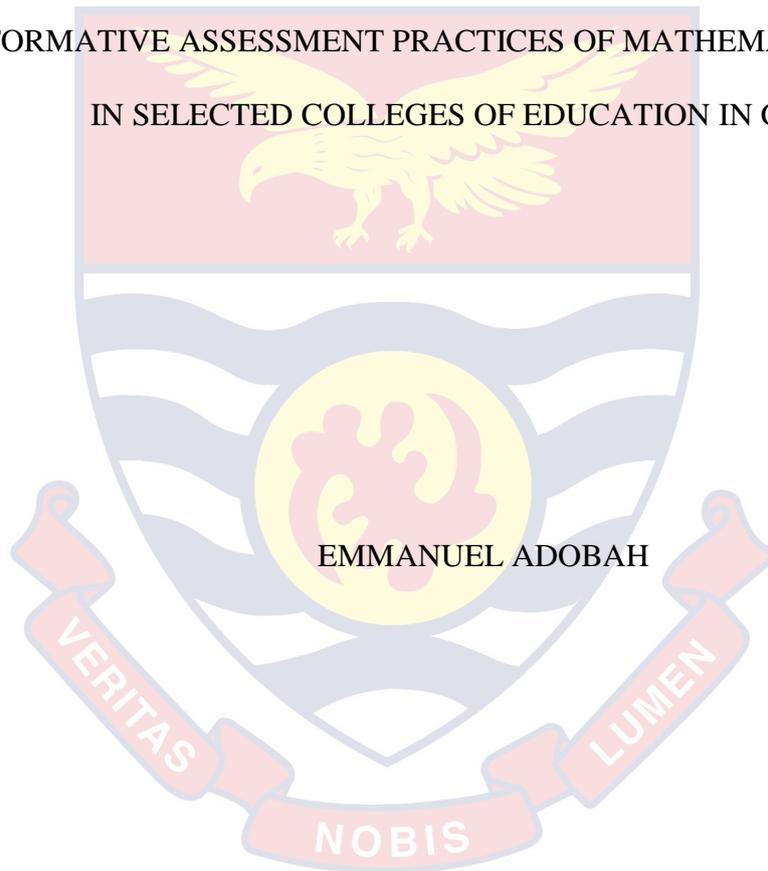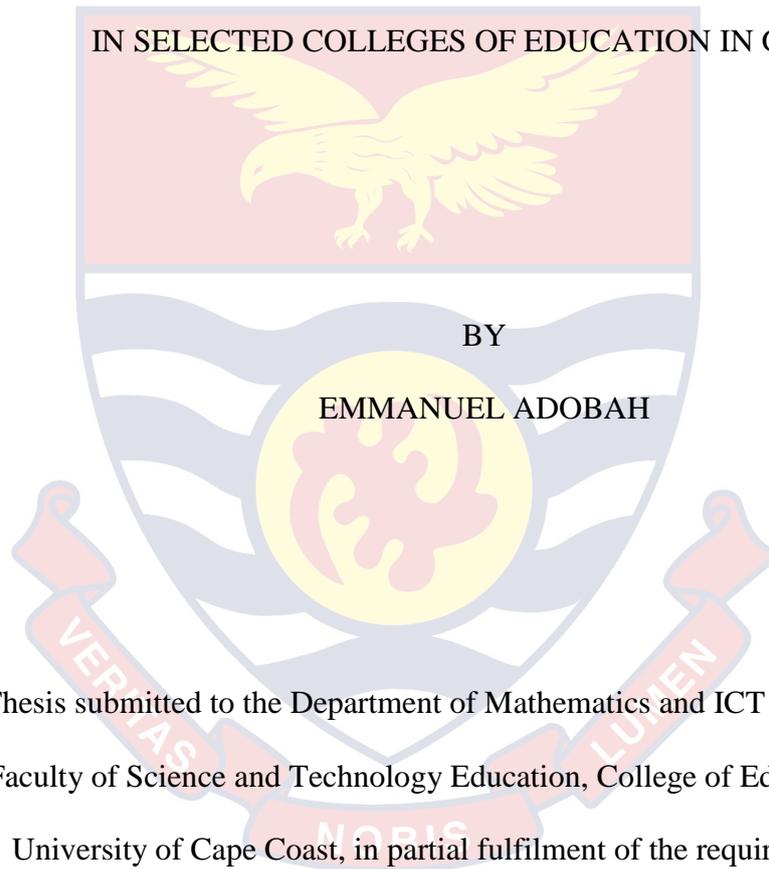UNIVERSITY OF CAPE COAST

FORMATIVE ASSESSMENT PRACTICES OF MATHEMATICS TUTORS

IN SELECTED COLLEGES OF EDUCATION IN GHANA

EMMANUEL ADOBAH

2020

UNIVERSITY OF CAPE COAST

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BY

EMMANUEL ADOBAH

Thesis submitted to the Department of Mathematics and ICT Education of the

Faculty of Science and Technology Education, College of Education Studies,

University of Cape Coast, in partial fulfilment of the requirements for the

award of Master of Philosophy degree in Mathematics Education

JUNE 2020

DECLARATION

Candidate's Declaration

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

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

Name: EMMANUEL ADOBAH

Supervisor's Declaration

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

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

Name: DR. CHRISTOPHER YARKWAH

ABSTRACT

The study primarily focused on formative assessment practices of Mathematics tutors in selected Colleges of Education in Ghana. The study adopted Convergent Parallel research design to guide the study. A sample of 56 Mathematics tutors from the selected Colleges of Education were sampled for the study through census sampling method. Twelve Colleges of Education in Ashanti and Bono Regions were used. Data for this study were qualitative and quantitative in nature. Questionnaires were used to collect quantitative data from the participants on socio-demographic characteristic and knowledge on formative assessment practices. Again, observation checklist and interview guide were used to collect data (qualitative) to confirm the responses from the questionnaire. The study revealed that tutors use oral test to evaluate students during mathematics lessons. It was also revealed that tutors used conventional method of teaching, group work and independent study as teaching approaches during mathematics lessons. Based on the findings, it was concluded that, majority of the respondents used oral test to assess students during lessons. It was therefore recommended that tutors from various Colleges of Education that were involved in the study should used other forms of assessment regularly. It was also recommended that tutors from the colleges that were involved in the study must assign mumerical scores to students work during lessons.

KEYWORDS

Assessment practice

Convergent parallel

Formative assessment
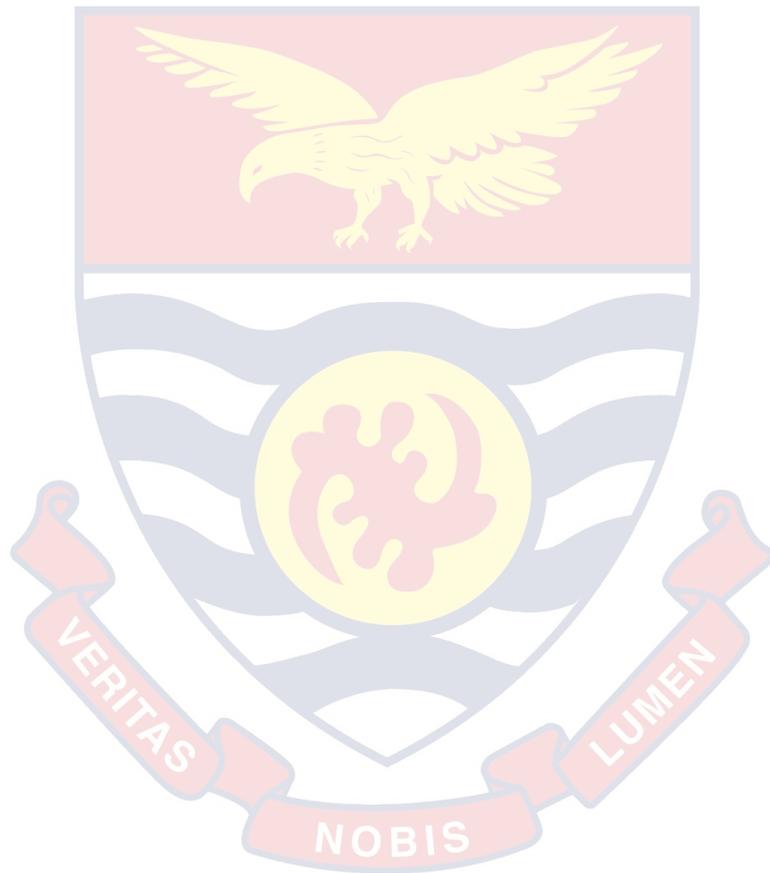
ACKNOWLEDGEMENTS

First and foremost, I would like to acknowledge the Almighty God for granting me His mercies and strength throughout the time of this study. I would also like to acknowledge the concerted efforts of my able supervisor Dr. Christopher Yarkwah for his commitment and dedication towards this work. I am very thankful, Doctor.

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I also need to thank all my mates (M.Phil Mathematics Education students) for their support, cooperation and tolerance through this course. Thank you very much.

DEDICATION

To my precious wife: Patience Mensah and my lovely children:
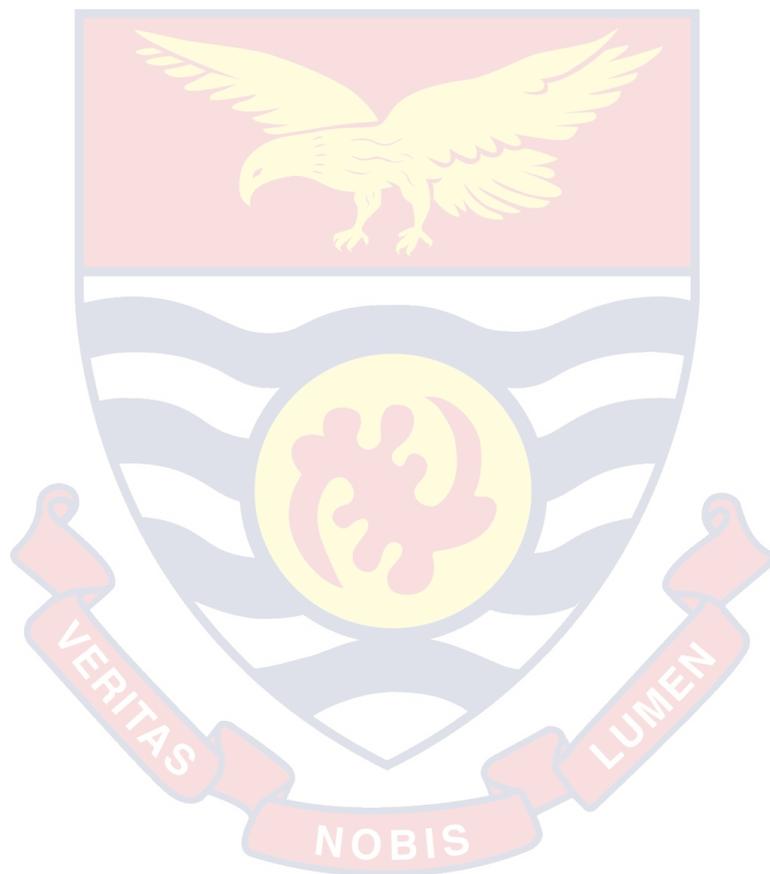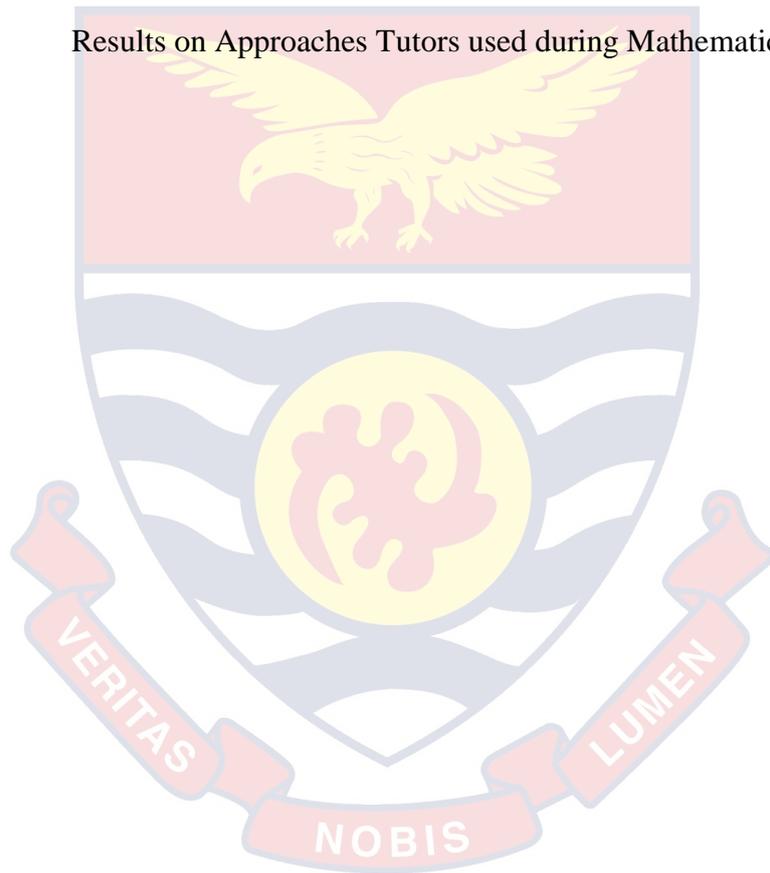
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CHAPTER ONE

INTRODUCTION

The principal focus of this study was to assess formative assessment practices among mathematics tutors of some selected colleges of education in Ghana. The study sought to explore how mathematics tutors evaluate their students during lesson, scoring practices of mathematics tutors during lesson, indication that suggest students participation during lesson and also teaching approaches tutors use during lessons. In this introductory chapter, the background of the study, statement of the problem, outlines the research questions that the study sought to answer, and the significance of the study were discussed.

Background to the Study

In the view of educationist especially cognitive psychologist, mathematics is not much appreciated or understood by learners due to the fact that it is not well taught by teachers (Kira, Scott, & James, 2013). The most genuine shortcoming in the educating of Mathematics is the mental supposition about how mathematics is found out depends on the boost reaction hypothesis (Althouse, 1994; Cathcart, Pothier, Vance, & Bezuk, 2001; Sheffield & Cruikshank, 2000). The Stimulus-Response hypothesis expresses that learning happens when a bond is built up between some boost and an individual reacting to it (Cathcart, Pothier, Vance, & Bezuk, 2001). They went further to state that, the situation on boost hypothesis drill turns into a significant segment in the instructional procedure in light of the fact that the more frequently a right reaction is made to improvement, the more settled the bond becomes (Cathcart *et al*., 2001). Under this theory (Stimulus-Response),

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understudies are given long and frequently complex issues, especially calculations with the conviction that the activities would reinforce their brain. Schools and educators need to understand that incredible savants, therapists, researchers, mathematicians and numerous others made information through examination and experimentation (Phillips, 2000).

Education is to preserve and advance the economic well-being of the individual and humanity in general. It is therefore, necessary for everyone to acquire basic education in order to make him or her fit into the society he or she lives (Darling – Hammond, Flook, Channa, Barron, & Osher, 2019). One of the implications of education is seen as the progress of strong central government control over the curriculum, teaching approaches and frequent testing in order to check attainment of the learners (Darling – Hammond, Flook, Channa, Barron, & Osher, 2019).

The idea of education is to prepare the individuals to play essential role in society. Education can be used as an influential tool, it can teach us to accept the individual to stay in a society. Quality Assurance Agency, (2007) view education to concern with the understanding of how people progress and study throughout their lives. The nature of knowledge is a critical engagement with ways of knowing and understanding phenomenon. Education offers intellectual, rigorous analysis of issue, processes and systems (QAA, 2007). The other benefits of education includes approaches to cultural, societal, political, ancient and economic contexts (QAA, 2007).

Assessment according to Dhindsa, Omar, and Waldrip (2007), is systematic process for assembly data about student accomplishment. It is also seen as an important component of teaching and learning process. Assessment

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according to experts, comes in various forms which includes formative and summative (Dylan, 2011; Gedye, 2010; Gibbs, 2010; Jenkins, 2010). In the case of formative assessment, it is to advance instruction and summative is to measure students' attainment. The use of assessment to classify, forecast and category has also changed to advance the process of teaching and learning in addition to accountability purposes (Martin, 2016).

The focus of assessment has enormous potential to effective learning but also to generate positive outcome of study subject (Aitkin & Sinnerma, 2008; Moss, 2008; Gipps, 2002). Assessment often leads to better outcomes for students because formal assessment tasks are constructively aligned with the teaching and learning procedure (Ali, 2018). This means that assessment information that has been generated demands that teachers and students focus on teaching and learning in such a way that it could be assessed (Black & William, 1998; Crooks, 1998; Harlen, 2007). The active dynamic and socially responsive natures of these assessment processes are, not only thought to align with socio-cultural principles of learning but have also shown to be central to raising student achievement (James, 2006). Assessment from this perspective, therefore, is said to be formative assessment or assessment for learning (Black & William, 1998).

It is becoming more and more obvious that formative assessment is an integral component of the teaching and learning process (Browne, 2016). Ampiah, Hart, Nkhata, and Nyirend (2003) contend that a teacher needs to know what children are able to do or not if he/she want to plan successfully. Also, Goodrum, Hackling, and Ronnie (2001) asserted that "an assessment is a

key component of teaching and learning process". This means that formative assessment is integral part of teaching, learning and evaluation.

Contemporary perspective of assessment now considers assessment to be a critical and integral part of effective learning (Arndt, & Tesar, 2015; Harlen, 2007; James, 2006). The emphasis in contemporary outcomes-based approach in education is mainly on skills. Outcomes-based education is an attempt to reform certain educational practices in order to prepare learners better in schools to cope with the demands of life. Learners therefore must not only acquire knowledge but also demonstrate skills and values to help them fit into society. The focus of education in general must provide the basis for learners to become informed, independent, skilled and responsible people with in grained values, who are able to make a positive contribution to society (Curriculum standards for Mathematics, 2008).

Formative assessment techniques used by tutors to assess learners in Mathematics hardly caught the attention of the stakeholders in education (Ryan, Whitebook, & Cassidy, 2014). Formative assessment techniques normally focused on evaluating what learners know or learnt as well as what they do not know. The use of assessment tools in class may include a written, oral, observation or demonstrations during teaching and learning process. Other alternative forms of assessment instruments such as rubrics, concept maps, portfolios, student journals, self-evaluation and peer or group evaluation are necessary to determine what students actually know and where they are in the learning progression (Birgin, 2011).

Yueming (2004) noted that formative assessment helps teachers to make important decisions about learners on a daily basis during instruction. In

addition, the assessment information may support explanation, monitoring of students' progress, giving constructive feedback and enlightening both students' learning and teaching approaches (Flanagan e*t al*, 2009). Other studies have reinforced the idea that formative assessment is part of the learning cycle and adds value to students' performance (Clark, 2012; Farrell, 2009; Spiller, 2009;).

Over the hundreds of years, education has had different goals, from spreading the gospel to creating an elite group to run the colony. After Ghana gained its independence in 1957 the education system, then modelled on the British system, has experienced a series of improvements in education. Especially the reforms in the 1980s geared the education system away from purely academic to more in tune with the nations manpower needs (Isahaku, 2009). The present structure of education, which starts at the age of six (6) years, consists of two years of early grade and six years of primary education, three years of Junior Secondary School, three years of Senior Secondary School and four years of University education. The first eleven years of formal education form the basic education were free and compulsory. Currently, three years in secondary is also free (Duflo, Kremer, & Dupas, 2017). But for all these levels of formal education assessment plays a vital role from one level to another.

In Ghana, formative assessment is well embraced and practiced by teachers at all levels of Education (Amoako, 2018; Asare, 2015; Anhwere, 2009). The intention for the practice of formative assessment in Ghanaian schools, irrespective of the level is to improve instruction. This means that assessment information that is generated formatively is used by teachers and

students to inform subsequent teaching and learning processes (Harlen, 2007). Classroom teachers have used various forms of assessment to monitor their student's mathematical learning and inform their future instruction, gradually, external assessments are being used by policy makers throughout the world to gauge the mathematical knowledge of a country's students. Sometimes it helps to relate that knowledge to the knowledge of students in different nations. As a result, external assessments often influence the instructional practices of study hall instructors (teacher). The importance given to assessment by many patrons make formative assessment a topic of importance to educators (tutors) at many levels (Herman, 2013).

Educators understood cause and effect through curiosity and exploration. Students or learners are free to study environment and its phenomenon under the leading of their teachers. Learning of mathematics in recent times suggest that there is repetition of processes that were already done by other people and their investigations that seek to fulfill the same pattern (Brooks, & Brooks, 1999).

Mathematics has now become a key component for logical development of mankind, even though sometimes people think otherwise (Walker, & Zhu, 2013). Mathematics is a subject matter that individuals know well, even those people who have never been to class can create computation instruments fundamental for their everyday lives (Rogers, 2017). It is of a general notion that Mathematics is a worldwide language which makes it the main tool to nonconcrete, generalize and produce all the information (Nagavalli, 2015). In the case of Mathematics, people can advance their

logical and serious thinking which could allow them to solve increasingly difficult problems (Martínez, 2010).

As far as procedure for teaching Mathematics is concerned, the new method of teaching and learning Mathematics is built on the perspective of the "Realistic Mathematics Education" (Makonye, 2014). The determination of this perspective is that, Mathematics in schools must be considered as a human activity that has to be nourished on the experiences of students, to be adapted to their personal characteristics and must be related to everyday life and the real needs of students (Heuvel-Panhuizen, 1998).

Decision - making is a cyclic procedure whereby educational choices about pedagogical decisions are precursor conditions (Opfer, & Pedder, 2011). Teachers' knowledge is important in policy making which seems to suggesting that in order to make informed pedagogical decisions, teachers must be able to analyse and assess specific learning episodes, in blend with contextual and situational factors (Windschitl, 2014). Teachers should be able to connect all this information they have to their specialist knowledge of the teaching-learning process in order to guide subsequent teaching actions. Thus, making good pedagogical decisions hinges on the excellence of the pedagogical information held by the teacher.

Statement of the Problem

Mathematics is a unique subject and it is a fundamental part of scool curriculum. It is an instrument for the development of all other sciences programme (Anderson, 2009). Knowingly or unknowingly, we are using arithmetic in every facet of life (Ziegler, & Loos, 2010). Moreover, majority of students across the world dislike mathematics (Ding, Pepin, & Jones, 2015).

Scarpello (2007) reports that seventy-five percent of Americans stop the study of mathematics and stay away from many occupations linked to mathematics. It has been an experience that the word "mathematics" brings forth feelings of spine-tingling fear from the majority of the masses while giving way to a regrettable respect.

Zan and Martino (2007) suggests that attitude of teachers to the teaching of mathematics makes the subject complex for the learners. Also, teachers emotions beliefs and behavior which are associated with mathematics do drive the learners away from the subject. And matter of academic, the mathematics teacher is to make the learning of the subject an interesting one. Hence, emotions and beliefs should be done away with (Zan & Martino, 2007). Epistemic convictions of understudies are known to impact the sorts of accomplishment objectives, learning procedures and their accomplishment (Muis, 2008; Muis & Franco, 2009; Trautwein & Ludtke, 2007).

Boaler (2008) shared her knowledge at Stanford University over the past 10 years, that only 16 students in the University pursued Mathematics as their major subject out of 1,470 learners. This low number of learners offering Mathematics as their main subject has created a sense of urgency for researchers to understand the difference between non-Mathematics majors and Mathematics majors. Achievement and interest among children was low, but the problem does not stop there. Mathematics is seems to be widely hated among adults because of their school experiences and most adults avoid Mathematics at all cost (Boaler, 2008). Boaler further explained that adults need to think more mathematically to live in today's society (Boaler, 2008).

