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The Existing Culture Of Mathematics Teaching And Learning: A Case Of The Senior High Schools In Ghana

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ABSTRACT

One of the goals of the 1987 education reforms in Ghana is to enable all school going-children in the country to have the practical skills in mathematics, understanding the concept, and to help them to overcome the day to day challenges involving calculable situations. Among the major causes of fears in students learning mathematics at secondary levels is the culture of mathematics teaching and learning. Students' acquiring practical skills in mathematics learning had an influence on their views. The formation of their views also have an impact on their learning situations, which one way or the other determine how mathematics is learnt. The purpose of the current study is to assess the existing culture of teaching and learning mathematics in the Second cycles' schools in the context of students' perceptions. The descriptive survey design was used for the study. Questionnaire was used to collect data from 1288 respondents using systematic sampling procedure. Data was analysed using frequency, percentages, reliability index and correlation coefficient. Results of the study revealed that the teaching of mathematics have had an impact on the graduates' performance over the years. It also depicts substantial trends of changes and attitudes towards learning mathematics across class levels. The study recommends that teachers should give enough homework/class exercise to students, mark them and give feedback to students as early as possible. In service training should also be given to mathematics teachers to up-date their skills. Finally the Monitoring and Evaluation teams in the Ghana education Service should intensify their supervision roles.

1. INTRODUCTION

Education is one area that enhances the development of a country and therefore needs to be given enough attention. One of the most existing education reforms in Ghana is the 1987 one which has given birth to many reforms or reviews since its implementation in 1987. Obviously, the education reform policies of the country, since the implementation of the 1987 reform seems to have very similar reasons given by successive governments for introducing an education reform.

Apparently there are justifiable fears that access to quality education is becoming elusive to many people, especially the rural dwellers in the country. According to Daddieh, (1995) the development of human capital required for nation's social, economic and political system is facing a big challenges. In a recent report on education, the Ministry of Education (MoE) iterated that among the ultimate goals of the education reforms in Ghana is to enable all school going-children in the country have mathematical skills, understandings of the mathematical concept, and to help them to overcome the day to day challenges involving calculable situations (MoE, 2002).

Students frequently encounter problems in learning mathematics, and for that matter preventing many students, more especially those in secondary level to gain admissions for further studies. The learning

challenges includes lack of understanding of the concepts and the principles (World Bank, 2004). What contribute to these challenges are considered from various perspectives which includes, language differences, the historic factors, the school system with national curriculum and the culture of teaching and learning. No single crucial factor can be found to explain this phenomenon, yet this study found it imperative to consider the existing culture of teaching and learning as the most influential contributor.

Globally, curriculum development for learners in general, portrays one of the three broad approaches namely; knowledge-based, outcome-based and competence based (Wong, Lam, Wong, Leung, & Ida Mok, 2001). Historically, Ghana inherited knowledge-based curriculum approach from Britain (Fredua-Kwarteng and Ahia, 2005). The laid emphasis solely on knowledge grasping and it was content driven. The focus was more on cognitive domain, while the Affective and psychomotor domains were missing.

In the case of outcome-based, it is the nationally defined outcomes and the content is generated based on the intended outcomes. Such approach is thematic in generating the learning contents.

For the competence based, the emphasis is on competences, which are defined in terms of knowledge, skills and attitudes that the learner has to acquire gradually in the process of teaching and learning. The competences can be demonstrated (knowledge) by the learner or performance based (skills), as well as those based on behavioural perspectives (attitudes). The study consider the competence-based approach as the best to be considered in the case of mathematics teaching and learning.

According to Fredua-Kwarteng and Ahia, 2005, many countries over the world revised their school curricula from content based to competence-based curricula. These major reforms in curricula at all levels of Educational systems have implications in the ways teachers teach and students learn. The question is how the existing culture of teaching students mathematics reflect on their ability to learn. The role of the teacher is to facilitate mathematics learning and in the light of this, the approach is said to be student-centred. Unlike the previous content-based curricula, where the teacher has to identify the competences required in a given lesson and build on earning activities to facilitate the development of those competences into the learners.

This current reform in curriculum development have asserted a move from teaching mathematics by memorization to the teaching of concepts in order to gain understanding. However, Kalugula, 2000 and Wangeleja, 2007 iterated that, teachers' practices are not changing and examination style contributes to this rigidity in pedagogical shift. The reasons why mathematics is difficult to learn is that the concepts in mathematics are abstract and difficult to understand, and also the students have alternative meaning of certain mathematical words before any mathematics teaching takes place.

