Improving the Teaching and Learning of Mathematics in Second Cycle Institutions in Ghana I

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Abstract: As a teacher of Mathematics, I am sure many of us feel quite disturbed and worried when the results of the Senior Secondary School Certificate Examination are released and we observed that some subjects record as high as a hundred percent success while the results are often "spoilt" by mathematics. Graded 6 and above are usually oases of success in a desert of failure. This study addressed the way of improving the teaching and learning of mathematics in Second Cycle Institutions in Ghana.

Key words: Mathematics, second cycle institutions, SSCE, teaching and learning, MAG

INTRODUCTION

Mathematics has been vital to the development of Civilization. From ancient to modern times mathematics has been fundamental to advances in Science, Engineering and Philosophy (Monastryrsky, 2001). Mathematics will continue to take pre-eminence in the society and at all level of the educational strata; because of the importance of mathematics and the prime of place it occupies in our society and on the curricular of the primary, secondary and tertiary levels of educational in Ghana.

We have often heard students saying they have been looking for Mathematics for four, five even six years. In other words Mathematics has been the impediment or hindrance to their progress from the experience, out of all the subjects on the school curriculum it is Mathematics that records the most woeful and hard rendering results In publicly-conducted examination and higher institution of learning Mathematics. This disappointingly poor performance of students in Mathematics year-in-year-out have been a constant source of concern, worry and anxiety to all stakeholders in educational sector-Government, Educationist, Professors, Principals, Teachers, Parents, Guardians etc. The purpose of this study is to cure the incessant mass failure in mathematics and improve the teaching and learning of Mathematics.

AIMS AND OBJECTIVES OF MATHEMATICS TEACHING TO PRIMARY AND JUNIOR SECONDARY SCHOOL CHILDREN INCLUDE THE FOLLOW

- Helping the child to explore and understand the word around him.
- Helping the child to be able to compare and contrast objectives
- Helping the child to acquire the technique of problem solving
- Helping the child to develop his logical thought processes

It implies (Table 1) that the teachers must carefully select topics as well as methods of presenting the topics to the learner's level so as to make him benefit from the teaching and learning process, effectively.

Table 1: Piaget's stages: (Ohuche, 1990)

Ages	Stages	Characteristics
0-2 years	Sensory-motor	Child differentiate between himself and other objects through movement and use of his senses. Also know that object exists even when he cannot see them.
2-7	Pre-operational	Child can now use language imitation and other means of representing things to link events from past, present and future. But quite often, the link is illogical e.g. number changing because appearance is altered.
7-11 years	Concrete-operation	Child understands and reasons well about abstract quantities of objects, e.g. number, volume, but only in relation to things experienced.
11-15 years	Formal-operation	Child reasons logically in the abstract about things that exist or are possible and begins to generate hypothesis about all types of possible relationship of objects and events.

FACTORS THAT IMPEDE OR HINDER THE TEACHING AND LEARNING OF MATHEMATICS (ADETUNDE, 1987)

- Lack of sufficient competent/qualified mathematics teacher (s): In adequacy in the number of qualified mathematics teacher is one of the factors that impeded or hinder the teaching and learning of mathematics. some teachers that are teaching mathematics are not having certificates in mathematics, rather in other discipline and they are supposed to be outside teaching mathematics, some of the teachers took teaching of mathematics as a last resort and even use it as a stepping stone to make lucrative job or further studies since they are not trained mathematicians.There are few trained professionals who were working as mathematics teachers compared with those on the job who are not qualified to teach the subject.

- In ability of various arms of government to introduce in service training for the intending mathematics teachers so as to cope with the shortage of qualified mathematics teachers. Those teachers who graduated in another field of studies and are ready to help in the field of mathematics must undergo in-service training in order to know the various methods of teaching to be used in the teaching of mathematics.