Vingsle (2014) studied teachers' knowledge and skills in formative assessment. A case study of teachers' formative assessment practices during mathematics lesson in year 5 was employed. The study was conducted in a town in the northern part of Sweden where interviews and field notes were used for data collection. A teacher and a whole class was used as a sample for the study. The purpose of the study was to identify activities and characterize the knowledge and skills that a teacher of mathematics uses in her formative assessment practice during whole-class lessons. The study revealed that formative assessment practice was very complex, demanding and a difficult task for the teacher in several ways. The study was limited in telling the knowledge level of teachers. Again, because the researcher used one person, it would be difficult for the researcher to generalize his findings on others hence the need for more empirical study.

In Ghana, it seems few teachers are coming out of college as Mathematics teachers and the obvious reason could be that they have difficulty with the subject (Enu, Agyman, & Nkum, 2015). Those who choose teaching as a profession relatively start work at a young age and majority of these teachers leave the profession as they grow (Akyeampong, 2013). Akyeampong explained that about 40% of students enter teacher training colleges and have the requisite qualification at the first sitting of their exams from the secondary school. It can be inferred that many do not qualify for further studies after completing secondary education and have to re-sit for some of their papers so as to meet academic entry requirements. In fact, the majority who also have good grade in mathematics also move to other tertiary institutions avoiding teaching programme so that they do not teach

(Akyeampong, 2013). The appropriate form of assessing mathematics lesson and financial remuneration could be a factor of people not enrolling into colleges of education to become teachers

Assessment in Mathematics in Ghana needs to emphasis more on formative assessment in order to help students to gain firm grounds on subject matter in various subject they study (Amoako, Asamoah, & Bortey, 2019). In formative assessment, earlier problem of learners can be detected and addressed through teaching, learning and assessment (formative). Classroom assessment plays a central role in education and is entirely entwined and embedded in teachers' teaching practice (Veldhuis, 2015). Teachers can use a whole range of activities to assess their students in their classroom practice that are simply part of their teaching practice.

Teachers are aware that marking of exercise, assignments and giving prompt feedback on learners work are practices that can be used with a specific assessment focus. Often, assessment is only associated with the use of (standardized) assessment instruments, such as externally developed tests, which results in assessment for all learners. Be that as it may, little proof exist that educators really utilize developmental evaluation to illuminate arranging and instructing (Browne, 2016). In accordance with the ongoing solid accentuation on test results numerous instructors, educators, understudies, and their folks are voicing worries about the extraordinary number and sort of tests understudies experience during their instructive profession (Ritt, 2016).

The approach in handling topics in Mathematics is to have variety of approaches in order to improve the understanding of the learners in a particular topic. The attendance of a high percentage of word problems in

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mathematics textbooks led the tutors to conduct a more complete search on strategies for learners to appreciate word problems and problem solving (Fuchs, Seethaler, Powell, Fuchs, Hamlett, & Fletcher, 2008). Many researchers stated that teachers have many difficulties when solving arithmetic word problems and these had discourage most learners from pursuing Mathematics to high level (Seifi, Haghverdi, & Azizmohamadi, 2012).

A lot of studies conducted that have reported formative assessment practices of teachers in different subject areas and at different levels of our educational hierarchy (Amoako, 2018; Andersson & Palm, 2017; Mclntosh, 2017; Armah, 2013; Bokoe, Eshun, & Bordoh, 2013). However, when it comes to college of education mathematics tutors' knowledge in formative assessment practices, it appears not much studies have been done on it in Ghana. Amoako, Asamoah, and Bortey (2019) personal experience in a local school as a teacher, it has been observed that teachers in general have poor attitude towards formative assessment. The challenging aspect of this situation is that most of the teachers overlook their core responsibility of intermittently assessing their students in class for the determination of providing response to improve upon teaching and learning (Amoako, *et al*., 2019).

This has therefore call for study to be done to assess formative assessment practices among Mathematics tutors of some selected colleges of education in Ghana.

Purpose of the Study

The purpose of this study was to provide researchers and mathematics educators information about the formative assessment practices at the colleges of education in Ghana. Specifically, the main focus of the study was to assess

formative assessment practices of Mathematics tutors in selected Colleges of Education in Ghana**.**

Research Questions

1. How do mathematics tutors evaluate students during mathematics lesson?

2. What are the scoring practices of mathematics tutors during mathematics lesson?

3. What are the indicators that suggests students participate in mathematics lesson?

4. What teaching approaches do mathematics tutors used during mathematics lesson?

Significance of the Study

The findings of this study may provide information that could be of great importance to the strengthening of instructor training programme in the area of formative assessment practices. The formative assessment practices may be modified to meet the current trend assessment in Colleges of Education and also to enhance performance of students. The findings may thus help to put in place suitable techniques mathematics tutors would use to evaluate students during lesson. Also the findings of this study may help mathematics tutors to use appropriate procedure to score students during lesson. It may also help College mathematics tutor's to use appropriate strategies to ensure students participate during lessons as well as teaching mathematics effectively during lesson.

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Delimitation of the Study

The study was confined to only two regions in Ghana (Ashanti and Bono Regions) which is made up 12 colleges (11 public and one private) out of 46 Colleges of Education in Ghana. The study was limited to only mathematics tutors from the 12 Colleges of Education in Ghana.

Limitations of the Study

There were a number of limitations, which should be taken into consideration when interpreting the findings. First, during the administration of the questionnaire, Colleges were in examination period and tutor could not submit completed questionnaires on time due to the examination related issues. Again, the result of the study could also be influenced by whether or not the participants answered the questions (questionnaire and interview guide) honestly. But in all these did not affect the results of the study.

Organization of the of the Study

The study is organized into five chapters. Chapter Two reviews the literature review (evaluating students in mathematics lesson, scoring practices of mathematics tutors, indicating that suggests students participating in mathematics lesson and teaching approaches mathematics tutors used during lessons) as well as the theoretical and conceptual framework of the study. Chapter Three covers the research methods whilst Chapter Four deals with results and discussion of the data gathered. Finally, Chapter Five covers overview of the study, summary of the findings, conclusions and recommendations.

Chapter Summary

This chapter started with the introduction which focus on background to the study indicating the importance of formative assessment practices in schools including Colleges of Education in Ghana. Four research questions were used to guide the study. The next was the statement of the problem and it talks about the state of formative assessment practices in schools and the gap that exist with respect to mathematics tutors at Colleges of Education in Ghana. The significance of this study also points out how usefulness of results of the study to stakeholders in education and mathematics educators as well as formative assessment is concerned.

Delimitations of this study defined the scope or the coverage area which is made up of 12 Colleges of Education with only one being private College of Education from Bono and Ashanti Region. The limitations of study were the challenges encountered during the work and how these were resolved. Organisation of study tells how the whole work had been arranged.

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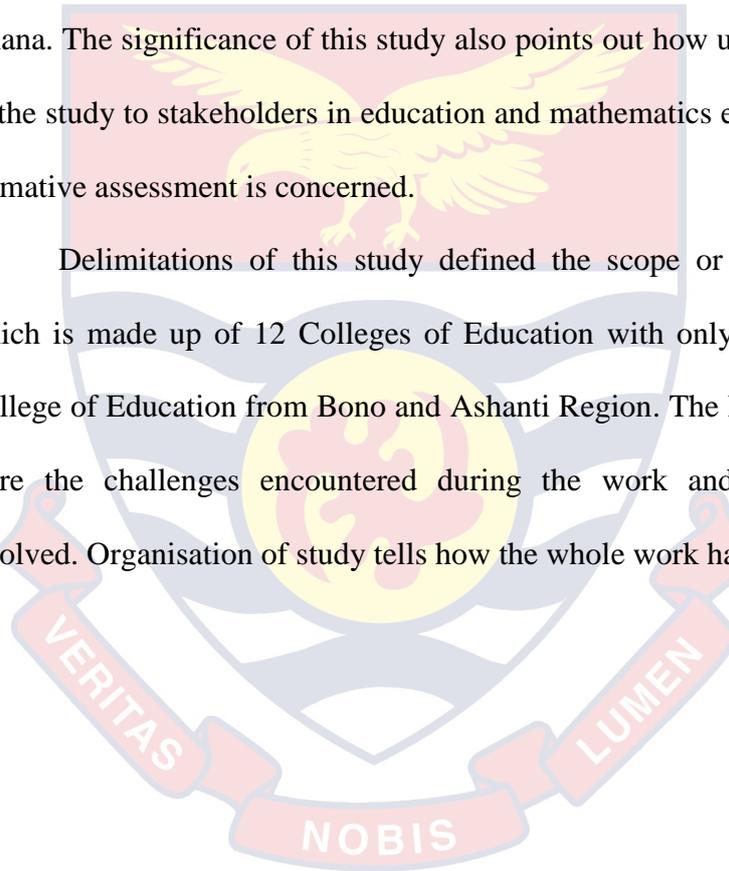
CHAPTER TWO

LITERATURE REVIEW

This chapter presents a review of relevant literature of this study. It also discusses concept of assessment, review of theoretical framework and conceptual framework on the study. It also looks at evaluating students in Mathematics lesson, scoring practices in Mathematics, indicators that suggests students participate in Mathematics lesson and teaching approaches Mathematics tutor used during lessons.

Concept of Assessment

Assessment is the systematic process of documenting and using empirical data on the knowledge, skill, attitudes, and beliefs to refine programs and improve student learning *(*Allen, 2004). This assist the assessor to evaluate the learners learning outcome in relation to his or her progression in learning process. Mann (2001), also sees assessment as a vital mediating factor that influence a student's relationship to his or her institution. This is where the institution can equally assess the learner learning outcome for the institution to have full confidence in the students they are training for country and world at large.

Andrade and Du (2007) stressed that self-assessment is also assessment which makes students reflect and assess the nature of their work and their learning, judge how much they reflect unequivocally expressed objectives or models, recognize qualities and shortcomings in their work and overhaul in like manner. It remains where learners would be able to evaluate the learning outcome of instructor properly during teaching and learning process. These references and everyday classroom practices show various

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capacities, structures, apparatuses and strategies accessible to educators, as classroom assessors, just as various terms, expressions, ideas and depictions of evaluation.

Terms like assessment, estimation and testing have been firmly connected with and identified with appraisal. They are even in some cases utilized reciprocally as intends to assemble data on student learning. A layman or a normal onlooker may believe that they have a similar significance, however there are unmistakable contrasts. According to Mundrake (2000), "Assessment, testing and evaluation are terms used to describe the outcomes of the educational process" (p. 45). Mundrake (2000) further noted that "Assessment is the term currently used to describe all aspects of evaluation and testing" (p. 45).

According to Bachman (2004), "The term 'assessment' is commonly used with a variety of different meanings. Indeed, the term has come to be used so widely in many different ways in the field of language testing and educational measurement that there seems to be no consensus on what precisely it means" (p.6). Brown (2004) defined assessment as "any act of interpreting information about students' performance, collected through any of a multitude of a means or practices" (p. 304).

Assessment requires assigning numerical performances to students output. This describes the degree to which they have explicit qualities or attributes estimated by explicit norms, or models filling in as a wellspring of proof of numerous parts of an individual understudy's information, getting, aptitudes or potentially capacities (Darling-Hammond, 2010).

Data inspired through any of a huge number of means or rehearses and different measures suggested by the instructive framework including exercises of educators, students, a composed test paper, a meeting plan, an estimation task utilizing hardware and class test (Ghaicha, 2016). It should fill in as a type of conveying input to the two students. In the study hall, appraisal thinks about students' exhibitions on undertakings in an assortment of settings and settings. It is the most terms that portrays how instructors assemble and use data on students. This procedure generally includes a scope of various qualitative and quantitative strategies (Hammarberg, Kirkman, & de Lacey, 2016). For instance, the language capacity of students can be assessed using standardized tests (pen or pencil and paper test, oral tests, portfolios and functional activities).

Assessment refers to the process of arriving at judgments about abstract entities, for example, programs, curricula, associations, foundations and individuals (Hammarberg, Kirkman, & de Lacey, 2016). For example, foundational assessments are led to find out how well an education system is working. In most education settings, appraisal is an essential segment of any assessment. It is the process of making a decision about quality of content and programs offered to a group of students (Dunlosky, Katherine, Rawson, Marsh, Nathan, and Willingham, 2013). Educators usually evaluate students and use this assessment data to judge the quality of student learning for summative or formative purposes (Houston, & Thompson, 2017). High quality assessments do not automatically require the use of pen-and-pencil tests or examinations (Oduntan, Ojuawo, & Oduntan, 2015). Neither do they require the use of complex measurement methods (Hammarberg, & de Lacey, 2016).

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Of course, assessments may use information from tests and measurement. It is an open question whether teacher-made evaluations are better by using any or both of exams and measurements (Tshabalala, Mapolisa, Gazimbe, & Ncube, 2016).

Another term that is frequently connected with assessment is measurement. It is the procedure by which a quantified value, normally numerical, is assigned to the attributes or measurements identified with students' performance while measuring ability or aptitude in such a way that the students quality of performance is preserved (Bachman, 2004; Nitko, 1996; Airasian, 1994). Gallagher (1998) is even more specific when she says "measurement is the process of quantifying the degree to which someone or something possesses a characteristic, quality, or feature" (p.3). It can be done by counting how many correct responses a student gives in relation to the total, or by assigning a percentage or by appointing a student a numerical score. However, not all assessment requires the measurement of students and assigning marks or scores to them.

Nearly, testing is the way toward managing a test to inspire and gauge a specific conduct (idea) from which one can make deductions about specific qualities of an individual, typically under normalized conditions (Duckworth & Yeager, 2015). For instance, tests are utilized to gauge how much a student has learned in a given course or subject by methods for pretty much formal, methodical techniques for appraisal used to decide an student's information as to a foreordained substance (Peersman, 2014). Regularly, these techniques require the utilization of paper-and-pencil - instruments intended to inspire some unequivocal conduct, information, or aptitude from the test taker.

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Linn and Gronlund (1995) described examination as "a type of assessment that typically consists of a set of questions administered during a fixed period of time under reasonably comparable conditions for all students" (p.5). Sometimes the results of assessing students are reported on a numerical scale reflecting nature of learning through a quantitative score or imprint. Higher evaluations reflect more elevated levels of learning or ability; though lower grades mirror an insufficiency or ineptitude identified with the objective substance.

History of Assessment

The historical backdrop of evaluation is grounded on history of evaluation. Guba and Lincoln (1989) drawn a four stage history of evaluation. First generation evaluation patent in the period up until World War I. It is depicted as the period of estimation, where students were characterized as objects. Tests were used to determine the students' content mastery. Not long after World War I, the second era of assessment started, the era of description.

Second generation of evaluation methods were objective-oriented (Guba & Lincoln, 1989). Early in the post-Sputnik period, third generation evaluation, with its stress on ruling and the principles upon which decisions were made. The first three evaluation generations were labeled as being based in the modernist custom of closed methods with an importance to control. Fourth generation evaluation was based on a post -modern, constructivist paradigm characterized by open systems with an emphasis on authorization.

Scriven (1967) first proposed the differentiation among formative and summative methodologies concerning assessments of educational program and instructing techniques. He saw that while evaluation "may have a role in the

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on-going improvement of the curriculum" (p. 41), it could also be used to inspect the curriculum of a complete program. In view of this acknowledgment, he presented the terms 'formative evaluation' and 'summative evaluation' to differentiate these distinct roles (Scriven, 1967, p. 43). He proposed that evaluators could accumulate data from early in the process of implementation to identify areas for improvement and adaptation, and at progressive phases of advancement.

In a review of the formative assessment literature from French-speaking countries, Allal and Lopez (2005) drew the history of formative assessment from Scriven's (1967) original explanation of "formative evaluation" of educational programme. It was noted that the period "assessment" had "progressively replaced 'evaluation' when the object is student learning in the classroom" (p. 241).

Bloom (1969) accredited with suggesting that the distinctions from Scriven applied to curriculum could also be applied to the evaluation of student learning, or what is normally mentioned today in the United States as 'assessment' (Allal & Lopez, 2005; Knight, 1995; Wiliam, 2006). Bloom (1969); Bloom, Hasting and Madaus (1971) adopted Scriven's idea of apply the idea to student assessment in their work on "mastery learning." Allal and Lopez (2005); Knight, (1995); Wiliam (2006) at first suggested that instruction be broken down into successive phases and students be given a formative assessment toward the finish of every one of these stages. Educators would then use the assessment results to provide feedback to students on gaps between their performance and the "mastery" level, and to change their own

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instructing to all the more likely meet distinguished adapting needs (Allal, 2005).

Newton (2007, p. 152) comprehensive Manual on Formative and Summative Evaluation of Student Learning that Bloom et al. (1971) acknowledged three features to differentiate between formative and summative:

1. Purpose – predictable uses to which the outcomes will be put (formative assessment emphases on assisting the learner to study while summative assessment emphases on grading or certification).

2. Portion of course covered – timing (formative assessment tends to be more recurrent, emphases on smaller units of tuition and occurring during a course rather than at the end).

3. Level of generalization sought by items in the tool used to gather information for the assessment (formative assessment emphases on testing for narrow components of skill while summative assessment emphases on testing for broad skills).

Towards the completion of the 1980s, Sadler (2001) built up a theory of formative assessment dependent on the conditions for powerful input (Newton, 2007). He chose not to emphases timing as did Bloom et al. (1971) and Scriven (1967) utilizing reason and impact to recognize formative and summative assessment (Sadler, 1989).

Formative assessment is worried about how decisions about the nature of student reactions (performances, pieces, or works) can be utilized to shape and improve the student's ability by short - circuiting the haphazardness and wastefulness of experimentation learning (García-Jiménez, & Eduardo, 2015).

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Summative stands out from formative assessment in that it is worried about summarizing or summing up the accomplishment status of a student and is outfitted towards detailing toward the finish of a course of study particularly for motivations behind confirmation. It is basically detached and does not ordinarily immediate affect learning, despite the fact that it frequently impacts choices which may have profound educational and personal consequences for the student. The essential differentiation among formative and summative assessment identifies with reason and impact, not to timing (Kapukaya, 2013).

Theoretical Perspective of Formative Assessment

The theory that guided the research is the Constructivist theory put forward by Lev Vygotsky (1896-1935). Constructivism theory is based on the belief that humans are able to construct knowledge by accepting the information they are available to. Vygotsky's theory is also known as social constructivism and explains that children are mingled and advanced through cooperative activity and learning that takes place through socialization and learning. Vygotsky's idea is based on the fact that human learning is dependent on connections between a learner and an expert within the learners' zone of proximal development; a zone where learners can almost, but not quite, whole a task alone.

In the context of this study the professional is the lecturer or facilitator. Through the help gave by increasingly proficient others (tutor), students can see, focus and their memory limits are changed by social setting, custom, religion and language. Vygotsky accepted that for information to be created, school learning must occur in important setting while learning in genuine world is occurring (Ozer, 2004).

The theory advances dynamic learning and cooperation among students where discovery is helped by the tutor and among students themselves. As indicated by the theory, students' needs ought to be recognized in the classroom and they ought to be upheld and presented to conversations, project group, examine joint efforts and critical thinking. Building and disguising information is the key substance of Vygotsky's constructivism theory (Ozer, 2004). In the theory, tutors are expected to interact with learners and guide them by developing a variation of classroom assessment and teaching approaches, the spine of ideology on which formative assessment thrives.

The constructivist-learning condition presents the student with chances to assist them with expanding on earlier information and see how to build new information from valid experience. A few creators had referred to the significance of constructivist moves toward that connect with students in interdisciplinary investigation, community oriented action and field-based open doors for experiential learning, reflection and self-assessment (Kaufman, 1996; Kroll & LaBosky, 1996).

Constructivism is essentially a theory which depends on perception and logical assessment, about how individuals learn. It says that individuals develop their own comprehension and information on the world, through experiencing things and reflecting on those experiences (Bereiter, 1994). At the point when we experience something new, we need to accommodate it with our past thoughts and experience, possibly changing what we accept, or perhaps disposing of the new data as insignificant. Regardless, we are dynamic makers of our own insight. To do this, we should pose inquiries,

investigate, and evaluate what we know. In the classroom, the constructivist perspective on learning can point towards various distinctive instructing practices. In the most broad sense, it typically implies urging students to utilize dynamic strategies (experiment, true critical thinking) to make more information and afterward to ponder and discuss what they are doing and how their comprehension is evolving.

The instructor ensures he/she comprehends the students' prior originations, and aides the action to address them and afterward expand on them (Oliver, 2000). Constructivism has origins in philosophy, psychology, sociology and education. Be that as it may, while it is significant for instructors to get constructivism, it is similarly imperative to comprehend the suggestions this perspective on learning has for educating and educator proficient turn of events. (Tam, 2000). Constructivism's focal thought is that human learning is built, that students assemble new information upon the establishment of past learning. This perspective on adapting forcefully appears differently in relation to one in which learning is the inactive transmission of data starting with one individual then onto the next, a view wherein gathering, not development, is critical. Two significant thoughts circle around the basic thought of built information. The first is that students build new understandings utilizing what they definitely know. There is no clean slate on which new information is carved. Students come to taking in circumstances with information picked up from past experience, and that earlier information impacts what new or altered information they will develop from new learning encounters (Phillips, 1995).

The concept is that learning is dynamic rather than inactive. Students stand up to their comprehension considering what they experience in the new learning circumstance. On the off chance that what students experience is conflicting with their present comprehension, their comprehension can change to suit new understanding. Students stay dynamic all through this procedure: they apply current understandings, note significant components in new learning experience, judge the consistency of earlier and rising information, and dependent on that judgment, they can adjust information (Phillips, 1995).

According to Driscoll (2000), Constructivism learning theory is a philosophy which improves students' intelligent and conceptual development. The fundamental idea inside the constructivism learning theory is the role which encounters or associations with the connecting climate play in student education. The constructivism learning theory contends that individuals produce information and structure importance dependent on their experiences. Two of the key ideas inside the constructivism learning theory which make the development of a person's new information are settlement and absorption.

Absorbing makes an individual fuse new experience into the old experience. This makes the individual grow new viewpoints, reevaluate what were once misconceptions, and assess what is significant, at last modifying their perception. Accommodation, then again, is reframing the world and new experiences into the psychological limit effectively present. People imagine a specific style in which the world operates. At the point when things do not work inside that unique situation, they should oblige and reframing the desires with the results.

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Constructivism is frequently contrasted with objectivism, which is generally cited similar to the antithesis or direct inverse of constructivism. A lot of objectivist theory depends on crafted by behaviorists such as Skinner (1953.) Objectivists accept that illuminate at particle itself is understandable beyond any human psyche, and that any individual translation of information can be supposed to be either right or erroneous. Objectivists see singular bits of illuminate at particle as images or money that can be gained by people, and can be moved from human to human should the right learning conditions exist (Jonassen, 1991). While a significant part of the early work in formal instructional plan got from objectivist theory, present day scholastic personalities have come to acknowledge that learning situations which all the more intently coordinate the requirements of constructivist learning might be increasingly compelling. The apparent advantages of constructivist learning might be especially significant where the educating of complex abilities, for example, critical thinking or basic reasoning aptitudes are concerned (Tam, 2000).

On the off chance that we acknowledge that constructivist theory is the most ideal approach to characterize learning, at that point it follows that so as to advance understudy learning it is important to make learning conditions that straightforwardly open the student to the material being examined. This offers ascend to the view that constructivist learning must occur inside an appropriate constructivist learning condition. One of the focal occupants of all constructivist learning is that it must be a functioning procedure (Tam, 2000); along these lines, any constructivist learning condition must give the chance to dynamic learning.

