagiarism, maintaining confidentiality of the respondents were all observed in this study. These all constitute ethical issues that need to be observed in research studies (Kumar, 2011). The participant were not forced to offer the information but they did it out of their own volition as the researcher explained the rationale of the study to them. The participants were also assured of confidentiality to the information that they gave. Permission was also sought from participants before they were tape recorded. The

researched were also made aware that they could withdraw at any moment they wanted.

3.15 Summary of Chapter Three

This chapter presented the methodology of the study. The chosen research design was the concurrent triangulation mixed research design. The research setting was also described. Population of the study, sampling and sample size, sampling procedure as well as the research instruments were also elaborated upon whiles the measures to ensure validity and reliability were also explained.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.0 Overview

This chapter presents the research questions and the analysis of data collected. The research instruments were used for the exploration of the public junior high mathematics teachers' conceptions of the purpose of assessment and the teachers' practice of mathematics assessment in Bongo District, Ghana.

The interview data was used to answer research questions 1. The questionnaire and interview were used to answer research question 2, the interview data and observation were also used to answer research question 3 whiles the questionnaire and interview again were used to answer research question 4.

The questionnaire was administered to the sampled 58 public junior high school mathematics teachers whiles observation and interview were also conducted on seven and six public mathematics teachers respectively .

The study examined the following research questions:

1. What are the public junior high school mathematics teachers' conceptions of the purpose of assessment?
2. What assessment tools do the public junior high school mathematics teachers of Bongo District use to assess pupils' learning outcomes?
3. How do the public junior high mathematics teachers assess their pupils in Bongo District in Ghana?
4. To what extent do the junior high school mathematics teachers' conceptions of assessment practices reflect in the purpose of assessment in Bongo district of Ghana?

Using the result from the instruments: structured questionnaire, semi-structured interview and structured observation, the chapter also presents these results in five sections. The first section presents the demographic information of the study's participants whiles section two, three, four and five respectively offer answers to research questions one, two, three and four. This is then followed by discussions of results.

4.1 Demographic Information

The bio data of the 58 public junior high mathematics teachers sampled using a multistage sampling procedure were analysed using the SPSS computer software. The information is illustrated in Table 4.1

Table 4.1: A Summary of Demographic Information of Mathematics Teachers in Bongo District (n=58)

Demographic factor Category	Frequency	Percent (%)
Gender		
Male	52	89.7
Female	6	10.3
Total	**58**	**100.0**
Age		
20-30 years	29	50.0
31- 40 years	28	48.3
41- 50 years	1	1.7
Total	**58**	**100.0**
Academic Qualification		
Diploma	27	46.6
Bachelor's Degree	29	50.0
Master's Degree	2	3.4
Total	**58**	**100.0**
Rank in Ghana Education Service(GES)		
Superintendent 2	8	13.8
Superintendent 1	3	5.2
Senior Superintendent 2	14	24.1
Senior Superintendent 1	5	8.6
Principal Superintendent	26	44.8
Assistant Director 2	2	3.4
Total	**58**	**100.0**
No. of Years in Teaching Mathematics		
1-5 years	29	50.0
6-10 years	22	37.9
11-15 years	6	10.3
16-20 years	1	1.7
Total	**58**	**100.0**

Source: Field data (2019)

From Table 4.1, the total number of public junior high school mathematics teachers sampled for the study was 58. This sample comprised 52 (89.7%) males and 6 (10.3%) females. The results therefore revealed that many more male mathematics teachers were in the public junior high schools than their female counterparts in Bongo district.

Besides, 29 (50%) were within 20-30 years, 28 (48.3%) of the teachers were also within the age distribution of 31- 40 years while 1 (1.7%) was also within the age distribution of 41-50 years. The implication is that majority of the public mathematics teachers from the district were within the twenty to thirty year range.

Also, 27 (46.6%) of the teachers had Diploma as their highest academic qualification, 29 (50.0%) of them had Bachelor's degree as their highest academic qualifications while 2 (3.4%) of them had Master's degree as their highest academic qualification. Majority of the teachers were then discovered to hold Bachelor's degree while Master's degree was the least highest academic qualification held by the mathematics teachers.

On the highest Ghana Education service (GES) rank held by the mathematics teachers, it was noticed that 8 (13.8%) held the Superintendent 2 rank, 3 (5.2%) held the Superintendent 1 rank, 14 (24.1%) held Senior Superintendent 2 rank, 5 (8.6%) held Senior Superintendent1 rank, 26 (44.8%) held Principal Superintendent rank and 2 (3.4%) held Assistant Director 2 rank. It implies that most of the teachers had principal superintendent whiles assistant Director 2 was the least rank in Ghana Education Service held by the mathematics teachers.

Finally, the demographic information illustrating the number of years that the teachers taught mathematics were as follows: 29 (50%) of the teachers taught mathematics within 1-5 years, 22 (37.9%) of the mathematics teachers also taught

mathematics within 6-10 years, 6 (10.3%) of the teachers taught mathematics within 11-15 years and 1 (1.7%) of the mathematics teachers taught mathematics within 16-20 years. Thus, twenty-two representing majority of the mathematics teachers (37.9%) taught mathematics within 6-10 years.

4.2 Research Question 1: What are the public junior high school mathematics teachers' conceptions of the purpose of assessment?

As part of providing answers to this research question, the mathematics teachers' conceptions were analysed using themes. Two themes emerged from the interview data: Assessment for learning and assessment of learning. How to go about conducting the assessment and how to use the results under each were considered and explored using the one-on-one interview data. Part 1 aspect of Section B of the research instrument was used to answer this research question.

Assessment for learning

When the teachers views on why, what and how assessment strategies are used to enhance learning outcomes in their classrooms, they each expressed their opinions. For instance, in describing what assessment is, the following is what Teacher 3 had to say:

> *'Uhm, assessment is em..is just talking about checking your pupils performances about learning. Their improvement and weaknesses so that you will be able to identify and improve upon their learning'.*

When I further wanted to know from the perspective of the teachers why they assess their pupils, the following is what Teacher 1 said:

> *'We assess one, to identify their weaknesses and strengths. Number two, after identifying their weaknesses and strengths, you will be able to plan your lessons to improve their learning'.*

The explanation of teacher two is directed towards assessment for learning except to add that feedback will be very useful when it is used immediately to modify classroom instructional process than using it to plan for lessons later.

When the teachers were asked whether they think assessment enhances learning, all except one answered in the affirmative. Their affirmation was not taken for granted. The teachers were further asked to explain their positions. In fact, their explanations left only teacher three as the one's whose position was acceptable. The following is what Teacher 3 again had to say:

> *'Yes, it directs the way students learn. Because like for instance, me, if I enter to introduce a topic you have to tell them the rationale behind the topic. After that you tell them that these are some of the things you will like them to be able to do at the end of the lesson. So if you give the children the rationale and the things they are supposed to do, the application, they will be able to also understand and try to benefit from the topic'.*

As asserted by Bennet (2009), it is erroneous to think that every decision of assessment directs learning. Teacher three's (3) explanation was the only one that is related to assessment for learning. Willam (2011) also asserted that the sharing of the learning goal with the learners by the teacher is the fountain of assessment for learning. This made the position of Teacher 3 as accurate in describing assessment for learning.

In describing how the mathematics teachers use the assessment results, only one teacher mentioned the use of assessment related to the concept as:

Teacher 1 again mentioned that assessment is used *'to monitor their growth in learning'*. According to the teacher, it is meant to monitor learning growth of the pupils. In conclusion, the teacher had a fair conception of assessment for learning.

Assessment of learning

When the mathematics teachers' conception of assessment of learning were explored, many of the teachers expressed their knowledge, value for and high perceptions towards the concept.

The following was what Teacher 4 said:

> '*Eem to me em, I think assessment is a tool used to get the feedback from your input… input per se can be like what you have been teaching or the knowledge imparted'*. .

Teacher 6 also added that:

> *'Basically assessment is just the examination of students on what they have learned. The things they have learned in the course of the learning process'*.

The impartation of knowledge to learners coupled with examinations of what is learned relates to finding out what leaners have achieved from learning. Therefore, this teacher conceived assessing the achievement of learners in the classroom.

When I wanted to know what the teachers use the assessment results for, the following was what some of them has to say:

> Teacher 2:'*To ascertain the level of understanding of the students. Two, to also see whether you have achieved in your objectives'*.
>
> Teacher 4: '*Mmm, one is to motivate them to learn. Once there is assessment they will have that zeal to learn in order to see whether they are absorbing what you have given them'*.
>
> Teacher 5: '*You assess them to know whether the method that you have used eeh whether they have understood it or not and to also write on the remarks column whether you are able to meet all your objectives or not'*.
>
> Teacher 6: '*Eeem, as I mentioned earlier, is about identifying strengths and weakness on their part. It emm also helps you as a teacher to strengthen your pedagogical methods. It can also eeh help you to prepare your teaching methods…lets say the scheme of work and lesson notes in accordance with the level of students. And then to help them eem choose their career. It can also be used for demotion and promotion'*.

From the mathematics teachers' responses, it is explicit that they hold an over whelming view for assessment of learning. This is in line with Olutola, Daramola and Ogunjimi's (2016) assertion that the summative assessments which are meant to register and report the performance levels of learners, for comparison and satisfying accountability purpose describe assessment of leaning. Thus, the mathematics teachers conceive much more of assessment of learning in their classroom.

4.3 Research Question 2: What assessment tools do the public junior high school mathematics teachers of Bongo District use to assess pupils' learning outcomes?

The mathematics teachers' use of assessment tools were explored using questionnaire and semi-structured interview. With the questionnaire, a four-point likert scale was employed with the rating scale: Never (1), Seldom (2), Sometimes (3) and Often (4). Section A, Part Two aspect of the research instrument was analysed to answer the research question. Tables 4.2 and 4.3 are the illustrations of the analysed results.