The sad fact is that, learners in Ghana is now facing a big challenge of getting a good pass in mathematics to move to the next step of further studies. Mathematics has prevented majority of school-going children from

pursuing further in their studies. However, our present and past authorities have not seriously looked at the contributing factors that making it difficult for Ghanaians to learn mathematics.

The culture of teaching and learning mathematics explain the beliefs or the views and experiences of the learners in the subject. Students' experiences in learning mathematics influence the formation of their views. Students' views or beliefs also affect their learning behaviour, which in turn affect their interest in learning the subject (Wong, et. al., 2001). In other words, mathematics beliefs form a frame for an individual's knowledge structure which broadly influences the mathematics performance of the individual.

Over the past twenty-four years, the implementation of education reforms is still being a hectic situation to successive governments of Ghana. Obviously, if the successive education reforms includes the general transformation of teaching and learning culture, the interest in mathematics learning would be improved. According to Fredua-Kwarteng and Ahia (2004, part1), mathematics had seriously become problematic and is posing limitations to our SHS graduates in seeking admission into tertiary institutions. It is imperative to find out from SHS students if they appreciate the existing culture of teaching mathematics and their levels of difficulties in learning mathematics topics.

The purpose of the current study is to assess the existing culture of teaching and learning mathematics in the Senior High Schools in Ghana in the context of students' perceptions. The specific objectives are to:

- Assess the perception of students on the culture of mathematics teaching;
- Students views on the learning of mathematics as subject;
- Examine students levels of difficulty in learning various mathematics topics; and
- Find the relationship between the perceived level of students' learning and graduates performance in mathematics.

The study was guided by the following research questions:

- What are the students' perceptions of the culture of mathematics teaching?
- What are the students' views on mathematics learning?
- What topics in mathematics do Students' perceived level of difficulties?
- Does the existing culture of Mathematics teaching and learning got effect on the SHS graduates performances in mathematics?

Professor Lee (2006) recognised that teachers play a central role in the process of education, more especially the mathematics tutors. Given good mathematics syllabus and good textbook, but without good teachers, the subject may not be well taught. If there are good syllabus and good textbooks, and there is a good teacher, then the subject matter could be well taught. The numerous education reforms in Ghana have clearly stated that; all students can learn mathematics and that all students need to learn mathematics (Agyeman, Baku,

Gbadamosi, 2000). They set high achievable expectations for all students, and call for teachers and parents to help all students strive towards achieving those standards. The reforms seek to have the nation's mathematics education and the mathematics curriculum framework call for major changes, both in terms of what mathematics will be taught, and in how it will be taught.

The recommendations provided are very specific, yet, it is not intended that they would be implemented dogmatically. The big question therefore is, do teachers use the right pedagogy as described in the mathematics curriculum? The answer to this question as the study is set to find, would help educational stakeholders, to tap the findings to improve on the facilities needed for teaching and learning mathematics in schools.

This study involves SHS students in the evaluation of the existing culture of mathematics teaching and their views on mathematics learning. As a result, Mathematics Tutors will know their strengths and weaknesses in the quality dimension of teaching and learning enterprise. It might also pave the way for the tutors to be able to identify some of their students' level of difficulties in learning topics in mathematics, as well as their attitude towards the subject, which could have its effects on graduates' performance in mathematics.

2. RESEARCH METHODOLOGY

The descriptive research design was adopted for the study. This involves collecting data in order to test hypothesis or answer research questions concerning the current status of the subject of study (Cohen, L., Manion, L., & Morrison, K., 2000). Descriptive research design was chosen because of the practicality of the study as it involves gathering respondents' opinions and attitudes. The target population of the study is made up of the entire SHS students of public senior high schools in Ghana. The accessible population is the total student population of three randomly selected public Senior High Schools (SHS) in Central Region of Ghana. The schools selected are mixed schools.

Basically, multi-sampling techniques were adopted for the study. First, the purposive sampling technique was used to select one region out of the ten regions in Ghana. The Central region was selected because the researchers are living and working in Cape Coast. Again a simple random sampling technique was used to select three schools from the 49 public Senior High Schools (Ghana Education Service, 2010) in the Central region. The systematic sampling technique was also used in selecting a maximum of twenty students from each studying programme at each class and school. In this regard, a total of 1440 respondents were expected, but, lesser students' population was found offering some of the programmes. With this, the total respondents were 1288. Tables 1 depicts the distribution of 1288 respondents by class or the level of students.