Conceptual Review of Formative Assessment

Conceptual framework constructed by the researcher is based on the research questions, it has five components: competencies, mode of lesson delivery, qualification or experience, student's participation or engagement and center being formative assessment as core objective of the study.
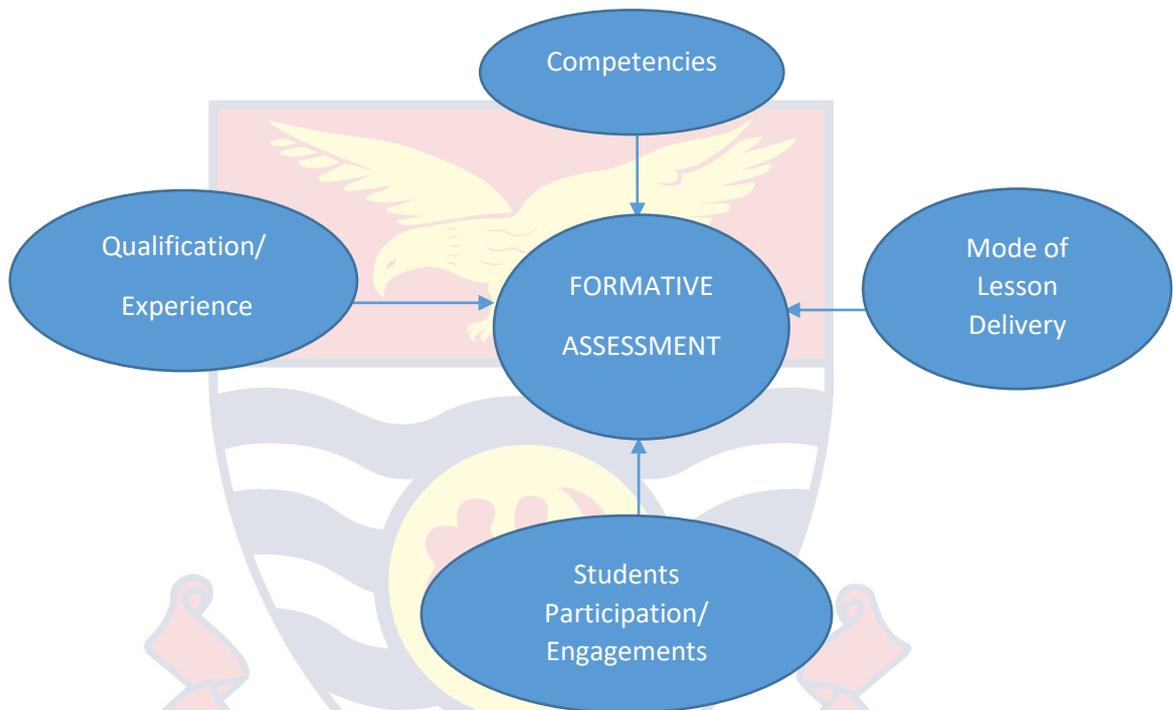
Figure 1: Conceptual framework on formative assessment.
Source: Authors Own Construct, 2019

Formative assessment is the heart of improving student knowledge outcomes as well as teaching and learning is concern. Formative assessment is an effective way of assessing students abilities while promoting effective learning and teaching in classroom. Black, Harrison, Lee, Marshall and Wiliam (2003), Formative assessment applies not to the appraisals themselves, yet to the capacities they serve in supporting students learning and giving proof that is utilized to adjust the instructing to address learning issues.

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Formative assessment been the main objective (center) framework, all the component work towards the pivot of the framework (formative assessment).

Competency play key role when it come into assessment practices in classroom. Tutor who is the assessor of assessment need to be well feasted in assessment practices so as to used proper technics to assess learner during teaching and learning process. A tutor who is competent can apply good formative assessment strategies to enhance learner's learning outcome (Akinbobola, 2004). A capable mathematics instructor goes to meetings, workshops and courses, has a good classroom control, viable informative abilities, sufficient information regarding the matter, use an assortment of showing techniques, or systems and show excitement for educating (Akinbobola, 2004). Therefore the focus of the formative assessment is to improve upon the current situation of the learners.

Tutors' qualification and experience count a lot when it comes to formative assessment practices in school set up. One experiences professional teacher can play is when it comes into assessment practices during teaching and learning process. Tutors number of years expand in classroom for upgrading his or her knowledge play significant role in formative assessment practices in classroom during teaching and learning practices. It is therefore enhance formative assessment which promote students' performance in the course of teaching and learning. Dial (2008), agreed that long stretches of training experience and instructor's degree level affect in general accomplishment of understudies on the correspondence expressions and mathematics. Long periods of experience, just as the cooperation between long periods of experience and degree level, affected student accomplishment in

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both correspondence expressions and mathematics uncertain outcomes demonstrated educator degree level alone had impact on student accomplishment.

In order to achieve the stated goal in teaching and learning of mathematics, formative assessment cannot be over looked. Formative assessment help tutors to achieve their objective in particular topic as teaching and learning is concern. Student's participation and engagement play vital role when it comes to situation where tutors want to find learning outcome of learners. Tutors should apply formative assessment strategies which will enhance student's involvement in classroom during teaching and learning process. Benner *et al.* (2009) suggest that coordinating classroom and clinical teaching strategies, moving from an accentuation on basic deduction to an accentuation on clinical thinking and creating instructing techniques that are centered on the students, for example, recreations, unfurling contextual investigations and live meetings.

Formative assessment is very importance when it comes into mode of lesson delivery in mathematics lesson delivery. It is the formative assessment which support the Mathematics tutors to find out the strength and weakness in his / her lesson delivery. Every good lesson delivery enhance through the application of appropriate formative assessment strategies. Boaler (2006, 2016) prompts that educating should draw upon rich scientific exercises, which have high savvy request, rather than falling back on repetition learning, with the goal that it can teach an inspirational mentality towards mathematics. It only formative assessment practices which informed the teacher to address individual challenges during teaching and learning process. The formative

focuses on the headway of the students, the affirmation of their troublesome minutes, their explanation and the best approach to outperform them. The formative assessment is not deciphered in grades, it involves data, a criticism for both the student and the instructor at the learning procedure.

In the nut shell, all the four component; Competency, Mode of lesson delivery, Qualification or experience and Students participation or engagement were connect to formative assessment which is the pivot of the framework. This means that all four component work towards formative assessment. Thus, for formative assessment to effective teacher's competencies, mode of lesson delivery, qualification or experiences and their mathematical knowledge is very important.

Evaluating Students in Mathematics Lesson

All classroom instructors have since quite a while ago utilized different types of assessment to screen their students' mathematical learning and illuminate their future guidance (Veldhuis, Van den Heuvel -Panhuizen, Vermeulen, & Eggen, 2013). Progressively, external assessment are being utilized by arrangement creators all through the world to measure the mathematical information on students (Platas, Ketterlin-Geller, & Sitabkhan, 2016). Now and again to contrast that information with the information on students in different nations. Therefore, external assessment regularly impact the instructional acts of classroom instructors. The significance given to assessment by numerous partners makes assessment a subject important to teachers at numerous levels (Best, Knight, Lietz, Lockwood, Nugroho, & Tobin, 2013).

It is believe that those keen for enormous scope assessment just as classroom assessment have a lot to offer each other than the teacher. Assessment plan in science instruction dependent on sound assessment standards is talked about with enormous scope and classroom assessment being separated (Darling-Hammond, Herman, & Pellegrino, 2013). [Again, with a conversation of how the plan standards cover. Mathematics classroom assessment give some particular instances of assessment systems that used to improve instructing and learning process. The enormous scope assessment in mathematics training on educational program, approach, guidance and classroom assessment brings difficulties that instructors face just as approaches to help them] (Johnson, 2017).

 Assessment has been utilized for different purposes, for example, giving student grades, national responsibility, framework checking, asset allotment inside an area, student arrangement or observing, deciding mediations, improving instructing and learning, or giving individual input to students and their folks or guardian (Newton 2007). Instructors are some of the time assessed situated partially on how well their students perform on such assessment (Wilson & Kenney 2003). Classroom assessment assembles data and gives criticism to help singular student learning (De Lange 2007; National Research Council [NRC], 2001).

Black and William (2010) pointed out from a study in USA that the giving of imprints and reviewing capacity are overemphasized, while the offering of valuable guidance and the learning capacity are underemphasized (p. 84.). Educators may think that it hard to overlook the consistent need of reviewing their students' works as opposed to putting these on 'hold' and

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concentrating on formative practices. In addition, prior investigations have focused on the intensity of formative assessment with input for supporting student accomplishment and inspiration to be fundamental in the learning procedure (Ozan & Kıncal, 2018). That is in the event that it gives explicit data about the work related to norms or learning movement, recommend techniques for development, as opposed to grades and social comparison (Nolen, 2011).

Formative assessment and input would then furnish the students with a chance to show signs of improvement comprehension of the hole between their present and desired performance. Some suggestions are however, made as procedures for the implementation of formative assessment. This is where teachers should consider formative as importance issue when it comes to active teaching and learning in classroom.

According Black (2010); Hedge (2001) self and peer-assessment could be used to serve a formative function. This in their view serves as a compliments when doing formative assessment on students. These can be utilized as methodologies in the classroom to advance metacognitive thinking among students and to allow them to be increasingly engaged with their learning. These systems are turning out to be increasingly more popular known in schools, particularly for tertiary level students. First, self-assessment gives student independence, which urges the students to monitor and notice their own advancement. This point could likewise assist the educators with preparing their exercises when understanding which territories the students are battling with and simultaneously by allowing the students a chance to pick the taking in center from their own needs (Dragemark & Oscarson, 2010).

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Second, peer-assessment acclaim shifts from self-assessment in the way that it as a rule requires to be told. The students are commonly progressively certifiable when they assess themselves (Farell, 2002). In situation where students try to assess themselves without any instructor, it aid their understanding of the concept very well. Black (2010), proposed that the core of the formative interaction is the dynamic inclusion of students (for example posing of inquiries during instructing and requesting clarifications on what the educator previously said while teaching) when the student produces proof and is utilized to direct further upgrades. Black (2010) further pointed out that the proof that the instructors gather to adjust their educating to address student issues must be reliable with built up standards for effective learning.

Black (2010) summed up four essential standards as the accompanying explanations:

1. Start from a student's current comprehension.

2. Include the student effectively in the learning procedure.

3. Build up the student's comprehension of the points and standards for powerful learning.

4. Advance social learning, for example learning through conversation (p. 360).

Moreover, tutors can use questionnaires to learn about students' motivation for knowledge, the manners by which they like to learn, the issues they have with learning and their responses to past classroom experience as a procedure for assessing students for learning (formative purpose) (Hedge, 2001). This helps the instructor to get a holistic opinion of students about the entire theme of discussion.

Again, the concept of questioning as a technique has a long history in the territory of formative assessment; be that as it may, what has changed through the span of time is a move from close-ended questions to progressively educational, open-ended formats. Black, Harrison, Lee and Marshall (2003) urge instructors not exclusively to develop more effective questions yet in addition to encourage a domain where students must think systematically and give their own solutions to their questions.

In addition, Black *et al.,* (2003, p. 39) argue that formative questions must be challenge "a common misconception, to create some conflict that requires discussion" which urges students to think about a reaction or a thought from various points. To construct more formative questions, the authors (Black *et al.* (2003) inspire classroom instructors to organize their questions taken into consideration three themes: "frame questions" around the big idea that are worth asking; increasing the "wait time" with the goal that students can think and express their reactions; and encouraging "follow - up' questions or exercises to guarantee students comprehend.

Classroom assessment techniques fluctuate the same amount of as instructional strategies for students (McMillan, 2003). Traditional assessment practices incorporate summative assessment that assess at the end of instruction at either the finish of a unit or after a set time of learning. Instructors have generally utilized target tests that measure explicit abilities utilizing impartial questions or situations.

Generally, assessment strategies can be categorized as traditional or alternative dependent on the realism and complexity of the assessment tasks and the measure of time required for the assessment (Gronlund, 2006).

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Conventional assessment, for example, numerous decision, true – false and coordinating things are regularly lower in realism and complexities of the tasks assessed yet require brief period to direct and score (Gronlund, 2006). Alternative assessments, for example, portfolios, perceptions, and other performance-based assessments are higher in both realism and complexities of the tasks assessed and require more opportunity to utilize and score than traditional assessments (Gronlund, 2006). There has been a development toward the utilization of more alternative assessments than conventional assessment. The contentions for alternative assessments over conventional ones depend on the thought that alternative assessments are more naturally inspiring than traditional assessments (Shepard, 2000).

In the Assessment Standards for School Mathematics, the National Council of Teachers of Mathematics (NCTM, 1995) describes assessment as the way toward social affair proof about a student's information on, capacity to utilize, and demeanors toward, mathematics and making inferences from that proof for an assortment of purposes (p. 3). Any technique used to assess children's mathematics learning should reflect significant objectives and goals (Lin, 2006) so the assessment results can be utilized to settle on proper instructional choices (Romagnano, 2001) and assist instructors with distinguishing approaches to improve mathematics teaching and learning (NCTM, 1989).

Without a doubt, the National Research Council, in its report Everybody Counts (1989), states: We should guarantee that tests measure what is of worth, not exactly what is anything but difficult to test (p. 70). In this manner, assessment ought to be a ―bridge between teaching and learning,

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helping instructors gather proof about student accomplishment so as to modify instruction to more readily meet student adapting needs (Wiliam, 2007, p. 1054).

Mathematics instructors have designated that how students learn (i.e., the mathematical procedures through which they learn) is as significant as what they learn (i.e., the specific mathematical content) (Kilpatrick, Swafford, & Findell, 2001; Ma, 1999; NCTM, 1989; 2000; 2006). As students engage in the procedure of doing mathematics, they make meaning of mathematics concepts for themselves, relating conceptual and practical understanding.

There has been the debate of alternative techniques in assessment. However, Herrera, Murry and Cabral, (2007) include formative and summative assessment along with other types of accurate assessment, such as performance based assessment, portfolios, self-assessment and peer-assessment, interview-based assessment, play based assessment, cooperative groups assessment, dialogue, journal and scaffold essays.

Diagnostic assessment is also seen as an alternative form of assessment. Although some authors view diagnostic assessment separately from formative assessment, the intention is that diagnostic assessments are used for formative purposes (Wiggins & McTighe, 2007). Diagnostic assessment or pre-assessment is used to collect information for planning instruction and acknowledging learners' needs (Black & William, 1998). Wiggins and McTighe (2007) assert that pre-assessments "include checks of prior knowledge and skill levels and surveys of interest or learning-style preferences." The writers preserve that, a great number of students come to school with a misconception that they are not brilliant enough to do a certain

task, such as drawing a picture or writing an logical memory (Wiggins & McTighe, 2007). Given this scenario, a teacher is responsible for recognizing these misconceptions and finding ways to confront them.

Scoring Practices of Assessment in Mathematics

Educators have utilized testing instruments to transmit to students and their parents what substance and aptitudes which are extremely significant for the students to know. In spite of the fact that the revealing would in general be as a grade and structure of assessment sent inconspicuous messages with respect to what was significant (Haldane, Bringing, & Rodriguez, 2002). Teachers have had isolated sentiments on the best strategies for assessing student learning results. Some few teachers advocate the utilization of traditional forms of assessments, for example, numerous decision tests and different types of target tests, Different instructors advocate for increasingly contemporary ways to deal with assessment, for example, portfolios, diary investigate and look into papers. Traditional types of assessment are proficient at estimating information norms and targets, particularly when there is a lot of information to be estimated. Such tests are utilized for estimating students' information, comprehension and application, which are fundamental aptitudes that students need in order to succeed in their studies (MacMillan, 2008).

During the most recent decade alternative assessment techniques were formed and executed into instructive practice because of new disclosures and changing theories in the field of student learning result. These imaginative techniques in student assessment have been bolstered on the premise that they produce dynamic, intelligent and automatic students. These new strategies for student assessment have acquired a great deal of changes the manner in which

instructors see understudy learning and scoring rehearses in evaluation (Elango, Jutti and Lee, 2005). Educators were encouraged to change their concentration and embrace alternative types of assessment for the scoring practices. The changing point of view was driven by the need to utilize classroom assessment that perceive the manner in which educators survey information, aptitudes and capacities of in students' classroom. Authentic form of assessments was acquainted as a result of its potential with test complex mental capacities in the classroom (Reynolds, Livingston, & Willson, 2009; Waldrip, Fishers & Dorman, 2009).

Instructors have a wide scope of classroom assessment techniques and scoring practices to utilize. These strategies give educators access to amazing assessment of students learning by scoring them through instructing and learning process. Through classroom assessment, educators gather different types of data so as to make educated, predictable and fitting decisions with respect to students learning results. Educators and school managers are the primary leaders on the types of assessment and specific assessment tasks utilized in schools (Cavanagh, Waldrip, Romanoski, Dorman, & Fisher, 2005). Educators control classroom assessment conditions by picking how they assess their students much of the time. Given students input through their scoring practices upgrade powerful educating and learning in classroom. McMillan (2008) found that "Assessment of students at classroom level is basic in light of the fact that compelling dynamic is put together somewhat with respect to the capacity of educators to comprehend their students and to coordinate activities with precise assessment of their scores" (p. 5).

Boaler (2016) advises us that slip-ups can introduce an incredible learning opportunity which instructors can exploit by giving criticism on the activities and how this could be improved as opposed to concentrating on the student attributes. Black, Harrison, Lee, Marshall and William (2004) express that classroom exchange, activities and friend bunches are types of formative assessment which used to assess students' advancement in classroom, The valuable methods of helping students change from detached beneficiaries of the information to dynamic students is to assume liability for their own learning. Clark (2008) proposes that the utilization of an assortment of instructing and assessment strategies can animate student's accomplishment, while highlighting the significance of determining achievement standards and learning expectations in any assessment settings.

Foster (2003) articulates similarly that the incorporation of blended showing strategies and assessment by including the two activities and assignments, checking students' advancement, prompting on the advancement, giving adequate practices and offering criticism to practices in instructing mathematics can add to compelling learning. Instructing and assessment methods play a primary role in fostering good learning and contributes to students' achievement. Therefore, when instructing, educators have the duty to apply an assortment of educating and assessment strategies to improve learning results that definite high score of the students.

Scriven (1981); Kulik (2001) had talk the utilization of observational for showing assessment in light of the fact that the visit from the guide instructor and establishment director will make pre-administration educators modify their instructing styles. Scriven (1981) calls attention to that the

quantities of perception by supervisor and tutor educator are generally little to convey a quality assessment during showing practice in term of scoring. Kulik (2001) additionally included that the supervisor and coach instructor who assess pre-service educators may have inclinations that may slant their perceptions and decisions.

The utilization of perception as the primary apparatus to assess pre-service instructor during encouraging practice may be viable. In light of the adjustment in the assessment of encouraging practice is important to guarantee the educator preparing establishment to deliver a quality instructor for what's to come. Notwithstanding the best possible assessment to the student, a viable assessment should help the pre-service educator to upgrade their training abilities just as their expert improvement is concerned. The objective of the assessment techniques utilized nowadays to assess the pre-service instructors during training practice is vital just as encouraging calling is concerned.

Indications of Student Participating in Lesson

Students' class support and commitment plays a noteworthy role over the present advanced education. Student commitment theory is based on an establishment of over seventy years of research planned for improving students' learning results. These thoughts remember Tyler's idea of time for task talked about by Merwin (as refered to in Kuh, 2009a), trailed by Pace's (1979) nature of exertion, as a determinant of learning results, and Astin's (1999) theory of inclusion. The pith essence of the current student engagement theory is that students' encounters, joined with institutional qualities, decide the degree of engagement on a school campus (Astin, 1975; 1985; 1993b;

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Kuh, 1991; Kuh & Documenting Effective Educational Practice (Project), 2005; Pace, 1982).

Given that the quality and quantity of student involvement is critical to student engagement in college, institutions must also develop programs that promote engagement (Pascarella & Terenzini, 2005), and make policies that enhance their college experience (Kinzie & Kuh, 2004, Kinzie et al., 2005). These student inputs and campus environment factors were used in developing the instruments for measuring student engagement in higher education. Student engagement therefore refers to as the cumulative time, effort and other resources invested by both students and their institutions to enhance student development (Trowler, 2010). Engagement has been defined as the quantity of time and effort students put into their studies and into other activities that lead to the experiences and outcomes that constitute student achievement (Pascarella & Terenzini, 2005, p. 602).

Engagement is the place more students are effectively associated with their subject and the instructive assets accessible to them. The more students practices and get input on their composition and other learning exercises, the more adept they ought to become regarding a matter (Kuh, 2003). Carini, Kuh, and Klein (2006) inspected 1,058 students at 14 four-year colleges and universities and discovered positive connections among commitment and both basic reasoning and grades. Even the lowest-ability students profited more from commitment than less connected with cohorts. Certain establishments all the more successfully convert student commitment into better execution on basic reasoning measures.

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At present, there is an emphasis in college of instruction to push toward increasingly dynamic learning methodologies. Benner et al. (2009) suggest coordinating classroom and clinical teaching procedures, moving from an emphasis on basic intuition to an emphasis on clinical thinking and creating instructing techniques that are centered around the students, for example, reproductions, unfurling contextual investigations and live meetings. Everly (2013) looked at test aftereffects of students who had address just arrangement to the individuals who had dynamic learning exercises in the classroom. It was uncovered that students who had dynamic learning systems scored altogether higher on a normalized evaluation test than students who got address just (Everly, 2013). A number of teaching practices are associated with supporting or engagement of students in teaching and learning environment and include them are:

Defining clear substance objectives for assignments; coordinating undertaking material to the substance objectives; system guidance, for example, investigating and suggesting use; framework student information; decisions of material and advancing community oriented help. The research of Lutz et al. (2010) not just features that students of fluctuating accomplishment levels react to various accentuations of instructor practices yet raises the likelihood that the errand type in which understudies are locked in might be pivotal for creating commitment that prompts accomplishment gains (p. 14).

In work by Lutz et al. (2010), it proposes that the designing of platforms that educators use impact the help of student commitment in complex errands. The thought of various framework or instructional practices for upgrading student commitment in assignments of various or differing

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complexities ought to be sought after. Along with the information that students of changing degrees of accomplishment react to varying educator practices, the structure, the board and conveyance of guidance for different assignments (contingent upon unpredictability and object) is another thought for meeting explicit understudy needs to improve commitment and accomplish better results.

Stephan, Caudroit, Boiche, and Sarrazin (2011) investigate student's impression of their competency finding that in specific circumstances, for example, accepting horrible scores, students will in general markdown criticism or assessments to safeguard their confidence. Stephen et al. (2011) clarify the reasons that students need to self-secure by limiting the assessment they get is not evoked by the assessment itself, however by the subsequent low apparent fitness (p. 451). Instructional practices that cultivate joint effort as opposed to rivalry and support positive results through improving companion connections and advancing accomplishment are significant for achieving a feeling of relatedness (Turner et al., 2011).

According to So (2010), "interaction refers to a reciprocal communication and learning process between two or more human actors (e.g., instructors, other learners) or between learner and non-human agents (e.g., computers)" (p. 256). Interactions occur when objects and events mutually influence one another and it therefore enhances classroom participation. Interaction occurs when learners use technologies to access content, ideas and information, as well as to communicate about course content with the instructor and their peer learners (Prammanee, 2005). Interaction adds the use

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of computers and the Internet as the means of communication in this definition as far as classroom interaction is concerned.

Roblyer and Wiencke (2004) deemed five elements vital for interaction in courses learner study: "(a) social and rapport-building designs for interaction, (b) instructional designs for interaction, (c) interactive capabilities of course technologies, (d) evidence of learner engagement, and (e) indication of instructor engagement" (p. 26). The authors developed a rubric of concurrent validity and consistency of results across four courses and found five elements to be quality indicators for interaction in study courses. The interaction has been successful in showing instructor opinions, on-going research is critical to continue addressing technology advances and allowing a wider range of teaching and interaction in classroom.

Factors that Influence Formative Assessment Practices in Mathematics

According to a study directed in assessment and assessment practices, a few elements have been referenced to impact the mentor's assessment (Duncan and Noonan, 2007). The elements which have been featured to impact the mentor's formative assessment in the various study incorporate academic levels, subject or region of specialization, class size and assessment - based preparing gained by the academic staff (Duncan & Noonan, 2007).

According to research that has been led in assessment it has been referenced that academic levels or mentors capabilities impact their assessment practices (Noordin & Jusoff, 2009). Advancing through academic levels is connected to encounter which can impact the assessment practices of the mentor at College level. It is referenced in certain study that academic staff

assessment practices can improve if the mentors have sequential communications with assessing students (Sato *et al*., 2008).