Table 4.2 : The Exploration of the Public Junior High Mathematics Teachers' use of Alternative Assessment Tool

ITEM	N F(%)	S F(%)	St F(%)	Of F(%)	T F(%)
I use portfolio in my classroom for assessing pupils	17(29.3)	11(19)	22(37.9)	8(13.8)	58(100)
I use anecdotal records in my classroom as one of the tools for assessing pupils	22(37.9)	17(29.3)	12(20.7)	7(12.1)	58(100)
I include clearly structured rubrics in classroom assessment of my pupils	0(0)	3(5.2)	20(34.5)	35(60.3)	58(100)
I use oral questioning in my classroom for assessing pupils	4(6.9)	7(12.1)	15(25.9)	32(55.2)	58(100)
I consciously engage learners in self-assessment practice	2(3.4)	7(12.1)	26(44.8)	23(39.7)	58(100)
I use group project as a tool /method for assessing pupils in my class	1(1.7)	8(13.8)	26(44.8)	23(39.7)	58(100)
I employ peer assessment	12(20.7)	12(20.7)	21(36.2)	13(22.4)	58(100)
I use observation in my classroom for assessing pupils	3(5.2)	15(25.9)	26(44.8)	14(224.1)	58(100)
I make use of conferences in assessing pupils	23(39.7)	14(24.1)	16(27.6)	5(8.6)	58(100)
Total	**84(16.1)**	**94(18.0)**	**184(35.2)**	**160(30.7)**	**522(100)**

N= Never(1), S= Seldom(2), St= Sometimes(3), Of = Often(4), F = Frequency and T = Total

Source: Field data (2019)

Table 4.3: The Exploration of the Public Junior High Mathematics Teachers' use of Traditional Assessment Tools

ITEM	N F(%)	S F(%)	St F(%)	Of F(%)	T F(%)
I use true or false test for assessing pupils in class	12(20.7)	20(34.5)	17(29.3)	9(15.5)	58(100)
I use essay type test in assessing my pupils	11(19)	12(20.7)	14(24.1)	21(36.2)	58(100)
I use multiple-choice test for assessing pupils in class	0(0)	5(8.6)	22(27.9)	31(53.4)	58(100)
I use matching type objective test in assessing my pupils	13(22.4)	13(22.4)	28(48.3)	4(6.9)	58(100)
Total	**36(15.6)**	**50(21.6)**	**81(34.8)**	**65(28.0)**	**232(100)**

N=Never(1), S=Seldom(2), St=Sometimes(3), Of=Often(4) and T= Total

Source: Field data (2019)

Table 4.2 is an analysis of alternative assessment tools perceived to be used by the public mathematics teachers. From the analysis, it was noticed that 28 (48.3%) of the mathematics teachers claimed to never or seldom use portfolio in classroom for assessing pupils while 30 (51.7%) perceived to sometimes or often use portfolio to assess learners. 3 (5.2%) declared that they never use or seldom use scoring rubrics whiles 55 (52.8) admitted to either sometime use or often use scoring rubrics . Thirty-nine (67.2%) professed that they never or seldom use anecdotal records but 19 (32.8%) acknowledged that they sometimes or often use the tool for assessing learning outcome. Eleven (19%) never perceived or seldom perceive that they oral questioning as an assessment tools in classroom, 47 (81%) perceive to sometime use or often use oral questioning. Nine (15.5%) of the teachers perceived never to use self-assessment or either seldom use it but 49 (84.5%) acknowledged that they sometime or often it. Nine

(15.5%) perceive never to use or seldom use project work whereas 49 (84.5%) sometime or often use project in assessing mathematics learning outcome. 24 (41.4%) conceded never using or seldom use peer assessment whereas 34 (58.6%) sometime or often use peer assessment. Eighteen (31.1%) admitted that they never use or seldom use observation while 40 (68.9%) professed that they sometime or often use observation in assessing learning outcome. Thirty-seven (63.8%) also never or seldom use conferences as an assessment tool while 21 (31.1%) asserted that they sometime use or often use conferences. Generally, 178 (34.1%) of their choices revealed that the teachers perceived never or seldom use alternative assessment tools in their classrooms where as 344 (65.9%) of their choices were noticed to be in favor of sometime or often use of alternative assessment tools.

From Table 4.3 which is the analysis of the traditional assessment tools the mathematics teachers' perceive to use , it was revealed that 32 (55.2%) perceived never or seldom use true or false test items for assessing mathematics, 26 (44.8%) sometimes or often use it in assessing mathematics learning outcome. Twenty-three (39.7%) alluded never or seldom use of essay test items to assess learning outcome but 35 (60.3%) perceived that they sometimes or often use it to assess their learning outcome. Five (8.6%) confirmed that they never or seldom use multiple choice objective test items whereas 53 (91.4%) sometime or often use it to assess mathematics learning outcome. Twenty-six (44.8%), confirmed that they never use or seldom use matching type test items but 32 (55.2%) alluded that they sometime or often use the tool for assessing mathematics learning outcome. In conclusion, 86 (37.2%) of the 58 mathematics teachers' choices confirmed that the teachers never or seldom use the traditional assessment tools whiles 146 (62.8%) confirmed that the teachers sometimes or often use the traditional assessment tools in assessing mathematics learning

outcomes in Bongo district of the upper Region, Ghana.

The quantitative data confirmed some of the tools the teachers used in assessing their learners as was revealed in the questionnaire. When the interviewees were asked to mention some of the mathematics assessment tools that they use in their classrooms and explain why they choose those tools, this is what some of the teachers recounted:

> Teacher 1: *'Number one, to me when an objective is taught, first of all I use oral questioning to get a quick feedback on what we are doing so far. The oral questioning helps students to be able to speak in the midst of their colleagues. So that [sic], that one promotes fluency in the class and also you get a quick feedback of the student and you make them confident in themselves too. That is oral questioning. After the oral questioning, it is followed by written exercise. So that written exercise, you will be able to identify each of their strengths as you go book by book . You will be able to identify the strengths of each of them. Then you will be able to do corrections accordingly. Then after the class exercise, you will follow it by homework. The home work, it will be a bit difficult than the class exercise. So that they can be assisted in the house…You keep them learning in school and you keep them learning in the house. Then after the end of every topic, I follow it by class test. So the class test is may be what has been treated though out the week to test them and see whether they can remember what has been taught at the beginning of the topic the end of the topic. Then at the end of the term, you give them exams'.*

Relatively similar positions were expressed by Teachers 3,4 and 6.

> Teacher 3 said: '*I give them project work and classroom exercise. I give them home work. I want to check their knowledge and understanding. To be able to see the importance of mathematics in their environment. I use questioning to revise pupils previous knowledge. projects can let parents also find the importance of learning'.*

All that Teacher three (3) said implies that she makes use of both alternative assessment tools and traditional assessment tools to assess the learners in her classroom. Teacher 4 on his part also stated and explained by saying:

> '*Oh I use test. As I indicated earlier, the main thing is to motivate them to learn. Here, the main thing is to motivate them to learn. Normally, here we use the test, class test, exams. But when you are doing observation as a mathematics teacher, you are trying to know the behavior of the child. Sometimes some students will come with very bright ideas . Some few years, you will see that they can't even do anything again. It is your observation that you call such students and you talk to them. When there is no test, students don't learn for that one is a thing that run through them'.*

Teacher 5 also added that:

> '*Yes we give the written one. We always give them exercises to do so after working it we always go through and mark. Ok we also have oral questions to recap their understanding'.*

Teacher 6 also had this to say:

> '*Sometimes I will use questioning and answering techniques. It could also be in the form of exam, observations and oral evaluations. 'Sometimes eeh eeh depending on the time at stake'. Because if it is just after a lesson, may be that one is for a short period. If there is a next master to come, I can use the oral one to just assess them on their understanding….but if it a long time. That way you can use the written one to just assess them on their overall understanding of the whole topic or two or more topics'.*

The teachers alluded to using oral questioning, observations, class or written exercises, project work, homework and exams. This represent a mixed use of traditional and alternative assessment tools. However in the teachers' explanations on why they use those tools, their explanations mainly positioned them within the traditional motive

of assessment practices. For instance, teacher six indicated that when there is no enough time and the next teacher is to take over the class he uses oral questions to just get the understanding. Just measuring learners' understanding at the end of the lesson will align this conception to the traditional assessment mode. Again, the responses of the teachers during the interview also confirmed the questionnaire analysis by revealing a blend of both traditional and alternative assessment tools used by the teachers. Many more of the teachers professed to use assessment to complete the remarks column of their lessons notes, to promote the learners and to ensure that the objective of their lessons are met, however, teacher three also stated that she does so to find out whether the learners understand the importance of mathematics in their daily lives. Thus there is a conceived merger of traditional and alternative assessment practices.

4:4: Research Question 3: How do the public junior high mathematics teachers assess their pupils in Bongo District in Ghana?

How the mathematics teachers assess learning outcome was investigated through the use of observation schedule and interview schedule. From the observation, some pre-determined elements of mathematics assessment processes were observed among seven mathematics teachers whom the researcher purposively selected. One-on-one type of interview was also used to investigated how the teachers assess learners taking cognizance of the assessment processes: planning, gathering data, interpreting data and using results. A purposive sample of six teachers was also interviewed. Section B, part 1 and 2 aspects of the research instruments were used together to answer this research question. Table 4.4 is an analysis of the observation data.

