Constructivism Learning Approaches: Assessment of Student's Participation and Approaches to Teaching of Mathematics in Selected Colleges of Education in Ghana

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Abstract

The study focused on use of Constructivism learning approaches to assess formative assessment practices of Mathematics tutors in selected Colleges of Education in Ashanti and Bono Region in Ghana. The study adopted Convergent Parallel research design to guide the study. A sample of 56 Mathematics tutors were sampled through census study. Questionnaire, interview guide and observation checklist were used to collect data from the participants. The study 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. It was concluded that the study has brought to the light that tutors ensured students participation in mathematics class using different methods or approaches. This may due to tutors attend professional development to improve their teaching strategies as well as mathematics is concerned.

Keywords*: Assessment practice, Formative assessment, Convergent parallel, Mathematics and Constructivism.*

Background to the Study

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).

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).

In Ghana, formative assessment is well embraced and practiced by teachers at all levels of Education (Asare, 2015; Amoako, 2018). 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.

The constructivism 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.

Statement of the Problem

Mathematics is a unique subject and it is a fundamental part of school 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.

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 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.

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 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; Armah, 2013; Bokoe, Eshun & Bordoh, 2013; Mclntosh, 2010). However, when it comes to college of education mathematics tutors' knowledge in formative assessment practices in respect to student's participation and approaches to teaching of Mathematics, it appears not much studies have been done on it in Ghana. Amoako, Asamoah and Bortey (2019) have 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 as well as teaching approaches is concern (Amoako, Asamoah & Bortey, 2019).

Research Questions

1. What are the indicators that suggests students participate in mathematics lessons?
2. What teaching approaches do mathematics tutors used during mathematics lessons?

Theoretical Perspective of Formative Assessment

The main focus of the study was to assess student's participation and approaches to teaching of Mathematics in selected Colleges of Education in Ghana through the use of constructivism learning approaches. Therefore, constructivist learning theory put forward by Lev Vygotsky (1896-1935) is the theory that guided this study. Constructivism theory is based on the belief that humans are able to construct knowledge by accepting the information they are available to them. 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.

REVIEW OF RELATED LITERATURE

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; 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 where 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.

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 had less dynamic learning systems (Everly, 2013).

A number of teaching practices are associated with supporting or engagement of students in teaching and learning environment among 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).

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).

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.

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.

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 and 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 (Yashau, Mji and 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 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.

Research in mathematics instruction show that incorporating of Information and Computer Technology (ICT) changes the idea of educating and learning of Mathematics (Zhang and 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 support 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 and 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.

Instructional approach (teaching method) that 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.

METHODOLOGY

Research Design

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 issues from different edges to affirm results (Creswell & Plano 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 have developed a more complete understanding of a phenomenon. The different methods were ordered equally, the strands were kept independently during analysis and then the results were mixed during explanation as recommended by Creswell and Plano Clark (2011).

Population

A population is the general group from which the researcher wishes to obtain data from to study (Frankel & Wallen, 2006). 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 population for this study were all college of education tutors from the Colleges in Bono and Ashanti region in Ghana. 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 region were sampled for the study through census sampling technique. The researcher used all the mathematics tutors in these regions because the number was small and they could easily be identified. Eight tutors were purposively selected for interview and observation based on their experience and willingness to take part in the exercise. 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. Another instrument used for the study was observation check list. This was where the researcher observed the lessons of some Mathematics tutors. In this study, the researcher used checklist during observation stage where tutors were observed in the classroom during instructional period.

Furthermore, another instrument the study used 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.

Data Collection Procedure

The main purpose of this study was to assess formative assessment practices 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 in 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 colleges in Ashanti and Bono region by the researcher. Eight tutors were 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 by the same tutors from Ashanti and Bono regions.

Validity and Reliability of the Instruments

The face and content validity of the instruments were established by having the instruments validated by two (2) Mathematics Education experts from the University of Cape Coast, Cape Coast. The reliability of these instruments was established by pilot-testing the instruments using 12 Mathematics educators from two colleges in Central Region of Ghana. The reliability analysis showed that the designed instruments were reliable and could be used for the study.