The continuous cooperation with assessment gives a bit of leeway to the academic staff who have instructed for a more drawn out timeframe, with more experience and high academic levels to have great assessment practices (Masole, 2011; Sato et al., 2008). On the opposite side, different studies have featured that academic levels don't impact guides assessment practices (Masole, 2011). This features a hole of indisputable research about assessment practices among guides as indicated by their academic levels. Effectiveness in assessment is impacted by branch of knowledge or specialization of the academic staff (Dunca & Noonan, 2007).

According to Dunca and Noonan (2007) subject specializations have a great deal to clarify in the assessment practices of the academic staff. Then again, Susuwele-Banda (2005) featured that mentors regions of specialization did not add to the guide's assessment practices. In certain studies it is featured that there are contrasts in assessment practices of the mentors as indicated by their various zones of specialization or capabilities (Adams & Hsu, 1998; Bol et al., 1998; Koloi-Keaikitse, 2012; Stiggins and Conklin, 1992), while others differ that the distinctions don't exist (Dunca and Noonan, 2007). The distinctions in assessment practices among the coaches have been abundantly featured between the guides in the specializations of science and expressions subjects (McMillan, 2003; Stiggings & Conklin, 1992).

Tutors assessment practices have been slanted to the idea of class sizes assessed (Black & Wiliam, 1998; Dunca & Noonan, 2007; Koloi-Keaikitse, 2012; Monk & Haller, 1993; Susuwele-Banda, 2005). Studies done in

assessment feature that the idea of class size impacts the manner in which the guides assessment their students (Gibbs & Simpson, 2004; Masole, 2011). Huge class measures in assessment are seen as a danger to the nature of assessment on the educator and might result into unfortunate activities on the students. In the various studies done in assessment, instructors have recognized that they assess huge classes which causes them to assess ineffectively the students they educate (Masole, 2011).

Class size decrease has been referenced as one of the manners in which can improve student assessment and their learning (Graue et al., 2007; Susuwele-Banda, 2005). This is on the grounds that huge class sizes lead to poor utilization of assessment equipment and materials, giving of general imprints to students, absence of fixation by tutors while assessing, emergency of time on the teachers, deficiency of apparatuses and assets, and advancement of negative mentalities by the instructors in favor of assessment (Masole, 2011).

Classes proper for good assessment and performance of students should be sizable or little in number for teachers to enough deal with the assessment (Finn et al., 2003; Jones, 2006; Masole, 2009, 2011). In 2012, the normal student/educator proportion in elementary school was 42:1 (UNESCO, 2015). This indicate that for any effective teaching, learning and assessment the class size should not exceed 42 learners in the class. In circumstances where the classes are too enormous, they ought to be decreased to smaller classes which teachers can deal with adequately while assessing students (Bennel & Molwane, 2008; Susuwele-Banda, 2005). This would give tutors space to take care of students separately during the guidance procedure and

furthermore, to enough assess and grade their work during the assessment procedure (McMillan, 2003; Miller et al., 2007).

Then again, a few investigations have referenced that there is a negative connection between class size and evaluation rehearses (Duncan & Noonan, 2007; Locastro, 2001; Reynolds et al., 2001; Welsh, 1989). The negating finding on whether class size impacts mentors evaluation rehearses or not, features absence of grounded concentrates on the connection between class size and appraisal rehearses (Locastro, 2001; Reynolds *et al*., 2001).

Effective assessment of students by the mentors in any learning foundation relies upon the nature of assessment preparing achieved in assessing students (Zhang and Burry-Stock, 2003). Benefiting assessment instructional classes are a portion of the manners by which foundations can outfit their academic staff with the necessary assessment abilities and aptitudes in assessing students (Duncan & Noonan, 2007; Harlen, 2005; Sato et al., 2008; Tindal & Haladyna, 2002).

Experimental study that have been attempted in assessment - based preparing have featured that preparation impacts academic staff's assessment practices (Brookhart, 2003; Duncan & Noonan, 2007; Guskey, 2003; Masole, 2009; Phamotse et al., 2011; Stiggins, 2002, 1999; Zhang & Burry-Stock, 2003). Studies have found discovered that academic staff's ownership of acceptable assessment capabilities and aptitudes make as the sufficient in assessing students (Stiggins, 1999, 2002; Zhang & Burry-Stock, 2003).

Allowing a chance to guides to assess students without appropriate assessment capabilities and aptitudes can be compared to academic self-destruction in a learning environment (Popham, 2004; 2009). This is on the

grounds that during assessment academic staff embrace basic academic choices on students and the investigation program without the necessary ability. In a general investigation of studies done in assessment, it has been featured that a large portion of the academic staff in foundations have insufficient capabilities and aptitudes in assessing students (Phamotse et al., 2011; Stiggins, 1999; Zhang & Burry-Stock, 2003).

It has been referenced in look into that coaches with assessment - based preparing have preferable assessment practices over the individuals who have not embraced any assessment - based preparing (Masole, 2011). Instructors who need sufficient capabilities and aptitudes in assessing students are probably going to have poor assessment practices (Howie, 2006; Stiggins, 2002).

In examines which have broken down the assessment abilities and aptitudes of academic staff it was found that most academic staff in organizations were uncouth in assessing students and furthermore, a couple of academic staff had embraced assessment - based preparing (Alkharusi, 2011, 2012; Masole, 2011; Phamotse et al., 2011; Zhang & Burry-Stock, 2003). In colleges where majority share academic staff train in their callings assessment - based preparing is discretionary to students, while in different colleges they do not have such preparing for the two students and their instructors. In such a circumstance, this features assessment - based preparing are not taken as a significant issue in these specific establishments (Phamotse et al., 2011). However it is realized that assessment are unavoidable in the learning procedure (Pellegrino et al., 2001). It is vital that academic staff be outfitted with satisfactory abilities and aptitudes in assessing students, that is, in the

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manner in which they configuration, regulate, decipher, and apply the outcomes got from the assessment (Koloi-Keaikitse, 2012).

In various investigations done in assessment instruction partners have upheld for assessment - based preparing to theacademic staff so as to improve their assessment practices. This would enhance the manner in which the academic staff assess students in the classroom (Guskey, 1994; 2003; Stiggins, 1999; 2001; 2002).

Teaching Approaches in Mathematics Lesson

Learning approaches (strategies) are defined as the behaviors and views that teachers used to select and integrate new information with their existing information (Weinstein & Mayer: 1986). This is way teachers used to elicit information from learners in order to find out their strength and weakness in classroom activities.

In spite of government efforts, mathematics has not experienced much change in terms of how it is presented (Awoniyi, 2016) thus study conduct in Ghana. These reflect reliably in low performance levels in mathematics among students at the first and second cycle institutions. Results from the Trends in International Mathematics and Science Study (TIMSS); revealed that performance in mathematics were below average in some countries while Ghana is not excluded. In the study, 8 graders in Ghana were ranked 43rd among 44 and 46 among 47 countries that take part in the study in 2003 and 2007 respectively. There have not been better improvement for the past decade as far as Mathematics is concerned. The state is not too different in the senior high school (SHS) Mathematics results over years.

The instructor factor is viewed as one of the noticeable explanations behind students' poor performance in mathematics. In Ghana, the methodology of encouraging mathematics is principally educator focused which is described by transmittal strategies (chalk and talk, overwhelmed by instructor talk), making students to totally rely upon educators (Leong, 2012). With this teaching approach, students can utilize conventional calculations, yet they once in a while disguise and form further knowledge into the mathematics they are learning. Clearly educators were additionally educated in a similar way and for the majority of them ought to adjust new strategies for guidance to upgrade mathematics learning is an intricate innovation (Dunlosky, Rawson, Marsh, Nathan & Willingham, 2013).

Conversely, a student focused instructing approach is one that bolsters students in creating numerical thinking, while at the same time urging them to see the educator as somebody who is there to assist them with understanding mathematics while making settings which assist them with creating importance in mathematics (Brodie, 2006; Yashau, Mji & Wessels, 2005). Be that as it may, student focused talk is a lot harder to accomplish practically speaking than it seems, by all accounts, to be in strategy. Chisholm and Leyendecker (2008) note that student focused instruction is one of the most inescapable thoughts; yet it is extremely difficult for them to flourish in the classroom

Such a methodology expects instructors to have an assortment of abilities, just as a sound information on mathematics content. The utilization of an assortment of training approaches and styles is suggested, on the grounds that it can "support adjust capacity and long lasting learning in the instructing

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learning process" (Vaughn and Baker, 2001). Shulman (1986), in his fundamental meaning of instructive substance information, expresses that there are no single most impressive types of portrayal, the instructor must have nearby an authentic armamentarium of elective types of portrayal. Shulman's definition centers the requirement for educators to have available to them an assortment of approaches to speak to the topic, so as to make it important to their students.

Some basic procedures in mathematics learning incorporate direct teaching, cooperative learning and problem - based teaching. Other imaginative instructing strategies that can be added to educators' collections, incorporate manipulatives, genuine application, joining of innovation gadgets, and games (Moore, 2012). Manipulatives can be effective in making an outside and progressively solid portrayal of the mathematical ideas being educated (White, 2012). Another instructing approach that adds to students' accomplishment in mathematics is the incorporation of games in the teaching procedure (Moore, 2012). Utilizing games to instruct mathematics adds to mathematical reasoning and information improvement (Nisbet & Williams, 2009). Ke and Grabowski (2007) add that "playing games plays important roles in a child's psychological, social, and intellectual development." Boaler records that there is a gap between what researches has shown to work in instruction mathematics and what really happens in schools. Boaler (2006, 2016) recommends that teaching should draw upon rich mathematical activities, which have high intellectual request, instead of resorting to rote learning, so that it can inculcate a positive mindset towards mathematics. Studies further argue that the connection of mathematics to real-world

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situations gives teachers the opportunity of making mathematics seem more reachable and pleasant to learners (Miller, 2009).

Students do not appreciate mathematics to the degree that they don't perceive how mathematics will guarantees proficiency in every human undertaking, particularly how it applies to their future professions (Leder & Forgasz, 2003). This is conceivable if the investigation of mathematics is made less unpleasant and mathematics itself gets significant and applicable to the individuals who study it. It is significant that instructors who encourage mathematics ought to be sharpened and prepared to give chances to their students to appreciate the investigation of mathematics and benefit it.

Research in mathematics instruction show that incorporating of Information and Computer Technology (ICT) changes the idea of educating and learning of Mathematics (Zhang & Liu, 2016). ICT appears to give a point of convergence which empowers association among students and the innovation itself. This infers ICT utilized in guidance to sopport constructivist teaching method, where students use innovation to investigate and arrive at a comprehension of numerical ideas which appear to be unpredictable. For ICT to be utilized viably in regular instructing (Mathematics), radical changes are supported in ways to deal with educating.

The similitudes between the instructional practices for accomplishment inspiration and the practices advanced in mathematics teaching; Stipek, Salmon, Givvin, Kazemi, Saxe, & MacGyvers (1998) distinguished practices that decidedly influence student inspiration and applied learning. The instructional practices advanced by mathematics instructors looking for change underline exertion, learning and dominance directions, which are all

related with building understanding. Stipek et al. (1998) refer to explicit supporting instructional works on including: (a) urging availability to take on testing errands and face challenges; (b) developing understanding, confirm by acing ideas; (c) advancing dynamic student commitment and independence, encouraging sentiments of control and more noteworthy pleasure; and (d) developing sentiments of competency for assignments that give individual significance, are tolerably testing and offer assortment.

Instructors who utilize supporting instructional practices approaches in guidance likewise will in general advance helpful learning conditions and show positive effect towards their students during educating and learning process. Students are urged to clarify appropriate methodologies, assess their approach and value the techniques utilized by mentors to tackle issues. This style of teachers passes on desires that students can realize, that exertion for clarifying their reasoning is required and that, in spite of disarray or mishaps, students should endure. Expanding on these instructional methodologies, there are educators who show positive effect by exhibiting enthusiasm for and regard for students, uncover their pleasure and estimation of mathematics, care about student commitment and offer help for students learning as they require it.

Turner and Meyer (2004) additionally note that the connection among accomplishment and inspiration is significant on the grounds that it proposes that helping students comprehend will support future inspiration in mathematics. Schweinle, Meyer and Turner (2006) arrive at comparable decisions about student inspiration and influence, seeing that specific educator practices, for example, criticism and explanation, support for self-

rule, collaboration, and accentuation on learning for the wellbeing of its own - are identified with student inspiration in mathematics class.

Turner, Warzon and Christensen (2011) distinguished four standards to propel and educate students from a yearlong mediation study working with mathematics instructors. These four standards advocate components of competency, autonomy, belongingness and meaningfulness that are focal builds of self-assurance theory (Deci & Ryan, 2000). Competency is related to intrinsic motivation emphasizing mastering of concepts. In this way, mathematics teachers that presses for comprehension and gives developmental input, utilizing enlightening language is seen as steady for students. At the point when instructors utilize an independence approach instead of a controlling one, they offer students command over parts of their learning, for example, pace and decision, and this is found to foster in student motivation (Reeve, 2009).

In particular, educators who act in self-sufficiency steady ways support inspirational factors, for example, interest and needs, explain the reasons for task requests, use informative language, and accept student's expressions of negative affect as valid. This approach is how instruction allows students to experience personal autonomy, satisfy psychological needs and generally experience positive learning (Reeve, 2009). On the other hand, the result of controlling encouraging styles decides an outer locus of control (as opposed to interior) which makes an impulse to carry on of blame, disgrace or nervousness and can prompt negative working in learning settings (Reeve, 2009).

Another instruction approach to improve mathematics attainment in the class is the use of manipulatives. Bouck (2010) defined mathematics manipulatives as "Physical objects students can manipulate to explore and develop an understanding of a mathematical concept" (p. 186). According to Rapp (2009), manipulatives have been shown to help improve both attainment and inspiration in mathematics among all students, especially visual-spatial learners (p. 9).

Numerous mathematical ideas are hard for students to completely comprehend. Before students can perform mental mathematics or comprehend an abstract concept, they have to have a solid comprehension of the essential numerical idea. Manipulatives permit students to see and contact the materials that represent mathematical ideas, which make these ideas genuine and concrete.

As indicated by Cooper and Null (2011), mathematicians can either be ordered as having a deductive way to deal with mathematics instructing or an inductive way to deal with mathematics educating. Educators who embrace a deductive way to deal with mathematics instructing accept that mathematics ought to be instructed and learned as a lot of rules and systems to be followed and remembered. Fox (1983) depicted the instructional acts of the deductive methodology as straightforward theory. Instructors who adopt an inductive strategy to mathematics instructing feel that mathematics ought to be educated and learned by giving students genuine learning encounters that expect students to show up at their own standards and methodology for tackling issues. Fox portrayed the instructional acts of the inductive methodology as created theory. The deductive methodology puts the substance in the middle,

while the inductive methodology puts the student and their adapting needs in the centre.

Chapter Summary

The review of the relevant literature began with the purpose of the study for which the literature was being reviewed. This was organised under sub – headings; concept of assessment, review of theoretical framework and conceptual framework. It also looks at evaluating students in Mathematics lesson, scoring practices in Mathematics, indicators that suggests students participate in Mathematics lesson and teaching approaches used in Mathematics lesson.

The theory that guided the study was Constructivist theory put forward by Lev Vygotsky (1896). Constructivism theory is based on the belief that humans are able to construct knowledge by understanding the information they are accessible to. The theory is also known as social constructivism and explains that children are socialized and developed through collaborative activity and learning that takes place through socialization and education. The Conceptual framework which guided the study and its interconnectedness were also discussed.

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CHAPTER THREE

RESEARCH METHODS

This section talks about the technique used to carry out this study in order to assess formative assessment practices of mathematics tutors in selected colleges of education in Ghana. It talks about the research design that was adopted for the study, the population, the sample and the sampling procedures and the instrument used for the data collection. The procedures for the data collection and the method of analysis of the data for the research are also explained in this chapter.

Research Design

Research designs are the main processes and directions that are followed in conducting research. The choice of research design for a specific research is centered on the purpose of the study (Cohen, Manion & Morrison, 2011). The research design adopted for this study was convergent parallel design. It has been conceptualized as a triangulation approach whereby qualitative and quantitative outcomes are united to investigate an issues from different edges to affirm results (Creswell & Clark, 2011). This legitimizes the choice of convergent parallel design by the researcher since that is actually what this investigation is about. In this design, two free strands of quantitative and qualitative data were collected in a single phase; merged the results of the two strands and afterward searched for combination, uniqueness, logical inconsistencies or connections between the two datasets.

Convergent parallel design was appropriate for this research because the quantitative results with qualitative findings was developed in more complete understanding of a phenomenon. The different methods were

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ordered equally, the strands were kept independently during analysis and then the results were mixed during explanation as recommended by Creswell & Clark (2011).
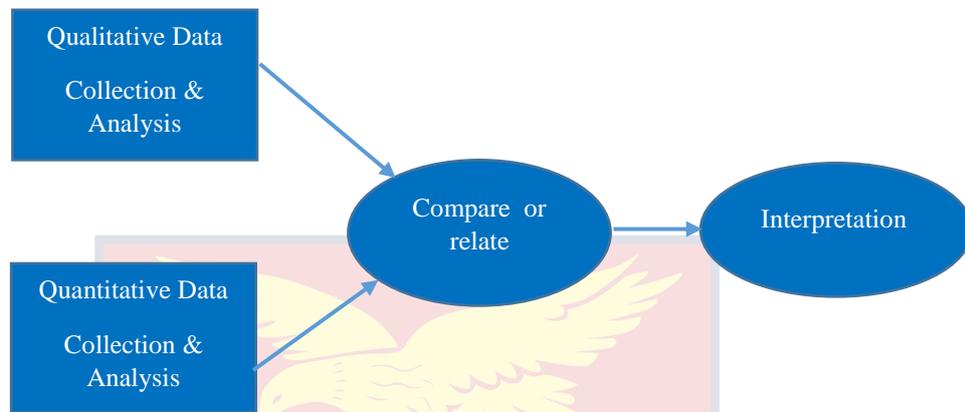
Figure 2: Convergent parallel design (**Creswell & Clark, 2011**).

The mixed techniques approach falls under the logic worldview (Fraenkel, Wallen, & Hyun, 2012; Gray, 2009), Which holds the view that information is built dependent on the real factors of our involvement with the world just as being socially developed (Gray, 2009).

Convergent parallel design as proposed by Creswell and Clark (2011) has strengths and weaknesses. The identified strengths bring to light Mathematics tutors perception of their understanding of assessment practices in Colleges of Education as well as how they used assessment in the different settings as they taught. The mixed technique approach joins both quantitative and qualitative methodologies through the collection and analysis of both qualitative and quantitative information and mixes the two types of information (Creswell & Clark, 2011) and these assists to provide a comprehensive analysis of the topic under discussion (Creswell, 2008). The mixed methods approach assists with responding to addresses that cannot be replied by just quantitative or qualitative methodologies alone (Creswell &

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Clark, 2011). In addition, mixed strategies give the chance to utilize one way to deal with clarify or better comprehend the results of the other methodology.

In the case of weakness of convergent parallel design, it had its own deficiencies among which were the powerlessness to pose examining inquiries just as look for explanations, failure to decide the conditions under which the respondents reacted to the survey things just as the capacity to create high lethargic rate (Sarantakos, 2013). Despite the weakness, it was considered that the strengths of convergent parallel far outweighed that of the weaknesses and therefore it was considered to be best design for this study

Population

A population is the general group from which the researcher wishes to obtain data from to study (Frankel & Wallen, 2006). According to Amedahe (2004), the target group about which a researcher is interested in gaining information and drawing conclusions is what is known as the population. It is a group of tutors from colleges of education in Ashanti and Bono Regions in Ghana and they were made up of both male female tutors. The age the tutors were range from 25 years to 42 with most of them above 42 years. The population according to Banerjee and Chaudhury (2010) well-defined population as "an entire group about which some information is required to be ascertained" (p.5). The population for this study were all college of education tutors from the Colleges in Bono and Ashanti region in Ghana. The study cover tutors from only Ashanti and Bono Region in Ghana.

The target population consisted of all Colleges of Education tutors in Ashanti and Bono Region in Ghana. This constituted all the mathematics tutors from the 12 Colleges of Education in Ashanti and Bono Region.

The available population was reached subsequent to taking out all people of the objective population who will or may not partake or who cannot be gotten to at the study period (Bartlett et al., 2001). The accessible population were all the mathematics tutors in Ashanti and Bono Region in Ghana. There were 12 College in Ashanti and Bono Region which is made up of 56 tutors.

Sampling Procedure

A sample is "a smaller [but hopefully representative] collection of units from a population used to determine truths about that population" (Field, 2005). All 56 mathematics tutors in Ashanti and Bono Regions were sampled for the study through census sampling technique. The researcher used all the mathematics tutors in the Collges in the Regions because they could be easily access and identified. Eight tutors were purposively selected for interview and observation based on their experience and willingness to take part in the exercise. These respondents had been in the College of Education for more than 10 years as mathematics tutors in selected Colleges. The sample used therefore represents the characteristics of Mathematics tutors in College of Education tutors in any part of the country who had spent at least a year in the College of Education.

Data Collection Instruments

Research instruments used for the study comprises of questionnaire, interview guide and observation check list. Questionnaire was used to collect data from tutors of the selected Colleges of Education. The questionnaire was appropriate because it gave the tutors the opportunity to express their views on the assessment practices in the College of Education. The questionnaire helped

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the researcher to collect information from a large number of respondents at the same time. Return rates of questionnaire could improve if the questionnaire was delivered and response rate encouraged.

On the other hand, questionnaire also has its own deficiencies among which were inability to asked probing questions to seek clarifications, inability to determine the conditions under which the respondent responded to the questionnaire items was ability to generate high unresponsive rate (Sarantakos, 2013).

Again, structured and semi – structured questionnaire were designed by the researcher to collect data from Mathematics tutors in selected Colleges of Education. The questionnaire was in five sections (section A - E). The section "A" covered biographical data which sought information on the tutor's professional status, number of years he/ she had taught the subject and among others. The section "B", sought general information on how the mathematics tutors evaluate students during Mathematics lesson. The section "C' also covered the scoring practices used by Mathematics tutors during mathematics lesson. The section "D' talks about the indicators which suggests student's participation during mathematics lesson. The section "E" also addressed issues on teaching approaches or methods used by Mathematics tutors during Mathematics lesson. The questionnaire were open and closed ended and closed ended were made of three scale. The scale ranged from strongly agree, agree, neither agree or disagree, disagree and strongly disagree. It was only research question 4 which was range from never, sometimes and always. For convenience of the analysis of the data and discussion strongly disagree and

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disagree was merged as 'disagree' while strongly agree and agree was also merged as 'agree'.

Another instrument the researcher used for the study was observation check list. This was where the researcher observed the lessons of some Mathematics tutors and observed their formative assessment practice. Observation study involved the systematic recording of observable phenomena or behaviour in a natural setting (Gorman & Clayton, 2005). The value of observation permits the researcher to study people in their native environment in order to understand things from their perspective (Baker, 2006). In this study, the researcher used checklist during observation stage where tutors were observed in the classroom during instructional period.

Furthermore, another instrument the researcher for the study was interview guide. This was where the researcher interviewed the tutors whose lessons were observed to confirm what was observed during their lessons. Cohen et al (2007) sees interviewing as "a valuable method for exploring and negotiation of meanings in a natural setting". This was where respondents were free to express the views on issue without fear and panic.

According to Schostak (2006) added that, an interview is an extendable conversation between partners that aims at having an in-depth information about a certain topic or subject and through which a phenomenon could be interpreted in terms of the meanings interviewees bring to it. The value of an interview was not only for information but it also build a holistic snapshot, analyses of words, report detail views of informants and it enables interviewees to "speak in their own voice and express their own thoughts and feelings" (Berg, 2007). This was where the researcher used structured

interview guide to collect the needed information from participate for the purpose of the study.

