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What perceived practices of teachers contribute to students' mathematics learning and achievement at the SHS level? A Case study in the Central region of Ghana

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Abstract

This study examines the importance of Senior High School level mathematics to the development of a country. It would not be enough for a country to just believe that mathematics is important until a substantial amount of the subject content have been successfully imparted into a country's schooling citizens. This has made students' mathematics achievement an issue of concern to many countries of today including Ghana. These concerns have necessitated this research to investigate what should be done by educational institutions to enhance the teaching and learning of mathematics. Various outcomes and contributions made in the past regarding teachers endeavors have been provided to students to learn and achieve in mathematics have been reviewed in this study to inform readers of what have existed already. While some reviewed works criticized methods used in teaching mathematics and also condemned shorter instructional periods for the teaching and learning of mathematics, others made suggestions and recommendations that would help improve achievement in the subject. This work employed both quantitative and qualitative methods. The analysis revealed that majority of SHS mathematics teachers perceives the following professional activities to be influential to SHS students' mathematics development: Assigning mathematics homework and reviewing the given homework, encouraging learners to work in groups, engaging the whole class in discussion, using additional mathematics textbooks as instructional tools, taking students' prior understanding into account when planning a lesson and motivating student to practice mathematics on their own

1.0 Introduction

The Senior Secondary School, currently known as Senior High School, of the educational system in Ghana is a crucial one because it is at this level that some specialization begins. Also, it is from this level that specialized training colleges and tertiary institutions admit their students. However, this level of Ghana's educational system is being hit with problems and various criticisms making it less functional. According to Anamuah-Mensah committee (2002) this sub-sector has had its ups and downs since the 1987 Educational Reform. Criticisms of the Reform have ranged from overloaded curriculum to unhelpful combinations of subjects, leading to problems of admission to tertiary institutions, especially the universities. In spite of the earlier intervention to correct some of the glaring anomalies, there is still hue and cry over the education delivery in mathematics at this level.

Mathematics is studied as a core subject in all Senior High Schools and it is intended to build on the knowledge and competencies developed at the Junior High School level. Students are expected at the SHS level to develop the required mathematical competence to be able them to use their knowledge in solving real life problems. The reason for the mathematics syllabus at this level focuses on attaining one crucial goal: to enable all Ghanaian young persons' to acquire the mathematical skills, insights, attitudes and values that they will need to be successful in their chosen careers and daily lives. The current syllabus is based on the premise that all students can learn mathematics and that all need to learn mathematics (CRDD, 2007). One needs no further description to accept the subject as important and dear to the heart of curriculum designers in Ghana.

Apart from the fact that mathematics is compulsory for all pre-university students, the subject is a hurdle to be cleared by all students who wish to enter into the university. It is required of a student to pass three core subjects in addition to three elective subjects to guarantee a university admission in Ghana. One of these three core subjects happens to be mathematics and this has triggered the urge of students in second cycle level to do everything possible to pass mathematics. This needed achievement creates an unnecessary tension on both students and especially mathematics teachers any time the external examination draws closer and closer because this examination has produced disheartening result over the years in mathematics in some schools.

Evidence that was available to the Anamuah-Mensah Committee (2002) depicted that though there has been some improvements in the results of the SSSCE (presently WASSEC) in Mathematics, about 45% of the students fail to pass the subject. Some of these disheartening results in Mathematics over the years have raised questions about what teachers are teaching, what students are learning and what learning opportunities are being provided for students by schools. One of the questions that need to be answered lies in the ability of educators to assess

what learning practices do SHS teachers perceive to being enhancing students' mathematics knowledge and the impact of these practices on students' mathematics knowledge? Mathematics educators need to make such an assessment because Linn & Baker (1993) emphasised that it was prudent for teachers to provide adequate and timely instructions of specific content and skills prior to an examination. Therefore educational assessment and its achievement must depend on the learning opportunities that have been created for students to learn. Ysseldyke, Thurlow, & Shin (1995) have defined opportunity to learn as the criteria for, and the basis of assessing the sufficiency or quality of the resources, practices, and conditions necessary at each level of the education system to provide all students with the needed material in national curriculum.