Table 1: Characteristics of Respondents by Level

Level	SHS1	SHS2	SHS3	SHS4	Class Total	%
Male	162	169	166	152	649	50.4
Female	154	163	159	163	639	49.6
Total	**316**	**332**	**325**	**315**	**1288**	**100.0**

A survey was conducted in 2011/2012 academic year at the three randomly selected public Senior High Schools in the Central Region of Ghana. The instrument used for this study was a set of questionnaire that comprised two major parts. Part A involves a set of 26-item questionnaire that was designed to identify students' perception on the existing culture of mathematics teaching. The first section of the part elicited information on the students and tutors background. The part B comprised 21-items regarding students perception on mathematics teaching, The second part (B) is in four sections and subsections with a total of 44-item designed to identify students' views on the existing culture of learning mathematics in Senior High School (SHS) of Ghana.

Section one, is titled Students Habits of Learning Mathematics, section two, is Students' Conception of Mathematics, section three, the Attitude toward Mathematics, and final section four, the levels of difficulty of various topics as perceived by the students. An SHS student could choose between the six programmes: General science, Agriculture Science, Business (Accounting & Secretarial), General Arts, Vocational (Home Economics & visual Arts) and Technical (MOE, 1986). The six programmes considered in the study were General science, Agriculture Science, Business, General Arts, Home Economics and visual Arts as shown in Table 2. After establishing rapport with the Heads of schools, permission was granted for the exercise. Basically for the purpose of the study and some operational words, as well as the procedure for answering the questionnaire was clarified to the students. Ample time was given to the respondents to complete the questionnaire.

Table 2: Progammes of the Participants in the Senior High School selected

	Gen. Sc.	Arts	Bus.	Agric.	Home Econs.	Vis. Arts	Class Total	%
Male	111	115	113	152	16	142	649	50.4
Female	113	114	113	41	186	72	639	49.6
Total	224	229	226	193	202	214	1288	100.0

The statistical analyses used were frequency, percentage, reliability index and correlation coefficient. The reliability index (Cronbach α) of the study for all the 1288 respondents was **0.85.** For the qualitative analysis, written responses of the students were analysed by listing the problems encountered by each students in his explanation.

3. RESULTS AND FINDINGS

Presented here is the research findings guided by the following research questions; what are the students' perceptions of mathematics teaching; what are the students' views on mathematics learning; what topics of mathematics do the Students' perceived level of difficulties and Does the existing culture of Mathematics teaching and learning have any effect or not, on the SHS graduates performances in mathematics.

Measuring teaching effectiveness is so important because, the evidence produced is used for major decisions about stakeholders' future in academia. In other words, students' evaluation can be used to improve classroom instruction, student learning, and to foster professional growth of the tutors, and also the results of such evaluation are used for administrative/personnel decisions like promotion and awards

Students' views on mathematics learning on the other hand, looked at students' conception of mathematics, their attitude toward mathematics and their learning habit. Students perceived difficulty level in learning topics in mathematics is the third research question. The homogeneity in the Students' perceived level of difficulties to topics in mathematics was assessed, while the general performances of the SHS graduates in mathematics constituted the fourth and final research question deliberated on. The rating levels were given, ranging from Strongly Agree (4) to Strongly Disagree (1).

3.1 THE STUDENTS' PERCEPTIONS OF MATHEMATICS TEACHING

The attendance of Tutors, the mathematics content, tutors' mode of delivery and homework given, marked and discussed with students were the four selected core areas under students' perceptions of mathematics teaching. Under this part, students responded to 21 items that asked their level of agreement or disagreement with various statements about the culture of mathematics teaching. Reliability for this scale, estimated with Cronbach's alpha, for the 21 items was 0.87

Attendance of Mathematics Tutors

The Table 3 depicts the Means and Standard Deviations (SD) on Tutors' Attendance. Two items loaded on the core area, were tutor being regular and punctual in class and scoring produced a mean of 3.24 (SD= 0.817) and 3.24 (with SD= 0.757) respectively. It is well noted that lower standard deviations on the items (SD <1.0) suggest a lower divergence of opinion among the respondents on their tutors' attendance. The study vividly reviewed that students were very satisfied with Tutors' attendance.

Table 3: Means and Standard Deviations on Tutors' Attendance

Attendance	Mean	Standard Deviation (SD)
Tutor met class regularly	3.24	.817
Tutor was punctual	3.24	.757

Content of Mathematics

Four items loaded on the second core area, which was named content of mathematics. The Table 4 shows the items with their means and corresponding standard deviation. For instance, the mean of 3.49 (with *SD= 0.651*) indicated that, the students were in agreement to the statement "Tutor provided termly topics to students at the beginning of term" while the respondents were less agreed to Tutors provided the list of recommended textbooks with the mean of 2.62 (SD= 0.835).