- Lack of provision of instructional teaching aids: Importantly, there are no provisions for instructional aids or improvised teaching aids so as to facilitate smooth teaching of mathematics in both primary and post secondary schools by the ministry of education. Even where there are some availability of teaching aids the teachers are not used to it.

- Lack of encouragement from society-(negative reinforcement). There is no encouragement from the society in the learning of mathematics "society have been saying that mathematics has no application in human activities and so there is no need studying it, this is as a result of the warped societal value system which places much premium on material wealth thus serving as a disincentive to education. Even the societal believe is that mathematics teachers are the poorest teachers in the world which is not the case.

- Conspicuous absence in its totality of mathematics laboratory and resource centre in almost all the primary and second cycle institutions in Ghana, hinder the teaching and learning of mathematics.

- The parents and guidance failed woefully to create the necessary interest and probably the needed infrastructure at home for the study of mathematics.

These include lack of home study, inspection of assignments, corrections and given appropriate incentives.

- General lack of seriousness of students to their studies, especially mathematics-a subject in which they think there is practically nothing to study because mathematics is abstract.

- Poor background of the knowledge of mathematics by students from primary school.

- Time allocated for mathematics lesson is not enough and sometimes unsuitable, in some school mathematics lesson is fix in afternoon period.

- Lack of or non availability of libraries in schools.

- In Urban areas, overcrowding and overpopulation in classes.

- Lack of encouragement to teachers: Opportunities to attends workshops, seminars, refresher courses and other incentives that can make for efficient and effective performance.

- Lack of commitment, dedication and devotion on the part of teachers.

- Lack of appropriate or suitable mathematics text books.

- Examination malpractice.

VARIOUS APPROACHES OR METHODS OF TEACHING THAT CAN BE USE IN THE TEACHING AND LEARNING OF MATHEMATICS

The teacher must make use of various methods or approaches to the teaching of mathematics. The word Method, simply means the way /technique in which the teacher used in transmitting values, knowledge, skills or experience into the learner through the process of teaching and learning. The process of teaching is been carried out by the teacher and the process of learning is been carried out by the students themselves. The learning methods is based on the practical participation in the things/values been passed across to the students. The Nutffield mathematics project in Britain wrote a book title I do and I understand this phrase is taken from part of the Chinese old proverb (Wayne, 1938).

<div align="center">

I hear and I forget,
I see and I remember,
I do and I understand

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That is to say what I do, I understand; this implies that the teacher must make sure that the student(s) participate in the learning situation.

The teacher must use various methods of teaching, (Adetunde, 1987), like:

Dogmatic method: This is the process by which the teacher emphasizes on the three uses of rules and principles in a given lesson. It is this rules and principles that the students will follow in solving any given problems. Here the students are been deprived of their right, of thinking on their own. However, we can see that some advantages in using this method in teaching Maths and such advantage is that, it saves time, energy and less of useless thinking because the students are guided by the given rules or lay down principles.

Inductive method: This is a method whereby lesson is presented from concrete to abstract, from specific or particular to general and from examples to formular. It is a method for constructing formular with the help of sufficient number of concrete examples.

Synthetic method: This is opposite to analytic method of learning and teaching. This method proceeds from known to unknown, simple to complex. This method is the process where by the lesson starts from what the students have already known and connect it to what the students have not known yet. i.e., to say Breaking instructional materials into small units that could be easily learn and build it learning units into a body of structural organized body of knowledge. The student needs to know the prerequisites first of all, for example if a teacher wants to teach Quadratic equation, he needs to be taught simple equation, factorization, expansion, identification of type of equations, completing the square before teaching the concepts of Quadratic equations. Here the teacher needs to build the students on the foundation of things that are already been known or taught. It starts with the data available or known and connects the same with the conclusion.

Project method: This type is the way where by topics are given out to every individual students and they are encouraged to go and developed it on their own. The students work at their own rate and they will be discovering many facts as a result of researches they have undergone. This method removes laziness and also it makes the student to develop their mental ability. This project method is the type been given to the students in polytechnics, colleges of education and Universities, especially for the completion of their course in the area of the field of their study.