The instructional experiences involve that aspect of teaching techniques and learning activities that is provided by the teacher during the lesson delivery. Teachers by this measure have to design their lesson activities to benefit all, (the high, average and weak students). This can be done by the teachers' effort to blend various teaching techniques and instructional activities intermittently to know students grasp of content at different levels during a lesson delivery. An experienced mathematics teacher would adopt a teaching technique that would enable him/her to get closer with his or her students to know in depth what their weaknesses, interests, capabilities and needs are in studying mathematics, (Barwell *et al.*2007). Lamb and Fullarton (2002) stated that school systems may gain little by targeting teachers only, and need to give consideration to the role of pupils' grouping practices and the effects of tracking and streaming on classroom learning environments.
If the above conjunctures are necessary constituents that facilitate students' achievement, then what should be the teachers' role in ensuring its success in the teaching and learning of mathematics? How can we be sure that teachers' practices would enhance mathematics achievement at the SHS level? The purpose of this research is therefore to conducted to answer the following:

1. What are teachers' perceived practices that enhance teaching and learning of mathematics?

2. To assess whether these perceived practices explain students' achievement?

2.0 Literature Review

Many years ago, models have been examined, reviewed, revised and edited to fit into today's modern society, beginning with Carroll (1963) model to date. During these periods, several models were developed to explain the teaching and learning process. One of this models that has been adapted to support this research in terms of theory is that of Huitt, (1995). Huitt's model is one of the most recently developed models that discusses and identifies the major categories of variables that have been related to school achievement. Part of these variables of categories focused on school- and classroom-level processes that predicted school learning as measured on students' performance and standardised tests of basic skills.

The model shows Input (what students and teachers bring to the classroom process) and Output (measures of learning done outside of the classroom) as the beginning and end of the teaching/learning process. Huitt (1995) believes that educators must first identify or propose an end result because how one identifies and measures the end product (Output) will influence the selection of important predictor variables. According to Gage & Berliner (1992), until the outcome objectives are known, nothing else can be considered. Once achievement measures are selected, educators can begin to focus on those variables that can explain fluctuation or variability in the achievement measures. The direct impact on measures of this model of school learning is those variables related to Classroom Processes (what is going on in the classroom). This category includes two major subcategories; Teacher Behaviour and Student Behaviour. It is so because the success of any educational process depends on what teachers offer and what students are ready to accommodate. Teacher Behavior includes the subcategories of planning (getting ready for classroom interaction), management (getting the class under control), and instruction (guiding the learning process).

In general, planning activities have little predictable relationship with student achievement (Gage & Berliner, 1992). Both management and instructional variables have been found to be moderately related to achievement, but the lack of a strong relationship may be due to a factor of teacher inconsistency (Rosenshine & Stevens, 1986). That is, teachers often change their management and instructional practices based on the time of the day or the characteristics of a particular group of students. What teachers and students do in the classroom will depend to some extent on the characteristics or qualities teachers bring into the teaching/learning process. In Huitt's (1995) model these are labeled Input variables. The subcategory of Teacher Characteristics includes such variables as values and beliefs; thinking (what teachers perceive) and personality. While each of these is important to the classroom environment, teacher efficacy is one of the best predictors of student achievement (Proctor, 1984; Ashton, 1984). If a teacher perceives that, in general, students can learn the knowledge or skills,

and that, specifically, he can teach them, then that teacher is more likely to use the knowledge and skills he has and the students are more likely to learn.

The findings about the relationship between instructional period and students' achievement have important implications for teachers. Particularly, it seems prudent to allocate sufficient time for mathematics instruction at every grade level. Short contact periods in mathematics, instituted by policy makers for whatever practical or philosophical reason, should be seriously questioned. To ensure that students receive the best tuition and mathematics achievement standards, teacher-student contact periods need to be reconsidered. According to McKnight, *et al.* (1987), the more time students engage in learning activities, the more they learn, even when teaching is weak. Direct instructional time is related to the number of instructional days and hours per year as well as the allocation of instructional time within each class period. Evidence has it that when teachers spend more time on learning activities and less time on classroom management and discipline, student learning improve (DeStefano et al. 2007). The issue of instructional time is beyond mere propositions because a number of studies have found a positive relationship between total time allocated to mathematics and general mathematics achievement.

