

Effective Strategies for Teaching and Learning of Mathematics in Secondary Schools

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abstract: Ozoro (1973), Adeniyi (1988) and Osibodu (1988) in Alio (1997) reported of constant high failure rate in mathematics examinations at the Senior School Certificate Examination (SSCE). Result of WAEC/NECO SSCE obtained from the examination officer (2002-2006) shows that the performance in mathematics was too poor, therefore necessary steps has to be taken in order to upgrade the performance of students and also the teaching and learning of mathematics in secondary schools. The high failure rate is of great concern to the nation because the situation is adversely affecting Nigeria in achieving her objectives towards science and technology. The reasons for students' poor performance in mathematics is attributed in this paper to teachers and students negative attitude to mathematics, poor method of teaching, lack of qualified mathematics teachers and so on. Being aware of these problems, the paper suggests some strategies that can be used to enhance effective teaching and learning of mathematics in our schools. The paper focuses on the strategies that are very crucial to effective teaching an learning of mathematics in order to achieve success in our secondary schools. The paper also suggested some recommendations based on the problems highlighted.

Introduction

Mathematics is being taught since ages in schools and both pupils and students in secondary schools have been learning Mathematics. There has been increasing concern and emphasis on the teaching and learning of Mathematics. However, pupils and students achievement in Mathematics depicts that they have not been learning Mathematics very well. They achieve poorly in both internal and external examinations. Alio (1997) reported that, the high rate of failure in public examination in Mathematics especially at the Senior School Certificate Examination (SSCE) has become a subject of constant comment by many people (Ozoro 1993, Adeniyi, 1988, Osibodu 1988). Among numerous factors that contribute to high rate of failure in Mathematics as cited by (Aiken and Dregger, 1961, Mc Dermoth, 1966 and Neale, 1969) in Alio (1997) are nature of mathematics, cultural beings of the Mathematics contents, lack of qualified teachers, poor students background in mathematics, lack of mathematics laboratory, poor teaching techniques. Also Harbour-Peters (1997) attributed the low

interest in mathematics to teachers non-utilization of appropriate teaching techniques. Aiken (1972) and Munro (1979) in Alio (1997) asserted that difficulty associated with the specialized language of the subject also contributes to the students' poor performance.

In June 1999, the National Mathematics Centre sampled some twenty states of the federation to find out the problems of teaching and learning of mathematics in secondary schools. Some of the problems highlighted are:

High exodus of teachers to other professionals, because teachers are not well recognized in the society and they lack proper incentive in teaching, lack of qualified teachers in the field to handle the subject effectively, poor attitude of pupils/teachers to mathematics, lack of teaching/materials for both students and teachers.

Teachers are force to teach to teach mathematics due to shortage of mathematics teachers, for that students' performance in mathematics continue to deteriorate. The table shows the performance of students in WAEC/NECO SSCE Result (2002-2006).

**TABLE 1.1: WAEC/NECO RESULT (2002-2006)
GOVERNMENT DAY SECONDARY SCHOOL, MINNA**

EXAM	YEAR (%)	NO OF STUDENTS	CREDIT	PASS	FAIL
WAEC	2002 %	714	27 (3.8)	31 (4.3)	656 (91.9)
NECO	2002 %	719	35 (4.9)	55 (7.6)	629 (87.5)
WAEC	2003 %	503	03 (0.6)	18 (3.6)	482 (95.8)
NECO	2003 %	934	36 (3.9)	22 (92.4)	876 (93.8)
WAEC	2004 %	434	01 (0.2)	12 (2.8)	421 (97)
NECO	2004 %	803	17 (2.1)	19 (2.4)	767 (95.5)
WAEC	2005 %	279	- (00)	06 (2.2)	273 (97.8)
NECO	2005 %	650	71 (10.9)	275 (42.3)	304 (46.8)
WAEC	2006	372	02 (0.5)	04 (1.1)	366 (98.4)
NECO	2006 %	845	79 (9.3)	130 (15.4)	636 (75.3)

Teachers and students should be given proper attention and encouragement, so that by the end of their secondary education, they can go into universities to study mathematics and hence qualified hands to handle the subject effectively.

At this juncture having been aware of all these problems some strategies to enhance effective teaching and learning of mathematics in secondary schools have to be adopted. This paper, therefore, suggests some strategies that can enhance effective teaching and learning of mathematics in our schools.