Deductive method: This is unlike inductive, here lesson are presented from general to more specific or particular, from formular to examples and from abstract to concrete.

Lecture method: This is process where by the lesson is presented in the form of exposition. Here the teacher prepare the lecture in a simple and meaningful ways and deliver it in the class in the form of a speech, there is only one way communication i.e., to some extent limited interacting are experienced. The teacher presents the word, the picture or an ideal. The chalkboard is important where the lecturer can write important points for clarity. This method is ideal for large crowd. Here individual work to student is neglected because teacher teaches large crowd of students.

Heuristic method: This is the Burner's method of teaching Mathematics. This is the process where by child/children is/are placed as discoverer. Under this method the student should be involved in the process of knowledge getting (i.e., knowing is a process not a product) the teacher do not need telling the student everything but he has to help the student to go about the very task of learning and help the learner to learn the varieties of problems solving and ways to transformation information for better use. This process demands complete self activity or self education on the part of the learners; the teacher's job is just to guide the student to be able to solve problems on their own. This method enable the student to be self confidence, independence of judgment and having thinking power and it also enables the student to be able to acquire real understanding and clear notion of the subject and it enhance a complete mastering of what he has learnt. The heuristic method demands extra ordinary labour and special preparation from the teacher. For example, a teacher using this method, draw things like this. This can be used in expressing an equation $X+2X+1$

$$a = a^2+ab+b^2+ab$$
$$a^2+b^2+2ab = (a+b)(a+b) = (a+b)$$
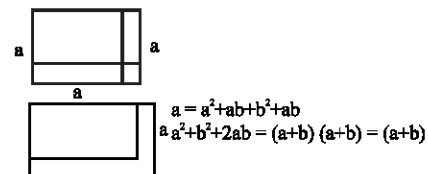
Analytic method: This method proceed from unknown to known, analysis meant breakup of problem in hand so that its ultimate goal gets connected to something obvious or already known. This analytic method is difficult to acquire efficiency and speed and it may not be equally applicable to all topics, it is a lengthy method, this is the method J. S. Bruner the prophet of discovery learning in Mathematics emphasis that learning must start from complex to simple. It is opposite to the synthetic method of learning.

WAYS OF IMPROVING THE TEACHING AND LEARNING OF MATHEMATICS

There is nothing which has problems that will not have solution to the problems, this section deals with solution or recipes to the causes of failure in mathematics in second cycle institution in Ghana.

- The step to be taking is that the government should be very interested in the teaching of Mathematics at the primary school level this should be done through provision of mathematical instructive equipment, that will enable the pupils having a pictorial images of elementary mathematics, by this the problem of poor background of mathematics knowledge from primary school will be eradicated away and it will bring about successful result in the mathematics in second cycle institutions.

- Government should also give incentive to Mathematics teachers, given them better condition of services increase their salaries and make them have interest in the work they are doing rather than making them fill rather inferior to their counterparts in other fields. If this is done any trained teacher will teach the students to the level of their understanding, the fact that motive force for Mathematics learning is the thrill of discovery and not the dubious aim of getting high mark that somebody else or the kudos of a price. If government created this atmosphere then we are making efforts in bringing up people whose behaviour will not entirely determined by self-interest, but rather be interested in the course of teaching mathematics than thinking whether their counterparts have overtaken them in the get rich quick" race. If the government can be able to do this, the problem of lack of competent teachers will be solved because people will be rushing the field.

- Government should also award scholarship to mathematics students in the university, colleges of education, so that this will encourage many people or students to come for the subjects. If government should be able to do this, majority of the students will now then have new vision and interest to the subject, the wrong motive will then be removed.

- The government should provide adequate teaching materials so that it will make the concept of the mathematics to become more meaningful and interesting to the students, by this the abstractness of the subject mathematics will be removed in the mind of the student, if the government can do this, it will reduce the mass failure of student in Mathematics.

