
Improving Students' Negative Attitude towards the Study of Mathematics and Related Disciplines in Nigeria Schools.

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ABSTRACT

Improving students' negative attitude towards the study of Mathematics and related disciplines was the focus of this paper. Common characteristics among students studying Mathematics include negative attitudes such as lack of interest, zeal and hatred toward the subject. The paper examined the concept of attitude and Mathematics and its related disciplines. Since Mathematics is a subject which has to be learnt by doing, rather than by reading, the paper looked at factors responsible for students' lack of interest, zeal and hatred for the subject. These include the inherent difficulties of the subject itself, common conditions affecting students' backwardness in the course of studying the subject, the issue of quality teaching and excellent learning. Paving way for the need for an integrated oriented approach that will enable students to engage in constant practice was advocated. It discussed approaches such as presentation of manipulative during instruction, constructivist models approach of instruction and using of technology-based approach through the use of Mathematics laboratory. Recommendations were made that the training and re-training of Mathematics science teachers should be based on technology and the establishment of technology-based Mathematics laboratories in schools by government (Federal and State) and Private Companies.

INTRODUCTION

Mathematics is a basic requirement for admission into tertiary institutions and for most courses of study, whether in the arts, social sciences or sciences. The knowledge of the subject is also needed in almost all spheres of human endeavours. Edukugho (2004) opined that, although seen as problematic, more feared and dreaded by students, no subject curriculum in the school system at the basic levels (primary or secondary) is more important than Mathematics. Unlike other subjects, it is about problem solving. It is regarded as the pillar of science and technology and the life wire of any nation (Sule, 2006). According to Sule (2006), the level of any nation's development depends on the level of scientific and technological development of that nation. The consequences of a weak foundation in the subject adversely affect the production of skilled technological manpower of any nation. Therefore, future scientists

and technologists must be given a solid foundation in Mathematics in order to meet the diverse needs of such a nation. Unfortunately, many of them would – be future scientists and technologists that must be given solid Mathematical foundation see an aura of invincibility surrounding the subject, with the phobia created especially by many Mathematics teachers (Edukugho, 2004). The researcher observed that, Arithmetic turns off many pupils in primary schools, while students at the secondary schools are often scared of Mathematics (especially Algebra); thus, see the subject as problematic.

Students' and pupils negative attitude towards Mathematics is a threat to science and technological development of a developing nation like Nigeria. Sule (2006) observed that, many youths who intend to go into studies in the fields of science and technology are not ready to do so, simply because of the negative attitude they have developed over the

years towards the subject. The researcher further noted that students' negative attitude towards Mathematics had made many people to go into careers they never intended to. Many are roadside mechanics, local farmers, carpenters, welders; tailors, to mention but a few, because of the fear of Mathematics (Sule, 2016).

In a related vein, Alibi (1995) reported that students regard the subject, physics as a jig saw puzzle – something baffling or silly. This is a psychological defeat and a disabling attitude that can lead to vicious circle of deep fear and losing interest on the subject. From this researcher's own observations and experiences, students of Business Studies taking Business Mathematics as a core course, are of this category of students. Even when worked examples of Mathematical concepts in class are given as a test for continuous assessment, very few can give back correctly the procedures and solutions of the mathematical concepts in question.

The fight against Mathematics failure in Nigeria educational system in order to make the subject friendly, less mystifying and less abstract had led to the adoption of some strategies by concerned educationists, researchers and the National Mathematics Centre –NMC (Asinde, 2007; Ale, 2006; Ogazi, 2004; Edukugho 2004). Despite all efforts to improve on the teaching and learning of the subject, performances of most students continued to be poor, year after year. Ale (2006) observed that students' poor performances in examinations (like the West Africa School Certificate Examination (WASCE), or Senior School Certificate Examination (SSCE), to mention but a few) are due to teachers' poor handling of the subject and some other related factors. The focus of the paper therefore, is how students' negative attitude towards Mathematics can be improved upon for the better.