McKnight, *et al.* (1987), in a review of research on instructional time, found strong support for the link between allocated instructional time and students' performance. Internationally, Keeves (1976) found a significant relationship across Australian states between achievement in mathematics and total curriculum time spent on mathematics. (D'Amico et al. 2001) also found that high-quality instructional practice and implementation of curriculum together may be associated with student achievement. In spite of the numerous findings linking instructional time and students' achievement, there are some teachers and students who have turned deaf ear to it. They attend school irregularly and sometimes absent themselves during mathematics periods. Grouws and Smith (1996) acknowledged that in spite of these research findings, many students still spend only minimal amounts of time in the mathematics class.

Teachers are widely viewed as the group that most directly affects student achievement. They help ensure students learn content and control the classroom activities most related to learning. As a result, teacher training is often the most widely used strategy to improve educational quality based on the presumption that better trained teachers will lead to increased levels of student learning (DeStefano et al. 2007). Recent studies of teacher effects at the classroom level using the Tennessee Value-Added Assessment System and a similar data base in Dallas, Texas, have found differential teacher effectiveness as a stronger determinant of differences in student learning (Sanders & Rivers, 1996; Wright et al. 1997; Jordan et al. 1997). In Ghana, the Ghana Education Service (GES) is trying several means to get all teachers trained. However, it is still common to find untrained personnel recruited by GES to teach mathematics in Ghana, especially, in the rural areas.

The effects of a teacher's experience (number of years taught) on students' learning are enormous and cannot be over looked. A research conducted by Murnane & Phillips, 1981; Klitgaard & Hall, (1974) have found a relationship between teachers' effectiveness and their years of experience. For example, a controlled study of middle school mathematics teachers, matched by years of experience and school setting, found that students of certified mathematics teachers experienced significant gains in achievement than those taught by teachers not trained in mathematics. Variables presumed to be indicative of teachers' competence which have been examined for their relationship to students' learning include measures of teachers' academic ability, years of education, years of teaching experience, measures of subject matter and teaching knowledge, certification status, and teaching behaviors in the classroom (Darling-Hammond 1999).

3.0 Methodology

In this study, a multiple research method has been employed and this has permitted the researcher to make use of both quantitative and qualitative data collection techniques and data analysis procedures. Tashakkori and Teddlie (2003) argue that multiple methods are useful if they provide better opportunities for a researcher to answer research questions and where the methods allow a researcher to better evaluate the extent to which the research findings can be trusted and inferences to be made from them. Though, the two approaches have distinct procedures in terms of research directions, any single approach would be unduly simplistic for this study. Saunders et al. (2007) emphasised this point saying; "not only is it perfectly possible to combine quantitative and qualitative within the same piece of research, but in our experience it is often advantageous to do so (p:119)". The choice of the approaches had also depended on what the researcher sought to achieve, thus, the stated objectives of this research. The researcher used questionnaire to collect data on both students' and teachers' practices and concerns of teaching and learning of mathematics.

The qualitative aspect of this work had to do with gaining new perspective and more in-depth information that were difficult to convey quantitatively. One striking feature of a qualitative research design is that the researcher strives to understand people in terms of their own definition of their world that cannot be obtained in a quantitative method (De Vos *et al.*, 2002). This design offered the researcher the opportunity to focus on finding answers to questions that could not be answered quantitatively and that was based on the social experiences of the respondents. The open ended questionnaire and semi structured interviews were used under this design as a valuable way of triangulating the data collected by means of closed ended questionnaire.