The effective ways of teaching and learning of mathematics

The following are strategies that could be adopted to encourage and motivate

teachers and students in the teaching and learning of mathematics.

Motivation of teacher

The work of the teacher is made easier when he/she is motivated, he will be challenged to plan adequate learning activities to maintain the zeal of the class. Motivation is a force that energizes and directs behaviour. Motivation is a force that spurs, arouse and sustains a behaviour until a goal is achieved (Eggen and Kauchak, 2000).

The adage "he who pays the piper dictates the tone" holds water in motivation of teachers. Mathematics teachers should be effectively motivated by their employers and their head teachers. Teachers should be paid promptly and adequately. Both government and head teachers should employ extrinsic

motivation techniques to motivate mathematics teachers. Mathematics teachers should be sent to workshops retraining conferences and seminars in order to update their teaching techniques.

Scholarship and service training with pay should be granted to mathematics teachers. The teacher training institutions should train the teachers in practical and demonstrate teaching of various topics in mathematics in order to equip them with the challenges they will face when they start teaching. These techniques among others will make mathematics teacher happy, confident and interested in his subject.

Adoption of discovery method of teaching

Teachers are encouraged to use discovery method of teaching in the classroom. This is one of the most effective method of teaching mathematics. It allows learner to actively participate in the learning process. This is supported by this popular Chinese proverb process.

What I hear I forget

What I see I remember

What I do I understand

Mathematics teachers should teach the students to exploits the following guides which Kersh and Donald (1991) gave as the activities that promote understanding of mathematics.

- i. Making a sketch drawing or figure
- ii. Identifying relevant data in the problem
- iii. Identifying irrelevant data in the problem
- iv. Identifying and stating assumption
- v. Collect data and make up questions
- vi. Find alternative ways to solve the question
- vii. Select the best way out of the alternatives and
- viii. Finally arrive at the solution to the problem.

Colburn in Azuka (2004) quoted that "To succeed teachers the science of numbers

to young children, it is necessary to allow them to exercise their own skills in performing examples rather than giving them rules. They should be allowed to pursue their own method first and explain it, and if it is not possible, some improvements should be suggested".

Popoola (2004) advised that teachers should evolve strategies that involve learners' active participation such as given the learner guidelines on how to solve a problem and allowing him to use these guidelines to get to the solution of the problem and also by the use of instructional aids in teaching such strategies will generate interest in the students.

Deliberation policy to attract and retain teachers of mathematics

The problems of the teaching of mathematics in secondary schools stem from the problems of teachers which in turn root from the poor remuneration and allowances of teachers. The problem of poor remuneration results in other problems such as low number of mathematics teachers, low commitment, high work load and poor quality of teaching. Therefore, the best frank way of addressing the problems of the teaching of mathematics is to first of all address the problems of teachers who are described as "the hub of any educational system". This could ensure an uninterrupted supply and retention of mathematics teachers in the school.

Use of Mathematics Laboratory

Mathematics laboratory is very important and necessary in the development of mathematics concepts relevant to modern technology. Mathematics is laboratory plays a unique role in the teaching and learning of mathematics concepts. Adeniran (2000) listed the role it plays include:
* providing non-threatening, realistic and concrete approach to the learning of

mathematics as opposed to the difficulty encountered in learning the formal abstract treatment of a typical textbook.

* providing opportunity for individual and independent work which is profitable to creative, talented students.

* providing opportunity for working in small groups which encourages leadership, shared responsibilities and team work.

Mathematics laboratory is a place where mathematical principles, ideas and concepts are practicalised and demonstrated.

It is an experimental room for teachers and students to teach and learn mathematics practically. (Obodo, 2004).

Like other sciences, the school needs to set up a mathematics laboratory. This should be equipped with teaching aids, models, charts, mathematical games, history of past mathematicians, scissors, cardboard papers, graph board and so on. Some of the concepts in mathematics could be practicalised to generate the interest of students. Activity in all teaching the general principle is: Things before ideas and ideas before works.

The use of teaching aids

Teachers have to take cognizance of instructional materials in the teaching of mathematics in both primary and secondary. According to Obianwu in Gimba (2007) teaching aids includes all devices which can be used by teachers to represent a complete body of information in the teaching and learning process for a more effective instructions. Mathematics being seen as difficult subject to most students, should be taught by adopting the use of teaching aids to motivate the students' interest on the subject.