Table 4.4: How the Public Junior High Mathematics Teachers Assess Learning Outcomes in Classrooms

ITEM	P F(%)	N F(%)	TOTAL F(%)
EVIDENCE OF PLANNING			
1. Evidence of learning goal shared with pupils	1(14.3)	6(85.7)	7(100)
2. Prior planned assessment tool(s) to use.	2(28.6)	5(71.4)	7(100)
EVIDENCE OF GATHERING DATA			
3. Asking focused questions in class to clarify what and how students are learning	2(28.6)	5(71.4)	7(100)
4. Giving assignments to find out understanding of learners	4(57.1)	3(42.9)	7(100)
5. Provision of opportunity for learners to demonstrate their learning	2(28.6)	5(71.4)	7(100)
EVIDENCE OF INTERPRETING RESULTS			
6. Self-reflective assessment opportunities provided for pupils	0(0.00)	7(100)	7(100)
7. Provision of check list describing understanding of learners	0(0.00)	7(100)	7(100)
8. Provision of clear rubrics	0(0.00)	7(100)	7(100)
EVIDENCE OF USING RESULTS			
9. Provision of feedback to learners	3(42.9)	4(57.1)	7(100)
10. Using results to modify teaching and learning	1(14.3)	6(85.7)	7(100)
11. Using results to differentiate teaching and learning	1(14.3)	6(85.7)	7(100)
Total	16(20.78)	61(79.22)	77(100)

P=Present, N=Not present and F= frequency

Source: Field data (2019)

From the Table 4.4, the observation discovered that the act of sharing learning goals with the learners by the teachers was observed once (14.3%) in the teachers' assessment process whereas same was not noticed among six of the observations (representing 85.7%) with the mathematics teachers' assessments processes. It was

again revealed that 2 (28.6%) of the seven teachers made use of prior planned assessment tools in class while 5 (71.4%) of the observed teachers did not use prior planned assessment tools during assessment. These elements are anchored to the planning stage of the mathematics assessment process.

On the stage of gathering data, 2 (28.6%) teachers were observed asking focused questions in class to put to bear what and how students are learning while this was not present among 5 (71.4%) of the teachers. Four (57.1%) of the teachers were observed giving assignments to find out learners' understanding while same was not observed among 3 (42.9%) of the mathematics teachers. Two (28.6%) of the mathematics teachers provided opportunity for learners to demonstrate their learning while same was not present in 5 (71.4%) of the mathematics teachers' assessment process.

With the elements of assessment observed relative to the process of interpreting data, none of the elements observed were present in the assessment process of the seven mathematics teachers.

On the stage of using the data, 3 (42.9%) of the teachers provided feedback to learners while 4 (57.1%) did not provide feedback to learners. One (14.3%) used results to modify teaching and learning whereas 6 (85.7%) of the observed teachers did not use the results to modify learning. One (14.3%) used assessment results to differentiate teaching and learning whiles 6 (85.7%) teachers did not use the assessment results to differentiate learning.

The analysis of the observed data as illustrated in Table 4.4 had the teachers predominantly engaged in giving assignment to find learners understanding (57.1%) and the providing feedback (42.9%). It was generally noticed that 16 observations representing 20.78% had the observed elements of assessment present while 61 times

of the observation representing 79.22% did not find the observed elements of the assessment process present.

During the observation of teacher one, it was noticed that in a lesson on the topic, 'Ratio and Proportion', one student who was called to work on the chalk board struggled for some time. The teacher then asked a question which then drew the learner's attention to always think of factors of a number when doing division.

None of the teachers also gave the students the chance to self-assess or peer assess. It was quite surprising when teacher six who was teaching 'Linear Equations' in form two failed to respond to most questions asked by the pupils or even give chance to the learners peers or allow the learners themselves to provide answers that are confusing to them so that they corrected appropriately. Attention was never paid to the learners in that direction.

The interview data also confirmed the observation data as true reflection that is worthy of arriving at a credible conclusion. When the mathematics teachers were asked to describe how they normally assess their students, below are what some of them had to say:

> Teacher 1: *'Ok, eeh you, you plan on first of all for the objectives that you want to achieve[sic]. When you plan on the objectives, now the questions will now be based on the objectives that you have plan. Eee, so after planning , you first of look at the objectives that you want to achieve. Then based on the objectives, you now set the questions based on the objectives. That is all about the planning aspect. Then the administration. When you want to administer the assessment. You need to each….. encourage individual eehh efforts. So that when you want you have to know about their individual performance, you have to make your supervision very strict. So that they will not copy. They will not copy each other [sic] that is when you want to get the individual performance. Then when you want to get a group. When you give them in group, then you need to encourage them to discuss it in the groups. Then you encourage that everybody participate in the group work. Then after that, after they have finished with the group work[sic], you need to let them present it to the whole class. So a group will come out and you allow someone to present. Then you don't tell them the leader will present: They can leave it on the leader. But you have to tell them that*

any person at all can present. So that when they come out, you choose any of them to present. Then after presentation you allow them to ask questions, then you also ask them questions.

As explained by Teacher one (1) above, the description of the assessment process involves planning, setting the questions, administering the questions and appraising the whole process of the assessment.

Again, Teacher 2 also had this to describe how he conducts assessment of learning outcomes in the mathematics classroom in Bongo District:

'Normally, if when I'm to end my lesson, I use exercises and followed by homework. Some questions are there that you can't give it like that, you have to give it through project work. It is a long term thing. Project work is a long term thing. You can't give examinations questions without studying it. At least, that particular thing or that particular question or test that you have administered, it should have a target. If after administering the test, the students are falling below; They are not getting the target that you have set, then there may be there is a mistake or a fault somewhere. Is it the method of teaching that is making them not to understand, or what is it? So you can try another way and see. So let assume that a normally set my pass mark 50 as my pass mark, so say 70%-80% of my students are not getting the pass mark. That means there is something wrong. So either I will have to reteach . I have to prepare my lessons well, come and teach. Maybe the methodology that I have used, the students are not getting me, I have to change it or the questions that are set. There are may be problems with them. Whether they are above their standard or too low. Humm, for it is not normal for you to set questions and students will just score everything. If they score everything, there is a problem, if they fail too there is a problem'.

The description by teacher two above typifies that the assessment process involves gathering of data scoring and interpreting the results. The teacher's description was also dominated by the gathering of learning outcomes by means of traditional assessment tools.

Finally, when Teacher 5 was asked to describe how he assesses learning outcomes in the mathematics classroom, the following is what the teacher had to say:

> *'Yeeh, after teaching, after teaching, you have to give them class exercise .Then you score them. After scoring, if somebody is scoring above average, you give the person very good. If the person score at the middle, you give the person good. Then if the person scored all, then you give the person excellent. We always record the results in our SBA, then their termly report cards and also praise them in the classroom and tell them oh, you have to learn. The slow learners they have to contact the fast learners. If they don't understand, they always say that they always learn from their peers or understand from their peers better than from their teachers'.*

From the teachers responses, it is clear that planning stage was mentioned by some of them with unclear explanations of the process. The process of gathering data through the various assessment tools and the use of results were the dominant components in their descriptions of how they assess learning outcomes. Few accounts of interpretation of results also took place. A classic example is in teacher two's response. The teacher gave an illustration giving a conjecture of how his assessment results are interrelated. It is teacher five whose description explains results interpretation but with large scale assessment practice. It is there prudent to conclude that the mathematics teachers concentrate their assessment process within data gathering process and use the result for varieties of decisions.

4.5 Research Question 4: To what extent do the junior high school mathematics teachers' conceptions of assessment practices reflect in the purpose of assessment in the Bongo District of Ghana?

This research question was also answered by exploring the extent to which the mathematics teachers' conceptions of assessment practices reflect in the purpose of assessment. Assessment for leaning, as learning and of learning were then compared using simple percentages and frequencies. The exploration made use of section A part three and section B part one aspects of the research instruments in answering the research question. The questionnaire was a four point likert scale of rating: strongly disagree (SD), disagree (D), agree (A) and strongly agree (SA). Drawing inspiration from Spencer and Pharm (2015) the questionnaire was analyzed by merging strongly disagree and disagree whiles agree and strongly agree were also merged for easy interpretation. Tables 4.5, 4.6 and 4.7 are the presentations of the analysis of the various conceptions. The qualitative analysis was intended to either confirm or disconfirm the quantitative analysis based on the individual concepts.

Table 4.5: The Extent to which the Public Junior High School Mathematics Teachers' Conceptions of Assessment Practices Reflect in Assessment

ITEM	SD F(%)	D F(%)	A F(%)	SA F(%)	T F(%)
Providing each student with accurate and descriptive feedback is what assessment should focus on	3(5.2)	11(19.0)	20(34.5)	24(41.4)	58(100)
Before assessment, the teacher should planning with learners to determine a clear criteria for success is imperative	4(6.9)	12(20.7)	13(22.4)	29(50)	58(100)
Assessment is to cater for the individual learning needs	1(1.7)	4(6.9)	12(20.7)	41(70.7)	58(100)
Good classroom assessment practices make use of portfolios, independence projects and journals as methods for assessing pupils in class .	3(5.2)	4(6.9)	32(55.2)	19(32.8)	58(100)
Providing opportunity for pupils to take responsibility of their own learning is key to assessment	1(1.7)	10(17.2)	33(56.9)	14(24.1)	58(100)
Total	**12(4.1)**	**41(14.1)**	**110(37.9)**	**127(43.8)**	**290(100)**

For Learning

SD=Strongly Disagree(1), D=Disagree(2), A=Agree(3), SA=Strongly Agree(4), T=Total

Source: Field data (2019)

On assessment for learning, the results revealed that more of the frequencies and proportion of the distribution favored the assessment for learning by either agreeing or strongly agreeing to such practice than the teachers disagreed or strongly disagreed to its practice in the classroom. Out of 58 public school mathematics teachers indicated in Table 4.5, 14 (24.2%) either strongly disagreed or disagreed that the provision of

each student with the accurate descriptive feedback is what assessment should focus on whiles 44 (75.9%) agreed or strongly agreed to the assertion. Sixteen (27.6%) either strongly disagreed or disagreed that a teacher should plan with learners to determine a clear criteria for success whiles 42 (72.4%) either agreed or strongly agreed to the assertion. Five (8.1%) also strongly disagreed or disagreed to the statement that assessment is to cater for the individual learning needs whiles 53 (91.4%) either agreed or strongly agreed in favor of the statement. On the item that postulated that a good classroom assessment practice makes use of portfolios, independence projects and journals as methods for assessing pupils in class, 7 (12.1%) strongly disagreed or disagreed to the item whiles 51 (88.0%) also agreed or strongly agreed to that questionnaire item. Eleven (18.9%) strongly disagreed or disagreed with the statement that the provision of opportunity for pupils to be custodians of their own learning is the cardinal principle of assessment but 47 (81%) agreed or strongly agreed to the declaration.