One hundred and ninety two (192) persons were contacted. Thirty two (32) of which were mathematics teachers and one hundred and sixty (160) students from four (4) Senior High Schools in the Central Region. The descriptive survey was used in this case because it is a preferred design for this research and a lot of literatures support it. As far back as 1993, survey had been used for researches that had typically employed the questionnaire and interview to determine the opinions, attitudes, preferences and perception of persons of interest to a study (Borg et al 1993). Baumgartner et al. (2002), also enshrined in their publication that descriptive survey involves determining the views or practices of a group through interviews or by administering a questionnaire.

The schools were selected from two district using convenience sampling. According to Harris (2002) convenience sampling, sometimes also called haphazard sampling, refers to a sampling process in which the researcher selects a sample primarily because it is accessible and reasonably representative of the population of interest. Purposive sampling was used to select the targeted number of mathematics teachers needed for the research from all the selected schools in the two sampled districts. Purposive sampling was preferred to other sampling technique because the mathematics teachers were selected based on teachers' willingness to support the research in terms of responses.
Further, random sampling was used to select the targeted students needed for the research in all the SHS. There were three (3) different forms in each school. These were form one (F1), form two (F2) and form three (F3). The researcher employed the balloting system to select one of the forms which happened to be F3. Within F3, we have students in different classes who were offering different programmes. Therefore, for each school, the researcher selected four (4) classes. In schools like Winneba Senior High School and Apam Senior High School where the classes were more than four (4), class prefects were asked to pick ballot papers of which four were Yes and the rest No. This balloting helped to have the number of classes for the study. The systematic sampling method was then used to select students who were needed to complete the questionnaire. A sample frame which represented names of students of the selected classes from the selected schools was requested from the schools' administrations. Using the class list as the frame, one (1) of every five (5) persons was selected from each class. A total number of ten (10) students were selected from each class in each of the schools. In all, one hundred and sixty (160) students were selected for the research exercise.

Data Collecting Instruments
In order to answer this research question, it became imperative to choose appropriate data collection devices. As a result, a careful examination of relevant literature and expert judgment, questionnaire and semi-structured interview were chosen to gather the data for this study. The anonymity of questionnaires was considered a relevant issue which made it a preferred option. A five Likert Scale scale was used. Again, each questionnaire was scrutinized using the relevance and the potential of the item in answering the research questions as a yardstick. Three (2) types of questionnaire were developed for two different responding groups, namely, students and teachers. Each questionnaire was made up of two main parts, close ended and open-ended parts. The first part contains items that elicited information on the bio-data such as the background of each group of the respondents and their views on teaching and learning of mathematics. The demographic component of the questionnaire essentially elicited information on academic/professional qualification, number of years of teaching mathematics and the average number of students in a class. This was in tune with the research since these variables helped the researcher to make deductions from views of respondents.

The second part of the questionnaire depended on the targeted group of respondents. The teachers' questionnaire consisted of three sections B, C and D. Items in section B elicited responses' on how often respondents perform certain activities during instruction hours. Twelve questionnaire items numbering 6.1 to 6.12 were provided for respondents to tick given a five (5) likert scale (Almost Always, Frequently, Sometimes, Rarely and Never). Section C had eleven (12) items numbering 7.1 to 7.12 were provided for respondents to indicate by ticking given a five (5) likert scale (Strongly Agree, Agree, Neutral, Disagree and Strongly Disagree). The purpose of these questionnaire items was to elicit views from respondents on what they think should be done during mathematics instructions. The final section being section D involves open ended questions that allow the

respondents to express their personal sentiments regarding teaching and learning of mathematics at the SHS level. Considering the students questionnaire, items concerned students own assessment of their mathematics performance and the level of efforts they usually put in their mathematics work forms the second aspect. This was to find out whether there existed a relationship between students working effort, students' mathematical performance and teachers' perceived practices. The final of the students' questionnaire was intended to assess what students think the school should do to support them in learning mathematics. This allow students to bring out what the questionnaire could not provide them.