Table 4: Means and Standard Deviations on Content of Mathematics

Content of Mathematics	Mean	Standard Deviation (SD)
Tutor provided termly topics to students at the beginning of term	3.49	.651
The mathematics topics was based on the termly schedule of work provided	3.25	.766
Topics are likely to be adequately covered at the end of term	3.04	.834
List of recommended textbooks was provided	2.62	.835

Mode of Delivery

The ten items loaded under the third core area is depicted in Table 5.

Table 5: Means and Standard Deviations on Tutors' Mode of Delivery

Mode of Delivery	Mean	Standard Deviation (SD)
Tutor demonstrate knowledge of mathematics	3.33	0.647
Tutor delivery was well organized	3.40	0.642
Tutor effectively communicated what he was trying to teach	3.30	0.739
Tutor used class time to fully promote learning	3.13	0.819
Tutor encouraged independent study	2.99	0.980
Tutor encouraged critical thinking	3.36	0.652
Tutor encouraged practice by solving problems	3.45	0.654
Tutor was responsive to students questions and concerns	3.35	0.589
The Tutor made room for questions and expression and concern	3.29	0.681
The Tutor was genuinely concerned with students' progress	3.24	0.781

It talks about the pedagogies the mathematics tutors used to impact learning into their students. The core area had its name the mode of delivery. The respondents were very satisfied with mean score for all items greater than three, except the one with Tutor encouraged independent study, with a mean of 2.99 (SD= 0.980)

Homework/Class Exercise

Five items were loaded under the forth core area to assess the Homework and Class Exercise given, marked and discussed with the students. The competence based mathematics curriculum needs Constance practices and demonstration of skills. The students agreed to the statement indicating adequate class exercise being

given by their tutors. However, the students less agreed to the given of adequate homework, marked and subsequently discussed with them on time (see Table 6).

Table 6: Means and Standard Deviations on giving and marked Homework/Class Exercise

Homework/Class Exercise	Mean	Standard Deviation (SD)
Tutor gave adequate homework	2.65	0.898
Tutor gave adequate class exercise	3.04	0.913
Marked homework were returned on time	2.87	0.983
Marked homework were subsequently discussed on time	2.75	0.877
Marked class exercise were subsequently discussed in class	2.98	0.896

Grand Mean Rating

Table 7 depicts means and difference percent between those who agreed and those who did not, under the Grand Mean Rating

The grand mean rating in the study refers to the average of the mean scores of the number of items under each core area which indicates the overall performance of the tutors in that dimension.

Table 7: The Grand Mean Rating of the Core Areas assessed

CORE AREA	Mean	Difference Percentage (%)
Attendance	3.24	62.0
Content of Mathematics	2.98	49.0
Mode of Delivery	3.27	63.6
Homework/Class Exercise	2.86	43.0

For example, in the case of Attendance, the grand mean score was 3.24, (with those who agreed out-numbered those who did not by 62%). "Content of Mathematics" (mean = 2.98, difference = 49%), "Mode of Delivery" (mean = 3.27, difference = 64%) and "Homework/Class Exercise" (mean = 2.86, difference = 43%). Majority of Students were in agreement to the Tutors' mode of delivery, while few were satisfied with the given, marked and discussion of homework by their Tutors.

3.2 STUDENTS' VIEWS OF MATHEMATICS LEARNING

Students at all levels of the Ghanaian educational ladder still have problems learning mathematics and literature studies that have specifically focused on Students' views of mathematics learning in Ghana have not been found yet despite the persistence of the problem. The applied implication is that feedback data consisting of student ratings of teaching as well as their views on the learning of mathematics in second cycle institution in particular is not found. Although student ratings is not sufficient as the informational basis for assessing students learning in general, it is one of the necessary types of information for the evaluation of classroom instructions.

The presence of some, but not many, studies that explore the student perspective of evaluations suggests that this is an important issue. In literature, some studies seem to address issues in the current study, yet they are slightly different. Some focus on a different culture or very rigid curriculum/professional orientation (Ballantyne, 1998; Harnash-Glezer & Meyer, 1991; Beach, M.C., Price, E.G., Gary, T.L., Robinson, K.A., Gozu, A., & Cooper, L. A., 2005). In the case of Students' views of mathematics learning, the study revealed the following;

Students' learning habits

The results indicated (see Table 8) that most of students at each class (SHS1- 4) took positive steps, as they agreed to the idea of having discussions with classmates to solve their difficult problems.