In conclusion, 53 (16.1%) of the teachers' total choices related to the concept either strongly disagreed or disagreed to all the items on assessment for learning while 237 (81.7%) of the total choices either agreed or strongly agreed to all items under assessment for learning. This indicates that majority of the mathematics teachers conceived to practice assessment for learning in their schools. The qualitative data also confirmed the mathematics teachers of having fair knowledge and understanding of assessment for learning. Some traces of assessment for learning elements were mentioned by the mathematics teachers. This came to light when the researcher asked the teachers to explained assessment in their own words during the interview process.

The following is what some of them had to say.

> Teacher 3: *'Uhm, assessment is em..is just talking about checking your pupils performances about learning[sic]. Their improvement and weaknesses so that you will be able to identify and improve[sic]them'.*

> Teacher 5: *'Assessment is the feedback that you get from your students after teaching'.*

From the two mathematics teachers, the narratives above situated their conceptions with assessment for leaning. Drawing inspiration from William (2011), immediate feedback is a bedrock of assessment for learning and this feedback should not merely be provided but used in order to advance learning. Thus, these teachers' conceptions resulting from their definitions of assessment would partially locate them with the assessment for learning assessors. Teacher 3 also posited that assessment is meant to improve learning. Enhancement of learning is the hallmark of assessment for learning. Another question from the questionnaire was posed to the teachers to find out whether they conceive assessment as a tool that directs learning in the classrooms and that their positions were to be explained. This particular item intended to solicit the teachers' views on what they engage the learners in during assessment in order to enhance learning. Their responses were expected to bring to bear the purpose the teachers really conceive assessment to play. The following was what some of those interviewed had to say.

> Teacher 4: *'Yes, is two way affairs. You know yes, you can say it directs how the child learns. Because if there is assessment, as I indicated that it motivates the child to learn, is a direction. Because if the child has no knowledge of learning to do anything, the behavior is different*

> Teacher 5 : *Yes. Because eeh without assessment, you will not know whether your objectives are met. It is necessary. It is necessary. You know students you need to give them after teaching you need to give the exercise to do so that even with the exercises that they are doing[sic] you have to do that so that they can [sic] some of the always go and put the books down. So you have to give them assignment so that when they get to their houses they can learn engage themselves in the books too. Moreover, that one even helps them to learn and even go beyond the*

content you are teaching them. Some can even go ahead because of the exercise being given.

Teacher 6: '*Yah, to some extent because knowing know very well that you are going to be assessed at the end of the lesson or may be at the end of the term, it motivates the students to keep on learning hard because they know very well that they will be assessed at the end. And then if it is used in its right context here as a teacher sometimes depending on the outcome of the assessment you will be able to determine that ooh it was effective or maybe I need to revisit what I taught with them'.*

From the responses of the three teachers above, they all replied in the affirmative to the statement that assessment in mathematics directs the learners' way of learning. However, their explanations portrayed them of not having conceived assessment for learning. For it will be inappropriate to think that all forms of assessment decisions motivate learning (Stiggins, 2002 as cited in Ghaica, 2016). Besides, when the mathematics teachers were also asked to mention the uses of the classroom the assessment results they always gather, the following were some of the responses that the interviewed teachers offered:

Teacher 1:*'We assess one [sic], to identify their weaknesses and strengths. Number two[sic], after identifying their weaknesses and strengths you will be able to plan eeem your lessons to improve their learning'.*

Teacher 3:' *I do this because I want to check their learning and understanding to see the importance of maths in the environment. ....to find out the improvement of learning.' Oral questions are used to revise pupil's previous knowledge. Projects can also let parents find the improvement of learning.*

Teacher 4: '*Mmm, one is to motivate them to learn. Once there is assessment they will have that zeal to learn in order to see whether they are absorbing [sic] what you have given them'.*

Teacher 5: '*You assess them to know whether the method that you have used eeh whether they have understood it or not. And more to the point to also write on the remarks column whether you are able to meet all your objectives or not[sic]'.*

Reconciling the views of the mathematics teachers in both the questionnaire and the interview analysis, it positions the teacher conceding assessment for learning in their classrooms. The teachers knowledge, value, perceptions of assessment for learning was explicitly expressed.

Table 4.6: The Extent to which the Public Junior High School Mathematics Teachers' Conceptions of Assessment Practices reflect in Assessment As Learning

ITEM	SD F(%)	D F(%)	A F(%)	SA F(%)	T F(%)
Teachers should design assessment for learners to think about their own learning	2(3.4)	7(12.1)	(53.4)	18(31)	58(100)
Assessment is designed to cater for the individual learning needs	1(1.7)	3(5.2)	13(22.4)	41(70.7)	58(100)
Any assessment that is designed aimed at empowering learners to take risks on their own	9(15.5)	12(20.7)	21(36.2)	16(27.6)	58(100)
Providing opportunities for pupils to take responsibility of their own learning is key to assessment.	2(3.5)	3(5.2)	52(89.7)	1(1.7)	58(100)
TOTAL	**14(6.0)**	**25(10.8)**	**117(50.4)**	**76(32.8)**	**232(100)**

SD=Strongly Disagree(1), D=Disagree(2), A=Agree(3), SA=Strongly Agree(4), T=Total

Source: Field data analysis with the aid of IBM SPSS 25 (2019)

With assessment as learning, 9 (15.5%) of the respondents strongly disagreed or disagreed to the statement that teachers should design assessment for the pupils to

think of their own learning whiles 49 (84.4%) of the respondents agreed or strongly agreed respectively to that questionnaire item. Four (6.9%) of the mathematics public teachers strongly disagreed or disagreed to another item which stated that assessment is to cater for the individual learning needs. However 54 (93.1%) agreed or strongly agreed to that item. Twenty-one (36.2%) of the respondents also disagreed or strongly disagreed to the conception that any assessment is done as a means of empowering learners to take risk on their own, whereas 37 (63.8%) agreed or strongly agreed to the assertion. The final item as part of the assessment as learning had 5 (8.7%) either disagreeing strongly or agreeing to the item whiles 53 (91.4%) agreed or strongly agreed to that questionnaire item. In conclusion and relative to the assessment as learning, 39 (16.8%) of the responses either disagreed or strongly disagreed of its practice in their classrooms as against 193 (83.2%) of the general responses either agreeing or strongly agreeing to that practice. The implication from the outcome of the questionnaire is therefore that, the mathematics teachers conceived to practise assessment as learning more than those who did not conceive of its practice in their classrooms. This result was however completely contrary to the outcome of the interview data. For instance, when the researcher wanted to know from the perspective of teachers what assessment was, whether assessment motivates learning or not and what the teachers use the assessment results for as mathematics teachers, there was virtually no substantial response that portrayed the teachers to engage in assessment as learning. Their responses did not represent them as having knowledge, value for or perceived to practice assessment as learning. The following was what Teacher 1 had to say:

> *'When you want to administer the assessment. You need to each….. encourage individual each efforts. So that when you want you have to know about their individual performance, you have to make your supervision very strict. So that they will not copy. They will not copy*

each that is when you want to get the individual performance. Then when you want to get a group. When you give them in groups, then you need to encourage them to discuss it in the groups. Then you encourage that everybody participate in the group work'.

From the response of teacher one, an effort of assessment as learning quality was mentioned as encouraging individual efforts through group work and also boost individual efforts through strict supervision. Strict supervision may rather fall within the domain of using large -scale assessment process which is also within the assessment of learning paradigm. Though metacognition is the fountain of assessment as learning (Bennet, 2009) this was not noticed in the teachers responses to validate their conceptions for this purpose of assessment that was demonstrated in questionnaire. Assessment as learning purpose is exhibited via the provision of opportunities for the learners to self-assess or peer assess (Dikli, 2003). Though it was disclosed from the quantitative results that the teachers conceive to cater for individual difference of learners, none of the teachers said anything useful in relation to it when they were interviewed. This seems to suggest that the mathematics teachers either did not conceive the practice of assessment as learning or they conceive little of its practice in their classroom.