Validity and Reliability

Hopkins (2000) expressed precision as validity and reliability**.** He explains that validity represents how well a variable measures what it is supposed to measure and reliability tells how consistent the measure will be on a retest. For the suitability of the instrument for collecting data to be determined, the instrument was pre-tested which is also known in research parlance as piloting The rationale for the pre-testing in this research was to scrutinize the reliability and validity of the questionnaire.

Data Analysis Procedures

The data analysis procedure involved the use of inferential statistics or statistical data analysis. Regarding the inferential statistics, version 16.0 of the Statistical Package for Social Sciences (SPSS) computer software programme was used for data storage, calculation of central tendencies and frequency. Also the regression (scatter plot) was employed for the data analysis. The outcome of participants views were found by summing the scores for the items and dividing them by the number of items on the Likert-type scale. This formed the mean scores for each respondent. The Mean is one of the simplest models used in statistics.

The determination of positive and negative observation of a respondent was based on Kubiszyn and Borich (1984) assertion that "higher weights are associated with positive attitudes and lower weights with negative attitudes and as a rule, a mean rating of 3.0 is used, that is, if the score is equal to or greater than 3.0, a positive attitude exists and if the score is less than 3.0, then a negative attitude exists" (p:150). This assertion is also supported by Lundstrom and Lamont (1976) who explained that the Likert scale can be analyzed in one of two ways: either on an item-by-item basis (profile analysis),or by summing the numerical value of the responses to each item hereby yielding one score per subject for the whole attitude scale (aggregate analysis). The mean score of 3.0 was used as a cut-off point to re-code confidence into high and low and observation into positive and negative.

4.0 DATA ANALYSIS AND RESULT

For the researcher to be able to answer this research question, the researcher posed two investigating questions for mathematics teachers. Below are each of the posed questions and their analysis based on the data collected. What are teachers' perceived practices that enhance teaching and learning of mathematics?

Table 4.1: Mean responses on teachers practices

ITEM	N	Mean	Std.Dev
7.1 Pose open-ended question	26	3.50	1.175
7.2 Engage the whole class in discussion	26	4.15	.967
7.3 Require learners to explain their reasoning	26	3.77	1.107
7.4 Allow learners to work at their own pace	26	2.27	1.116
7.5 Ask learners to explain concepts to one another	26	2.92	1.055
7.6 Ask learners to seek alternative method for solution	26	3.69	1.225
7.7 Assign mathematics homework	26	4.69	.471
7.8 Encourage learners to work in groups	26	4.31	.838
7.9 Review homework assignments	26	4.35	.629
7.10 Make special provision for learners who are not doing well in your class	26	3.19	1.327
7.11 Assist learners after worked class	25	2.36	1.497

Mean score greater than 3 represents general agreement whereas a mean score less than 3 represent general disagreement.

The table above indicates the averages of responses of the items teachers perceived could enhance teaching and learning of mathematics at the SHS level. From the table 4.1, items 7.1, 7.2, 7.3, 7.6, 7.7, 7.8, 7.9 and 7.10 had a mean score that was greater than 3.0. The interpretation is that teachers are in favour of (agree with) those questionnaire items and that they think those activities, when performed, could enhance students' opportunity to learn mathematics. Considering the standard deviations that correspond to the various items (7.1, 7.2, 7.3, 7.6, 7.7, 7.8, 7.9 and 7.10), it could be seen that some of the views of the teachers were widely dispersed. For instance, item 7.7, which talks about assigning mathematics homework to students, had the lowest of the standard deviations (SD=0.471) meaning that a greater number of teachers shown collective concern of agreeing to item 7.7. This also means there was less of dispersed thought of agreeing or disagreeing from teachers as compared to items 7.10 (make provision for learners who are not doing well in your class) which has a standard deviation (SD=1.327). A deviation of 1.327 depicts a wider dispersion in teachers thought of choosing to agree or disagree and this cannot be an accurate representation of the mean, (Field, 2005).