Table 8: Students Habits of Learning Mathematics

	Percentage			
	SHS 1	SHS 2	SHS 3	SHS 4
When I meet difficulties in learning Mathematics, I will				
consult the teacher	26.86	27.25	27.31	27.33
discuss with classmate	30.05	30.57	30.84	30.84
search for reference	27.22	27.25	27.14	27.15
give up	15.87	14.93	14.71	14.67
When I meet difficulties in solving Mathematics, I will				
insist working out myself	24.75	24.71	24.71	24.69
accept others advice	27.44	28.43	28.17	28.23
accept others assistance	30.03	29.94	30.03	30.09
not mind copying others work	17.78	16.92	17.09	16.99
Average hours spent weekly on all homework	6.77	5.90	6.70	7.72
Average hours spent weekly on mathematics homework alone	3.23	3.14	3.64	4.20
Percentage of time spent on mathematics homework	47.7	53.2	54.3	54.4
Student have private tutor or attend tutorial class outside school hours	52.0	50.8	51.0	51.3

Students were reluctant to give up when they encountered learning difficulties, more especially at the highest level. The students' intentions to consult the teacher increased noticeably from SHS one (26.9%) to the higher classes. It was the lower class that most students did not mind copying the work of others as the percentage decreases when they get to higher levels. Less than twenty-five percent of students at all levels insist on working mathematical problems by themselves while 30% accept others assistance.

In another development, the study revealed that, on average the student uses between 6 to 8 hours per week on homework, and 3 to 4 out of the total hours per week on mathematics homework alone. The proportion of time spent on mathematics homework was found between 48% and 54%, which followed similar patterns of

the figures obtained in earlier studies in different regions (Wong, N.Y., Kong, C.K., Lam, C.C., & Wong, K.M.P. (2004)). The highest percentages occurred at SHS levels 3 and 4. On the other hand, over 50% of the students either had private tutors or joined tutorial class outside school hours.

Conceptions of mathematics

Table 9 depicts the three dimensions found in the study that the students strongly agreed with all the statements similar to the findings of earlier empirical research. The study revealed that students often perceive mathematics as a subject which only involved calculations. Students at all levels had mean score above three and therefore felt that mathematics is a calculable subject. In this regard, it could be an obstacle to deeper understanding of the discipline, if the students see this as the only aspect of mathematics.

Table 9: Students' Conception of Mathematics

Conceptual form of Mathematics	Mean Score			
	SHS 1	SHS 2	SHS 3	SHS 4
Mathematics is seen as calculable subject	3.29	3.36	3.32	3.40
Mathematics involves thinking	3.47	3.53	3.43	3.38
Mathematics is seen as useful	3.40	3.48	3.42	3.23

Another dimension of students' conception of mathematics is that mathematics involves thinking, and in a similar manner, majority conceived mathematics as a subject that involved thinking. Such a conception is also common among the teachers, according to Wong, study conducted in 2001. In case of seeing mathematics as useful, students were of the view that mathematics is useful, particularly when applied to daily life as found in the earlier literature studies (Wong 2001; 2005).

3.3 STUDENTS' ATTITUDE TOWARD MATHEMATICS

In order to have a clearer picture of the trends of students' attitude toward mathematics, observations were made according to the following categories: students' interest, preference for understanding, confidence and competence, classroom learning and outside class learning. As shown in Tables 10 to 13, the statements that students at the four levels mostly agreed to had a mean score of three and above on a 4-point scale, while mean scores below 3 indicates those mostly disagreed.

Interest

Table 10 reveals that students' interest in solving mathematical problems dropped substantially from SHS 1(3.03), while attending mathematics classes and interest in calculations had mean score all above 3. The statement they mostly disagreed to was "trying mathematical problems not required by the teacher". The implication is that, students themselves do not practice what they have learnt in school and this happens throughout all the levels.

Table 10: Students' interest in Mathematics

Interest	Mean (on a 4-point scale)			
	SHS 1	SHS 2	SHS 3	SHS 4
I love solving mathematical problems	3.03	2.97	2.95	2.97
I am very interested in attending mathematics classes	3.13	3.15	3.13	3.16
I am interested in mathematical calculations	3.17	3.07	3.06	3.08
I rarely try those problems not required by the teacher	2.58	2.57	2.55	2.56

Preference for Understanding

Table 11 shows that, in general, students at all levels realized that understanding was important. This is reflected in the low mean score below 2.00, for "Understanding the content is unimportant …" and the high score 3.32 for "If I understand the concept concerned, I can always find a way to calculate the problem." Although there was a concern for understanding the reasons behind a formula, there was a mean score below three. Students tended to understand the concept more than knowing the formulas alone.

