

## **SETTING MATHEMATICS LABORATORY IN SCHOOLS**

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### **ABSTRACT**

Mathematics as a subject is indispensable in the development of any nation with respect to science and technology since mathematics itself is the language of science. In this 21<sup>st</sup> century where virtually all attentions are shifted towards technological advancements and the mathematics education into the 21<sup>st</sup> century project is waxing stronger in objectively achieving all its goals in which mathematics is a veritable tool. Hence, this paper explicitly discuss the concept of mathematics and education, mathematics laboratory and its numerous advantages, mathematical equipment/materials in an ideal mathematics laboratory and how to set a mathematics laboratory. Pictorial representations of mathematics laboratory with some mathematical instructional materials were used to substantiate the paper.

### **INTRODUCTION**

Mathematics involves thinking logically and reasonably so as to understand how formulae are derived and their applications. In order to enhance learners' mastery and meaningful learning of mathematics, it is necessary to reduce to the bearable minimum its level of abstraction with the use of instructional materials. Adenegan(2010) testified to this that instructional materials, when properly used in the teaching and learning situation, can supply concrete bases for conceptual thinking, high degree of interest for students in making learning more permanent.

According to Oyekan (2000), "instructional materials are those things that can facilitate effective teaching and pleasant learning that is teaching aids through which learning process may be encouraged and motivated under the classroom situation". These enhance the teaching learning process when adequately and appropriately used.

To this end, this paper focuses on setting mathematics laboratory which directly houses instructional materials. Specifically, this paper aims at defining a mathematics laboratory, listing and identifying mathematical equipment/materials that can be put in a mathematics laboratory and enumerating ways of setting mathematics laboratory in the school.

### **Concept of Mathematics and Education**

Mathematics is the study of numbers, set of points and various abstract elements together with relation between them and operation performed on them. In the beginning, mathematics curriculum in school was arithmetic, since people were just able to calculate, but by the early 1950's the concept of mathematics in the school as subject had developed and was being taught in three different sessions as arithmetic, geometry and algebra.

One of the objectives of teaching mathematics in all strata of education, from primary school level upward is the attainment of an understanding of the nature of the subject within the umbrella of a science education in relation to everyday activities of one's life as asserted by Adenegan (2003). Mathematics leads people into discovering things. However, new discoveries cannot be made unless it is effectively taught through application of adequate and efficient human and physical facilities.

Mathematics cannot be pushed aside in our day to day activities, yet mere mentioning the name of the subject sends cold chill round majority of the students' spine. Nervousness and fear that followed are better seen than imagined! The mathematics students shiver and fear wrinkles up their youthful faces. Then one wonders why this repulsive and uncheerful attitude towards mathematics in our schools, (almost at all levels; primary schools not excluded), in a period when the government desires a technological breakthrough. Could this be attributed to ineffective and inefficient handling of mathematics or inadequacy and non availability of instructional facilities? It is, however, important to note that for pupils to develop interests and do well in mathematics, being the language of science, and a tool for their future career, care must be given to what is taught and how they are being taught in the various schools.

Education can be defined as the process of imparting and acquisition of knowledge through teaching and learning especially at a formal setting such as schools or similar institutions (Alao, 1997). Thus, education can be perceived as a process whereby a person learns how to learn. It actually begins at birth and ends at death. In fact, education is an age-long concept. Mathematics as a subject is part of the curriculum content taught and learnt at different educational strata. Education enriches man with information and when one is not informed, one is at the risk of being deformed.

### **Importance of Mathematics**

Mathematics is a model for thinking, for developing scientific structure, for drawing conclusions and for solving problems. It is a subject that deals with facts. As a result, Olademo (1990) opined, "this subject-mathematics should be given much consideration and let no man think of it as abstract or as untrue". As posited by Balogun et al (2002), "Mathematics instruction is a training of logical thinking. It is a means of solving many problems. It is confronted with finding solutions to problems that have not been provided by a similar type. Its greatest virtue is its flexibility and the high esteem at which it is held as a tending discipline is partly due to its illustrious pedigree".

People who have become more and more skeptical towards mathematics saw it as discipline that pursues needless complications, inventing unrealistic problems and prescribing solving methods within the frame of elementary mathematics. To this end, Adenegan (2003) highlighted Mathematics importance under four broad functions-utilitarian, cultural, social and personal functions.

- Utilitarian functions: It is useful in everyday life that is it serves as a functional tool in studying individuals everyday problems; it is useful as a tool to other discipline, that is, serves as a hand maiden for explanation of quantitative situations in other subjects such as economics, physics, navigation, finance, biology and even the arts. This service of Mathematics is exceedingly important to future scientists, engineers, technologists, technicians and skilled mechanics; it is useful for national income and budgeting and useful for laying foundation for further education.
- Cultural functions: It is useful for calculation in local languages and useful for naming objects.
- Social functions: It is useful in voting, games and lotteries, birth and death rates and population census.

- Personal functions: It encourages correct or accurate thinking, allows for cooperation with others to achieve common goals, allows for character building (patience, persistent and perseverance) and remarkably, it makes one to be happy.

In a nutshell, “Mathematics is now an enormously useful science which, in order to attain this status, has had to cross a desert of usefulness where Mathematics was nursed tenderly as a science of mind” (Balogun et al 2002)”. Astronomy is a practical science of Mathematics. It is used to foretell the calendar, feast, eclipses, wars, pestilence, whirlwinds, storms and the future of nation and even of individuals. It is a useful application of Mathematics and would link on for at least the next two millennia.