Pilot Testing

For reliability of the instruments, the researcher conducted pilot testing of the instrument on a sample of 12 tutors randomly selected from two colleges in Central region. The questionnaires were administered personally to the respondents and were answered in the presence of the researcher. Modification was done based on the nature of pilot test. Therefore reliability coefficient for the alpha value of the pilot test was 0.837 which was good for the Low-Stakes testing.

Data Collection Procedure

The main purpose of this study was to assess formative assessment practices of mathematics tutors of selected colleges of education in Ghana. For the purpose of confidentially, tutors responses and name of tutors who participated in the research were not noted on the instruments to allay their fears of being exposed. All instruments (questionnaire, observation check list and interview guide) were administered to the tutors in the selected Colleges in Ashanti and Bono region by the researcher. The administration and collection of questionnaire was done within six months period and it delay the analysis of the work because Colleges were in examination week and as a result went on recess as soon as examination was over.

To ensure smooth collection of the data from the study Colleges, a letter of introduction was obtained from Department of Mathematics and ICT Education, College of Education Studies, University of Cape Coast to introduce the researcher in the administration of the questionnaires.

Permission was sought from Vice Principal of the selected Colleges of Education first, as the head of academic staff before administration of the questionnaire and tutors were given 35 minutes to respond to the questionnaire. Eight tutors were purposively selected for interview and observation based on their experience and willingness to take part in the exercise to see how the formative assessment was applied in their natural setting during teaching and learning process. Observation checklist was used during observation section to observe formative assessment practices in the classroom based on the stated research questions. The same tutors who were also interviewed to confirm what was observed in their classroom with interview guide. One major problem that was encountered during the study was the tutor's unwillingness to allow themselves for observation and interview exercise during the study and fear of bring out the facts they did not performed during observation period.

Validity and Reliability

Validity refers to the extent to which a test measures what we actually wish to measure (Cooper et al, 2011). To ensure validity of the research instruments, the questionnaire were given to the researcher's colleagues and supervisors for both face and content validity. Reliability of the test items were tested when twelve (12) from two colleges of education in central region were involved in the pilot test. Cronbach alpha was used to determine the reliability coefficient of the instruments. The overall reliability coefficient of the research instrument from the pilot study of the instruments was 0.837, Fraenkel and Wallen (2000) assert that "for research purposes, a useful rule of thumb is that reliability should be at .70 and preferably higher" (p.179) hence

the overall questionnaire was reliable. The reliability coefficient of the main research work instrument was 0.829 and it was really reliable for the study.

Data Processing and Analysis

In any study (research), the raw data collected from the field needs to be processed into meaningful and relevant information for decision – making. The data collected for this study were both qualitative and quantitative. The responses to the various items on the instruments (questionnaire, interview guide and observation checklist) was coded, entered into the computer and edited to enhance easy identification. The analysis of the data was done by using statistical package for social science (SPSS) software version 22.

Since data analysis was aimed at answering research questions that guided the study, data analysis was done and organized according to the study's research question. In order to clarify this, the research questions were re – stated here in turn and mode of the data analysis for the research question discussed. The items in the questionnaire were assigned values on five – points Likert – type scale format with strongly agree (5), agree (4), neutral (3), disagree (2) and strongly disagree (1). Because the scale was on five – point Likert – type scale format, it was put in to three points during the analysis with strongly agree and agree as 'agree', neutral and disagree and strongly disagree as 'disagree'.

Data from this study were both qualitative and quantitative in nature. The quantitative data was the one that used to solicit participants' responses on the socio demographic characteristic from the respondents and their knowledge on formative assessment practices at colleges of education in the selected colleges in the study area. Again, qualitative data was also used to

solicit participant knowledge on formative assessment practices to confirm their responses from the questionnaire.

Analysis of the data related to first research question

The first research question that guided the study was; 'How do mathematics tutors evaluate students during mathematics lesson?' The data for this research question came from mathematics tutors in the study colleges with the used of (questionnaire, interview guide and observation checklist). The questionnaire was analysed using frequencies and percentages while interview guide and observation checklist were used to confirm the results from questionnaire.

Analysis of the data related to second research question

The second research question that guided the study was; 'What are the scoring practices of mathematics tutors during mathematics lesson?' To answer the above research question, data from mathematics tutors in the study colleges with the used of (questionnaire, interview guide and observation checklist). The questionnaire was analysed using frequencies and percentages while interview guide and observation checklist were used to confirm the results from questionnaire.

Analysis of the data related to third research question

The third research question that guided the study was; 'What are the indicators that suggests students participate in mathematics lesson?' To answer the above research question, data from mathematics tutors in the study colleges with the used of (questionnaire, interview guide and observation checklist). The questionnaire was analysed using frequencies and percentages

while interview guide and observation checklist were used to confirm the results from questionnaire.

Analysis of the data related to forth research question

The forth research question that guided the study was; 'What teaching approaches do mathematics tutors used during mathematics lesson?' The data for this research question came from mathematics tutors in the study Colleges with the used of (questionnaire, interview guide and observation checklist). The questionnaire was analysed using frequencies and percentages while interview guide and observation checklist were used to confirm the results from questionnaire.

Chapter Summary

The chapter dealt with the discussion of the methodology that was adopted for the study. The convergent parallel design was employed for the study. It has been conceptualized as a triangulation approach whereby qualitative and quantitative results were brought together to explore a research problem from multiple angles to confirm results (Creswell & Clark, 2011). All 56 mathematics tutors in Ashanti and Bono region were sampled for the study through census sampling technique. Again, eight tutors were purposively selected for interview and observation based on their experience and willingness to take part in the exercise. Research instruments used for this study were questionnaire, interview guide and observation check list. The limitations were administration of the questionnaire and interpreting the data. The data administered when colleges were in examination session and interpretation of the data also take some time and all these affected the completion time of the thesis. The research question were analysed using

frequencies and percentages. Results from this chapter would be presented in chapter four.
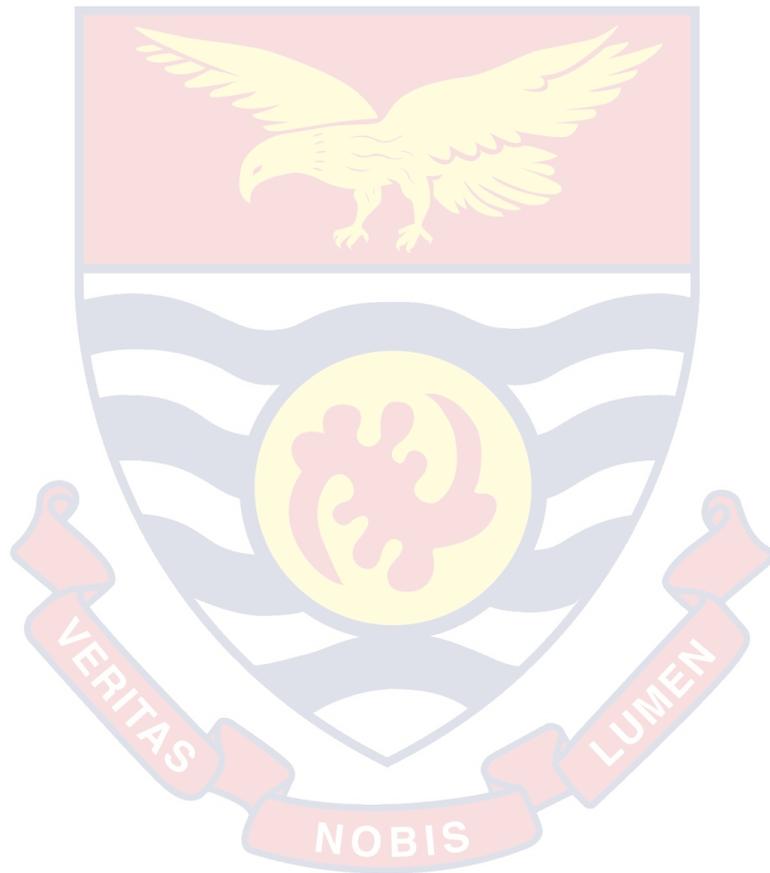
CHAPTER FOUR

RESULTS AND DISCUSSION

The purpose of this study was to assess formative assessment practices of mathematics tutors in some selected Colleges of Education in Ghana. The research design adopted for the study was convergent parallel design. Quantitative and qualitative data were used and they were collected at the same time; merged the results of the two and afterward searched for combination, uniqueness, logical inconsistencies or connections between the two datasets. The target population for the study were all Colleges of Education tutors in Ashanti and Bono Region in Ghana. The data for study were also collcted from 56 tutors in 12 Colleges of Education in Ashanti and Bono Region. Censue sampling technique was used for his study. Research instruments used for the study were questionnaire, interview guide and observation check list. The research questions for the study were analysed using frequencies and percentages.

In this chapter the information gathered from the field through the use of questionnaires, interview guide and observation checklist were analysed and discussed in sub-headings to throw more light on questions asked on the field in relation to the research questions.

Socio-Demographic Characteristics of Respondents

The socio-demographic characteristics of respondents were considered in the study are gender, educational qualification, working experience of the respondents, and age of respondents. The results is presented in Table 1.

Table 1: Results of Socio-Demographic Characteristics of Respondents

Characteristic	Frequency	Percentage
Gender		
Male	44	78.6
Female	12	21.4
Age		
25 - 30 years	2	3.6
31 - 36 years	13	23.2
37 - 42 years	16	28.6
Above 42 years	25	44.6
Highest Educational Attainment		
First Degree	2	3.6
Second Degree	54	96.4
Years of teaching Mathematics in College		
0 - 5 years	22	39.3
6 - 10 years	13	23.2
Above 10 years	21	37.5

Source: Field Survey, Adobah (2019)

Table 1 shows that 44 respondents representing 78.6% of the total number of participants were males while 12 representing 21.4% of the total numbers were females. This clearly shows that, there were more male participants than their female counterparts. Taking the age of respondents into accounts, it was revealed that 3.6% of the respondents were age between 25 - 30 years. About 23.0% of the respondents were age between 31 - 36 years. Again, it was revealed that 28.6% of the respondents had age from 37 - 42 years and 44.6% of the respondents had the above 42 years. This is an indication that majority of the respondents were matured and they will have some knowledge on assessment in relation to mathematics.

On the issue of tutors qualification, it was revealed that 54 (96.4%) of the respondents had second degree as their qualification while only 2(3.6%)

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had first degree at the time the data was collected. The results as in Table 1 showed that majority (96.4%) of the respondents had second degrees while the least (3.6%) respondents had their first degrees. It clearly show that majority of the respondents had degrees that make them understand issues when it comes to responding assessment in mathematics.

Analysis of data related to research question one

The first research question that guided this study was; ''How do Mathematics tutors evaluate students during Mathematics lesson?'' The data for this research question was obtained from mathematics tutors in the colleges that were involved in the study. The researcher used questionnaire, observation check list and interview guide to solicit the information from these tutors. The observation checklist addressed issues that really happen in the classroom during teaching and learning process. The interview guide result was to confirm what tutors really do during lesson delivery. The results from the questionnaire is presented in Table 2.
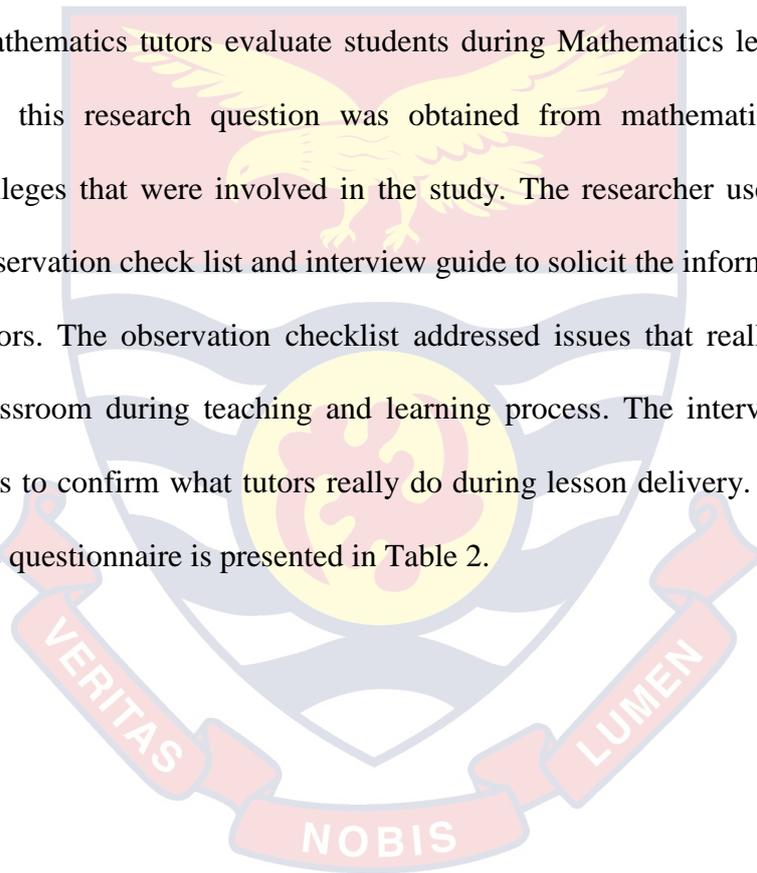
Table 2: Results on Evaluation of Students during Mathematics Lesson

Statement	D	N	A
1. I use oral test to assess students during lesson introduction	3 (5.4%)	25 (44.6%)	28 (50.0%)
2. I use oral test to assess students in mid – way of the lesson	3 (5.4%)	21 (37.5%)	32 (57.2%)
3. I use oral test to assess students during concluding part of the lesson	5 (9.0%)	11 (19.6%)	41 (73.2%)
4. I use class exercise to assess my students mid-way through the lesson	7 (12.5%)	20 (35.7%)	29 (51.8%)
5. I use class exercise to assess my students during the concluding phase of the lesson	1 (1.8%)	3 (5.4%)	52 (92.8%)
6. I usually give topics to my students to do presentation during mathematics lesson	4 (7.2%)	7 (12.5%)	45 (80.3%)
7. I usually give group work to students during mathematics lesson	1 (1.8%)	2 (3.6%)	53 (94.7%)
8. I usually give students individual task during lesson	3 (5.4%)	3 (5.4%)	50 (89.3%)
9. I use observation in the mid-way of the lesson to assess students	20 (35.7%)	11 (19.6%)	25 (44.6%)

Source: Field Survey, Adobah (2019)

Key: D = Disagree, N = Neutral and A = Agree

A cursory look at Table 2 indicates that only 3 (5.4%) of the respondents disagreed to the assertion of the use of oral test to assess students during lesson at the introductory stage of the lesson whilst 25 (44.6%) of the respondents remained indifferent to the assertion. Again, majority (n=28, 50.0%) of the respondents indicated that they use oral test to assess students during lesson at the introductory stage.

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Again, majority (n = 32, 57.2%) of the respondents indicated that they use oral test to assess students in mid – way (developmental stage) of their lessons. The results also showed 21(37.5%) of the respondents were neutral to the subject under discussion. However, only 3(5.4%) of the respondents disagreed with the use of oral test to assess students in mid – way (developmental stage) of their lessons. This clearly indicated that more than half of the respondents used oral test in mid – way of their lessons.

Analysis of results also revealed that majority (n = 41, 73.2%) of the respondents use oral test to assess students at the concluding part of the lesson while 11(19.6%) of the respondents remained neutral to the use of oral test during the concluding part of their lessons. Only 5(7.2%) of the respondents disagreed to the use of oral test to assess students during the concluding part of their lessons. On the use of class exercise to assess students during lesson, the results revealed that out of the total of 56 respondents, only 7(12.5%) disagreed with the use of class exercise in mid-way of the lesson. Majority (n = 29, 51.8%) of the respondents agreed to the used of class exercises to assess students in mid-way of the lesson while 20(35.7%) of respondents remained indifferent to the used of class exercise in mid-way of their lessons. It clearly indicates that more than half of the respondents used class exercises to assess students in mid-way of the lesson. It was also revealed that almost all (n = 52, 92.8%) of the respondents use class exercise to assess students during the concluding part of their lesson. Only 1(1.8%) of the respondents disagreed on the use of   class exercise to assess students during the concluding part of the lesson while 3(5.4%) of the respondents remained neutral to that assertion.

The use of presentation as mode of assessing students during mathematics lesson had shown that more than half (n = 45, 80.3%) of the respondents gave topics to students to present on during lesson. Again, 7(12.5%) respondents remained neutral to the assertion of giving topics to students to present during lesson while only 4(7.2%) of the respondents disagreed with the issue. On the issue of giving group work to students during lesson, the results revealed that almost all (n = 53, 94.7%) respondents that were involve in the study gave group work to students during lessons. Only 1(1.8%) of the respondents do not give group work to students during lessons while 2(3.6%) respondents remained neutral to the assertion.

The use of individual task to assess students during lesson was also considered on how mathematics tutors evaluate students during lessons. The results indicated that more than half (n = 50, 89.3%) of the respondents use individual task to assess students during lessons while 3(5.4%) of the respondents remained neutral to the assertion of giving individual task to assessing students during lesson. About 5% of the respondents indicated that they do not use individual task to assess students during lessons.

Additionally, it was revealed that 20(35.7%) of the respondents disagreed to that assertion of using observation to assess students in mid – way of the lesson. Again, almost half (n = 25, 44.6%) of the respondents also agreed to the assertion of using observation to assess students in the mid – way of the lessons. About 12% of the respondents remained indifferent to the use of observation to assess students in mid – way of the lesson.

Interview Results on how Tutors Evaluate Students during Lesson

All the eight respondents used during the interviewed indicated that they assess their students during lessons. The assessment strategies used include: oral questions, short quizzes, short test, class exercise, diagnostic test and group work. In terms of the oral questioning, five respondents use this approach in their formative assessment. Short test however, was indicated to be used by two of the respondents while diagnostic test was used by only one respondent from the eight respondents that were interviewed. Oral test was used by majority (5) of the respondents because it was perceived to be easiers to use during lessons. Also oral test helps to involve every student during teaching and learning process. It was used by majority of the respondents who had the view that it helps to involve students during lessons. Tutor coded A002 said that: "*I used oral test to assess my students more than any other assessment technique because it is easy and quick way to find students' understanding of the lesson taught''*. Tutor B001 also said that: "*I used oral test to assess my students since it help me to give instant feedback to students during teaching and learning process".*

Observation Results on how Tutors Evaluate Students during Lesson

All the eight respondents observed during the study revealed that they all assess students during lessons. The methods or mode of their assessment include; question and answer, oral question, short exercise, individual work as well as group work. From the study, more than half (5) of the respondents used oral question, individual work and short exercises to assess their students during lesson. It was also revealed that two respondents used question and

answer to assess their students while only one tutor used group work to assess his or her students during lesson.

On the issue of feedback given to students after responding to question in class, it was revealed that almost all respondents (6) responded good or very good after a students had given correct answer to a question. It was also revealed that only two respondents (tutors) indicated that the use of hands shake when students answer question corretly during lesson.

In general, the results from both quantitative and qualitatitave data (questionnaire, interview and observation) revealed that tutors involved in the study use various method such as oral questions, class exercises, group work, observation, presetntations, etc to assess their students at the introduction stage, mid – way and in the conclusion stage of their lessons. While from the questionnaire, tutors indicated that they usually use group work and presentation to assess students, the observation and interview results indicated otherwise. From all the lessons observed, no presentation was observed while group work was somehow used by the tutors to assess students. From both the interview, observation and questionnaire, it was realized that most prevelant means of assessing students was the oral and written exercises as tutors indicated that the find these methods very quick and essay to assess their students' understanding of mathematics concepts.

Analysis of Data related to Research Question Two

The second question that guided this study was: "What are the scoring practices of Mathematics tutors during Mathematics lesson?" This research question basically sought to find out the scoring practices used by Mathematics tutors that were involved in this study. The data for this research

question was collected from mathematics tutors in the Colleges at Bono and Ashanti region in Ghana. The researcher used questionnaire, observation check list and interview guide to solicit information from these tutors from these Colleges for the study. Table 3 presents the results of scoring practices enacted by these tutors in their various Colleges.

Table 3: Results on Scoring Practices of Mathematics Tutors during Lesson

Statement	D	N	A
1. I usually award marks to students when they respond to oral questions in class	15(26.8%)	29(51.8%)	12(21.5%)
2. I score students exercise during lesson	3 (5.4%)	13(23.2%)	40(71.4%)
3. I score students during presentation exercise	_	5 (8.9%)	49(87.5%)
4. I usually award marks during group work	_	2 (3.6%)	53(94.6%)
5. I score individual task during lesson	7 (12.5%)	6 (10.7%)	43(75.8%)
6. I usually observe students during lesson and award marks	28(50.0%)	11(19.6%)	17(30.4%)

Source: Field Survey, Adobah (2019)

Key: D = Disagree, N = Neutral and A = Agree

Table 3 indicated that majority (n = 29, 51.8%) of the respondents remained neutral to how tutors scored their students during lessons. It was also shown that 15(26.8%) of the respondents disagreed to the assertion of awarding of marks to students when responded to oral questions during lessons while 12(21.5%) of the respondents agreed to the awarding of marks to students when responded to oral questions during lessons.

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Additionally, it was revealed that majority (n = 40, 71.4%) of the respondents agreed to the assertion of scoring students exercise during lesson. However, only 3(5.4%) of the respondents disagreed to the assertion of scoring students exercise during lessons while 13(23.2%) of the respondents remained neutral to the assertion of scoring students exercise during lessons.

Analysis of the results also revealed that 49(87.5%) of the respondents agreed to the assertion of scoring students during presentation exercise. Only 5(8.9%) of the respondents were indifferent to the issue. Majority (n = 53, 94.6%) of the respondents who were engaged during the study award marks to their students during group work. However only 2(3.6%) of the respondents remained neutral to the issue.

Table 3 revealed that majority (n = 43, 76.8%) of the respondents scored individual tasks during lessons. Again, only 6(10.7%) of the respondents were indifferent to the assertion of scoring individual task during lessons while 7(12.5%) of the respondents disagreed to the issue of scoring individual tasks during lessons.

Again, it was clearly indicated that half (n = 28, 50.0%) of the respondents disagreed to the assertion of awarding marks to students work when observed them during lessons. It was also revealed that 17(30.4%) of the respondents agreed to assertion of awarding marks to students work when observed them during lessons. However, 11(19.6%) of the respondents remained neutral to the assertion of awarding marks to students work when observed them during lessons.

Interview results on how tutors scored students during lesson

All the eight respondents interviewed during the study responded that they score students during lessons. The methods or mode of scoring their students include; scoring exercises, scoring presentations, scoring observations, individual scoring and scoring of group work. It revealed that most tutor score their students exercises during lessons. When respondents were asked about how they scored their student orally, they could not give any reasonable explaination. For example, respondents coded 'C001' indicated that '*when students give an answer to questions orally I make them aware whether they are wrong or right but I don't give them any score'*.

Out of the 8 respondents who were interviewed, six respondents indicated that they scored their students exercise without awarding marks. Tutor coded D002 said that: "*I normally give exercises to students in class during lessons and I marked without scoring"*. This means that tutors only marked to indicate whether the students is wrong or right.

 Observation results on how tutors scored students during lesson

On the issue of scoring practices among mathematics tutors from the Colleges that were involved in the study, it was revealed that all the eight respondents observed during the study marked their students work during lessons. Some of the respondents marked students with a prepared scoring key while other marked without scoring key during lessons. Out of the eight respondents observed during the study, only one of respondents marked students work with scoring key during lessons while the majority (7) of respondents marked students work without scoring key during lesson. It was revealed that two of the respondents from the study marked and assigned

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numerical score to the marked work. It was shown that five (5) of the respondents marked students work without assiging numerical value to them during lessons.

It was shown that six (6) of the respondents engaged in the study wrote comments like 'good' after marking students work during lessons. The comment 'good' serve as motivation to most students in class and it inspired them to do better in the subsequence days as far as teaching and learning is concerned. It was only two respondents who wrote 'keep it up' after marking students work during lessons.