Mathematics and Its Related Disciplines

Mathematics is the study of quantities and relations through the use of numbers and symbols for making calculations. It is the creation of the human

mind, concerned primarily with ideas, process and reasoning. Mathematical statements are made both in words and symbols. Its form is highly abstract. It involves a mixture of concepts and techniques. The knowledge of concept without the knowledge of techniques for applying it does no good. Similarly, it is difficult to learn techniques and know when to apply them without understanding the concept(s) behind the techniques. Students do best when the mixture of both concepts and techniques are known and applied.

Mathematical systems are purely deductive; being sets of rules for the manipulation of symbols. It concerns numbers in relation to other disciplines like Measurement, Physics, Chemistry, Biology, Business Studies, Accounting, Banking and Finance, to mention but a few. The legitimacy of any system of measurement is determined by empirical data (facts from the real world). Measurement as a discipline concerns how much of an attribute is present in a person, an object or event which requires a numerical statement of the amount (Ukwuije & Opara, 2012; Nunnally, 1981). According to Nunnally (1981), scientist develop measures by stating rules for the quantification of attributes of real objects, borrowing Mathematical systems for examining the internal relations of the data obtained with a measure, and for relating different measures to one another. Also, the theory of connections (Fibre Bundles) and the formulation of Gauge field theory in Physics were development from differential geometry in Mathematics (Pais, 1982; Cao, 1997). According to these researchers, quantum mechanics theory (in Mathematics) used in Physics, consist mainly of differential geometry and partial differential equations. Probability theory is also applied in statistical mechanics. The great practical value of the normal distribution curve shows how it is applied to the distribution of measurements and to errors made in scientific observations (Guilford, 1984). According to the researcher, the normal curve and elementary statistical methods are also applied in Biological and Social data.

The Concept of Attitude

Attitude is an internal dispositional state of the individual that influences his or her choices of action and makes certain classes of action possible (Gagne, 1977). According to the researcher, attitude are organized through experiences that assert direct influences upon which the individual relates. Anastasi and Urbina (2007) see attitude as a tendency to react favorably or unfavorably toward a designated class of stimuli, such as national or ethnic group, a custom or an institution. According to Odili (2006), attitudes are fundamental to the dynamics of behaviours. Thus, one's behaviour towards any situation or event reflects the perception and emotional states of such an individual towards that event.

Attitudes are learned and developed just as most behaviours are learned through operant conditioning and observational learning and modeling. Also, attitudes determine how far a student learns (Odili, 2006). For instance, in an educational setting, a student who does not have interest in a compulsory and an indispensable subject like Mathematics has to condition himself or herself to develop a positive attitude towards the subject in order to achieve highly in it. If the student creates a favorable attitude towards the subject, he or she will not only enjoy studying it, but will derive satisfaction from the knowledge of its ideas gained.

Factors Responsible for Students' Negative Attitude towards Mathematics and Its Related Subjects

Many factors have been attributed to students' negative attitude towards the study of Mathematics (Adepoju, 2004), that had led to their constant failure in the subject. According to the researcher, there is anxiety in many youths in our society today due to consistent failure in the subject which has become a norm to them. Studies (Moody, 2008; Adepoju, 2004; Omoruan, 2017) have shown that the inherent difficulties of the subject cum students' perception of the difficulties and their conception of the subject, coupled with Mathematics

teachers' approach in resolving these difficulties are some of the factors responsible for their negative attitude, lack of interest and zeal towards the study of the subject. The inherent difficulties in Mathematics itself, had been traced to its abstract nature, and as one of the reasons many students have phobia for the subject. The abstract nature of Mathematics is in its language – its vocabularies, symbols and structures (Mbugua, 2012; Omoruan, 2017). While Mathematics vocabularies comprised words needed and used to denote concepts, the use of symbols are aimed at precision, brevity of words and generalization (Adepoju, 2004). Students find it difficult to appreciate the inter-connection of structures such as: $2x + 3y = 45$ and $5x + 4y = 74$ when written in words (find two numbers such that, twice the first added to three times the second is equal to forty – five; and also such that, five times the first added to four times the second is equal to seventy-four (Odili, 2006).