The diverse applications of mathematics abundantly establish that mathematics, as a discipline, is fit for purpose, as mathematics continually drives the expansion of the frontiers of other disciplines through their progressive formalization and symbolization and the building of mathematical paradigms of real world systems.

In Nigeria, a credit in mathematics is required for admission to countless programmes of study at the tertiary level of education. Ekhaguere (2010) asserted that in view of this fate-determining place of mathematics in the nation’s educational system, a policy must be formulated and implemented toward ensuring that no child is left behind in mathematics at the pre-tertiary level of education.

### **The Mathematics Laboratory**

As defined by Adenegan (2003), the mathematics laboratory is a unique room or place, with relevant and up-to-date equipment known as instructional materials, designated for the teaching and learning of mathematics and other scientific or research work, whereby a trained and professionally qualified person (mathematics teacher) readily interact with learners (students) on specified set of instructions. The picture below is an example of a mathematics laboratory where the children are seen playing with educational toys under the supervision of their teacher.



*figure 1: A typical mathematics laboratory with educational toys for children*

In a related term, a current version (miniature) of mathematics laboratory is the “mathematics corner”. This indeed is still a new concept. In a school where there is no mathematics laboratory, the teacher together with the students can readily improvise and create what we call the mathematics corner in the classroom as can be found in the picture below. The teacher can start by creating a corner in the class as mathematics corner where he can be depositing periodically mathematics equipment or ask the pupils to bring, with pride and boldness, local mathematics materials like different geometrical shapes so as to facilitate a successful take off and unhindered success of the establishment. The mathematics corner can contain some of the equipment found in the mathematics laboratory but will not be as full and well organized and assembled as what we found in the later.



*Figure 2: A typical mathematics corner at Mathematics Department, Adeyemi Coll. Of Edu. Ondo.*

The materials or equipment that can be found in the mathematics laboratory include, among others constructed (wooden/metal/plastic made) mathematical sets, charts and pictures, computer(s), computer software, audio-visual instructional materials such as projector, electronic starboard, radio, television set, tape recorder, video tape, etc, solid shapes (real or model), bulletin board, three-dimensional aids, filmstrips, tape photographs, portable board or whiteboard, abacus, cardboards, tape measure, graphics, workbooks, graphs, flannel boards, flash cards, etc.



*Figure 3: Teacher/Students-Made Instructional Materials: Solid Shapes and Geometrical Objects during a workshop for Junior Secondary School principals at Ebonyi State, Nigeria by the Author.*

Mathematics laboratory is relatively new in the teaching and learning of mathematics. It is a practical oriented classroom or place where materials useful for the effective teaching and learning of mathematics are kept. It is the latest design to make mathematics real. The term “laboratory method” is commonly used today to refer to an approach to teaching and learning of mathematics which provides opportunity to the learners to abstract mathematical ideas through their own experiences, that is to relate symbol to realities. It is uncommon in our schools today possibly as a result of lack of fund or the absence of any government policy on the provision of such laboratory facilities. In short, its non-existence in our schools is one of the major contributory factors to mass failure in mathematics. Thus, as highlighted by Adenegan (2003), the functions of mathematics laboratory include the followings:

- Permitting students to learn abstract concepts through concrete experiences and thus increase their understanding of those ideas.
- Enabling students to personally experience the joy of discovering principles and relationships.
- Arousing interest and motivating learning.
- Cultivating favourable attitudes towards mathematics.
- Enriching and varying instructions.
- Encouraging and developing creative problems solving ability.
- Allowing for individual differences in manner and speed at which students learn.
- Making students to see the origin of mathematical ideas and participating in “mathematics in the making”
- Allowing students to actually engage in the doing rather than being a passive observer or recipient of knowledge in the learning process.

## **SETTING MATHEMATICS LABORATORY**

Having already discussed extensively the mathematics laboratory, we will proceed to itemize how to set a befitting and remarkable mathematics laboratory in the school.

- 1 Identify the necessary materials required in the laboratory by labeling them with name tags.
- 2 Put or assemble all related equipment or materials on the same side/place. e.g. geometric objects should not be placed where audio-visual materials are positioned.
- 3 Put the bulletin board close to the entrance door in case of any information display.
- 4 Arrange the benches and tables to allow for free movement in the laboratory.
- 5 Hang relevant pictures and charts on picture rails and boards.
- 6 The starboard or white board must be positioned where every student can readily see it.
- 7 Shelves can be constructed for keeping and demarcating materials.
- 8 Electronic materials such as projector, television, etc, should be properly displayed.
- 9 Electrification of the laboratory should be professionally done to allow for safety use.
- 10 Display materials on tables in an organized manner.
- 11 The laboratory should be set in such a way that it must be well ventilated.
- 12 Handy materials that can be easily destroyed or lost can be kept in a cabinet or separate shelf.
- 13 Arrange the materials in places (on tables, shelves, board, etc) in a way that they can be easily accessed when needed and returned appropriately after use.

## CONCLUSION

It is expected that the 21<sup>st</sup> century mathematics educators/teachers should be readily acquainted with the modern day technique of teaching mathematics in our schools and possibly facilitate their teaching pedagogies with the aid of modern mathematics laboratories to be able to achieve the objectives of the mathematics education into the 21<sup>st</sup> century project. This paper hereby strongly *recommend* to all school teachers to liaise with their school principals/heads to facilitate the establishment of a mathematics laboratory or for a start, mathematics corner in their schools.

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