The results as presented on scoring practices of Mathematics tutors, revealed that respondents from the colleges that were involved in study marked students exercises, presentations, individual tasks and group work during lessons. However, some of these works are not marked with numerical scores. As indicated in the questionnaire most tutors were not sure whether they award marks to students when they respond to oral questions in class. From the interviws and the observations, it also came to light that class exercises also marked without assigning numerical scores as tutors only indicates whether answers were wrong or right.

Analysis of Data related to Research Question Three

The third research question that guided this study was: "What are the indicators that suggests students participate in Mathematics lesson?" To answer this research question, data gathered from 56 Mathematics tutor at Colleges in Bono and Ashanti region. Table 4 presented results on indicators that suggest students participation during Mathematics lessons.

Table 4: Results that Suggest students' Participation in Mathematics Lesson

Statement	D	N	A
1. Students interact with other colleagues by way of asking them for explanation during lesson	_	16 (28.6%)	40 (71.4%)
2. Students are always eager to respond to question during lesson	1 (1.8%)	16 (28.6%)	39 (69.6%)
3. Students are eager to do any mathematics exercise given to them during lesson	2 (3.6%)	13 (23.2%)	41 (73.2%)
4. All students take part in group work given to them during lesson	2 (3.6%)	13 (23.2%)	71 (73.2%)
5. Students do request for extra assignment for further practice	15 (26.8%)	31 (55.4%)	10 (17.8%)

Source: Field Survey, Adobah (2019)

Key: D = Disagree, N = Neutral and A = Agree

Majority (n = 40, 71.4%) of the respondents have indicated that their students interact with each other when the need arise during lessons. However, the result in Table 4 showed that 16(28.6%) of the respondents remain indifferent to the assertion.

Additionally, it was revealed that half (n = 39, 69.6%) of the respondents indicated that their students were eager to answer questions during lessons. Only 1(1.8%) of the respondents disagreed to the assertion of their students eager to answer questions during lesson while 16(28.6%) of the respondents remain indifferent to the assertion of students eager to answer questions during lesson.

Table 4 revealed that more than half (n = 41, 73.2%) of the respondents agreed to the assertion that students were eager to do any

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exercise during lesson. Only 2(3.6%) of the respondents disagreed to that students were eager to do any exercise during lesson while 13(23.2%) of the respondents remain indifferent to the assertion that students were eager to do any exercise during lesson.

Majority (n = 41, 73.3%) of the respondents agreed that their students take part in group work during lesson. Only 2(3.6%) of the respondents disagreed that students their take part in group work during lesson while 13(28.6%) of the respondents remain indifferent to the assertion that students take part in group work during lesson.

On the issue of whether students do request for extra assignment for further practice, it was revealed that more than half (n = 31, 55.4%) of the respondents remain indifferent to the assertion that students request for extra assignment for further practice. Only 10(17.8%) of the respondents agreed that students never requested for any extra assignment for further practice while 15(26.8%) of the respondents disagreed that students requested for extra assignment for further practice.

Interview Results on how Tutors Ensured Students Participation in Lesson

All the eight respondents interviewed during the study indicated that they ensure students or learners participation during lessons. These respondents indicated that the various ways through which they sure students participation include; equity in class, involving students in practical work, class discussion, asking of oral questions, class presentation, answer questions in class, students requesting for assignments, group work and individual work supervised by tutors during teaching and learning process.

Majority (5)of the tutors interview indicate that they ensured students participate in their lessons through asking of oral questions during lessons and involving students in practical work. Tutor coded D001 indicate that; '*I used questions and answers to ensure students participation during my lesson*. This means that tutors asked questions during instructional hours and students are called to answer while tutor indicate whether they wrong or right. Another section of tutors interviewed also indicate that they ensured learners participate in their lesson through class discussion, engaging students in practical work and also group work during lessons. Tutor coded C001 indicate that; *I always used class discussion during lessons to student to ensured students engagement in my lesson*. Two respondents also indicated that they used class presentation during lessons to ensured students participation in class. Tutor coded B001 indicate that; *using class presentation always make my students prepared in advanced before coming to class*.

Observation Results on how Tutors Ensure Students Participation in Lesson

From the results it was revealed that all the students take part in class work during lessons. Some of the activities that tutors used to ensure students participation include; students asking questions during lessons for clarifications, students answering questions during lessons, students solving questions in class, students interacting with each other when the need arise, students writing core points as their note in class and students pay attention in class during lessons.

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During the lesson observation, it was revealed that students did not ask questions in three of the tutor's class. However, it was also revealed that students participate in the lesson by asking several questions for clarification in the case of the five tutors class. Also, in the class of those five tutors lessons observed students were also answering questions, and writing note for future reference.

In general, the results as presented on how students participate in the lesson revealed that the tutors from the Colleges that were involved in study often ensured students participation in the lesson by students asking questions for clarification, writing note for future reference and participation in group work. It really confirm from the three instruments used to collect the data that tutor asked questions to ensured students participation during lessons. Tutors said they used practical work to ensured students participation during lessons but all the lessons observed it was not seen.

Analysis of Research Questions Four

The fourth research questions was; "What teaching approaches do Mathematics tutors used during Mathematics lesson?" In order to answer this research question data was obtained from Mathematics tutors at Colleges in Bono and Ashanti Region. questionnaire, observation and interview were used. Table 4 presented results on teaching approaches Mathematics tutors used during Mathematics lesson.

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Table 5: Results on Approaches Tutors used during Mathematics Lesson

Statement	N	S	A
1. I use conventional method in my lesson delivery	8 (14.3)	-	48 (85.7)
2. I use practical activity in my lesson delivery	2 (3.6)	1 (1.8)	53 (94.7)
3. I encourage work base learning during mathematics lesson	3 (5.4)	1 (1.8)	52 (92.9)
4. I use seminars in my lesson delivery	9 (16.1)	30 (53.5)	17 (30.4)
5. I encourage independent study during mathematics lesson	1 (1.8)	5 (9.0)	50 (89.2)
6. I do use technology in my lesson delivery	11 (19.6)	1 (1.8)	44 (78.6)
7. I usually encourage application of mathematics to real life situation during mathematics lesson	2 (3.6)	-	54 (96.4)

Source: Field Survey, Adobah (2019)

Key: N = Never, S = Sometimes and A = Always

Results in Table 5 show that (n=48, 85.7%) of the respondents indicated that they always used conventional method in their lesson delivery while 8(14.3%) of the respondents responded that they never used of conventional method in their lesson delivery.

Additionally, it was revealed that (n = 53, 94.7%) of the respondents always used practical activity in lesson delivery while 2(3.6%) of the respondents responded that they never used practical activity in lesson delivery. Only 1(1.8%) of the respondents indicated that he/she sometimes used practical activity in his her lesson delivery. Majority (n = 52, 92.9%) of the respondents indicated that they always encourage the used of work base learning during lesson while 3(5.4%) of the respondents indicated that they

never used of work base learning during lesson. Only 1(1.8%) of the respondents responded that he/she sometimes used of work base learning during lesson delivery in the Colleges that were involved in the study. Analysis of the results also show that (n = 30, 53.5%) of the respondents sometimes used of seminars in their lesson delivery while 17(30.4%) of the respondents always the used of seminars in their lesson delivery. However, only 9(16.1%) of the respondents indicated that they never used of seminars in their lesson delivery.

Again,, it was revealed that out of the total respondents of 56 tutors only 1(1.8%) of the respondents indicated he/she never used of independent study or learning during his/her lesson. Majority (n = 50, 89.2%) of the respondents always used of independent study or learning during mathematics lesson while 5(9.0%) of the respondents sometimes used of independent study or learning during lesson. It was obvious that more than half of respondents encouraged the use of independent study or learning during lesson in the colleges that were involved in the study.

It was revealed that more than half (n = 44, 78.6%) of the respondents always used of technology in lesson delivery. Only 1(1.8%) of the respondents sometimes used of technology in lesson delivery while 11(19.6%) of the respondents never used of technology in their lesson delivery.

Table 5 indicate that almost all (n = 54, 96.4%) respondents always apply mathematics to real life situation during lessons. However, only 2(3.6%) of the respondents never apply mathematics to real life situation during lesson in the Colleges that were involved in the study.

Interview Results on Teaching Approaches Mathematics Tutors used during Lesson

On the issue of teaching approaches normally used by mathematics tutors to ensure effective teaching and learning during lesson includes; activity method, discussion method, discovery method, lecture method, demonstration, repository method, brain storming, question and answer method and role – play. Five of the tutors interviewed indicated that they normally used activity method, discussion method, discovery method and lecture method to ensure effective teaching and learning of mathematics. Tutor coded A002 indicate that; *I used discussion method to enhanced the understanding of Mathematics concept during my lessons.* Two tutors out of the eight tutors interviewed indicated that they use brain storming and question and answers methods during lesson delivery. This where a tutor codec D002 indicate that; *I normally used question and answers methods during my lesson to ensured students understanding of concepts.* However, a tutor indicated that he or she used role – play and repository methods during lesson delivery.

Again, five tutors from the eight tutors interviewed explain that the above methods were normally used during lesson because it enhances learners understanding of the mathematics concept during teaching and learning process. Three tutors also indicated that, the above methods mentioned helped tutors to take care of individual differences during lesson delivery. Also, for learner to discovery new things for themselves tutors tried to put learners in the center of discussion during teaching and learning process.

On the issue of how to improve formative assessment in colleges of education, majority of the tutors (4) indicated that the course outline must be reduced in order to ensure effective formative assessment in the colleges. For improvement of formative assessment practices; '*in - service training on assessment must be organized for all tutors at colleges of education*' (A002). For effective use of formative assessment practices; '*Systems must be put in place to ensure fairness in the marks given to students as continuous assessment*' (B001).

Two tutors also indicated that tuotors should encourage the application of mathematics into real situation in order ti arouse and substain students in mathematics lessons.

Observation Results on Teaching Approaches Mathematics Tutors used during Lesson

One of the issues the researcher considered during the observation was the methods mathematics tutors used during lesson. It was observed that all the eight tutors observed during the study used various methods during lesson delivery. Among the methods used by the mathematics tutors includes; activity method, discussion method, lecture method, discovery method, group work,g individual teaching, student – centered approach and question and answer method.

Out of the eight tutors observed during the study, it was revealed that 5 tutors used lecture method, activity method, discussion method, student – centered approach and discovery method. However, three of the tutors used group work, question and answers and individual teaching during lesson delivery.

In general, the results from the three instruments revealed that majority of the tutors from the Colleges that were involved in the study used concentional methods of teaching, practical activity, group work, independent study as teaching approaches during lessons. Tutors mentioned application of mathematics into real life situation in questionnaire but in the qualitative data it was not demonstrated in the lessons observed. Also from the questionnaire tutors indicated the use of technology in their teaching but much was not seen during observation of their lessons.

Discussion of Results

How Mathematics Tutors Evaluate Students during Lesson

The results from research question one has indicated that majority of the tutors used oral question to assess their students in the introductory stage, mid – way and in the concluding stage of their lessons. The use of oral test by the respondents in most of their interactions with students in their class confirmed the study of Black (2010) that the heart of the formative interaction is the active involvement of students by asking questions and demanding responses during teaching and learning process. This is when learners call for more clarification on concept they do not understand during teaching learning process.

Tutors also use that platform to explain the concept to the learners in a different way for their understanding. These promote constructivist-learning approach where learners are given the opportunity to help them build on prior knowledge and understand on how to construct new knowledge from authentic experience. When learners are able to construct their own sentence during lesson, it help them to understand the concept very well. Again, tutors can

evaluate him / herself during teaching and learning process. Thus tutors can see if learners have really understood the lesson.

Oral questioning as formative assessment is essential tool for evaluating lesson because it is the easy and fastest way to assess learning outcome of the learners. The results has confirmed the work of Black, Harrison, Lee and Marshall (2003) which states that teachers must not encourage only to develop more effective questions but also to facilitate an environment where students must think analytically and provide their own answers to their questions. Much opportunities must be given to learners in the classroom to express themselves orally during teaching and learning process. When tutors make their lesson more learner centered, students feel to be part of the class and at the end it promotes learning. Opportunity given to the learners to express themselves orally in the class during lessons is another way of developing their speaking skills indirectly and it aids in their creativity, reading and writing skills as well as their listening skills.

The use of oral question in class as means of assessing learners always make students critical thinkers in the teaching and learning process. This makes students to pay attention in class since they can be called to answer question at any time. The finding is also in accordance with Scriven and Paul (2003) who saw critical thinking as an intellectually disciplined process in which students actively and skillfully conceptualize, apply, synthesize and evaluate information generated by observation, experience, reflection, reasoning and communication. This implies that student who really pay attention in class are able to analyse issue very well and apply it in different learning environment and its enhances his or her understanding of concepts.

Students who carefully pay attention in class, it help him / her to answer questions during lessons and are able to conceptualize, synthesize and apply information obtained in the new state. These students are able to answer such questions very well during end semester examination because they were able answered it oral in class and they could also transfer that idea to final examination.

The implication of the finding is that tutors using oral test to assessing students during lesson at the various stages of instruction suggest that students would perform better in their end of semester examination. Again, their assessment results will also be high to improve their final grade in order to assist these students for further study.

Scoring Practices of Mathematics Tutors during Lesson

The results from research question two has indicated that majority of tutors from the colleges that were involved in study scored students exercise, presentations, individual task and group work during lessons. The scoring of students work by the tutors during lesson can be done in different ways and this confirms the work of Clark (2008) who suggests that the use of a variety of teaching and assessment methods can stimulate learner's achievement, while pointing to the importance of specifying success criteria and learning intentions in any assessment settings.

The use of different scoring practices (assessment tools) help the tutors to really know the strength and weakness of each student as well as formative assessment practices is concerned. This tell the tutors the kind of assessment they can conduct in order to inspire the learners in the learning process. The

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assessment area where the learners perform best tells the tutor where the learner strength can be identified.

Tutors who scored individual students task during lesson help them to identify how each student's is progressing during the lesson and particular attention could be given to individual student with learning challenge. This is supported by the work of McMillan (2008) who found that assessing students in classroom level is very critical because effective decision making is based to some extent on the ability of teachers to understand their students. Tutors can find appropriate solution to students with learning difficulties during instructional period and it can be done in the form of addition tuition for such students or whole class teaching.

From the study it was revealed that majority of the tutors scored students in group work and thus one way of making students responsible during lesson. This affirm to the early work Black, Harrison, Lee, Marshall and William (2004) who find that classroom dialogue, exercises and peer groups are forms of formative assessment which used to assess students' progress in classroom. Thus the useful ways of helping students change from passive recipients of the knowledge to active learners during lessons. When students are taught of specific rules during lessons it makes them responsible in the lesson and it really make them active participant of the lesson. Therefore scoring students during group work is important scoring practices in formative assessment practices in the Colleges of Education as far as teaching and learning is concerned.

The study revealed that tutors scored students during presentations in class. This finding confirms to Foster's work (2003) that the integration of

mixed teaching methods and assessments by tutors involving both exercises and assignments (presentations), monitoring students' progress, advising on the progress, giving sufficient practices and giving feedback to practices in teaching mathematics can contribute to effective learning. Teaching, learning and assessment are methods that play a primary role in fostering good learning and contributes to students' achievement. Therefore, when teaching, teachers have the responsibility to apply a variety of teaching and assessment methods it improve learning outcomes that sure high score of the learners.

The implication of the finding is that tutors using various forms of scoring practices during lesson would encourage students to learn hard in order to enhance their performance since their weakness can be identify and address during lessons.

Indicators that Suggests Students Participation in Mathematics Lesson

The results from research question three on how tutors ensure students participation during lesson has revealed that majority of the tutors from the study Colleges often ensured students participation in their lesson through responding to questions in class, taking part in class exercise and active participation in group work as well as interacting with other colleagues by asking for explanation during lessons.

In the study it was revealed that majority of tutors often ensured learners participation through active participation in group work and as well as interacting with other colleagues for specific explanation during lessons. This corroborates work done by Everly (2013) who compared exam results of students who had lecture-only preparation to those who had active learning activities in the classroom. It was revealed from her work that students who

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had active learning strategies scored significantly higher on a standardized assessment test than students who received lecture only. This implies that teaching which ensure full participation of the learners during lessons promotes learning and it therefore brings higher performance at end of student programme.

It was also found out that majority of the tutors often ensure students participation in class through asking students questions and while students also showed eagerness to answer questions in class during lessons. This confirms the work done by Trowler (2010) that student engagement is the cumulative time, effort and other resources invested by both students and their institutions to enhance student development. This is where tutors should make it a point to engage learners frequently in the teaching and learning process through asking of questions during lessons to ensured learners understanding of concept and participation. When tutors asked questions during lessons it's arouse and sustained learner's interest in the teaching and learning process. Students who answer question in the class and get it correct, intrinsically they are motivated and it's enhances their performance in the particular subject (mathematics).

Again, it was revealed that majority of tutors often ensure students participation through taking part in class exercises during lessons. Benner *et al.* (2009) did not support this finding by recommending integrating classroom and clinical teaching techniques, moving from an emphasis on critical thinking to an emphasis on clinical reasoning and developing teaching methods that are focused on the learners, such as simulations, unfolding case studies and live interviews. This is where paper and pencil test issue should not be encouraged during lesson but rather assessment should focus on practical work or inbuilt

abilities from the learners. Student's participation does not only add interest to a course, but it also provides avenue for tutor to promote active learning and assess understanding of topic taught.

It was shown that almost half of respondent's responded that students sometimes requested extra assignment for further practice after lessons. This help students to bring their previous learning experiences to enhance effective teaching and learning process after taken work home to practice. This confirms the work of Phillips (1995) that learners come to learning situations with knowledge gained from previous experience, and that prior knowledge influences what new or modified knowledge they will construct from new learning experiences. This is where learners are able to use the knowledge again from classroom to a different environment to construct new ideas. The tutors who give students opportunity to construct their own knowledge from their learning experience belief in constructive learning theory. The finding is in accordance with Driscoll (2000), who stated that constructivism learning theory is a philosophy which enhances students' logical and conceptual growth. The underlying concept within the constructivism learning theory is the role which experiences-or connections with the adjoining atmosphere-play in student education. The constructivism learning theory argues that people produce knowledge and form meaning based upon their experiences.

Constructivism promotes social and communication skills by creating a classroom or environment that emphasizes collaboration and exchange of ideas. Students learn how to articulate their ideas clearly as they collaborate on tasks effectively by sharing in group projects or work. Students therefore

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exchange ideas and learn to "negotiate" with others and to evaluate their contributions in a socially acceptable manner.

The implication of this finding is that tutors ensuring students participation in class through several means would ehance their learning and it would therefore bring good performancein their internal examination. Again, it would promote socialization and cooperative learning among learners during teaching and learning process.

Approaches used in Teaching Mathematics during Mathematics Lesson

The results from research question four on teaching methods or approaches used by mathematics tutors during lessons. It was revealed that majority of the tutors from Colleges that were involved in the study used conventional method, practical activity, group work, and independent study as teaching approaches during mathematics lesson. It was also revealed that majority of the tutors encourage the application of technology in the teaching of mathematics and applying mathematics to real life situations.

In reference to method of teaching mathematics, it was revealed that majority of the tutors used conventional method during teaching and learning of mathematics in the study colleges. This affirm to the work of Leong (2012) that the approach of teaching mathematics is mainly teacher centred which is characterized by transmittal techniques to the used of chalk and talk, dominated by teacher talk, making students to completely depend on teachers. This is where the tutors teach without involvement of the learners during lesson. In contrast, a learner-centred teaching approach is one that supports learners in developing mathematical reasoning, while encouraging them to perceive the teacher as someone who is there to help them make sense of

mathematics while creating contexts which help them develop meaning in mathematics (Brodie, 2006:543; Yashau, Mji & Wessels, 2005:20). In learner-centred teaching approach the learner is able to construct his or her own knowledge base on his or her previous learning experience.

It was again indicated that majority of the tutors that were involved in the study always used practical activity and group work as teaching approaches in teaching mathematics. This finding is in accordance with Brodie (2006); Yashau, Mji, and Wessels (2005) that learner-centred teaching approach is one that supports learners in developing mathematical reasoning, while encouraging them to perceive the teacher as someone who is there to help them make sense of mathematics while creating contexts which help them develop meaning in mathematics. It give the learners opportunities to construct their own knowledge base on their previous learning experience gain from previous lesson or from other subject area.

Activity oriented lesson help the tutor to used varieties of teaching and learning materials to ensure better understanding of the lesson or topic treated or being treared during teaching and learning process. All the students get to know the difference between aids and materials and the role of materials in the classroom and its impact on the teaching of specific topic. Activity based lesson try to engage the whole learners in the lesson and it arouse and sustaineds their interest in the lesson. The use of a variety of teaching approaches and styles is recommended, because it can "encourage adapt-ability and lifelong learning in the teaching–learning process" (Vaughn & Baker, 2001). The use of group work in mathematics lesson ensure active participation of all the learners in the lesson and cooperative learning among

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learners. Leadership skills are developed in group work since leaders are appointed in group work.

Again, it was revealed that majority of tutors encouraged the use of independent learning or study approaches during mathematics lesson. Independent learning or study helps the tutor to attend to individual students during instructional period with instructional materials that will aid their understanding of concept or topic being treated. This is in accordance with Rapp (2009) that manipulatives have been shown to help improve both achievement and motivation in mathematics among all students, especially visual-spatial learners. When student's manipulative with instructional materials during lesson it aid their understanding of the concept and it also serve as motivation to the students. The use of instructional materials help the tutor to teach effectively as far as teaching mathematics is concerned.

The results indicated that majority of tutors applied technology in the teaching of mathematics and also applied mathematics in real life situations. The application of information communication technology in teaching of mathematic help the learners to easily understand the concept of mathematics. This finding is in accordance with Zhang & Liu, (2016) who also find that in mathematics education it shown that integration of Information and Computer Technology (ICT) in teaching mathematics changes the nature of teaching and learning of Mathematics in classroom. The use of (ICT) in teaching mathematics, learners develop special interest for the teaching and learning of the subject (mathematics). It also aroused and sustained the interest of learners and tutors find easy to explain concept which seem to be difficult to the learners. ICT seems to provide a focal point which encourages interaction

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between learners and the technology itself. This implies that ICT used in instruction support constructivist pedagogy, where learners use technology to explore and reach an understanding of mathematical concepts which seem to be complex. Introduction of (ICT) in to teaching is way of making a teaching child centred approach where every learners have the right to express his or her view during instructional period.

Application of mathematics into real life situations was one of the findings in this study by most tutors in study Colleges. Miller (2009) support the argument that the connection of mathematics to real-world contexts gives teachers the opportunity of making mathematics seem more accessible and enjoyable to learners. The study of mathematics must be related to real life situation so that learners will see its importance in the environment they found themselves. In contrast, Leder, and Forgasz (2003) also argue that students do not appreciate mathematics to the extent that they do not see how mathematics will ensures efficiency in all human endeavors, especially how it applies to their future professions. Therefore, tutor who teach mathematics should related the teaching of the subject to real life situation as it was find in the study. In accordance with Boaler (2006) he advises that teaching should draw upon rich mathematical activities, which have high intellectual demand, instead of resorting to rote learning, so that it can inculcate a positive mindset towards mathematics. So that learners will develop positive attitude toward the learning of mathematics to high level.

The implication of the finding is that the use of several teaching methods or approaches would ensure proper understanding of concepts or topics during lessons. This where individual differences can be cater for and it

would therefore improved students performance as well as assessment scores (marks) of the students.