Apart from the inherent difficulties of Mathematics, students' physical and psychological problems which can manifest in some common conditions are also responsible for their negative attitude towards the subject (Odili, 2006, Adepoju, 2004). According to Adepoju (2004:21), these common conditions are known as Mathematical dysfunctions, which include:

- a. **Dyslexia:** students' inability to translate printed language such as Mathematical symbols into meaning;
- b. **Dysgraphical:** students' inability to copy or draw simple geometric shapes without any distortion due to a fault of the muscles system used to encode letters and numbers accurately;
- c. **Dyscalculia:** students' inability to learn Arithmetic processes, characterized by retardation in calculation; and
- d. **Mathematical anxiety:** students' manifestation of the fear of Mathematics. All these can results in students' backwardness in this subject area. A student's affective

influences on learning also permeate classroom factors such as individual historical attitudes towards any subject as a learning area; and his or her personal view of himself or herself in relation to a subject like Mathematics, alters the way in which potential learning opportunities are perceived and responded to (OPT Eynde, De Corte & Verschaffel, 2006).

Another factor which had led to students' negative attitude towards Mathematics is the manner in and the pace at which Mathematical concepts are presented to pupils and students by teachers at various levels of the educational system (Adepoju, 2004). Asinde (2007) had also traced the poor handling of Mathematics at the basic level of the school system to the apathy pupils and students generally have for the subject. The researcher observed that teachers' lack of use of appropriate teaching methods and proper use of instructional materials, as the main reasons for students' fear and negative attitude towards the study of Mathematics and its related disciplines. The researcher further asserted that students are not being exposed to standard learning of the subject (that is, use of laboratory and activity approaches) and so to them, it is the most difficult subject in the school curriculum. Mewborn and Cross (2007) and Wilkins (2008) are also of the view that the Mathematics teachers' ability to resolve the subject inherent difficulties and students' perception of the subject reflects their own content knowledge concerning the learning they are to facilitate. Main while, the teacher is expected to constantly judge the nature and quality of the student's view against the Mathematical agenda. Ball (2000) called this a bivocal perspective, where the object of learning (the Mathematics concept) and the student's responses to situations of learning are continually interacting.

Yet another factor that have contributed to students' negative attitude towards the study of Mathematics is the way and manner assessment and measurement of students' learning outcomes are

being carried out. Strategies for assessing or measuring students learning outcomes are examination driven. This, in turn handicaps the pupils and students in appreciating the full power, beauty and universality of Mathematics in our world of challenges and complexities as they are more preoccupied with passing examinations than acquiring Mathematical knowledge

Assessment is a term used for the process of evaluating the status of the individual or a group, usually with reference to expected outcomes or criteria or treatment (Badmus & Omoifo, 1998). Measurement on the other hand, refers to techniques which enables someone to use numbers to describe educational behaviour (Nwana, 2007). Learning and assessment not based on conceptual understanding are bound to lead to a negative reactions from the learners; which can manifest in various ways as being experienced in our school system today in the form of malpractices and other vices. With technology-based laboratory, continuous assessment of students that enhances learning becomes an integral part of the instructional process and not the end of the learning cycle. Jamski (1991) averred that, assessment techniques of this nature involve communication process in which students learn something about what they can do, what they need to work on and what the assessor values.

THE WAY FORWARD

The process of making conceptual meaning is the focus of activities in the subject classrooms. In the study of Mathematics, the fact that students have to decipher signs and symbols is already a core problem. Hence, representing Mathematical concepts with various physical materials and the teaching and learning of its terminologies, symbols and structures are crucial aspects of Mathematics instruction that can be used to ameliorate the inherent difficulties of the subject and students' perception of these difficulties. The practicality of the teacher's methods and techniques in the classroom calls for suitable instructional materials, technology-based laboratory with experienced and inspiring Mathematics teachers.

A technology-based Mathematics laboratory allow for individualized instruction and active participation of students, where the conceptual ideas of a piece of knowledge is made known to the students. The laboratory method inculcates in pupils and students the spirit of operation and exchange of ideas (Ogazi, 2004). Various Mathematics models, materials, charts, computers and softwares, to mention but a few, are made available to the students in the laboratory. Experience has shown that without solid conceptual formation of concepts through presentation of manipulatives, diagrams and a good grab of Mathematics language, students often think about Mathematical concepts vaguely. The technology-based laboratory can be used to alter students' conception about the subject difficulties by encountering the use of real data and the assignment of real problems (Jamski, 1991).