According to Gana (1997) instructional aids is a means of motivation that help the students to (i) recall earlier learning, (ii) provide new learning stimuli,

(iii) activate students' response. Therefore teaching aids should be provided for mathematics teachers. The teachers in turn should utilize these aids by involving the students in their use. The teacher should also improvise some of the teaching aids that he can use.

The use of mathematical games

The use of mathematical games is an effective way of teaching and learning of mathematics. It practicalizes mathematics to students and assists them in learning. Obodo (2004), states that, the use of mathematical games helps in inculcating and retaining various mathematical concepts to which the games are related. They are guides to assist mathematics teachers on how best to teach mathematics effectively, using discovery method and students participation.

Award to good mathematics students in school

The school could organize some competitions to select good students for various awards. This could be in form of button badges with the inscriptions, "Mathematician of the week", "I love mathematics", "Mathematics is the key" and so on. This could be done in form of assignments to the students to be marked and the over all student selected. Students would always wish to win the button badges each week. This can help to:

- (i). Popularize the subject in the school
- (ii). Make students revise and internalize the topics covered
- (iii). Motivate students to study the subject

Formation of mathematics club

Mathematics club should be formed in the school. Club members should be counselled and assisted in the study of mathematics. Teachers could organize remedial lessons for the members and other activities like excursion, drama,

mathematics day, making of models and charts and general exchange of ideas on mathematics can be organized by the members in order to promote understanding of mathematics as well as the image of the club.

Counselling of students on mathematics

Mathematics teachers in the school should arrange for school counselors to counsel students individually or in groups in the school on the various aspects of the study of mathematics. Raliya (2006), sees counseling as a face to face helping relationship between a counsellor and a client in which the counsellor uses his or her professional knowledge and skills to positively influence the clients' thinking, feeling and action. Teachers and counselors can arrange at least once in a week for giving counsel to their students on the study of mathematics focusing on the following areas:

- a. problems of the study of mathematics and how to overcome them
 - b. importance of studying mathematics
 - c. how to solve mathematics questions
 - d. how to develop interest in mathematics
 - e. how to study mathematics after lesson hours
 - f. reduction of mathematics phobia among students
 - g. history of great mathematicians
 - h. how to answer mathematics questions
 - i. why students fail mathematics and so on
- from all these to students interest in mathematics could be generated.

Organisation of remedial lessons for slow learners

The school and the parents should complement the effort of teachers in the classroom by organizing remedial programme to help slow learners. This can be done by compensation the teachers with token fees. This has helped many students to

achieve higher performance in the mathematical sciences (Azuka 2004). "The level of students assimilation is not the same, this will encourage students that are very slow in assimilation to be able to meet up with their counterparts".

Keeping students abreast with the topics covered in junior classes

One of the major problems of students in learning mathematics is that they understand during lessons, but they find it difficult to revise after some times. Thus, they soon forget the lessons already taught, for instance senior secondary students may have forgotten the topics covered in junior classes. The teacher should device strategies to keep students abreast with topics covered in junior classes. This could be in form of assignments on past topics covered possibly as part of the continuous assessment. This would make the students to revise and keep pace with the past topics already covered.

Effective Evaluation of students

Students should have complete understanding of how their grades are determined. Whichever scale is used, teachers should make sure that students are clearly aware of it. Teachers need to orientate students on how scripts are marked and graded in both internal and external examinations. This would help students in their study and preparation for examination.

Conclusion

In spite of all effort by teachers, educators and administrators, government, parents and sundry to arrest the perennial problem of general poor performance in mathematics particularly at Secondary School Certificate Examination (SSCE) levels, the problem persists. Therefore the paper focus on the strategies that are very crucial to effective teaching and learning of

mathematics in order to achieve success in our secondary schools.

The strategies as practical measures, will help to motivate teachers and students in the teaching and learning of mathematics. These strategies should be combined with good administration and high standard of Education in the schools for effective results.

Recommendations

1. Government and school authorities should sponsor teachers for workshops and seminars to equip them on the effective ways of teaching mathematics to our pupils.
2. Government and school authorities should encourage students to learn mathematics by organizing inter-schools competition on mathematics and awarding the best school and also the best student.
3. Federal government should supply schools with enough materials for teaching and learning.
4. Schools should be well furnished with conducive atmosphere for effective teaching and learning.
5. Parents should help their pupils by providing them with the necessary materials for learning.

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