

# CONSTRAINTS TO TEACHING AND LEARNING OF MATHEMATICS IN ANAMBRA STATE SECONDARY SCHOOLS

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## **Abstract**

This study explores the constraints to teaching and learning of mathematics in Anambra State school system. It critically looked at methods of bridging the gap between a basic mathematical background and the ability to learn and use more advanced techniques. The paper also aims at exposing how the use of innovative teaching and learning approaches (including the use of mathematics laboratory, multimedia and web-enhanced systems) could contribute to student's learning and success in mathematical assessment. The multimedia method of teaching and learning has resulted in allowing an opportunity for the average secondary school student to learn from a minor to a relatively advanced topic successfully. It has also shown how to make the learning of mathematics an enjoyable experience for students. The study, therefore, recommends that mathematics laboratories be established in every school and more teaching aids be provided for effective mathematics learning by the students.

## **Introduction**

Observations have it that the real problem confronting the study of mathematics is with the way teachers handle mathematics and students' attitude to it. In other words, poor performance of students in promotion/public examinations in mathematics has more to do with the methods of teaching than the content of the subject.

It is evident that teaching mathematical concepts to students who do not have a very strong background in mathematics is always challenging because the students will always show signs of not understanding the procedures. The teaching process is extremely rewarding when the students begin enjoying the mathematical procedures, which leads to mastering the concepts. This paper also aims at demonstrating how it could be possible for learners in senior secondary schools with average secondary education level of mathematical skills can make the transition to a more advanced level more successfully. The main purpose is to determine if the use of innovative methods of teaching (including the technologies associated with modern computing and the use of mathematics laboratory) enhances learning.

These methods of teaching mathematics on television/computer and using mathematics laboratory are designed to demystify mathematics as a monster; present it as a student-friendly subject, assist students to perform considerably better in their examination and to help students to cope with the demands of the subject in order to enhance their career prospects and development. The target audience is the secondary school students because they are still at a very impressionable stage in their mental development and are more receptive to modern methods and trends.

The use of television/computer and mathematics laboratory will also boost the development of students' interest in mathematics; reverse the negative attitude of students to mathematics, define the place and influence of mathematics in everyday life, and assist students in appreciating mathematics as a critical subject in their educational development.

The goals of using multimedia technologies in teaching/learning process can be, in some cases, incompatible or in conflict with each other. Some of these goals include: minimising the time taken to learn and, hopefully, master the topic, maximising the enjoyment from learning, minimising the general fear associated with a mathematical topic, maximising students' perception of the practical uses of the topic, and minimising the distance between theory and practice. Obviously, some of these objectives are more important than the others. Therefore, they may be ranked according to their priorities. For instance, it would be quite logical to place 'minimising the time taken to learn and hopefully master the topic and maximising enjoyment' at the top of the list.

### **Minimising the Time taken to Learn and Master the Topic/Maximising Enjoyment**

Observations made by the author have shown that students learn faster when an act of learning is incorporated in multimedia technologies. A case study is the use of television in teaching mathematics to secondary school students. Learning process could be faster and more comprehensible when introduced to young people in the form of graphics, practical applications and through motion pictures. The use of television and other multimedia technologies minimise the time taken to learn and, as well, maximises enjoyment among students. In other words, students in senior secondary schools also enjoy learning through television motion pictures and the use of computer programmed lessons especially in mathematics. For example, there was one programme that was aired on Enugu Television Station (ETV) in the year 2000, 2001 and beyond called "*Dikeohamatics*" which was introduced and moderated by one Mr. Dikeoha Okwu. On this television programme, the mathematics teacher taught mathematics lessons, usually Algebra, trigonometry, etc, using graphics and prefabricated models. This programme was aired to thousands, if not, millions of viewers at home and it helped a lot of young students to know that mathematics is a subject of fun rather than a subject to be feared. This television mathematics learning programme "*Dikeohamatics*" gained so much popularity among secondary school students that had television sets at home. The students, during that period, it was aired had wonderful time enjoying mathematics procedures and techniques at home. In this process, those students who watched the programme found learning some mathematics techniques very easy that they would want to learn it over and over again. When about 20 students who watched the programme live on television were interviewed, they showed great interest and appreciation to the organizers of the mathematics-on-television programme. The students were happy to demonstrate the mathematics procedures and techniques they learnt.

Opinion of the author has it that if this method of mathematics teaching/learning is introduced in secondary schools in Anambra State, it would make students to enjoy learning mathematics from the very early stage. This will help them to advance to higher learning technology like using computer and projectors to learn. It is also important to show these students how to practically apply the knowledge of mathematics in physical and concrete life problems. This would help to eradicate the doubts as regards the abstract nature of mathematics which is the popular notion among a good number of the students in secondary school. This greatly reflects on the performances of the students in external examinations like the Senior Secondary Certificate Examination (SSCE). Naturally, students do not like mathematics, hence, mathematics teachers should device better ways of inculcating positive attitude towards mathematics in those students who still fear the subject. However, when the knowledge of mathematics is fully imbibed, it would help to make the nation a technology-driven and dynamic one. Therefore it makes good sense to use multimedia driven technologies as well as mathematics laboratory as modern teaching aids since these secondary school students like using these technological products.