Chapter Summary

The chapter presented four research questions and one hypotheses to be tested. The results have indicated that tutors use oral question to assess students at the introductory stage, mid – way and in the concluding stage of their lesson. It was revealed that tutors scored students exercises, presentations, individual tasks and group work during lessons. It was again revealed that tutors ensure students participation in the lesson by students asking questions for clarification, writing note for future reference, taken part in class exercises and participation in group work. It was indicated that majority of the tutors used conventional method, practical activity, group work, independent study as teaching approach used during lessons.
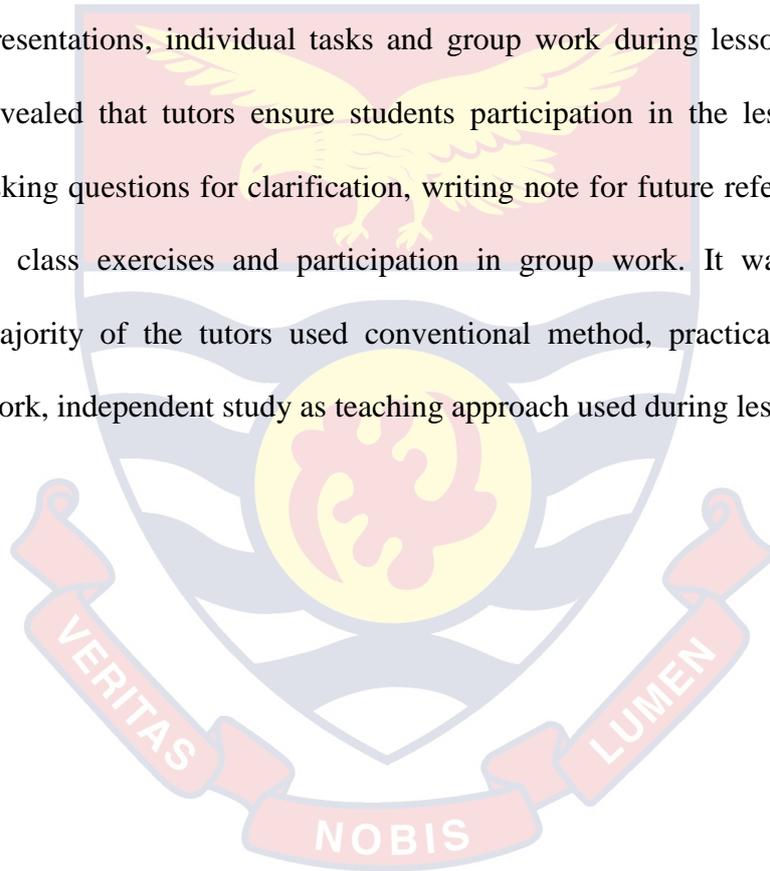
CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter being the final chapter for this research presents the summary of findings made from the analysis of data, the conclusion that could be drawn on the analysis made and the necessary recommendations made for future research work. The purpose of the study was to assess formative assessment practices of Mathematics tutors in selected Colleges of Education in Ghana**.** Four research questions were used to find out formative assessment practices of Mathematics tutors at Colleges of Education in Ashanti and Bono Region.   Fifty six (56) respondents were used for the study. In order to answer each of the research questions, convergent parallel design was adopted for the study. Questionnaire, interview and observation guide were the instruments used to collect data for the study.

Summary

Many interesting findings were revealed through this study and these are outline below.

1. The study revealed that majority of the respondents used oral test to assess students at the introduction stage, mid-way (developmental stage) and at the conclusion stage of the Mathematics lessons.

2. It was revealed that tutors scored students exercises, presentations, individual tasks and group work during Mathematics lessons.

3. It was again revealed that tutors ensured students participation in the lesson by students asking questions for clarification, writing

notes for future reference, taking part in class exercises and participation in group work.

4. It was indicated that majority of the tutors used face to face, practical activity, group work, independent study as teaching approach used during Mathematics lessons.

Conclusion

The study concludes that formative assessment practices of Mathematics tutors of the selected Colleges of Education in Ghana was found to be inappropriate. This is because, majority of the respondents used oral test to assess students during lessons and this may due to facts that other forms of assessment may be time consuming for the tutors. The study has also brought to the light that tutors ensured students participation in mathematics class using differents methods or approaches. This may due to tutors attend professional development to improved their teaching strategies as well as mathematics is concerned. The study has brought to bear the better understanding of assessment practices by mathematics tutors in the selected colleges of education in Ghana.

Implication for the Study

1. Tutors using oral test to assess students during lesson at the various stage of instruction suggests that students would do better in their end of semester examinations.

2. Tutors using various forms of scoring practices during lesson would encourage students to learn hard and it will enhance their performance since tutors would use several means of assessment before their final examination.

3. Tutors ensuring students participation in class through students asking questions for clarification, writing notes for future reference, taking part in class exercises and participation in group work would enhance students learning and it would therefore bring good performance in their semester examinations and this would help College authorities make good policies on assessment as far as teaching, learning and assessment is concerned.

4. The use of several teaching methods or approaches would ensure proper understanding of concept or topics during lessons and that would help the tutors to cater for individual differences during instructional period as far as assessment practices is concerned.

5. Regarding of how formative assessment is used by tutors in Colleges of Education, attempts should be made to provide extensive professional development opportunities that focus more on formative assessment practices to enable tutors to acquire more skills on how apply formative assessment during instruction period.

Recommendations

The following recommendations were made by the researcher to help address the issues raised by the respondents in this study. The results indicated that oral tests have been used to assess students at the various stages of instruction. It is therefore recommended that teacher educators from various Colleges of Education that were involved in the study should used other forms of assessment regularly.

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It is recommended that tutors from the colleges must assign mumerical scores to students work whether being class work or responding to oral questions.

It revealed from the study that students' response to questions in class, taking part in class exercise, taking part in group work and asking questions for clarifications were the means of ensuring students participation in class during lessons. It is therefore recommended that stakeholders (Principals and Heads of Department) in Colleges of Education should encourage tutors in Colleges of Education that were involved in the study to use these means to ensure learners participation in class. This will bring a deeper understanding of concept during teaching, learning and assessment.

The results indicated that majority of the tutors used conventional method, practical activity, group work, and independent study as teaching approaches during lesson. It is therefore recommended that authorities in Colleges of Education that were involved in the study should encourage tutors to use more of these approaches in their teaching since its enhance understanding of concept or topics to all learners as far as teaching, learning and assessment is concerned.

Suggestion for Further Studies

It is suggested that the study should be done in the rest of the Colleges of Education in Ghana to ascertain how formative assessment is done in those colleges and its impact on students' academic performance. This research work, due to time and other limitations, could not extensively explore all areas of the research; therefore students who wish to do extensive work on similar topic can use this study as a base for further research.

REFERENCES

Airasian, P. W. (1994). *Classroom assessment*. New York: Mc Grant Hill.

Aitkin, J. M., & Sinnerma, D. (2008). Looking at how students reason. *Educational leadership. 80*(2), 139-148.

Akinbobola, A. O. (2004). Effect of cooperative and competitive learning strategies on academic performance of students in Physics. *Journal of Research in Education. 1*(1), 71 – 75.

Akyeampong, K. (2013). Country report one - *Teacher training in Ghana – Does it count*? Department for International Development: Educational Papers (1- 138).

Ali, L. (2018). The design of curriculum, assessment and evaluation in higher education with constructive alignment. *Journal of Education and e-Learning Research, 5*(1), 72-78.

Allal, L., & Lopez, L. M. (2005). Formative assessment of learning: A review of publications in French. In organisation for economic co-operation and development, *Formative assessment-improving learning in secondary classrooms* (pp. 241-264): OECD Publishing.

Allen, *M. J. (2004). Assessing academic programs in higher education.* San Francisco: Jossey-Bass.

Althouse, R. (1994). *Investigating mathematics with young children*. New York: Teachers College Press.

Amoako, I. (2018). A meta-analysis on formative assessment practices in Ghana. *Research on Humanities and Social Sciences*, *8*(3), 2224-5766.

Amoako, I., Asamoah B. D., & Bortey, J. (2019). *Knowledge of formative assessment practices among senior high School mathematics teachers in Ghana*. 8-13.

Amoako, I., Asamoah, D., & Bortey, J. (2019). Knowledge of formative assessment practices among senior high school mathematics teachers in Ghana. *American Journal of Humanities and Social Sciences Research, 3*(3), 08-13.

Ampiah, J. G., Hart, K., Nkhata, B., & Nyirenda, D. M. C. (2003). *Teachers' guide to numeracy assessment instrument*. Nottingham: University of Nottingham.

Anderson, J. (2009). *Mathematics Curriculum Development and the Role of Problem Solving*. London: Churhill

Andersson, C., & Palm, T. (2017). Characteristics of improved formative assessment practice. *Education Inquiry, 8*(2), 104-122.

Andrade, H., & Du, Y. (2007). Student responses to criteria-referenced self-Assessment. *Assessment and Evaluation in Higher Education*, 32 (2), 159-181.

Armah, B. D. (2013*). Mathematics teachers' perception on classroom assessment and practices at the junior high schools in Ghana. A case study at Awutu Senya District.* (Unpublished Master's dissertation, University of Education, Winneba). Retrieved from http://www.uew.gh.com.

Arndt, S., & Tesar, M. (2015), Early childhood assessment in Aotearoa New Zealand: Critical perspectives and fresh openings. *Journal of Pedagogy, 6 (2), 71-86.*

Asare, K. (2015). Exploring the kindergarten teachers' assessment practices in Ghana. *Developing Country Studies*, 5(8), (2225-0565).

Astin, A. W. (1985). Achieving educational excellence: *A Critical Assessment of Priorities and Practices in Higher Education*. San Francisco: Jossey-Bass.

Astin, A. W. (1993). An empirical typology of college students. *Journal of College Student Development*, *34*(1), (36-46).

Awoniyi, F. C. (2016). The understanding of senior high school mathematics teachers of school-based assessment and its challenges in the Cape Coast Metropolis. *British Journal of Education*, *4*(10), (22-38).

Bekoe, S. O., Eshun, I., & Bordoh, A. (2013). Formative assessment techniques tutors use to assess teacher-trainees' learning in social studies in colleges of education in Ghana. *Research on Humanities and Social Sciences, 3*(4), 20-30.

Bernard, H. R. (2002). Research methods in anthropology: *Qualitative and Quantitative Approaches* (3rd ed.). Walnut Creek, CA: Alta Mira Press.

Best, M., Knight, P., Lietz, P., Lockwood, C., Nugroho, D., & Tobin, M. (2013). The impact of national and international assessment programmes on education policy, particularly policies regarding resource allocation and teaching and learning practices in developing countries. Final report. London: *EPPI-Centre, Social Science Research Unit, Institute of Education*, University of London.

107

Birgin, O. (2011). Pre-service mathematics teacher's views on the use of portfolios in their education as an alternative assessment method. *Educational Research and Reviews*, 6(11), 710-721.

Black, P., & William, D. (1998). Assessment and classroom learning. *Assessment in Education: Principles, Policy and Practice*. CARFAX, Oxfordshire, 5(1): 7-74.

Black, P. (2010). Formative assessment. *International Encyclopedia of Education, 3*(4), 359-364.

Black, P., & Wiliam, D. (1998). Assessment and classroom learning. *Assessment in Education*: *Principles, Policy & Practice, 5*(1), 7-74.

Black, P., & Wiliam, D. (1998). Inside the black box: *Raising standards through Classroom Assessment*, Phi Delta Kappan.

Black, P., & Wiliam, D. (1998a). Assessment and classroom learning. *Assessment in Education*, *5*(1), 7–71.

Black, P., & Wiliam, D. (1998b). Inside the black box: *Raising standards through classroom assessment*, *80*(2), 139–148.

Black, P., Harrison, C., Lee, C., Marshall, B., & Wiliam, D. (2003). Assessment for learning: putting it into practice. *Buckingham*: *Open University Press.*

Black, P., Harrison, C., Lee, C., Marshall, B., & Wiliam, D. (2003). *Assessment for Learning*. London: Open University Press.

Black, P., Lee, C., Harrison, C., & William, D. (2004). Teachers developing assessment for learning: *Impact on Student Achievement, Assessment in Education*, *11*(1), 49-64.

Black. P. J., & Wiliam. D. (2010). Developing the theory of formative assessment. *Educational Assessment, Evaluation and Accountability, 21*(1), 5-31.

Bloom, B. S., Hasting, J. T., & Madaus, G. F. (1971). *Handbook on formative and summative evaluation of student learning*. New York, NY: McGraw-Hill.

Boaler J. (2016). Ability and Mathematics: *the mindset revolution that is reshaping education, Volume 55*, Number 1, 2013.

Brookhart, S. (2003). Mixing it up: Combining sources of classroom achievement information for formative and summative purposes. In H. L. Andrade & G. J. Cizek (Eds.) *Handbook of formative assessment, 3*(279-296). Abingdon: Routledge.

Brooks, J., & Brooks, M. (1999). In search of understanding: The case for constructivist classrooms. Alexandria, VA: *Association for Supervision and Curriculum Development*.

Browne, E. (2016). Evidence on formative classroom assessment for learning. *Knowledge, Evidence and Development*

Browne, E. (2016). Evidence on formative classroom assessment for learning. *Helpdesk Report commissioned by the UK Department for International Development* (2-5).

Carini, R.M.; Kuh, G.D.; & Klein, S.P.(2006). Student engagement and student learning: *Testing the linkages. Res. High.Educ. 47,* (1–32).

Cathcart, W.G., Pothier, Y.M., Vance, J.H., & Bezuk, N.S. (2001). *Learning Mathematics in Elementary and Middle Schools*. Columbus: Merrill Prentice Hall.

Clark, I. (2012). Formative Assessment: A Systematic and Artistic Process of Instruction for Supporting School and Lifelong Learning. *Canadian Journal of Education* 35(2), 24-40.

Cohen, L., Manion, L., & Morrison, K. (2007). *Research Methods in Education* (6th ed.). London: Routledge.

Cohen, L., Manion, L., & Morrison, K. (2011). *Research Methods in Education* (7th ed.). New York, NY: Routledge.

Cresswell, J. W., & Plano Clark, V. L. (2011). *Designing and Conducting Mixed Method Research* (2nd ed.). Thousand Oaks, CA: Sage.

Creswell, J.W. (2008). *Research design- Qualitative, quantitative and Mixed Methods Approaches* (2nd ed.). London: Sage.

Creswell, J.W. (2009). *Research Design- Qualitative, Quantitative and Mixed Methods Approaches* (3rd ed.). London: Sage.

Creswell, J.W., & Plano Clark, V.I. (2011). *Designing and Conducting Mixed Methods Research* (2nd ed.). Los Angeles: Sage.

Crooks, T. (1998). The Validity of Formative Assessment. Educational Assessment Unit .University of Otago, Dunedin, New Zealand. *A Paper Presented at the British Educational Research Association annual Conference*, University of Leeds

Darling- Hammond, L. (2000). Teacher Quality and Student Achievement: *Education Policy Analysis Archives*, *8*(1), 45.

Darling-Hammond *et al* (2009). Implications for Educational Practice of the Science of Learning and Development, A*pplied Developmental Science*, *24(* 2) 97-140.

Darling-Hammond *et al.* (2013). Criteria for high-quality assessment. *Stanford, CA: Stanford Center for Opportunity Policy in Education*.

Darling-Hammond, L., Holtzman, D., Gatlin, S. & Vasquez Heilig, J. (2005). Does Teacher Preparation Matter? Evidence About Teacher Certification, Teach for America, and Teacher Effectiveness. *Education Policy Analysis Archives, 13*(4), 42 – 67.

Darling-Hammond, L. (2010). The flat world and education: *How America's Commitment to Equity Will Determine Our Future*. New York: Teachers College Press.

Dhindsa, H., Omar, K., & Waldrip, B. (2007). Upper secondary bruneian science students' of perceptions of assessment. *International Journal of Science Education, 29*(10), 1281-1280.

Dial. C. (2008). *The Effect of Teacher Experience and Teacher Degree Levels On Student Achievement in Mathematics and Communication Arts*. (Unpublished doctoral thesis), Baker University, Missouri.

Ding, L., Pepin, B. & Jones, K., (2015). Students Attitudes Towards Mathematics Across Lower Secondary Schools in Shanghai. *The Construct of Attitude in Mathematics Education* (pp.157-178).

Dörnyei, Z. (2007). *Research methods in applied linguistics*. New York: Oxford University Press.

Dragemark, O., Anne & Oscarson, M. (2010). *Using the CEFR in the Foreign Language Classroom*. In J. Mader and Zeynep Urkun.

Driscoll, M. P. (2000). *Psychology of learning for instruction*. (2nd ed.). Boston

Duckworth, A. L., & Yeager, D. S. (2015). Measurement Matters: *Assessing Personal Qualities Other Than Cognitive Ability for Educational Purposes, 44*(4): 237–251.

Duflo, E., Kremer, M., & Dupas, P (2017). The Impact of Free Secondary Education: *Experimental Evidence from Ghana* (pg.2), Retrieved on 23 – 03 - 2019.

Dunlosky J., Katherine A. Rawson,A. K., Marsh, J. E., Nathan, M.J., & Willingham, D. T., (2013). Improving Students' Learning With Effective Learning Techniques: *PromisingbDirections From Cognitive and Educational Psychology*, *Psychological Science*, *14(*1) 4–58.

Dylan, W. (2011). What is assessment for learning? *Studies in Educational Evaluation, 37,* (3–14).

Enu, J., Agyman, O., & Nkum, D. (2015). *Factors influencing Students' Mathematics Performance in some selected Colleges of Education in Ghana*. *3*(1*)*, 68-74.

Everly, M. (2013). Are students' impressions of improved learning through active learning methods reflected by improved test scores? *Nurse Education Today, 33*(2), 148-151.

Fraenkel, J. R., Wallen, N. E., & Hyun, H. (2012). *How to design and evaluate research in education*. New York: McGraw-Hill.

Fuchs, L. S., Seethaler, P. M., Powell, S. R., Fuchs, D., Hamlett, C. L., & Fletcher, J. M. (2008). Effects of Preventative Tutoring on the Mathematical Problem Solving of Third-Grade Students With Math and Reading Difficulties. *Exceptional children*, *74*(2), 155–173.

García-Jiménez & Eduardo (2015). *Assessment of learning: from feedback to self-regulation. The role of technology. Relieve, 21* (2).

Gedye, S. (2010). Formative assessment and feedback: *A review of Planet, 23*(1), 40-45.

Ghaicha, A. (2016). Theoretical Framework for Educational Assessment: A Synoptic Review. *Journal of Education and Practice*, *7* (24).

Gibbs, G. (2010). *Using assessment to support student learning at university of East Angelia*. Retrieved from https://portal.uea.ac.uk/documents/.../using-assessment to support student learning.

Gipps, C. (2002). Socio-cultural aspects of assessment. *Review of Research in Education, 24(2)*, 355 - 392.

Goe, L. (2007). *The Link between Teacher Quality and Student Outcomes: A Research Synthesis.* Available from National Comprehensive Centre for Teacher Quality database.

Goe,L., & Stickler,.M. (2008). *Teacher Quality and Student Achievement. Making the most of recent research*. Available from National Comprehensive Centre for Teacher Quality database. Retrieved on 29th June, 2015 from http://files.eric.ed.gov/fulltext/ED520769.pdf.

Goodrum, D., Hackling, M., & Rennie, L. (2001). The status and quality of teaching and learning of science in Australian schools. *Canberra Department of Education: Training and Youth Affairs*.

Gray, D. E. (2009). *Doing research in the real world. Los Angeles*: SAGE.

Gronlund, N. E. (2006). *Assessment of Student Achievement* (8th ed.). Boston: Pearson.

Guba, E. G., & Lincoln, Y. S. (1989). Competing paradigms in qualittive research. in N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of Qualitative Research* (163-194).

Guskey, T. R. (2003). How classroom assessment improve learning. *Educational Leadership*, *60*(2), 1-6.

Hammarberg K., Kirkman M., & de Lacey, S (2016). *Qualitative Research Methods*: when to use them and how to judge them. Human Reproduction, 31, Pages 498–501.

Harlen, W. (2005). Teachers' Summative Practices and Assessment for Learning - Tensions and Synergies. *Curriculum Journal, 16*(2), 207-223.

Harlen, W. (2007). Teachers' summative practices and assessment for learning -tensions and synergies. *Curriculum Journal,* 16(2), 207-223.

Hart, L. (1989). Describing the affective domain: saying what we mean. In Mc Leod & Adams (Eds.) *Affect and Mathematical Problem Solving* (37-45). New York: Springer Verlag.

Herman, J. (2013). Formative Assessment for Next Generation Science Standards. *Invitational research symposium on science assessment*, (1-28).

Heuvel-Panhuizen, M. (1998). Reform under attack: *Forty years of working on better mathematics education thrown on the scrapheap*? *1*, (1–25).

Houston, D., & Thompson, J. N.,(2017). Blending Formative and Summative Assessment in a Capstone Subject: 'It's not your tools, it's how you use them', *Journal of University Teaching & Learning Practice*, *14(*3).

114

Isahaku, S.(2009). *An Analysis of Dominant and Alternative Approaches to Education Reform in Sub-Saharan Africa: the Case of Ghana.* (Unpublished Thesis for the degree of Philosophy Doctor)*, Norwegian University of Science and Technology (pg.7).

James,M. (2006). Beyond method: Assessment and learning practices and values. *The Curriculum Journal. 17*(2), 109-138

Jenkins, J.O. (2010). A multi-faceted formative assessment approach: better recognizing the learning needs of students. *Assessment & Evaluation in Higher Education*, 35 (5), pp. 565–576.

Johnson, S. (2017). Design challenges for national assessment in this accountability era: *A Background Paper Commissioned by Cambridge Assessment.* Cambridge, UK: Cambridge Assessment.

Kapukaya, K. (2013). Assessment: A help or Hindrance to Educational Purposes. *International Journal of Humanities and Social Science*, *3(*6).

Kilpatrick, J., Swafford, J., & Findell, B. (2001). Adding it up: *Helping Children Learn Mathematics*. Washington, D.C.: National Academies Press.

Kira J. ., Scott C. M., & James P. S. (2013). A Meta-Analysis of the Efficacy of Teaching Mathematics With Concrete Manipulatives. *Journal of Educational Psychology, 105* (2).

Kuh, G. D. (1991). Assessing what really matters to student learning: *Inside the National Survey of Student Engagement. Change, 33*(3), 10-17.

115

Kuh, G. D. (2009). What student affairs professionals need to know about student engagement? *Journal of College Student Development, 50*(6), 683-706.

Kulik J. A., & Fletcher J. D. (2016). Effectiveness of Intelligent Tutoring Systems: A Meta-Analytic Review. *Review of Educational Research*, *86*(1), 1-9.

Leder, G., & Forgasz, H. (2003). Measuring Mathematical Beliefs and Their Impact on the Learning of Mathematics: A New Approach. *A Hidden Variable in Mathematics Education*? (95-113).

Leong, K. E. (2012). Good Mathematics Teaching: *Perspectives of Beginning Secondary Teachers*.(Unpublished Doctor of Philosophy thesis), (35 - 41).

Lin, P. (2006). Conceptualizing teachers understanding of students mathematical learning by using assessment tasks. *International Journal of Science and Mathematics Education*, 4(3), 545-580.

Looney, J. W. (2011). *Integrating Formative and Summative Assessment: Progress Toward a Seamless System?*. OECD Education Working Papers, No. 58, OECD Publishing.

Ma, L. (1999). *Knowing and Teaching Elementary Mathematics.* Mahwah, NJ: Lawrence Erlbaum.

Macmillan, A. (2004). Take-Home Numeracy Kits for Preschool Children, *Australian Journal of Early Childhood*, *29*(2), 29-39.

Makonye, P. J., (2014). Teaching Functions Using a Realistic Mathematics Education Approach: A Theoretical Perspective. *Marang Centre for Mathematics and Science Education, School of Education, 7* (3), 653-662.

Mann, S.J. (2001). Alternative perspectives on the student experience: alienation and engagement. *Studies in Higher Education*, 26(1), 7-19.

Martin, F. (2016). Using Learning Analytics to Assess Student Learning in Online Courses. *Journal of University Teaching & Learning Practice, 13*(3), 1-20.

Martínez M. J. (2010). Algoritmo ABN. El cálculo del futuro. Clave XXI. *Reflexiones y Experiencias En Educación* (2). CEP de Villamartín.