Data Processing and Analysis

The responses to the various items on the instruments (questionnaire, interview guide and observation checklist) was edited and coded to enhance easy identification and scoring before entered into the computer. The analysis of the data was done by using statistical package for social science (SPSS) software version 22 (quantitative) while qualitative was analysed in themes. These research question were analysed using frequencies and percentages while interview guide and observation checklist were used to confirm the results from questionnaire.

RESULTS

Indicates that suggest students' Participation in Mathematics lesson

In address research question, the results from the questionnaire is presented in Table 1.

Table 1: Results that suggest students' participation in Mathematics lesson

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

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 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 their students 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 ensure 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 interviewed 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 were 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 indicates that; *he or she always use class discussion during lessons 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 indicates 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.

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 tutor 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 ensure students' participation during lessons. Tutors said they used practical work to ensure students' participation during lessons but in all the lessons observed, it was not seen.

Approaches tutors used during Mathematics lesson

To address research question, the results from the questionnaire is presented in Table 2.

Table 2: Results on approaches tutors used during Mathematics lesson

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

Results in Table 5 show that (n=48, 85.7%) of the respondents indicated that they used conventional method in their lesson delivery while 8(14.3%) of the respondents remain indifferent to the use of conventional method in their lesson delivery.

Additionally, it was revealed that (n = 53, 94.7%) of the respondents used practical activity in lesson delivery while 2(3.6%) of the respondents responded remain indifferent to the used practical activity in lesson delivery. Only 1(1.8%) of the respondents disagreed to the use practical activity in the lesson delivery. Majority (n = 52, 92.9%) of the respondents indicated that they encourage the use of work base learning during lesson while 3(5.4%) of the respondents remain indifferent to the use of work base learning during lesson. Only 1(1.8%) of the respondents disagreed to the 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 disagreed to the used of seminars in their lesson delivery while 17(30.4%) of the respondents agreed to the used of seminars in their lesson delivery. However, only 9(16.1%) of the respondents remain indifferent to the 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 remain indifferent to the use of independent study or learning during lesson. Majority (n = 50, 89.2%) of the respondents agreed to the used of independent study or learning during mathematics lesson while 5(9.0%) of the respondents disagreed to the 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 agreed to the use of technology in lesson delivery. Only 1(1.8%) of the respondents disagreed to the use of technology in lesson delivery while 11(19.6%) of the respondents remain indifferent to the use of technology in their lesson delivery.

Table 5 indicate that almost all (n = 54, 96.4%) respondents agreed to the used of application of mathematics to real life situation during lessons. However, only 2(3.6%) of the respondents remain indifferent to the application of mathematics to real life situation during lesson in the colleges that were involved in the study.

Interview Results on Teaching Approaches that 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 indicates 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. Tutor codec D002 indicates that; *I normally used question and answers methods during my lesson to ensure 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 tutor should encourage the application of mathematics into real situation in order to arouse and sustain 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, 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 conventional 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

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 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 ensure learners understanding of concept and participation. When tutors asked questions during lessons it 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 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 respondents' ascertained 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 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 enhance their learning and it would therefore bring good

performance in 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 two 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 affirms 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 used practical activity and group work as teaching approaches in teaching mathematics. This finding is in accordance with Brodie (2006); Yashau, Mji & 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 gained from previous lesson or from other subject area.

Activity oriented lesson help the tutor to use varieties of teaching and learning materials to ensure better understanding of the lesson or topic treated or being treated 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 sustained 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 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 students' manipulate instructional materials during lesson it aids 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 helps 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.

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.

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 is where individual differences can be catered for and it would therefore improve students' performance as well as assessment scores (marks) of the students.

The Summary of Findings

The study has 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. It was indicated that majority of the tutors used conservational, practical activity, group work, independent study as teaching approach used during Mathematics lessons.

Conclusion and Recommendations

It is concluded that the study has brought to the light that tutors ensured students participation in mathematics class using different methods or approaches. This may be due to tutors attendance at professional development to improve 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. It is therefore recommended that stakeholders in Colleges of Education should encourage tutors in Colleges of Education that were involved in the study to use these means (response to questions in class, taking part in class exercise, taking part in group work and asking questions for clarifications) to ensure learners participation in class. . It also recommended that authorities in Colleges of Education who were involved in the study should encourage tutors to use more of these

approaches in their teaching since it enhances understanding of concept or topics to all learners as far as teaching, learning and assessment is concerned.

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