### **Use of Mathematics Laboratory as a Modern Teaching Aid in Secondary Schools**

Laboratory has been described as a room or a building specially built for teaching by demonstration of theoretical phenomenon in practical terms. With the laboratory experience, students will be able to translate what they have read in their texts to practical realities, thereby enhancing their understanding of the learnt concepts. Farombi (1998) argued that, seeing is believing is the effect of using laboratories in the teaching and learning of science, mathematics and other science related disciplines as students tend to understand and recall what they see more than what they hear. Therefore, laboratory is very important and essential to the teaching of mathematics and science, and success of any science course is much dependent on the laboratory provision made for it. Lending credence to this statement, Ogunniyi (1982) opined that there is a general consensus among mathematics and science educators that laboratory occupies a central position in science instruction. It could be conceptualized as a place, where theoretical work is made practical and practical work in any learning experience, involves students in activities such as observing, counting, measuring, experimenting, recording and carrying out fieldwork. These activities could not be easily carried out, where the laboratory is not well equipped. There is usually a strong move to emphasize the dependence of teaching mathematics on the existence of a well-equipped mathematics laboratory. Ango and Silo (1986) asserted that laboratory work among others:

- stimulate learners interests as they are made to personally engage in useful scientific and mathematical activities.
- affords the learner the basic skills and scientific method of solving problems.
- promotes long term retention of the knowledge obtained.

### **Materials and Methods**

A mathematics laboratory is a place where things can be stored, kept, counted, ordered, recorded, packed, unpacked, grouped, regrouped, arranged, rearranged, measured, joined and partitioned among numerous other activities. According to Odili (1990), the mathematics laboratory is a specially equipped room in a building, where mathematics lessons are taught in concrete terms. It could be a corner of the regular classroom with tables and apparatus or a room containing a collection of teaching aids for students' manipulation. The students carry out their projects and other activities in the laboratory. The mathematics laboratory should be the focal points of all mathematics work in the school. With adequate resource materials, it is expected that there will be enough materials and equipment to go round the students at any given time of practical work. The establishment of mathematics laboratories in secondary schools would be one way of stimulating interest in learning mathematics. The truth of abstractions is demonstrated in a concrete manner and the students, who are slow to comprehend abstractions, appreciate them more readily and become interested in mathematics. It is also a remedial environment, where advantaged or disadvantaged, the poorest or the best gifted students may have active sensory experiences from which concepts emerge. It is a resource center for the learning of mathematics. It is based on the principle of doing, learning by observation by proceeding from concrete to abstract. Some of the advantages of having a mathematics laboratory according to Ezike and Obodo (1991) include:

- It makes learning mathematics very interesting, meaningful and exciting.
- It is a means of verifying mathematical principles, laws or theories.

- It can be used to illustrate basic principles, laws or rules and development of such principles, laws or rules.
- It is a means of practicing one the cognitive and psychomotor skills like the ability to construct, measure, arrange, observe, classify and interpret data.
- It provides opportunity for students to learn how to use cutters, turners, drill bits, mathematical set, paint, brush, models of solids and charts as well as other kinds of laboratory equipment in mathematics.
- It encourages mathematical exploration and manipulation by students and keeps them alive and thinking, which also helps them to realize the applications of mathematics.

When students are exposed to practical activities, they are stimulated and thereafter, develop confidence and ability in problem solving Onwu and Moneme (1986); Raimi (1998). Adequate laboratory helps to provide a forum where the learner is given the exercise to subject his belief, idea, statements and theoretical proposition to test. In the absence of adequate resources and equipment for practical activities, practical work can rarely be experienced by students at any level or frequency in the learning of science in general and mathematics in particular.

No matter how excellent and attractive a teaching learning approach is, it only becomes relevant and important if practical activities are built into the daily teaching learning experience of students. To maintain and arouse the interest of students in this perspective, the teacher should be effectively involved in order to transform knowledge and facts to the learner for a good performance in examinations.

To what extent has laboratory been able to achieve these objectives?

Odulaja and Ogunwemino (1989) opined that, the teacher assumes a position of dispenser of knowledge with the laboratory serving the function of drill or verification. They further explained that at the other extreme, the teacher assumes the position of guide to learning and laboratory as a place where knowledge is discovered.

In their opinions, Salisu and Ismaila (1999) asserted that practical work has basic important role in the teaching and learning of science and mathematics particularly. They further posited that practical activities have motivation and propelling effect on students, enhancing their understanding of science and mathematics concepts and phenomena. Conversely, there is observation that, secondary schools in Anambra state which are government owned lack generally manpower and basic infrastructure like buildings and teaching materials. This observation, to a great extent, is true because some of the secondary schools visited in the area are spanned with old dilapidated structures that have lacked maintenance for a long time. It was only recently that the government of the day sparsely equipped some of the schools science laboratories. However, the issue of equipping or even introducing mathematics laboratories in the schools is far fetched.