Table 11: Students Preference for understanding

Preference for understanding	Mean Score			
	SHS 1	SHS 2	SHS 3	SHS 4
Reading explanation not necessary, can learn just reading formulas	1.87	1.88	1.86	1.86
When learning new topic, I wish the teacher could tell us the formula right away	2.40	2.47	2.45	2.46
When learning a new topic, I wish I could think through it myself first	2.79	2.76	2.78	2.77
If I understand the concept, I can always find ways to calculate the problems	3.32	3.32	3.32	3.31
In learning new topic , I am not concerned about how the formula came about	2.77	2.84	2.86	2.86

Confidence and Competence

As far as confidence is concerned, the students' confidence in numerical computations and solving word problems had mean scores below three. They however agreed to have confidence in solving problems involved in substitutions. Scores below three was also found in how they perceived their competence in understanding the content in the mathematics class (see Table 12).

Table 12: Students Confidence and competence in Mathematics

Confidence and competence	Mean Score			
	SHS 1	SHS 2	SHS 3	SHS 4
Have confidence in problems involving substituting numbers into formulas	3.01	3.06	3.07	3.08
Have confidence in doing pure numerical computations	2.85	2.82	2.81	2.83
Have confidence in doing word problems	2.67	2.60	2.61	2.61
I fully understand the content in the mathematics class	2.74	2.76	2.76	2.77

Textbooks, Classroom and Outside-class Learning

As depicted in Table 13, students at all levels disagreed to have less mathematics homework. This is an indication from Table 10 where students agreed in attending mathematics classes and interested in solving problems involving mathematics. Students at higher levels preferred using calculators as compared to those in first year, while they disagreed to a low level of participation in mathematics-related extracurricular activities as well as not reading mathematics textbooks.

Table 13: Classroom and Outside Classroom learning of Mathematics

Textbooks, Classroom and outside class learning,	Mean Score			
	SHS 1	SHS 2	SHS 3	SHS 4
I hope that I could have less homework	2.13	2.16	2.17	2.13
I would use calculators for numerical calculations	2.93	3.04	3.04	3.05
I often read mathematics textbooks (as supplementary readers)	2.55	2.51	2.53	2.53
I often take part in mathematics extracurricular activities	2.70	2.59	2.59	2.67

3.4 PERCEIVED DIFFICULTY OF TOPICS

A list of topics was given to the students for rating. The topics were taken from the SHS mathematics syllabuses issued by the Government of Ghana (MoE, Science and Sports, 2007). The main rationale for the mathematics syllabus is focused on attaining one crucial goal, thus to enable all Ghanaian young persons to acquire mathematical skills, insights, attitudes and values that they will need to be successful in their chosen careers and daily lives. The new syllabus is based on the premises that all students can learn mathematics and that all need to learn mathematics. Students were requested to rate the level of perceived difficulty of each topic on a 4-point Likert scale (1 = very difficult, 2 = difficult, 3 = easy, and 4 = very easy). The result is summarized in Table 14. The results indicated that, as students enter the high school level, they found mathematics more and more difficult. The mean score of SHS 1 students' rating was 2.73, being the lowest among the four levels. As they moved up to the next higher level (SHS 2), they had a mean score of 3.08 with a downward trend from there to 2.8 in SHS 4. A more refined picture emerges as we take into account the topics which they rated the easiest or the most difficult. The summarized result in Table 14 indicates that, students in all the four classes found some topics in mathematics more difficult. In SHS 1, the two easiest topics "Sets and Operations on Sets" and "Algebraic Expression" had mean scores of 3.41 and 3.26 respectively. The most difficult topics were "simultaneous linear equation" (2.04) and "uses and abuses of statistics" with mean 2.60.

For SHS 2, the easiest topic was "Plane geometry (3.31) and the "Quadratic equation in one unknown was considered most difficult topic (2.84).