Table 4.7: The Extent to which the Public Mathematics' Teachers Conceptions of Assessment Practices reflect in Assessment Of Learning

ITEM	SD F(%)	D F(%)	A F(%)	SA F(%)	T F(%)
There is always a known point of reference which is provided for learners and should be used to measure content learned	1(1.7)	4(6.9)	18(31.0)	35(60.3)	58(100)
Assessment is meant to provide pupils the opportunity to demonstrate what they know, can do and the confusion they might have so that they are appropriately ranked.	0(0)	2(3.4)	22(37.9)	34(58.5)	58(100)
Assessment is conducted in the classroom as a foundation for discussion of pupils' promotion.	2(3.4)	13(22.4)	24(41.4)	19(32.8)	58(100)
Pupils' assessment aims at preparing them well for the Basic Education Certificate Examination	6(10.3)	7(12.1)	19(32.8)	26(44.8)	58(100)
Assessment is meant for institutional accountability	4(6.9)	13(22.4)	20(34.5)	21(36.2)	58(100)
Assessment results need to be highly reliable and valid across all variety of performance .	0(0)	4(6.9)	7(12.1)	47(81)	58(100)
TOTAL	**13(3.7)**	**43(12.4)**	**110(31.6)**	**182(52.3)**	**348(100)**

SD=Strongly Disagree(1), D=Disagree(2), A=Agree(3), SA=Strongly Agree(4), T=Total

Source: Field data with the aid of IBM SPSS 25 (2019)

With respect to assessment of learning and out of the 58 public school mathematics teacher sampled, the outcome from the quantitative data as indicated in Table 4.7 revealed that 5 (8.6%) of the mathematics teachers either strongly disagreed or disagreed to the statement that there is always a reference point that is provided for learners and this should be used as a means to measure content learned while 53 (91.3%) either agreed or strongly agreed to that statement. Besides, 2 (3.4%) of the researched were noted to have either disagreed or strongly disagreed with the statement that assessment provides the individual student with the opportunity to demonstrate what they know, can do and the confusion they may have o that they can be ranked. However, 56 (96.5%) either agreed or strongly agreed to the questionnaire item. On another item which stated that assessment is done as a foundation for discussion on promotion, 15 (25.8%) of the respondents thought it should either be strongly disagreed or disagreed to while 43 (74.2%) were of the opinion that the item should either be agreed or strongly agreed to as a practice in their classroom assessment. One other questionnaire item which stated that pupils' assessment aims at preparing them well for the Basic Education Certificate Examination (BECE) had 13 (22.4%) either strongly disagreeing or agreeing to the assertion whiles 45 (7.6%) either agreed or strongly agreed to the that questionnaire item. Also, 17 (29.3%) strongly disagreed or disagreed with the statement that assessment is meant for institutional accountability whiles 41 (60.7%) agreed or strongly agreed to this assertion. Last, the item that stated that assessment results need to be highly reliable and valid across variety of performance had 4 (6.9%) either strongly disagreeing or disagreeing to the statement while 54 (93.1%) of the respondent either agreed or strongly disagreed to that particular item.

In a nut shell, 56 (16.1%) of the mathematics teachers 'overall choices either strongly disagreed or disagreed with assessment of learning practices whereas 292

(83.9%) of the teachers' over all choices conceived or strongly conceive assessment of learning. From the qualitative data, similar revelation on assessment of learning was noticed when the mathematics teachers were interviewed. For instance, when the interviewer wanted to know from the teachers why they assess their pupils, the following were what some of the teachers had to say:

> Teacher 4: *Mmm, one is to motivate them to learn. Once there is assessment, they will have that zeal to learn in order to see whether they are absorbing [sic] what you have given them.*
> Teacher 5: *You assess them to know whether the method that you have used eeh whether they have understood it or not. And more to the point to also write on the remarks column whether you are able to meet all your objectives or not'[sic].*

> Teacher 6: *Eeem, as I mentioned earlier, is about identifying strengths and weakness on their part. It emm also helps you as a teacher to strengthen your pedagogical methods. It can also eeh help you to prepare your teaching methods, let's say the scheme of work and lesson notes in accordance with the level of students. And then to help them eem choose their career. It can also be used for demotion and promotion*.

From the responses of the teachers, it is clear that the mathematics teachers placed much more emphasis on the use of assessment results to determine what the learners can remember after been taught, for institutional accountability, grading and diagnosing learning. Though motivation was mentioned by teacher four, the teacher further advanced that the assessment gives learners the zeal to remember what is taught in class. However, assessing learners to remember only measures the lower level of the cognitive dimension of learning and is aligned largely to assessment of learning (Nitko & Brookhart, 2014). There is therefore an indication that the mathematics teachers clearly conceive assessment of learning in their classrooms than assessment for learning and as learning.

4.6 Summary of Chapter Four

Chapter Four described how data was analyzed based on research question after research question. The analysis showed that, the public junior mathematics teachers conceived assessment for learning, assessment as learning and assessment of learning purpose. The teachers also conceived to also used both the traditional and alternative assessment tools in assessing the learning outcomes of students. The analysis was therefore discussed relating the outcome of the analysis to appropriate assessment literature.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.0 Overview

This chapter presents the summary of the study and reports major findings arrived at by the study. The inferences were carved from the findings of the study. Recommendations and suggestions for further studies in relation to the study were also delineated.

5.1 Summary of the Study

The study investigated the mathematics teachers' conceptions of the purpose of assessment and practices of assessment in the public junior high schools in Bongo District of the Upper East region of Ghana. In doing so, the study sought to:

1. Explore the public junior high school mathematics teachers' conceptions of the purpose of assessment in the Bongo District of Ghana.
2. Explore assessment tools that the public junior high school mathematics teachers use to assess learning outcomes in class rooms within Bongo District, Ghana.
3. Find out how the public junior high school mathematics teachers assess their pupils in classrooms in the Bongo District of Ghana.
4. Determine the extent to which the public junior high school mathematics teachers' conceptions of assessment practices reflect the purpose of assessment in Bongo District of Ghana.

Four research questions guided the study. Current triangulation mixed research design was used with closed-ended questionnaire, semi-structured interview and structured observation also employed as the research instruments. 58 public school mathematics teachers were sampled by means of multistage procedure for the questionnaire data whiles six and seven of the public mathematics teachers were also sampled purposively and used in conducting the interview and observation respectively. The public mathematics teachers' demographic information, their conceptions of the purpose of assessment, the assessment tools they conceive to use in assessing learning mathematics outcomes were sought. How the teachers assess their learners was also observed. The questionnaire and observation data were analyzed descriptively using the SPSS whiles the interview was also analyzed based on the themes emanating from the research questions.

5.2 Summary of Major Findings

Research Question 1: What are the public junior high school mathematics teachers' conceptions of the purpose of assessment in the Bongo District of Ghana?

The study found out that the mathematics teachers conceive assessment as a means of getting to know what the learners have achieved in the learning process so that the learner can be ranked, promoted whiles the teachers also use assessment to evaluate the extent to which their lesson objectives are achieved and as well keep records for schools. It was also noted to a less extent that assessment is also used as a means of diagnosing the strengths and weaknesses of learner in order to assist learners in the learning process. This confirms the study conducted by Oduro (2015) which also revealed that Ghanaian mathematics teachers hold a mixed of perception of assessment practices. The mixed of conceptions noticed in the study were mainly made up of

assessment of learning and assessment for learning.

Research Question 2: What assessment tools do the public junior high school mathematics teachers of Bongo District use to assess pupils' learning outcomes?

The study discovered that the public mathematics teachers conceive class test, written exercises, homework and exams, oral questioning, project work and to a little extent observations as mathematics assessment tools for assessing learning outcomes in their classrooms. This therefore represents a blend of both traditional and alternative assessment tools. The study however revealed a mixed conception for traditional assessment tools and alternative assessment tools. This conclusion confirmed the study conducted by Nabie, Akayuure and Sofo (2013) which also revealed that Ghanaian junior high mathematics teachers employ more traditional assessment tools than they use alternative assessment tools to assess learning outcomes.

Research Question 3: How do the public junior high school mathematics teachers in the Bongo District assess their pupils in the Bongo District of Ghana?

The study analysed the assessment process based on the planning stage, data gathering stage and data analysis stage and data usage stage.

From the verbal responses of the teachers, it was noted that the mathematics teachers focus the assessment process on gathering data about the pupils' leaning. This revelation was also corroborated by structured observation results. The appropriation of the stage of interpretation of results was none the less neglected. The planning stage was involved in the mathematics teachers assessment process.

Research Question 4: To what extent do the public junior high school mathematics teachers' conceptions of assessment practices reflect in the purpose of assessment in the Bongo District of Ghana?

The study revealed that the mathematics teachers' conceptions of assessment practices highly reflect assessment for learning (81.7%) and assessment of learning (83.9%) purpose in their mathematics classrooms. The qualitative results however failed to corroborate the revealed conception of 83.2 % towards assessment as learning from the quantitative analysis. The qualitative results revealed that the public junior high mathematics conception of assessment practices did not relate to assessment as learning. This could be deemed appropriate for the reason that assessment as learning is the newest of the education purpose of assessment, teachers may not have sufficient knowledge practically and value for it for same reason.

5.3 Conclusions

Mathematics assessment like any form of educational assessment is interwoven with classroom instruction and learning (Ministry of Education, 2012). Assessment is also a primary tool that should be understood by mathematics teachers since it is used to enhance learning (Willam, 2011). Public junior high mathematics teachers' conceptions of the purpose of assessment and practice of assessment is what the study explored in the Bongo District of the Upper East Region of Ghana.

It was revealed from the study that the public mathematics teachers conceptions of assessment is high towards assessment for learning . This was corroborated by both the quantitative and the qualitative data. To a large extent, the mathematics teachers conceive assessment of learning more than the other conceptions of the purpose of assessment.

The study further revealed that the mathematics teacher use more of the traditional assessment tools in assessing learning outcomes in their classrooms. The teachers' assessment process was also predominantly made of data gathering and the usage of assessment results.

5.4 Recommendation

Recommendation for further research related to the study were constructed from the study's findings:

First, workshops should be organised by the public junior high school head teachers and the Bongo District Directorate of Education for mathematics teachers on assessment as learning. This is necessary because assessment as learning is one of the purpose of assessment very important in mathematics assessment.

Second, the public mathematics teachers should not only be focused on the traditional testing, assignment and examination but should intimate creativity of assessment in their classrooms by employing new and emerging mathematics assessment methods such as, rubrics, portfolio and projects to enable their learners to also exhibit real life situations in mathematics as recommended by the Ministry of Education (2012).

Third, the mathematics assessment process from the findings was focused on data gathering, use of assessment results but with minimal planning. It is therefore recommended that in-service training be organised for the mathematics teachers on the mathematics assessment process so that the teachers can appreciate the role each of the stages play in the whole process.

5.5 Suggestions for Future Research

This study was conducted on the public mathematics teachers conceptions of the purpose of assessment and practice of assessment in the Bongo District of the Upper East Region of Ghana. It is therefore recommended that future researchers consider embarking on studies that will:

1. Include mathematics teachers from the upper primary schools as study participants.
2. Include mathematics teachers assessment challenges as part of the scope of the study.
3. Involve assessment of a particular topic by mathematics teachers.