Among other items that never gained supports from teachers in their choice of agreeing were two important issues, these are item 7.4 and 7.11. These two items had a mean values less than 3.0 from the table. It indicates that within the thought of the teachers who responded, majority are of the view against "Assist learners after worked class" and "Allow learns to work at their own pace". If teachers refused to assist learners after worked class then those students would not be able to solve some of the worked problems. This means they would hardly find meaning to the next topic, especially, when the concept taught was the basis for a new topic. One of the inferences that could be drawn from these findings is that some mathematics teachers have little commitment to their job. This inference was made because some of the students who participated in this study responded to the opened-ended question as *"mathematics teachers need to be motivated so that they would show some level of commitment in their teaching"*. About 7.9% of students representing 13 students made affirmative responses to this question.

Finding from the table 4.1 also shows that majority of the respondents do not allow learns to work at their own pace. For the sake of clarity, the researcher asked one of the interviewees "why is it that some mathematics teachers would not allow learners to work at their own pace?" and the response was *"the pace of some of the students is slow that if we encourage such a pace, we would end up teaching nothing within the stipulated instructional time and this in the long run will affect teachers ability to complete the syllabus before the final examination"*. The researcher finds the interviewee's response interesting and relevant because 38.5% (n=10) of the teachers responses have indicated that they rarely complete their syllabus in (Table 4.1).
It is evident from the above proceedings that some mathematics teachers have ignored taking students pace into consideration but rather adapted to a pace that would enable them complete their syllabus before final year's examination. This finding is consistent with Anamuah-Mensah Committee Report (2002) which stipulated that the education system continues to suffer from high stakes examinations such as Basic Education Certificate Examinations (BECE) and Senior Secondary School Certificate Examinations (SSSCE), which are used as indicators of quality. These examinations are so competitive that teachers tend to overemphasis solving problems for examinations rather than encouraging meaningful learning. No wonder 15.2% (25) of students requested for an extension of the instructional time allotted on school's time table for mathematics as a response to the open-ended question "*what do you think the school should do to support you in learning mathematics"?* On the whole, majority of the teachers think performing items 7.2, 7.7, 7.8 and 7.9 could enhance teaching and learning of mathematics at the SHS level. This is to say that giving assignments and reviewing those assignment, encouraging group work and general class discussion are factors that enhance students' opportunity to learn mathematics.

4.2 Responses of teachers on how often they engage in the listed items

	N	Mean	Std. Dev
6.1 make connections between mathematics and other disciplines	26	2.96	1.076
6.2 use additional mathematics textbooks as instructional tools	26	4.00	.915
6.3 have confident and enjoy teaching SHS mathematics	26	3.96	1.006
6.4 take students' prior understanding into account when planning a lesson	26	4.31	.679
6.5 cover all mathematics concepts in the syllabus	26	2.58	1.137
6.6 involve parents in the mathematics education of their children	25	2.44	1.161
6.7 advise students about job opportunities in mathematics	26	3.12	1.152
6.8 examine the students at the end of each topic	26	3.46	1.105
6.9 conducting frequent test	26	3.12	1.164
6.10 motivate student to learn mathematics on their own	26	3.85	.834
6.11 encourage group work among students	26	3.42	1.809
6.12 involving students in the teaching and learning process	26	3.65	1.017

From table 4.2 above, there are three items that participants rarely do as part of their course of executing their duties as teachers. These were items 6.1, 6.5 and 6.6. The implication is that teachers are not found of making connections between mathematics and other subject disciplines. This fails to inculcate in students the importance of mathematics in their schooling life and why the need for students to acquire some basic skills in the subject. This might be one of the reasons why some students show cold attitude towards the subject because they might have a belief that mathematics is not relevant to their course programmes. Students should be made to know the subject as a trans-disciplinary subject and deserves serious attention from all students. The other two items concerns teachers not covering all mathematics concepts in the syllabus and also not involving parents in the mathematics education of their children. Parental involvement has been found to be one of the influential factors of students' achievement in some researches including this very research. It is therefore unfortunate that respondents (teachers) have testified that they make minimal use of parents. This finding might be attributed to the dominance of the responses coming from boarding schools in this research. With the boarding schools, house masters/mistresses and school authorities act as parents therefore teaching methods that involve real parents cannot be effectively practice. However, this does not downplay the fact that parents must be involved in their wards mathematics education because Pezdek et al. (2002) found that increasing the accuracy of parents' awareness of their children's mathematical skills may be a sensible first step toward improving the poor mathematics performance of children.