Table 14: Students' Perceived Level of Difficulties

Class	Range and Mean(M)*	The two easiest topics and their mean scores (in parenthesis)	The two most difficult topics and their mean scores (in parenthesis)
SHS1	2.04-3.41 M=2.73	Set and operations on set (3.41)	Simultaneous linear equation (2.04)
		Algebraic expressions (3.26)	Uses and abuses of statistics (2.60)
SHS2	2.84-3.31 M=3.08	Plane geometry (3.31) Indices and logarithms (3.24)	Quadratic eqn. in one unknown (2.84)
			Surds (3.00)
SHS3	2.55-3.19 M= 2.87	Linear and quadratic graphs (3.19)	Sequence and series (2.55)
		Mensuration (2.85)	Bearings (2.15)
SHS4	2.62-2.98 M=2.80	Applications of trigonometry (2.98)	Logical reasoning (2.62)
		Rigid motion and enlargement (2.90)	Frequency distribution and fitted probability distribution (2.80)

*The Mean (M) is the average of the two values of the Range (R)

In a similar manner, the SHS 3 students considered "Linear and quadratic graphs" (3.19) and "measuration" (2.85) among their easiest topics. They perceived the topics "Bearings" (2.15) and "sequences and series" (2.55) as the most two difficult ones. The "Logical reasoning" (2.62) was the topic the SHS 4, the final year students perceived as the most difficult. The two easiest topics, to them were "Applications of trigonometry" (2.98), and "Rigid motion and enlargement" (2.90).

Another area which is important for comparison is the programmes disparities on students' perceived level of difficulties. Statistically with the Chi-square distribution it was tested that whether the students' perceived level of difficulties to topics in mathematics have significant dependency on the students' studying programmes. Since the calculated value, $x^2 = 2.09$ is less than the tabulated value, $X^2_{(\alpha=0.01,\ 15)} = 22.31$, the conclusion was that, there is no evidence at 0.01 level of significance to reject the null hypothesis of independence. Thus, the students' perceived level of difficulties in topics in mathematics does not depend much on the particular programme he or she is studying at all levels.

3.5 GRADUATES PERFORMANCE IN MATHEMATICS

The question of the existing culture of Mathematics teaching and learning having any impact on the SHS graduates performances in mathematics is what the study is considering under this section. Obviously, student performance in mathematics will partly depend on how he was taught and also the ways he learn the subject. Started from the 2002/2003 academic year, the graduates who received good passes (A1-C6) in mathematics had percentages less than thirty (30%) till 2006/2007. Fifty-two percent, (52%) had good passes in 2006/2007 academic year and depicted a downward trend again, (see Table 15). The study also revealed the proportion of female graduates' performance in mathematics.

Table 15: The SHS Graduates Performance in Mathematics from the three selected Schools

			Percentages (%)			
Academic Year	Good pass (A1-C6)		Weak pass (D7-E9)		Grand total	
	Male	Female	Male	Female	(A1-C6)	(D7-E9)
2002/2003	39.0	61.0	37.0	63.0	28.4	71.6
2003/2004	54.0	46.0	43.0	57.0	22.0	78.0
2004/2005	55.0	45.0	48.0	52.0	26.3	73.7
2005/2006	54.0	46.0	39.0	61.0	28.6	71.4
2006/2007	60.0	40.0	44.0	56.0	51.9	48.1
2007/2008	72.0	28.0	45.0	55.0	34.8	65.2
2008/2009	52.0	48.0	47.0	53.0	36.3	63.7
2010/2011	69.0	31.0	46.0	54.0	27.0	73.0
2011/2012	57.0	43.0	46.0	54.0	44.7	55.3
2012/2013	64.0	36.0	49.0	51.0	44.2	55.8

To test whether there has been changes in the female ratio of graduates with good passes (A1-C6) in Mathematics since 2002/2003 academic year, the calculated value, $x^2 = 27.17$ is greater than the tabulated value $x^2_{(0.05,\ 1)} = 3.84$. This means that there is much evidence to accept the alternative hypothesis (at $\alpha = 0.05$ level of significance) and conclude that, the female graduates have experience a fluctuating trend in their performance in mathematics. This is rear evidence in support of what portrayed in column three of Table 15.

4. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This study was guided by the research questions and discusses in detailed the perception of SHS students on the existing culture of mathematics teaching and learning. We can draw several broad conclusions that should prove useful to the school management. The recommendation given to ensure that Teaching and Learning opportunities for all students are fully maximised and to give opportunities for mathematics tutors to lead, provide direction and to ensure their subjects are being taught as well as possible.

In an effort of looking at students' perception on the culture of teaching and learning mathematics in our new educational system, this study was conducted in three randomly selected public SHS located in Central Region of Ghana. All the three schools were established some years before the implementation of the 1987 education reforms. Students' level of difficulties in learning topics in mathematics was also revealed and hypothesis tested to see if there is a programme disparity in terms of difficult levels. The SHS graduates' performances in mathematics were assessed to see if the existing culture of teaching and learning has any influence on them.