5.6 Contribution to Knowledge

The study has contributed to existing knowledge in mathematics assessment in the basic schools. The study offers a detailed information on the mathematics teachers' conceptions of the purpose of assessment in Ghana. The study highlights the extent to which the mathematics teachers' conceptions of assessment practices either relate to assessment for learning, assessment as learning or assessment of learning. The study confirmed previous studies that revealed that teachers hold varied conceptions of assessment. It also confirmed previous studies that also revealed that mathematics teachers employ more of the traditional assessment tools than they use alternative assessment tools.

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APPENDICES

APPENDIX A

LETTER OF INTRODUCTION

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Date: December 19, 2018

The Director
District Education Directorate
Bongo District Assembly
P. O. Box 4
Bongo –UE/R

Dear Sir /Madam,

LETTER OF INTRODUCTION

We forward to you, a letter from Mr. Samuel Adombire Azuure a second year M.Phil student of the Department of Basic Education, University of Education, Winneba, with registration number 8170030010.

Mr. Samuel Adombire Azuure is to carry out a research on the Topic *"Public Junior High Mathematics Teachers Conception of the Purposes of Assessment and Use of Assessment Tools in the Bongo District, Ghana"*.

We would be grateful if he could be given the needed assistance to carry out his studies in the District.

Thank you.

DEPT. OF BASIC EDUCATION
UNIVERSITY OF EDUCATION
WINNEBA, GHANA

SAKINA ACQUAH (MRS.)
(Ag. Head of Department)

APPENDIX B

PERMISSION LETTER FROM GES

In case of reply the number and date of this letter should be quoted.

GHANA EDUCATION SERVICE

District Education Office
P. O. Box 4
Bongo, U.E.R.

BND/ED/UER/413/Vol. 1/51
Our Ref:

REPUBLIC OF GHANA Date: 4th February, 2019

Your Ref:

Email:gesbongo@yahoo.com

Dear Samuel Adombire Azuure,

RE-APPLICATION FOR PERMISSION TO COLLECT DATA IN JUNIOR HIGH SCHOOLS

I write to grant you permission in reference to your letter dated 3rd February 2019, requesting permission to collect data for a research purpose in public Junior High Schools in the district.

While permitting you to undertake this exercise, it is expected that you will be guided by the ethical standards required for such a study.

It is also crucial that you take into cognizance the socio-cultural underpinnings and sensitivity of your target respondents to ensure that you do not breach the laid down norms and protocols of your study community.

We wish you well in your field work.

MOSES ASUMBUNO NYAABA
HRMD
FOR: DISTRICT DIRECTOR OF EDUCATION
BONGO

DEPUTY DIRECTOR (HRM)
GHANA EDUCATION SERVICE
P. O. BOX 4
BONGO DISTRCT

APPENDIX C

RESEARCH INSTRUMENTS

UNIVERSITY OF EDUCATION, WINNEBA

FACULTY OF EDUCATIONAL STUDIES

DEPARTMENT OF BASIC EDUCATION

Research instruments for public Junior High School mathematics teachers

Dear Sir/Madam, I am grateful that you have taken time within your busy schedule to complete this questionnaire. The researcher is an M Phil student of the University of Education, Winneba. The aim of this questionnaire is therefore to seek the **public junior mathematics teachers' conceptions of the purpose of assessment and explore their assessment practices** within Bongo District of Upper East Region, Ghana.

These research instruments are grouped into two sections: Section A and section B. Section A is made up of three parts: Part one which contains the demographic features of participants whiles part two contains the mathematics teachers' use of assessment tools and part three also has the conceptions of the purpose of assessments. **Section A is to be self-administered by the junior high mathematics teachers**. Section B also comprises interview guide for part one and observation guide for part two. Section B is to be personally used by the researcher to conducted the semi- structured interview and non-participant observation respectively.

Your name and identity as a participant **are not required**. Therefore, you are assured of confidentiality regarding all the responses that will be provided. I appreciate your efforts as a co-author of this vision as you also need to provide appropriate, independent and sincere responses**.**

SECTION A: SELF- ADMINISTERED QUESTIONNAIRES

PART 1: DEMOGRAPHIC INFORMATION

Instruction: As a participant of this study, choose appropriately by **ticking (√)** the one that corresponds with your demographic data.

1. Gender

1. Male [ ]
2. Female [ ]

2. Age (in years)

1. 20 - 30 [ ]
2. 31 - 40 [ ]
3. 41 – 50 [ ]
4. 51 and above [ ]

3. Academic Qualification

1. Cert A [ ]
2. Diploma [ ]
3. Bachelor's Degree [ ]
4. Master's Degree [ ]
5. Others [ ]

Specify……..……

4. Rank within Ghana education service

1. Lower than Superintendent 2 [ ]
2. Superintendent 2 [ ]
3. Superintendent 1 [ ]
4. Senior Superintendent 2 [ ]
5. Senior Superintendent 1 [ ]
6. Principal Superintendent [ ]
7. Assistant Director 2 [ ]

8. Assistant Director 1 [ ]

9. Higher than Assistant Director 1 [ ]

5. How long have you been teaching?

1. 1 – 5 year(s) [ ]
2. 6 – 10 years [ ]
3. 11 – 15 years [ ]
4. 16 – 20 years [ ]
5. 21 years and [ ]

6. How many years have you been teaching Mathematics?

1. 1 – 5 year(s) [ ]
2. 6 – 10 years [ ]
3. 11 – 15 years [ ]
4. 16 – 20 years [ ]
5. 21 years and above [ ]

PART 2

Instruction: Using the scale **1- 4**, **choose in each** statement by **ticking** (√) appropriately the degree to which you use or do not use the **assessment tools** provided below when assessing your pupils.

Rating Scale: Never (1), Seldom (2), Sometimes (3), Often (4)

S/N	STATEMENT	1	2	3	4
1.	I use portfolio in my classroom for assessing pupils				
2.	I use anecdotal records in my classroom as one of the tools for assessing pupils				
3.	I use true or false test for assessing pupils in class				
4.	I use essay type test in assessing my pupils				
5.	I include clearly structured rubrics in classroom assessment of my pupils.				
6.	I use oral questioning in my classroom for assessing pupils				
7.	I use multiple-choice test for assessing pupils in class				
8.	I use matching type objective test in assessing my pupils				
9.	I consciously engage learners in self-assessment practice.				
10.	I use group project as a tool /method for assessing pupils in my class				
11.	I employ peer assessment.				
12.	I use observation in my classroom for assessing pupils				
13.	I make use of conferences in assessing pupils				

PART 3

Instruction: Using the scale 1- 4, choose the extent to which you conceive the following assessment practices in your mathematics classroom by **ticking** (√) appropriately.

Rating Scale: Strongly disagree (1), Disagree (2), Agree(3), Strongly agree(4)

S/N	STATEMENT	1	2	3	4
1.	The provision of each student with the accurate descriptive feedback is what assessment should focus on.				
2.	Teachers should design assessment for learners to think about their own learning				
3.	There is always a known point of reference which is provided for learners and should be used to measure content learned				
4.	Before assessment, the teacher should plan with learners to determine a clear criteria for success				
5.	Assessment is to cater for the individual learning needs				
6.	Assessment is meant to provide pupils the opportunity to demonstrate what they know, can do and the confusion they might have so that they are ranked appropriately				
7.	Any assessment that is design for learners is a means of empowering learners to take risks on their own				
8.	Assessment is done in the classroom as a foundation for discussion on promotion				
9.	Pupils' assessment aims at preparing them well for the Basic Education Certificate Examination (BECE)				
10.	Good classroom assessment practices make use of portfolios, independence projects and journals as methods for assessing pupils in class				
11.	The provision of opportunities for pupils to be the custodians of their own learning is the cardinal principle of assessment				
12	Assessment is meant for institutional accountability				
13	Assessment results need to be highly reliable and valid across variety of performance.				

SECTION B: INTERVIEW GUIDE AND OBSERVATION GUIDE

PART 1: INTERVIEW GUIDE

Instruction: This part will personally be used by the researcher. Conduct the one-on-one interview by using the following as a guide.

1. What is your understanding of the term assessment?
2. In your opinion, what reasons will you assign for assessing your pupils?
3. From experience, do you think assessment directs the way students learn? Explain.
4. What assessment tools do you normally use in assessing your pupils? Why do choose those methods/tools?
5. Describe how you always assess your students.

PART 2: OBSERVATION GUIDE

Instruction: Using 'present'(√) or 'not present'(X), tick appropriately how you observed each of the stated descriptions in the classroom assessment process. This aspect will be used personally by the researcher to conduct the observation.