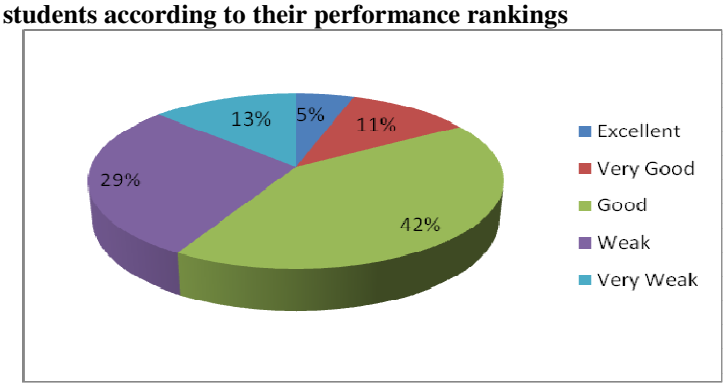
Apart from the three items discussed above, participants' responses depicted that they frequently perform all other items. This is because the mean values of those items are greater than 3.0. However, only items 6.2, 6.4 and 6.10 could be an accurate representation of the mean because these items have a standard deviations which are lesser than 1, from the table 4.2. Even though, items 6.3 and 6.12, for example, are having higher mean values of 3.96 and 3.65 respectively, their deviations are greater than 1. The implication is that majority of the teachers who responded to this study frequently; motivate student to learn mathematics on their own (6.10), take students' prior understanding into account when planning lessons (6.4) and also use additional mathematics textbooks as instructional tool (6.2). Items 6.2 and 6.4 together depict positive preparations that participants go through before mathematics lessons. Depending on a particular textbook all the time makes a teacher less informative and lesson delivery monotonous. Conversely, blending textbooks make a teacher resourceful and this brings variations in both teaching and information.

Do teachers perceived practices explain students' perceived performance?

In order to answer this question, the researcher decided to measure how these perceived practices of teachers relates with their students perceived performance with a scatter plot. Students performances were obtained by asking them to respond to the question: **How would you grade your own performance in mathematics?**

Figure 4.1 below is a pie chart showing the various percentages of responses that were given by students with each performance ranking.

Figure 4.1: Responses of students according to their performance rankings



From the pie chart, 29% of respondents attested that they are weak and 13% of them believed they were very weak in the subject. On the contrary, majority of the students indicated they were good and very good in mathematics with excellent coming from a few of them. On the whole, 58% of the respondents indicated that their mathematics performance were above average.

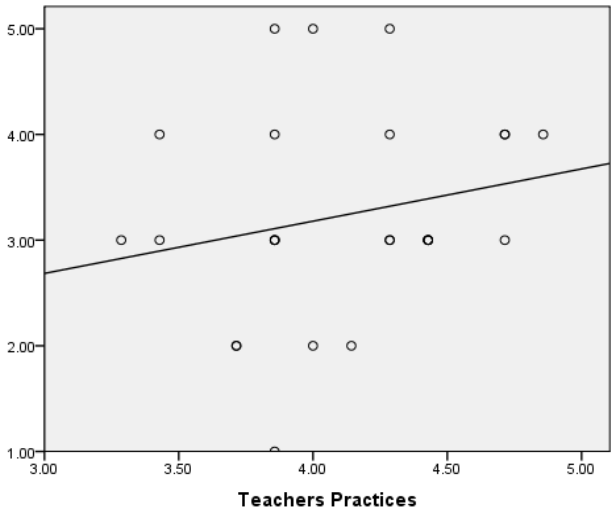
With these two variables, a scatter plot test was conducted resulting in a scatter diagram with a line of best fit which describes the level of relationship between the two variables. A summary of the model's analysis is as shown in Table 4.3 below.