Gilbert (1994) and Hodson (1996) also lent credence to the significance of practical work in learning of mathematics and science in general. In their submission, they identified six major significance of practical work in promoting effective learning of science and mathematics thus:

- Motivating students by stimulating interest and enjoyment.
- Teaching laboratory skills.
- Assisting concept acquisition and development.
- Developing and understanding of scientific inquiry and developing expertise in conducting inquiries.

- Encouraging social skills development.
- Inculcating the so-called scientific attitudes.

From the foregoing, it can be inferred that practical activities motivate students and are major attraction for them to study science particularly mathematics. Nevertheless, it could as well be deduced that without adequate laboratory equipment and resources, there will be little or no practical activity that would take place and consequently, any credible achievement in mathematics by the students will be a mirage.

### **Deductions**

In the course of this understudy, critical questions were raised as to whether:

- The level of infrastructural facilities available in the secondary schools is suitable for learning?
- Mathematics teachers have the right perception to mathematics laboratory programme in the schools?
- The mathematics laboratory programme will improve students' achievement in mathematics and attitude towards mathematics?

### **Is the level of Infrastructural Facilities Available in the Secondary Schools Suitable for Learning?**

The level of infrastructural facilities available in State owned secondary schools in terms of teaching aids was very low especially in Mathematics as compared to other science-based courses like Chemistry, Physics, Biology and Introductory Technology. Other facilities that can aid learning like chalk-board, textbooks, dusters, chalk, maps, Blackboard rulers and mathematical instruments were not adequately available in most of the schools assessed. This showed that the levels of infrastructural facilities available in these schools were not adequate for effective learning of mathematics and this has very grave consequences on the performance of students in mathematics.

### **Do Mathematics Teachers have the Right Perception to Mathematics Laboratory Programme in the Schools?**

Most of the teachers have a good perception of the need and importance of mathematics laboratory in the schools, while few teachers do not perceive the need to have a mathematics laboratory in secondary schools. These few teachers believed that with the provision of adequate Mathematics textbooks for the teachers and students, mathematics learning can effectively take place and the students' performance will be very high.

### **Will the Establishment of Mathematics Laboratory Programmes Improve Students' Achievement in Mathematics and Attitude towards Mathematics?**

There are indications from personal observations that students exposed to the use of mathematics laboratory performed better than those students, who were taught without the use of mathematics laboratory. This could be due to the fact that teaching mathematics by making the students to conduct practical work to investigate theorems assisted them in understanding the concepts better. This in turn helped them to be able to solve mathematical problems better. Also, the mathematics laboratory sessions made mathematics learning very exciting, interesting and meaningful to the students as this was discovered by the way students were eager to use the instructional materials

to carry out practical activities. Their actions during the practical experience and their discovery at the end show them that theorems are not abstract but real to life. This observation made by the author supports the claims of Odili (1990), who maintained that the mathematical laboratory should be the focal point of all mathematical work in the school. The result further corroborates the view of Adeniran (2006) that laboratory instructional strategy gives a new approach to mathematics learning because it provides a non-threatening, realistic and concrete approach to learning of mathematics as opposed to the difficulty encountered in learning the formal, abstract treatment of the typical textbook. The result of this study also agreed with that of Oyedeji (2000), where he discovered that students taught with Mathematics Laboratory Instructional Strategy performed significantly better than the control group in geometry. Findings of this study also agreed with Etukudo and Utin (2006), who carried out a study on the effect of laboratory and discussion methods of teaching on students' performance in mathematics at the secondary school level.

The reason for better performance and positive attitude toward mathematics could be because students were exposed to concrete objects in learning mathematics. Mathematics laboratory instructional strategy enabled the students to verify and discover several geometrical properties using models, paper cutting and folding techniques. Another reason might be because Mathematics Laboratory Programme provided opportunity for individual participation in the process of learning.

### **Conclusion**

Comparing a related study conducted by Nooriafshar (2001), Toowoomba High School Survey, in Australia; he observed that students appreciate more the use of multimedia systems for learning mathematics. The most interesting and certainly satisfying outcome was the performance of the students in assessments. In the late 90s when the multimedia system was used for the first time, well over 95% achieved satisfactory results. The Cut-offs for grades was about 10 to 15 percent higher than the previous years too. These achievements and performances support the hypothesis that by adopting innovative ideas, more students will be able to cross the bridge and learn advanced topics in mathematics in an enjoyable manner. A higher participation rate in the assessments indicates that the problem of the fear of mathematics has also been addressed.

The positive responses of the students to learning also demonstrate that the multimedia extension is an effective means of reinforcing the learning process, particularly for those students who are not able to take advantage of the traditional (face-to-face) mode of delivery. It is believed that if this method of using modern multimedia technologies could be adopted in Nigerian government owned secondary schools and Anambra state schools in particular; it will foster robust teachers/students' teaching and learning methods that will yield more positive results, thus making our society more technologically dynamic.

Finally, it provides scope for greater involvement of both mind and the hand, which facilitated cognition. Mathematics Laboratory Programme enables the teacher to demonstrate, explain and reinforce abstract mathematical ideas by using concrete objects, model, charts, graphs, pictures and posters etc. All these have the potential of increasing students' attitude towards the study of Mathematics.

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