During the time of conducting this exercise, 30 out of the total teaching staff of the three schools were handling the Core Mathematics with seven females. Nineteen of them are Professional teachers, five non-professionals and six National service personnel. With the tutor-student ratio of 1:175, it was inconceivable that the tutors could do well in assisting individual student with difficulties to excel.

In terms of Attendance, 75% of the tutors were rated Good and above. Under content of the subject, tutors did well in providing termly topics, adequately covered the syllabus, and provided reading materials for the students. Seventy-five percent of the mathematics tutors were rated Good and above in the case of delivery, but given of homework, marked and returned to class for discussion was not encouraging as the mean scores were below three.

It was also found that the students' level of difficulties was independent of the programme of study, while the percentage change in female graduates' performance in mathematics depicted a negative trend.

Research findings also revealed that most students preferred to discuss with classmates to solve their problems and do not give up easily when they encounter difficulties in solving mathematics problems. The students also consult their teacher at the first stages of the school (SHS1), and the rate dropped when moving to the final stage (SHS4). Students were generally interested in mathematics but averagely the interest dropped as they moving to higher levels.

In addition, students showed confidence in solving problems involving substituting numbers into formulas, however, they had trouble with word problems and numerical computation. Their trouble with word problems might possibly be due to the competence in language used in teaching the subject. The English language might have adversely affected performance in solving mathematical word problems.

Students showed no interest in mathematics "supplementary readers", and almost all the students did conceive mathematics as a useful subject. In other words, even those who are not mathematically oriented students like Home Economics and Visual arts did consider mathematics as useful. Besides, the rate of opting for "giving up when facing learning difficulties", was the lowest at all levels. It is not easy and may not even be desirable to summarize a list of topics that students found the most difficult (or the easiest). But it seems that those topics involving technical (if not tedious) manipulations were least welcomed by the students, whereas those requiring visual and hands-on experiences were students' favorites. Apparent difficulty and impracticality were also some of their concerns.

5. CONCLUSIONS

The study has vividly revealed the trend of affairs on the students' perception of teaching and learning mathematics in our new educational system and indeed affirmed the research questions put forward. The

nation as a whole is making the modest efforts to improve upon the study of mathematics in addition to other science subjects. Despite this, all cannot be said to be going on well for the existing culture of mathematics teaching and learning in SHS of Ghana. In any case, the positive response of certain issues does not mean that students did not encounter problems in learning mathematics. They faced real learning problems, in the existence of the discrepancy between what one hopes for and what one can really do. This is evident from the fact that they strongly agreed with the statement "I am interested in mathematical calculations."

On moving up to the higher levels, students' attitude toward mathematics learning became more and more positive and they perceived relatively difficulty in the topics learned. If our students have interest and a high regard for mathematics, their declining performance could be attributed not only to their competence, but also to the mismatch of the curriculum in a broader sense.

There is expectation that all mathematics tutors are to score Very Good and above in all the assessed core areas. Again students were able to come out with their views of learning mathematics. It is with this, that stakeholders should pay heed to the outcome of this study. The study also calls for those tutors rated Good and Satisfactory to do well to improve upon their performance. The problem of mathematics teaching and learning in the second cycled institutions of our country needs a very serious attention

In this light, this research offers timely information on the learning style of students and the difficulties they face. The data collected in this research offer School Management Committees (SMCs) and frontline teachers a full picture of teaching and learning mathematics in the school. Though this study carried out, constituted the first of its kind in developing nation like Ghana, we believe that authority must pay heed to the survey outcomes. With this information in hand, SMCs and teachers should be able to have a better curriculum implementation. On the other hand, there is a pressing need to cater for student differences and to devise means to help students with learning difficulties. Curriculum tailoring and differentiation should be considered. These research findings could help not only stakeholders in the selected SHS, but also all educational cycles with similar socio-cultural settings, to understand how students perceive the culture of mathematics teaching and learning.

6. RECOMMENDATIONS

With regard to the findings of the study, the following recommendations and suggestions are made for the necessary action to be taken by all stakeholders concerned.

Homework/class exercise is where tutors were rated below expectation at class levels. Tutors need to give enough homework/class exercise and do well to mark, return and discuss them with the students. Many students indicated in their general comments that class exercise were not marked in good time for discussion. Tutors with weakness(es) or shortcomings are to take remedial measures for future improvement.

Monitoring and Evaluation teams should be established to intensify the evaluation mechanism. The stakeholders should reflect upon whether the intended curriculum (curriculum documents, textbooks) and the implemented curriculum (including classroom teaching and teaching pedagogies) suit the needs of the students and help them to sustain their interest in the subject throughout their schooling.

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