Table 4.3: Summary table for the scatter plot analysis

R	R Square	Adjusted R Square	Std. Error of the Estimate	F	Sig.
.212	.045	.005	.990	1.126	.299

The independent variable is Teachers Practices.

Figure 4.2: Scatter diagram measuring Students Performance against Teachers Practices



The scatter diagram in figure 4.2 above shows that there is a positive relationship between students' performance and teachers' perceived practices. In other words, teachers perceived practices have been found to be influencing students' performance. The summary table 4.3 also confirms this relationship with a positive correlation coefficient of R = .212 and R^2 of .042. This shows that students' performance could positively be explained by

4.5% of teachers' practices. The implication is that other factors apart from teachers' practices contribute to students' achievement.
Analysis so far in this research depicted that majority of the teachers perceived items 6.2, 6.4, 6.10, 7.2, 7.7, 7.8 and 7.9 could enhance teaching and learning of mathematics at the SHS level. This is to say that motivating student to learn mathematics on their own, taking students' prior understanding into account when planning lessons, use additional mathematics textbooks as instructional tool, giving assignments and reviewing those assignment, encouraging group work and general class discussion are activities that enhance students' opportunity to learn mathematics. Indeed, each of the activities has influence on the learning outcomes of students since data collected for this study has proved it. This study found a positive relation between teachers perceived factors and students' performance.

Various literatures have emphasized that teaching techniques such as peer grouping and cooperative learning that is associated with some of these factors really improve students' mathematics learning because both techniques involve discussion among students. According to Posamentier *et al*. (2006), teaching of mathematics is not about dispensing rules, definitions and procedures for students to memorize, but engaging students as active participants through discussion and collaboration among students. Other researchers also concluded that to achieve success in learning mathematics, students should be given the opportunity to communicate mathematically, reasoning mathematically, develop self-confidence that motivate them to solve mathematics problems and one of the ways this could be done was through cooperative learning, (Johnson and Johnson 1990). In cooperative learning, students study in small groups that permit discussion among peers to achieve the same goals using social skills. This technique erases any shyness that is resulted in several trials and fail associated with weaker students in mathematics.

5.0 Conclusion

It was discussed earlier in this study the importance of Senior High School level mathematics to the development of a country. It would not be enough for a country to just believe that mathematics is important until a substantial amount of the subject content have been successfully imparted into a country's schooling citizens. This has made students' mathematics achievement an issue of concern to many countries of today. These concerns have necessitated numerous educational researchers to investigate what should be done by educational institutions to enhance the teaching and learning of mathematics. Various outcomes and contributions made in the past regarding teachers endeavors have been provided to students to learn and achieve in mathematics have been reviewed in this research to inform readers of what have existed already. While some reviewed researches criticized methods used in teaching mathematics and also condemned shorter instructional periods for the teaching and learning of mathematics, others made suggestions and recommendations that would help improve achievement in the subject. The analysis in this study revealed that majority of SHS mathematics teachers perceives the following professional activities to be influential to SHS students' mathematics development: Assigning mathematics homework and reviewing the given homework, encouraging learners to work in groups, engaging the whole class in discussion, using additional mathematics textbooks as instructional tools, taking students' prior understanding into account when planning a lesson and motivating student to practice mathematics on their own.

Recommendation

Based on the findings of this study, the following essential recommendations are made for consideration:

- Teaching and learning of mathematics at the SHS level should be strengthened with the provision of qualified and committed teachers so that students receive the best out of them. Since such teachers are inadequate in the system, first degree holders in mathematics who have graduated from non-professionals institutions should be recruited to teach at the SHS level.

- All mathematics teachers need to be properly motivated with good conditions of service to ensure their effectiveness and retention.

- A mechanism for organizing regular in-service training, workshops and seminar for all mathematics teachers in the system should be put in place. In addition, mathematics teachers must be encouraged to join the subject's Association known as Mathematics Association of Ghana (MAG).

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