SN	Item	Present(1)	Not Present (2)	Comments
	EVIDENCE OF PLANNING			
1.	Evidence of learning goal shared with pupils.			
2.	Prior planned assessment tool(s) to use.			
	EVIDENCE OF GATHERING DATA			
3.	Asking focused questions in class to put to bare (make explicit) what and how students are learning.			
4.	Giving assignments to find out learners' understanding.			
5.	Provision of opportunity for learners to demonstrate their learning in alternative mode.			
	EVIDENCE OF INTERPRETING RESULTS			
6.	Self-reflective assessment opportunities provided for pupils			
7.	Provision of check list describing learners' understanding			
8.	Provision of clear rubrics			
	EVIDENCE OF USING RESULTS			
	Provision of feedback to learners			
10.	Using results to modify teaching and learning			
11.	Using results to differentiate teaching and learning			

APPENDIX D

RELIABILITY MEASURE FOR QUESTIONNAIRE

1. Assessment for learning

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  /STATISTICS=DESCRIPTIVE SCALE
  /SUMMARY=TOTAL MEANS.
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Case Processing Summary

		N	%
Cases	Valid	20	**100.0**
	Excluded[a]	0	**.0**
	Total	20	**100.0**

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

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.724	.698	5

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
The provision of each student with the accurate descriptive feedback is what assessment should focus on	12.9000	2.516	.661	.604	.594
Before assessment, the teacher should plan with learners to determine a clear criteria for success	12.8500	2.345	.740	.699	.551
Assessment is to cater for the	12.7500	4.408	-.037	.023	.828

individual learning needs					
Good classroom assessment practices make use of portfolios, independence projects and journals as methods for assessing pupils in class	13.3000	2.958	.698	.569	.600
The provision of opportunities for pupils to be the custodians of their own learning is the cardinal principles of assessment	13.0000	3.474	.432	.222	.697

2. Assessment as learning

```
RELIABILITY
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  /STATISTICS=DESCRIPTIVE SCALE
  /SUMMARY=TOTAL MEANS.
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Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.692	0.697	4

Item-Total Statistics	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Teachers should design assessment for learners to think about their own learning	9.3500	4.029	.193	.164	.792
Assessment is to cater for the individual learning needs	9.3000	2.853	.749	.568	.454
Any assessment that is design for learners is a means of empowering learners to take risks on their own	9.5500	2.997	.531	.395	.590
The provision of opportunities for pupils to be the custodians of their own learning is the cardinal principles of assessment	9.7500	3.250	.500	.406	.612

Assessment of learning

```
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  /ORDER=ANALYSIS.
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Case Processing Summary		N	%
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	Total	20	100.0

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Reliability Statistics

Cronbach's Alpha	N of Items
.734	6

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	**Cronbach's Alpha if Item Deleted**
There is always a known point of reference which is provided for learners and should be used to measure content learned	17.2500	3.566	.587	**.659**
Assessment is meant to provide pupils the opportunity to demonstrate what they know, can do and the confusion they might have so that they are ranked appropriately	16.8500	3.713	.562	**.668**
Assessment is done in the classroom as a foundation for discussion on promotion	16.8500	4.239	.424	**.709**
Pupils' assessment aims at preparing them well for the Basic Education Certificate Examination (BECE)	17.0000	3.053	.687	**.619**
Assessment is meant for institutional accountability	17.0000	4.842	.147	**.770**
Assessment results need to be highly reliable and valid across variety of performance	16.8000	4.274	.409	**.713**

Reliability for all the tree conceptions together.

```
RELIABILITY
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AFL4 AFL10 AFL11 AAL7 AAL11 AFL5
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  /MODEL=ALPHA
  /STATISTICS=DESCRIPTIVE SCALE
  /SUMMARY=TOTAL.
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Case Processing Summary

		N	%
Cases	Valid	20	100.0
	Excluded[a]	0	.0
	Total	20	100.0

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

Reliability Statistics

Cronbach's Alpha	N of Items
.863	13

Item-Total Statistics	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
There is always a known point of reference which is provided for learners and should be used to measure content learned	39.4500	21.839	.705	.843
Assessment is meant to provide pupils the opportunity to demonstrate what they know, can do and the confusion they might have so that they are ranked appropriately	39.0500	22.682	.592	.850
Assessment is done in the classroom as a foundation for discussion on promotion	39.0500	24.576	.321	.864
Pupils' assessment aims at preparing them well for the Basic Education Certificate Examination (BECE)	39.2000	21.011	.718	.841
Assessment is meant for institutional accountability	39.2000	25.432	.162	.871
Assessment results need to be highly reliable and valid across variety of performance	39.0000	23.895	.464	.857
The provision of each student with the accurate descriptive feedback is what assessment should focus on	39.2500	20.934	.746	.839
Before assessment, the teacher should plan with learners to	39.2000	20.379	.823	.833

determine a clear criteria for success				
Good classroom assessment practices make use of portfolios, independence projects and journals as methods for assessing pupils in class	39.6500	22.871	.623	.849
The provision of opportunities for pupils to be the custodians of their own learning is the cardinal principles of assessment	39.3500	24.345	.359	.862
Any assessment that is design for learners is a means of empowering learners to take risks on their own	39.4500	20.471	.684	.843
The provision of opportunities for pupils to be the custodians of their own learning is the cardinal principles of assessment	39.6500	20.871	.691	.842
Assessment is to cater for the individual learning needs	39.1000	27.253	-.196	.886

RELIABILITY FOR ASSESSMENT TOOLS

1. Alternative assessment tools

Case Processing Summary

		N	%
Cases	Valid	20	100.0
	Excluded[a]	0	.0
	Total	20	100.0

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

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N. of Items
.791	.790	9

Item Statistics

	Mean	Std. Deviation	N
I use portfolio in my classroom for assessing pupils	3.0500	.68633	20
I use anecdotal records in my classroom as one of the tools for assessing pupils	3.2500	.85070	20
I include clearly structured rubrics in classroom assessment of my pupils	3.2500	.63867	20
I use oral questioning in my classroom for assessing pupils	3.5500	.60481	20
I consciously engage learners in self-assessment practice	3.0500	.68633	20
I use group project as a tool /method for assessing pupils in my class	2.9000	.78807	20
I employ peer assessment	2.7000	.86450	20
I use observation in my classroom for assessing pupils	3.2000	.76777	20
I make use of conferences in assessing pupils	2.8000	.83351	20

2. Traditional assessment tools

Case Processing Summary

		N	%
Cases	Valid	20	100.0
	Excluded[a]	0	.0
	Total	20	100.0

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

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.764	.769	4

Item Statistics

	Mean	Std. Deviation	N
I use true or false test for assessing pupils in class	3.0000	.91766	20
I use essay type test in assessing my pupils	3.3500	.67082	20
I use multiple-choice test for assessing pupils in class	3.2000	.89443	20
I use matching type objective test in assessing my pupils	2.8000	.69585	20

3. **Reliability for all assessment tools**

```
RELIABILITY
 /VARIABLES=TAT3 TAT4 TAT7 TAT8 AAT1 AAT2 AAT5
AAT6 AAT9 AAT10 AAT11 AAT12  AAT13
 /SCALE('ALL VARIABLES') ALL
 /MODEL=ALPHA
 /STATISTICS=DESCRIPTIVE SCALE
 /SUMMARY=TOTAL.
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Case Processing Summary

		N	%
Cases	Valid	20	100.0
	Excluded[a]	0	.0
	Total	20	100.0

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

Reliability Statistics

Cronbach's Alpha	N of Items
.866	13

Item Statistics

	Mean	Std. Deviation	N
I use true or false test for assessing pupils in class	3.0000	.91766	20
I use essay type test in assessing my pupils	3.3500	.67082	20
I use multiple-choice test for assessing pupils in class	3.2000	.89443	20
I use matching type objective test in assessing my pupils	2.8000	.69585	20
I use portfolio in my classroom for assessing pupils	3.0500	.68633	20
I use anecdotal records in my classroom as one of the tools for assessing pupils	3.2500	.85070	20
I include clearly structured rubrics in classroom assessment of my pupils	3.2500	.63867	20
I use oral questioning in my classroom for assessing pupils	3.5500	.60481	20
I consciously engage learners in self-assessment practice	3.0500	.68633	20
I use group project as a tool /method for assessing pupils in my class	2.9000	.78807	20
I employ peer assessment	2.7000	.86450	20
I use observation in my classroom for assessing pupils	3.2000	.76777	20
I make use of conferences in assessing pupils	2.8000	.83351	20

APPENDIX E

RESULTS FROM DATA ANALYSIS

Analysis of questionnaire data

FILE='C:\Users\a\Desktop\GGG\ref for research\SAM CODE LATEX.sav'

FREQUENCIES VARIABLES=GENDER AGE YEARSTEACHINGMATHS RANK QUALIFICATION

/STATISTICS=MODE SUM

/ORDER=ANALYSIS.

Statistics

		Gender of public Maths teachers	Age of public Maths teachers	Years in teaching Maths	Rank in GES	Academic qualification of Maths teachers
N	Valid	58	58	58	58	58
	Missing	0	0	0	0	0
Mode		1.0	1.0	1.0	6.0	3.0
Sum		64.0	88.0	95.0	276.0	149.0

Gender of public Maths teachers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	52	89.7	89.7	89.7
	Female	6	10.3	10.3	100.0
	Total	58	100.0	100.0	

Age of public Maths teachers

	Frequency	Percent	Valid Percent	Cumulative Percent
20-30 years	29	50.0	50.0	50.0
31- 40 years	28	48.3	48.3	98.3
41- 50 years	1	1.7	1.7	100.0
Total	58	100.0	100.0	

Years in teaching Maths

	Frequency	Percent	Valid Percent	Cumulative Percent
1-5 years	29	50.0	50.0	50.0
6-10 years	22	37.9	37.9	87.9
11-15 years	6	10.3	10.3	98.3
16-20 years	1	1.7	1.7	100.0
Total	58	100.0	100.0	

Rank in GES

	Frequency	Percent	Valid Percent	Cumulative Percent
Superintendent 2	8	13.8	13.8	13.8
Superintendent 1	3	5.2	5.2	19.0
Senior Superintendent 2	14	24.1	24.1	43.1
Senior Superintendent 1	5	8.6	8.6	51.7
Principal Superintendent	26	44.8	44.8	96.6
Assistant Director 2	2	3.4	3.4	100.0
Total	58	100.0	100.0	

Academic qualification of Maths teachers

	Frequency	Percent	Valid Percent	Cumulative Percent
Diploma	27	46.6	46.6	46.6
bachelor's degree	29	50.0	50.0	96.6
Master's Degree	2	3.4	3.4	100.0
Total	58	100.0	100.0	

Assessment for learning

FREQUENCIES VARIABLES=AFL1 AFL4 AFL5 AFL10 AFL11

Before assessment, the teacher should plan with learners to determine a clear criteria for success