Another pedagogy that focuses on activities that can help improve the teaching and learning of Mathematics is the constructivist model approach of institution. Constructivist perspective of Mathematics instruction involves a view that students must be actively involved in the learning process. This allows students to construct their own meaning and purpose for a concept by discovering its rules and engaging in realistic problem – solving activities. In this view, learning takes place in a social context (that is, cooperative learning) where learning to think mathematically and interpret Mathematical information are more important than memorizing and practicing algorithmic manipulations (Jamski, 1991; Moody, 2008; Exline, 2004; and Costa, 2004).

Students with low ability can attain the required level of mastery of the subject materials if given supplementary assignment, while those with physical deficiencies can be referred to a physician (a medical doctor) depending on the nature of the case. The best motivation for low teachable students of this category lies within their intellectual curiosity to discover Mathematical facts. Discovery in turn, arouses further curiosity such as intrinsic reward derived from solving a problem and reward derived

from being able to tell ones classmates or teacher about what he or she had just accomplished (Odili, 2006). Another form of motivation to students in the learning of Mathematics is by pointing out Mathematics applications in many fields of work. According to Odili (2006), students must be made to understand the role Mathematics plays to influence their opportunities and requirements in different fields of work. All these an inspiring, well – informed, competent and sympathetic Mathematics teacher will do to help students achieve the required results in this area of study.

To bring about quality teaching and learning in the study of Mathematical science and to pave way for technological development in any nation such as ours, the teacher factor and his or her methods of instruction must be taken seriously. Teachers according to Asiyai (2011) are the most potent factor in the educational system, which can influence the teaching and learning outcomes either positively or negatively. The researcher asserted that teachers implement the education curriculum, and thus determine the quality of education of any nation. Students' negative attitude towards Mathematics and related disciplines can be minimized when the teacher can successfully make an impact on pupils and students through innovative pedagogies and teaching that can encourage and support excellence. Ogbodo (2011) called for a need to introduce best practices and reform in pedagogy. The researcher averred that teachers' reliance on the traditional methods of instruction has become obsolete. Williams (2003) also found out that drive towards anticipated success is created among students when deep engagements with challenging problems are involved. Hence, creative lectures and group – work (as a strong constructivist approach) applied in the teaching – learning of Mathematics and related courses can bring greater achievement among students (Lorch, Lorch, Calderhead, Dunlap, Hodell & Freer, 2010; Taber, 2009).

CONCLUSION

This article has been able to highlight factors responsible for students' negative attitude towards the

study of Mathematics and related disciplines and how this can be minimized or eliminated. Unarguably, it is a fact that the subject inherent difficulties, teachers' methods of instruction and assessment procedures of students' learning outcomes are the major factors responsible for students' negative attitude and poor performances in Mathematics. Activity – based methods of instruction are the best ways to teach this subject. The use of manipulative, constructivist models approach and technology – based laboratory call for an opportunity for regular training and retraining workshops/seminars to be provided for teachers of Mathematical Sciences. These approaches to learning Mathematics will enable the teachers to give quality instructions that will encourage and support excellence in the learning and change of attitude towards the subject and its related disciplines. These pedagogies will make the subject less mystifying, less abstract, move meaningful and interesting to students of all levels of our educational system. The anxiety of passing examinations will be a thing of the past. These pedagogies will not only help students to understand Mathematical concepts better, but will also facilitate their reasoning skills, thereby improving on their achievement in the subject.

RECOMMENDATIONS

To guarantee quality learning outcomes in Mathematics and related disciplines in the school system, the paper suggests that:

1. Urgent steps should be taken to address Mathematics teachers' pedagogies / methods of instruction through training and re-training;
2. Technology – based laboratories should be established in schools (as a matter of urgency) by both the federal and state governments and private companies; and
3. Government and private companies should emulate Cowbell to provide more incentive like scholarships and loans to Mathematical Science teachers and students to encourage them to show more interest in the subject.

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