- The government should also make sure that they help every school in building mathematics laboratory and resources centers to the school so that the students will be able to go to the laboratory and resources centers to collect information, perform experiment of what is not clear to them, if the government can do this, teaching and testing them will not be new in their sight, (eye) and by this the mass failure in Mathematics will also be minimized because one proverb says I see and I remember, I do and I understand.

- The government should also make sure that some foreign oriented textbook that does not relate to the practical experience of our students should be discouraged while Ghanaian mathematicians should be encouraged to write suitable textbooks. If the government can do this, there will be sufficient and adequate Mathematics textbooks and are sold at very cheap price instead of the exorbitant prices of some of the books, the problem of huge failure in Mathematics in second cycle institutions will be reduced in the country. The government of this country should also make sure that she provide in-service training and seminars to the teachers who were not trained in the field of mathematics but are ready to continue in the field of mathematics, this will enable them to know various method of teaching to be used in the teaching of mathematics and also this will update their knowledge of the subject, if the government can do this the problem of insufficient teacher of Mathematics will be solved and those teachers who are not specialized in the mathematics field will have more knowledge of the field and this can also curb down the mass failure of mathematics in the country.

- The society as a whole must also make sure that they enlighten the students concerning the wrong motive they have already have in the subject, because many students were ill informed about the subject, that Mathematics is difficult, if the role of importance played by Mathematics is been known to the students they will have new vision and right motive to the subject which can bring about a solution to their wrong motive and thus can also reduce the mass failure in mathematics.

- In addition there should also be clubs to broaden knowledge and ideas of mathematics e.g. Mathematical Olympia. There should also be Mathematics Dictionary as for supplement to other material to give meaning to signs and symbol so that the believe that mathematics involve too many formulae to crown/memorize can be solve because as

they (students) are conversant with the dictionary they can be able to be grasping many things in it and it will reduce failure in Mathematics.

- For the objectives of Mathematics education to be achieved, enough periods should be allocated for Mathematics teaching in the second cycle institutions in Ghana and afternoon period should be discourage, this can also reduce the mass failure in Mathematics.
- In addition remedial work most be provided for concepts not properly grasped during the time allocated for the teaching of Mathematics, this can also brings about minimization in the poor performance in the subject.
- Another solution to the causes of the failure in Mathematics is that the teacher should be given the students assignment always in other to be keeping them busy always and because Mathematics involve constant practice, this will enable the students' to be more serious on this field.
- The government must also make sure that, she curbs the system of frequent changes of the curriculum, if there is continuity in the system the students will be more committed to their studies.

CONCLUSION AND RECOMMENDATIONS

This study deals with the recommendation make for curbing or minimizing the mass failure of Mathematics in second cycle institutions in Ghana.

The mathematical Association, Clubs, Societies, etc must make sure that they try and make all the necessary steps in stimulating the students interest in mathematics teaching. The mathematical association, clubs or societies must-provide Mathematics funfair or lectures or symposia in other to be stimulating the students interests, Mathematics contest/competitions between schools and mathematical Olympia organization by Mathematical

Association of Ghana (M.A.G) must also be made for stimulating the students and those who ever come first in the competition must be given special preference.

Not only this, this association must provide mathematical models, films to our various second cycle institutions in Ghana in order to solve all the problem confronting the teaching of Mathematics and the mass failure of Mathematics. Books must be provided in libraries of our secondary schools.

Also the teacher must also cater for individual differences when they are teaching-mathematics. Individual differences it self means unlike differences that is existing between any individual. The Mathematics teachers must know that even individual are not the same. We have lower and higher achievers the classroom and the teacher must be able to recognize the students that fall in these two categories.

The teacher should take not of the qualities of lower achiever, higher achiever and the guide lines for an effective programme for the lower and higher achievers

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