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	4	6.9	6.9	6.9
	Disagree	12	20.7	20.7	27.6
	Agree	13	22.4	22.4	50.0
	Strongly agree	29	50.0	50.0	100.0
	Total	58	100.0	100.0	

Assessment is to cater for the individual learning needs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	1.7	1.7	1.7
	Disagree	4	6.9	6.9	8.6
	Agree	12	20.7	20.7	29.3
	Strongly agree	41	70.7	70.7	100.0
	Total	58	100.0	100.0	

The provision of each student with the accurate descriptive feedback is what assessment should focus on

	Frequency	Percent	Valid Percent	Cumulative Percent
Strongly Disagree	3	5.2	5.2	5.2
Disagree	11	19.0	19.0	24.1
Agree	20	34.5	34.5	58.6
Strongly Agree	24	41.4	41.4	100.0
Total	58	100.0	100.0	

Good classroom assessment practices make use of portfolios, independence projects and journals as methods for assessing pupils in class

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	5.2	5.2	5.2
	Disagree	4	6.9	6.9	12.1
	Agree	32	55.2	55.2	67.2
	Strongly Agree	19	32.8	32.8	100.0
	Total	58	100.0	100.0	

The provision of opportunities for pupils to be the custodians of their own learning is the cardinal principles of assessment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	1.7	1.7	1.7
	Disagree	10	17.2	17.2	19.0
	Agree	33	56.9	56.9	75.9
	Strongly Agree	14	24.1	24.1	100.0
	Total	58	100.0	100.0	

Assessment is to cater for the individual learning needs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	1.7	1.7	1.7
	Disagree	3	5.2	5.2	6.9
	Agree	13	22.4	22.4	29.3
	Strongly Agree	41	70.7	70.7	100.0
	Total	58	100.0	100.0	

VARIABLES=AAL2 AAL5 AAL7 AAL11

Any assessment that is design for learners is a means of empowering learners to take risks on their own

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	9	15.5	15.5	15.5
	Disagree	12	20.7	20.7	36.2
	Agree	21	36.2	36.2	72.4
	Strongly Agree	16	27.6	27.6	100.0
	Total	58	100.0	100.0	

The provision of opportunities for pupils to be the custodians of their own learning is the cardinal principles of assessment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	2	3.4	3.4	3.4
	Disagree	3	5.2	5.2	8.6
	Agree	52	89.7	89.7	98.3
	Strongly Agree	1	1.7	1.7	100.0
	Total	58	100.0	100.0	

Assessment of learning

FREQUENCIES VARIABLES=AOL3 AOL6 AOL8 AOL9 AOL12 AOL13

Frequency Table

There is always a known point of reference which is provided for learners and should be used to measure content learned

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	1.7	1.7	1.7
	Disagree	4	6.9	6.9	8.6
	Agree	18	31.0	31.0	39.7
	Strongly Agree	35	60.3	60.3	100.0
	Total	58	100.0	100.0	

Assessment is meant to provide pupils the opportunity to demonstrate what they know, can do and the confusion they might have so that they are ranked appropriately

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	2	3.4	3.4	3.4
	Agree	22	37.9	37.9	41.4
	Strongly Agree	34	58.6	58.6	100.0
	Total	58	100.0	100.0	

Assessment is done in the classroom as a foundation for discussion on promotion

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	2	3.4	3.4	3.4
	Disagree	13	22.4	22.4	25.9
	Agree	24	41.4	41.4	67.2
	Strongly Agree	19	32.8	32.8	100.0
	Total	58	100.0	100.0	

Pupils' assessment aims at preparing them well for the Basic Education Certificate Examination (BECE)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	6	10.3	10.3	10.3
	Disagree	7	12.1	12.1	22.4
	Agree	19	32.8	32.8	55.2
	Strongly Agree	26	44.8	44.8	100.0
	Total	58	100.0	100.0	

Assessment is meant for institutional accountability

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	4	6.9	6.9	6.9
	Disagree	13	22.4	22.4	29.3
	Agree	20	34.5	34.5	63.8
	Strongly Agree	21	36.2	36.2	100.0
	Total	58	100.0	100.0	

Assessment results need to be highly reliable and valid across variety of performance

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	4	6.9	6.9	6.9
	Agree	7	12.1	12.1	19.0
	Strongly Agree	47	81.0	81.0	100.0
	Total	58	100.0	100.0	

Assessment tools.

Alternative assessment tools

FREQUENCIES VARIABLES=AAT1 AAT2 AAT5 AAT6 AAT9 AAT10 AAT11 AAT12 AAT13

Frequency Table

I use portfolio in my classroom for assessing pupils

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	17	29.3	29.3	29.3
	Seldom	11	19.0	19.0	48.3
	Sometimes	22	37.9	37.9	86.2
	Often	8	13.8	13.8	100.0
	Total	58	100.0	100.0	

I use anecdotal records in my classroom as one of the tools for assessing pupils

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	22	37.9	37.9	37.9
	Seldom	17	29.3	29.3	67.2
	Sometimes	12	20.7	20.7	87.9
	Often	7	12.1	12.1	100.0
	Total	58	100.0	100.0	

I include clearly structured rubrics in classroom assessment of my pupils

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Seldom	3	5.2	5.2	5.2
	Sometimes	20	34.5	34.5	39.7
	Often	35	60.3	60.3	100.0
	Total	58	100.0	100.0	

I use oral questioning in my classroom for assessing pupils

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	4	6.9	6.9	6.9
	Seldom	7	12.1	12.1	19.0
	Sometimes	15	25.9	25.9	44.8
	Often	32	55.2	55.2	100.0
	Total	58	100.0	100.0	

I consciously engage learners in self-assessment practice

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	2	3.4	3.4	3.4
	Seldom	7	12.1	12.1	15.5
	Sometimes	26	44.8	44.8	60.3
	Often	23	39.7	39.7	100.0
	Total	58	100.0	100.0	

I use group project as a tool /method for assessing pupils in my class

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	1	1.7	1.7	1.7
	Seldom	8	13.8	13.8	15.5
	Sometimes	26	44.8	44.8	60.3
	Often	23	39.7	39.7	100.0
	Total	58	100.0	100.0	

I employ peer assessment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	12	20.7	20.7	20.7
	Seldom	12	20.7	20.7	41.4
	Some Times	21	36.2	36.2	77.6
	Often	13	22.4	22.4	100.0
	Total	58	100.0	100.0	

I use observation in my classroom for assessing pupils

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	3	5.2	5.2	5.2
	Seldom	15	25.9	25.9	31.0
	Some Times	26	44.8	44.8	75.9
	Often	14	24.1	24.1	100.0
	Total	58	100.0	100.0	

I make use of conferences in assessing pupils

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	23	39.7	39.7	39.7
	Seldom	14	24.1	24.1	63.8
	Some Times	16	27.6	27.6	91.4
	Often	5	8.6	8.6	100.0
	Total	58	100.0	100.0	

Analysis of traditional assessment tools.

I use true or false test for assessing pupils in class

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NEVER	12	20.7	20.7	20.7
	Seldom	20	34.5	34.5	55.2
	Some Times	17	29.3	29.3	84.5
	Often	9	15.5	15.5	100.0
	Total	58	100.0	100.0	

I use essay type test in assessing my pupils

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	11	19.0	19.0	19.0
	Seldom	12	20.7	20.7	39.7
	Some Times	14	24.1	24.1	63.8
	Often	21	36.2	36.2	100.0
	Total	58	100.0	100.0	

I use multiple-choice test for assessing pupils in class

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Seldom	5	8.6	8.6	8.6
	Some Times	22	37.9	37.9	46.6
	Often	31	53.4	53.4	100.0
	Total	58	100.0	100.0	

I use matching type objective test in assessing my pupils

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	13	22.4	22.4	22.4
	Seldom	13	22.4	22.4	44.8
	Sometimes	28	48.3	48.3	93.1
	Often	4	6.9	6.9	100.0
	Total	58	100.0	100.0	

CODING OF QUALITATIVE DATA

Conceptions of the Purpose of Assessment

Assessment for learning (AFL)	1
Assessment as learning (AAL)	2
Assessment of learning (AOL)	3

Assessment Tools

Alternative assessment tools (AAT)	4
Traditional assessment tools(TAT)	5

Assessment Process

Planning (P)	6
Gathering data(G)	7
Interpreting data (I)	8
Using results(U)	9

Frequency of occurrence of the concepts(themes) in interview.

Concepts in interview	Alphabetic code	Numeric code	Freq.
Definition	Afl	1	2
	Aal	2	0
	Aol	3	4
Assessment tools	Aat	4	8
	Tat	5	11
Purpose of assessment	Afl	1	6
	Aal	2	0
	Aol	3	8
Assessment process	P	6	3
	G	7	8
	I	8	0
	U	9	5

A matrix of observation of the mathematics teachers' assessment process

		T1	T2	T3	T4	T5	T6	T7
P	1. Evidence of learning goal shared with pupils	X	X	X	√	X	X	X
	2. Prior planned assessment tool(s) to use	√	X	X	X	X	√	X
G	3. Asking focused questions in class to put to bare (make explicit) what and how students are learning.	√	X	√	X	X	X	X
	4. Giving assignments to find out learners' understanding	√	√	X	X	√	√	X
	5. Provision of opportunity for learners to demonstrate their learning in alternative mode.	X	X	X	√	√	X	X
I	6. Self-reflective assessment opportunities provided for pupils	X	X	X	X	X	X	X
	7. Provision of check list describing learners' understanding	X	X	X	X	X	X	X
	8. Provision of clear rubrics	X	X	X	X	X	X	X
U	9. Provision of feedback to learners	√	X	X	X	X	√	√
	10. Using results to modify teaching and learning	√	X	X	X	X	X	X
	11. Using results to differentiate teaching and learning .	√	√	X	X	X	√	X

KEY

√ = Present

X= Not present

T= Teacher

P= stage of planning

G= stage of gathering data

I= stage of interpreting

U= stage of using results