Mclntosh, M. E. (2017). Formative assessment in mathematics, the clearing house: *A Journal of Educational strategies, 71*(2), 92-96.

McMillan, J. H. (2003). Understanding and improving teacher's classroom assessment decision making: *Implications for theory and practice. Educational Measurement: Issues and Practice, 22*(4), 34–43.

McMillian, H. J., Cohen, J., Abrams, L., Cauley, K., Pannazzo. G., & Hearn, J. (2010). *Understanding Secondary Teacher's Formative Assessment Practice and Their Relationship to Student's Motivation.* Virginia Commonwealth University.

Mji, A. & Makgato, M. (2006). Factors associated with high school learners' poor performance: a spotlight on mathematics and physical science. *South African Journal of Education 26*(2),253-266.

Moss, C.A. (2008). Classroom assessment practices of Ohio teachers. *Conference Paper:* EDRS.

Nagavalli, T.(2015). A study of dyscalculic primary school children in Salem district and evaluation of applicability of innovative strategies as remedial measures. *Department of Educational Research and Policy Perspectives*. (1 - 219).

NCTM, (1989). *Teaching Children Mathematics*: *volume 1,* number 9

Newton, P. E. (2012). Validity, purpose and the recycling of results from educational assessments. In J. Gardner (Ed.)*, Assessment and Learning 2*(264–276). London: Sage.

Nitko, A. J. (2001). *Educational Assessment of Students* (3rd. ed.). Upper Saddle River, NJ: Merrill.

Nolen, S. (2011). The role of educational systems in the link between formative assessment and motivation. *Theory into Practice, 50*(319-326).

O'Farrell C. (2009). *Enhancing Student Learning through Assessments*: A toolkit approach (On line) Available at; www.tcd.ie/teaching-learning/academic-development/assets/pdf/250309-assessment-toolkit

Oduntan O.E., Ojuawo O.O., & Oduntan E.A. (2015). A Comparative Analysis of Student Performance in Paper Pencil Test (PPT) and Computer Based Test (CBT) Examination System. *Research Journal of Educational Studies and Review*,1(1),pp.24-29.

Opfer V. D., & Pedder, D. (2011). Conceptualizing Teacher Professional Learning. *Review of Educational Research 81*(3),376–407.

Oppong, S. H. (2013). The problem of sampling in qualitative research. Asian *Journal of Management Sciences and Education*, 1-9.

Ozer, O. (2004). Constructivism in Piaget and Vygotsky. *Fountain Magazine, Issue 48*. (On-line) Available at; www.fountainmagazine.com /issue/ detail/constructivism-in-piaget-and-vygotsky. Retrieved on; 25.05. 2015.

Pace, C. R. (1982). Measuring the quality of student effort. *Current Issues in Higher Education, 2(1)*, 10-16.

Pascarella, E. T., & Terenzini, P. T. (2005). *How College Affects Students*: A third decade of research (2nd ed., Vol. 2). San Francisco: Jossey-Bass.

Peersman, G. (2014). Overview: *Data Collection and Analysis Methods in Impact Evaluation, Methodological Briefs: Impact Evaluation 10,* UNICEF Office of Research, Florence.

Phillips, D.C. (2000). Constructivism in education: Options and second options on controversial issues. Chicago: *The National Society for the Study of Education*.

Platas, M. L., Ketterlin-Geller, R. L., & Sitabkhan,Y. (2016). Using an Assessment of Early Mathematical Knowledge and Skills to Inform Policy and Practice: Examples from the Early Grade Mathematics Assessment. *International Journal of Education in Mathematics, Science and Technology, 4(3).*

Quality Assurance Agency (2007). A Review of Literature, *Academic Quality and Accreditation, Laureate Education, Inc,* Volume *5*, Num. 4.

Reynolds, C., R., Livingston, R. B., & Willson, V. (2009). *Measurement and assessment in education* (2nd. ed.). Ohio: Pearson.

Ritt, M. (2016). The *Impact of High-stakes Testing on the Learning Environment*. Retrieved from Sophia, the St. Catherine University repository website: https://sophia.stkate.edu/msw_papers/658.

Rogers, G. W. (2017). *"I'm Not Good at Math": Mathematical Illiteracy and Innummeracy in the United States"*. (Electronic Dissertations). Retrieved from: https://digitalcommons.georgia southern.edu/etd

S. K., & Given Lisa M. (2008). Convenience Sample. *In The SAGE Encyclopedia of Qualitative Research Methods*. Thousand Oaks, CA: Sage.

Sadler, D.R. (2010). Beyond feedback: Developing student capability in complex appraisal. *Assessment & Evaluation in Higher Education*, *35(*5), 535-550.

Sadler, R. (1989). Formative assessment and the design of instructional systems. *Instructional Science, 18*(1), 119–144.

Sarantakos, S. (2013). *Social research* (4th ed.). London: Palgrave Macmillan.

Scarpello, G. (2007). Helping Students Get past Math Anxiety. *Techniques: Connecting Education and Careers (J1)*, *82*(6), 34-35.

Scriven, M. (1967). The methodology of evaluation. In: R. W. Tyler, R. M. Gagné & M. Scriven (Eds.), *Perspectives of Curriculum Evaluation, AERA Monograph Series on Curriculum Evaluation, Vol. 1* (pp. 39-83).

Seifi, M., Haghverdi, M., Azizmohamadi, F. (2012). Recognition of Students' Difficulties in Solving Mathematical Word Problems from the Viewpoint of Teachers. *Journal of Basic and Applied Scientific Research, 2* (3), 2923-2928.

Shepard P. (2000). The role of assessment in learning culture; *Educational researcher, 29* (7) (pp 4 - 14).

Shulman, L. S. (1986). Those who understand: *Knowledge growth in teaching. Educational Researcher*, *15*(2), 4-14.

Sivo, S. A., Saunders, C., Chang, Q., & Jiang J. J. (2006). How Low Should You Go? Low Response Rates and the Validity of Inference in IS Questionnaire Research. *Journal of the Association for Information Systems*, *7*(6), pp. 351-414.

Spiller, D. (2009). *Assessment: Feedback to promote learning*. The University of Waikato: New Zealand. (On line) Available at; www.waikato.ac.nz/tdu/pdf/booklets/6-assessmentFeedback.pdf Retrieved 13.09.2014.

Stiggins, R. J., & Conklin, N. F. (1992). In teacher's hands: *Investigating the practices of classroom assessment*. Albany: State University of New York Press.

Stiggins, R.J. (2002). Assessment crisis: *The Absence of Assessment for Learning*. Delta Kappan, *83*(10), 758.

Tshabalala, T., Mapolisa, T., Gazimbe, P., & Ncube A. C. (2016). Establishing the Effectiveness of Teacher-Made Tests in Nkayi District Primary Schools. *Nova Journal of Humanities and Social Sciences 4*(1),1-6.

Turner, E. E., Drake, C., Roth McDuffie, A., Aguirre, J., Gau Bartell, T., & Foote, M. Q. (2011). Promoting equity in mathematics teacher preparation: a framework for advancing teacher learning of children's multiple mathematics knowledge bases. *Journal of Mathematics Teacher Education, 15*(1), 67-82.

Van den Heuvel-Panhuizen, M. (1998). *Realistic Mathematics Education*: Work in progress.

Veldhuis, M., (2015). *Improving Classroom Assessment in Primary Mathematics Education*, *32* (8) 978-90-70786-

Veldhuis, M., Van den Heuvel -Panhuizen, M., Vermeulen, J., & Eggen, T. (2013). *Teachers' use of Classroom Assessment in Primary School Mathematics Education in the Netherlands*, *21(*2), 35-53

Vingsle, C. (2014). Formative assessment: *Teachers Knowledge and Skills to Make it Happen*. Retrieved from http://umu.diva.portal.org.

Walker, I. & Zhu, Y. (2013). *The Benefit of STEM Skills to Individuals, Society, and the Economy*. Report to Royal Society's Vision for Science and Mathematics (1 - 38).

Whitebook, M., & Cassidy, D. (2014). Strengthening the mathematics -related teaching practices of the early care and education workforce: Insights from experts. Berkeley, CA: *Center for the Study of Child Care Employment*, University of California, Berkeley, (1-32).

Wiggins, G., & McTigh, J. (2007). Schooling by design: mission, action and achievement. Alexandria, Virginia: *Association for Supervision and Curriculum Development*. *4*(542-598).

Wiliam, D. (2005). Keeping learning on track: *Formative assessment and the Regulation of Learning*. (pp.53–59).

Wiliam, D. (2006). Formative assessment: Getting the focus right. *Educational Assessment, 11*(3), 283-289.

Wiliam, D. (2007). Keeping learning on track: Classroom assessment and the regulation of learning. In F. K. Lester, Jr. (Ed.), *Second handbook of research on mathematics teaching and learning* (1053-1098).

Windschitl, M. (2014). *Rethinking the Continuum of Preparation and Professional Development for Secondary Science Educators. High School Science Laboratories*: Role and vision (pp. 27).

Yueming, J. (2004). *English as a Second Language: Teacher's Perception and use of Classroom-Based Reading Assessment*. (Unpoblished Doctoral Dissertation), Texas A&M University. (Online) Available at; http://oaktrust.library. tamu.edu/handle/1969.1/3102

Zan. R., & Martino, P. (2007). Attitude toward mathematics: Overcoming the positive and negative dichotomy. *The Montana Mathematics Enthusiast, 3* (157-168).

Zhang, D. & Liu, L. (2016). How Does ICT Use Influence Students' Achievements in Math and Science over Time? Evidence from PISA 2000 to 2012. *EURASIA Journal of Mathematics, Science and Technology Education*; 15(10).

Ziegler, M.G., & Loos, A. (2010). Teaching and Learning "*What is Mathematics*". *Mathematics Subject Classification*..

APPENDIX A

UNIVERSITY OF CAPE COAST

DEPARTMENT OF MATHEMATICS AND ICT

QUESTIONNAIRE FOR TEACHER RESPONDENTS

I am a postgraduate student from the University of Cape Coast (UCC) pursuing Masters of Philosophy in Mathematics Education. I am undertaking a research as part of the requirement for my programme on the topic: "Assessing formative assessment practices among mathematics tutors of Colleges of Education in Ghana". I will be very grateful if you could spare some few minutes of your time to respond to the items to aid the study. This exercise is purely an academic one, hence your views and information will be treated as confidential. Be assured that none of your information will be made available to untheorized person (s) which may cause embarrassment to you.

SECTION A: BIOGRAPHICAL DATA

Please, respond to each of the items in this section by ticking the response that is appropriate for you.

    1. Sex:

[ ] Male

[ ] Female

2. Age:

[ ] 25 - 30 years

[ ] 31 – 36 years

[ ] 37– 42 years

[ ] Above 42 years

3. Highest Academic Qualification :

[ ] B. Ed (Mathematics)

[ ] B. SC (Mathematics)

[ ] MPhil (Mathematics Education)

[ ] MSc (Mathematics)

[ ] PhD (Mathematics Education)

Other, specify:…………………………………………

4. What is your highest educational attainment?

[ ] HND

[ ] First degree

[ ] Second degree

[ ] Third degree

Other, specify:…………………………………………

5. How long have you been teaching Mathematics in this College?

[ ] 1 – 5 years

[ ] 6 – 10 years

[ ] Above 10 years

6. Which area of mathematics do you teach as well as the level (year).

S/N	Course(s)	Level 100	Level 200	Level 300
I				
II				
III				
IV				
V				

SECTION B: EVALUATION OF STUDENTS DURING

MATHEMATICS LESSON

Use the measuring scale to respond to each item where; S D = Strongly

Disagree, D = Disagree, N =Neutral, A = Agree and SA = Strongly Agree.

From the statement below, please indicate your level of agreement or

disagreement to the following statements. Please read each item carefully and

SELECT the response that best fits your abilities by ticking (√):

S\N	Statement	S D	D	N	A	S A
7.	I use oral test to assess students during lesson introduction					
8.	I use oral test to assess students in mid-way of the lesson					
9.	I use oral test to assess students during conclusion part of the lesson					
10.	I use class exercise(s) to assess my students mid-way through the lesson					
11.	I use class exercise (s) to assess my students during the conclusion phase of the lesson					
12.	I usually give topics to my students to do presentation during mathematics lesson					
13.	I usually give group work during mathematics lessons					
14.	I usually give students individual task during lessons					
15.	I use Observation in the mid-way of the lesson to assess students					

16. Apart from item 7 - 15 what other methods do you used to assess your students during mathematics lesson?

(i) …………………………………………………………………………

(ii) …………………………………………………………………………

(iii) …………………………………………………………………………

(iv) …………………………………………………………………………

(v) …………………………………………………………………………

(vi) …………………………………………………………………………

SECTION C: SCORING PRACTICES OF MATHEMATICS TUTORS DURING MATHEMATICS LESSON

Use the measuring scale to respond to each item where; S D = Strongly Disagree, D = Disagree, N =Neutral, A = Agree and SA = Strongly Agree. From the statement below, please indicate your level of agreement or disagreement to the following statements. Please read each item carefully and **SELECT** the response that best fits your abilities by ticking (√):

S\N	Statement	S D	D	N	A	S A
17.	I usually award marks to students when they response to oral questions in class					
18.	I score students exercise during lesson					
19.	I scored students during presentation exercise					
20.	I usually award during group work					
21.	I scored individual task during lesson					
22.	I usually observe students during lesson and award marks					

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23. Apart from scoring practices indicate in item 17 – 22, list five (5) most scoring practices you used during teaching and learning of Mathematics

(i) ……………………………………………………………………

(ii) ……………………………………………………………………

(iii) ……………………………………………………………………

(iv) ……………………………………………………………………

(v) ……………………………………………………………………

SECTION D: INDICATORS THAT SUGGEST STUDENTS PARTICIPATION IN MATHEMATICS LESSON

Use the measuring scale to respond to each item where; S D = Strongly Disagree, D = Disagree, N =Neutral, A = Agree and SA = Strongly Agree. From the statement below, please indicate your level of agreement or disagreement to the following statements. Please read each item carefully and **SELECT** the response that best fits your abilities by ticking (√):

	Statement	SD	D	N	A	SA
24.	Students interact with other colleagues by way of asking them for explanation during lesson					
25.	Students are always eager to respond to questions during lesson					
26.	Students are eager to do any Mathematics exercise given to them during lesson					
27.	All students take part in group work given to them during lesson					
28.	Students do request for extra assignment for further practice					

SECTION E: TEACHING APPROACHES MATHEMATICS TUTORS USE DURING MATHEMATICS LESSON

Use the measuring scale to respond to each item where; N = Never, S = Sometimes and A= Always. From the statement below, please indicate your level of agreement or disagreement to the following statements. Please read each item carefully and **SELECT** the response that best fits your abilities by ticking (√):

	Statement	N	S	A
29.	I use conventional methods in my lesson delivery			
30.	I use practical activity in my lesson delivery			
31.	I encourage work based learning during mathematics lesson			
32.	I used seminars in my lesson delivery			
33.	I encourage independent study during mathematics lesson			
34	I do use technology in my lesson delivery			
35	I usually encourage application of mathematics to real life situation during mathematics lesson			

36. Apart from the teaching approaches indicated in items 29 -35, list any five

teaching approaches you normally use during mathematics lesson delivery.

I ……………………………………………………………………………

II.…………………………………………………………………………

III.…………………………………………………………………………

IV.…………………………………………………………………………

V.…………………………………………………………………………

APPENDIX B

UNIVERSITY OF CAPE COAST

DEPARTMENT OF MATHEMATICS AND ICT

OBSERVATION CHECK LIST DURING LESSON

ASSESSING FORMATIVE ASSESSMENT PRACTICES AMONG

MATHEMATICS TUTORS OF COLLEGES OF EDUCATION IN

GHANA

1. Teacher code ……………………………………………

    Sex ……………………………………………………………

2. Level

…………………………………………………………………………..

3. Duration

…………………………………………………………………………

4. Class enrollment

………………………………………………………………..………

5. Topic

…………………………………………………………………………

What to look out for during lesson delivery

6.   Do tutor assess the lesson while teaching?

[ ] Yes

[ ] No

i.   If yes how was the assessment done?

…………………………………………………………………………

…………………………………………………………………………

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If no why? (Look out for the indicators eg. On hurry to finish the lesson etc)

…………………………………………………………………………………………

…………………………………………………………………………………………

7. How was the feedback given to students when response to question? (eg. Well done, etc)

…………………………………………………………………………………………

…………………………………………………………………………………………

8. How was the tutor's reaction after student's response? (eg sad, happy, etc)

…………………………………………………………………………………………

…………………………………………………………………………………………

9. Examine tutor while marking students exercise (do documentary analysis of the students marked exercises)

…………………………………………………………………………………………

……………………………………………………………………………………

10. What were some of the comments written by the tutor after marking students exercise? (eg. Good, bad, you can do better, etc)

…………………………………………………………………………………………

……………………………………………………………………………………

11. (a) Write some of the things that show that students are participate in the lesson (eg. Asking questions, be attentive, etc)

…………………………………………………………………………………………

…………………………………………………………………………………………

…………………………………………………………………………………………

…………………………………………………………………………………………

…………………………………………………………………………………………

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12. Write some of the teaching method (s) use by tutors during Mathematics lesson

……………………………………………………………………………………

……………………………………………………………………………………

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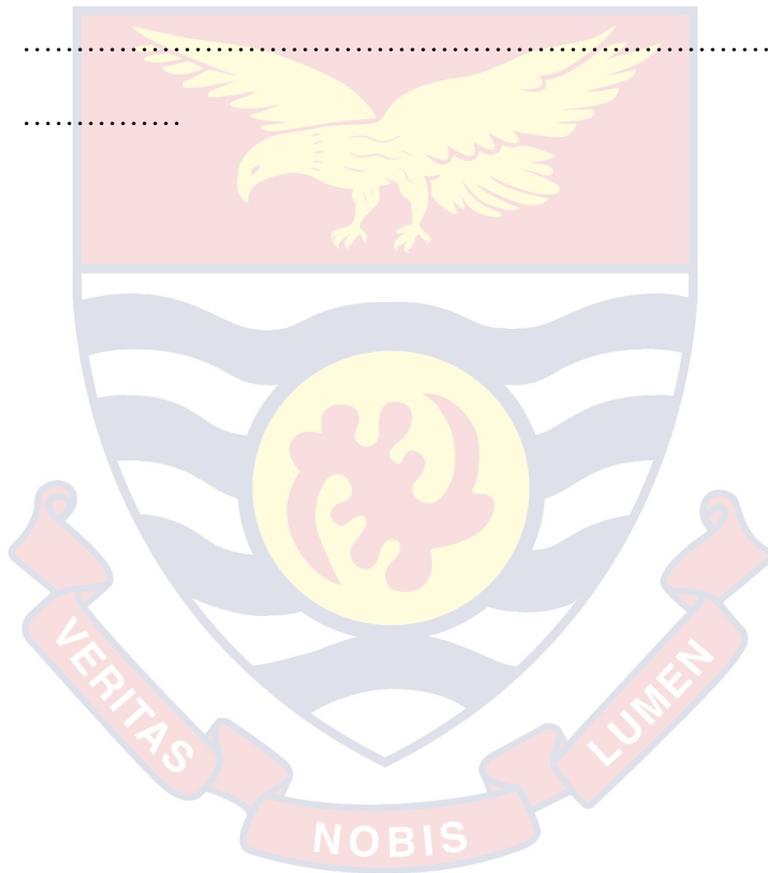
APPENDIX C

UNIVERSITY OF CAPE COAST

INTERVIEW GUIDE FOR TUTORS

ASSESSING FORMATIVE ASSESSMENT PRACTICES AMONG

MATHEMATICS TUTORS OF COLLEGES OF EDUCATION IN

GHANA

Theme 1: Evaluation of Students during Mathematics Lesson

1. Do you assess your students during Mathematics lesson (Yes/No)?

   If 'Yes' how do you assess them?.................…………………………

   …………………………………..……………………………………

   If 'No' why?..

Theme 2: Scoring practices of Mathematics tutors during Mathematics lesson

2. Do you assign numerical score to your students when you give them

   class exercise (Yes/No)?

   If 'Yes', how do you score them?..

   If 'No' why?...

3. Are you pre-viewed to other ways of formative assessment elsewhere

   (Yes/No)?

   If 'Yes', how is it done?..

   If 'No' why?...

Theme 3: Indicators which suggests students participate in Mathematics lesson

4. Do you ensure students participation in your lesson (Yes/No)?

   If 'Yes' how do you ensure their participation?

   …………………………………………….…………………………………

………………………………………………………………….

   If 'No' why?..

……………………………………………………………………………………

Theme 4: Teaching approaches Mathematics tutors use during Mathematics lesson

5. Please name some of the common methods you usually use during mathematics lesson?

   i.…………………………………………………………………………

   ii.…………………………………………………………………………

   iii.…………………………………………………………………………

   iv.…………………………………………………………………………

   v.…………………………………………………………………………

   vi.…………………………………………………………………………

   Why do you normally use the methods you have just listed in 5 above (Teaching Approaches?)

   i.…………………………………………………………………………

   ii.…………………………………………………………………………

   iii.…………………………………………………………………………

   iv.…………………………………………………………………………

   v.…………………………………………………………………………

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Suggestion to improve upon formative assessment in your college

6. What suggestions can you make to improve formative assessment in your college?

………………………………………………………………………

………………………………………………………………………
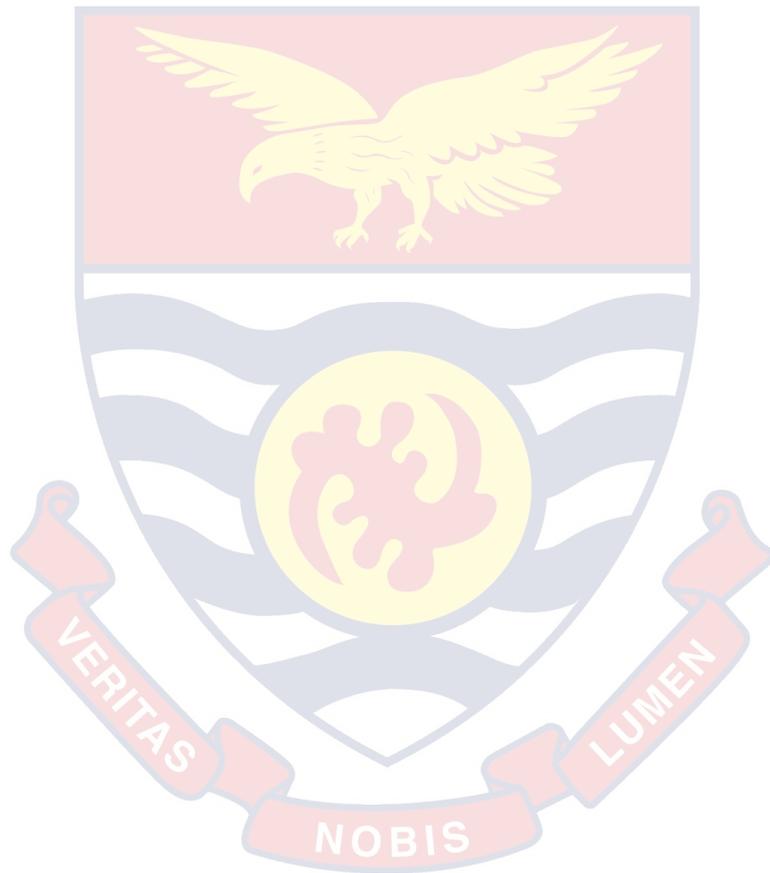
APPENDIX D

Output of the pre – test results

Reliability Statistics

Cronbach's Alpha	N of Items
.837	34

Cronbach's alpha	Internal consistency
$\alpha \geq 0.9$	Excellent (High-Stakes testing)
$0.7 \leq \alpha < 0.9$	Good (Low-Stakes testing)
$0.6 \leq \alpha < 0.7$	Acceptable
$0.5 \leq \alpha < 0.6$	Poor
$\alpha < 0.5$	Unacceptable