IMPROVING MATHEMATICS EDUCATION FOR NATIONAL DEVELOPMENT

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Abstract
The foundation of scientific, technological and economic development of any nation is mathematics education. The development of a nation is a function of the improvement on the quality of mathematics education available for her citizens. This paper consists of four parts. First, it explored the nature and characteristics of mathematics. Second, it highlighted some problems facing the quality teaching of mathematics in Nigeria. Third, it identified some contemporary problems of Nigeria. Finally, explanations were provided on the important roles of mathematics in addressing contemporary issues for national development purposes. Appropriate recommendations were made for the teachers of mathematics, curriculum developers, educational administrators and policy makers.

Keywords: Mathematics, education, national development, Nigeria

Introduction

Mathematics can be described as the application of logical reasoning and quantitative ideas which involve the counting, measuring, use of formulae and specific rules for addressing various day to day human phenomena. It is a way of life and an all embracing body of knowledge that opens up human mind to logical reasoning, analytical thinking and the ability to make abstract objects look real or concrete. Nwagbara (2013) has stressed that mathematics evolved in response to the needs of pre-history societies. Not only this, it is a very important input in the scientific and technological development of Nigeria. In a developing country like Nigeria, the role and impact of Mathematics as a subject cannot be over – emphasized because it is recognized as the foundation of science and technology without which a nation can never become prosperous and economically independent. For any country to experience any ground breaking and meaningful development in science and technology, the subject, Mathematics must be reckoned with among her students at the primary, secondary and tertiary levels.

The nations of the world, including Nigeria have recognized the roles to be performed by mathematics in the scientific, technological, economic, political and preservation of valuable heritage. The recognition of Mathematics by Nigerian government is shown in herNational Policy on Education (NPE) wherein it was stated that the goals and philosophy of Nigeria's

education is for all round development of the nation and recommends the teaching of mathematics at all levels of education in order achieve that overall goal of education(Federal Republic of Nigeria, 2008).

For a nation to develop technologically, she needs the efficient services of the following professionals: the technicians, engineers, actuarial scientists, accountants, economists, mathematics teachers, pharmacists and the likes. All these professionals must have a good training in mathematics. With this fact in mind and the prevailing circumstances, it could be said that mathematics teaching and learning in Nigeria is in a regressive state based on students' results in standardized tests conducted by some examination bodies such West African Examination Council (WAEC), National Examination Council (NECO) Joint Admission and Matriculation Board (JAMB) just to mention but a few. This has been generation a lot of concerns to parents, teachers and policy makers on how the problem could be reduced(Anaduaka& Okafor, 2013; Zalmon & Wonu, 2017).

Nature and Characteristics of Mathematics:

Mathematics is one of the most useful and fascinating division of human knowledge. In addition, it is a science and as such, it can be experimented, tested and applied to everyday activities whether indoor or outdoor. As noted by Adelodun (2014), students who are not grounded in Mathematics may have difficulties in using Mathematics concepts, principles and skills in the course of their science education. Furthermore, being a subject, it is made up of a body of knowledge governed by some rules developed on the basis of some peculiar characteristics and features that the subject is expected to exhibit. These characteristics include;

i. Mathematics is a subject of discipline which calls for serious mindedness in its approach and study and particularly comprehension of its principles;
ii. Mathematics is a subject of facts and exactness. It is an absolute subject and one that strictly relies on the principle of one-step after the other;
iii. Mathematics is a jealousy subject in that it requires total concentration and do not permit distraction while on the subject;
iv. Mathematics requires five non-negotiable steps in the process of solving a given question. These steps are to:

a. think (finding out the meaning of the key questioning word);
b. reason (this involves the process of questioning the questions);
c. patiently wait and observe, so as to know from what angle should the question be approached;
d. commence writing out the solution;
e. write out the solution to the given question in a concise and exact manner.

Problems Facing the Teaching and Learning of Mathematics in Nigeria Schools

Three basic elements are critical to the effective study and acquisition of a deep knowledge of mathematics. These include;

i. teaching the basic concepts and principles which are relevant to specific aspects in mathematics in such a lucid, simple to understand, down-to-earth and practical way of using most times, real-life illustrations and examples that could elicit in the students

what has been taught;

ii. teaching of the various procedural steps required to enable students easily solve questions in mathematics independently;

iii. regular practice of mathematics questions by students based on the knowledge or teaching acquired from (i) & (ii).

These steps are logical sequences for teaching and learning mathematics from the perspective of the teaching approach. It is rather unfortunate to note that apart from the dearth of qualified mathematics teachers, the teaching of the subject continues to create problems for most students to the extent that, the misunderstanding of the subject in no time develops into absolute hatred and dislike (Kaniz, 2015).

A major reason for this is that, the basic concepts and principles, which constitute the key for unlocking the knowledge of the subject, are not well presented to the students in a form they could easily understand even if discussed at all. Also, for reasons of limited understanding or share out-of-touch with the essential concepts and principles, many teachers engage in over-flogging the procedural steps required for solving mathematical questions without giving deep insight into the underlying principles. This usually led to the poor understanding of the subject by the students and the users of the subject.

Without a thorough knowledge of the basic and fundamental principles on which a specific aspect of mathematics is based, nothing really good can be made out with just learning the processes or steps required for solving mathematics questions. Indeed, any attempt at just learning how to solve a question reduces the whole process to a magical or abstract situation, which further confuses students and blurs the understanding of the subject (Panthi&Belbase, 2017).

This position is believed to largely account for the reason why majority of students hardly take to working out or practice examples on their own from their recommended textbooks. They claim to carry a mirage perception of the study process in general and a magical view of mathematics in particular with the feeling that mathematics as a body of knowledge is meant only for geniuses or special breeds(Hill, Schilling& Ball, 2004).

The pivot of any teaching process and indeed the major role of any teacher for that matter is to be able to attract and retain the attention of the students being taught. It is only through this that the students can be meaningfully imparted more so, in a mathematics class. In order to underscore this fact, it may be necessary to clarify the meaning of the words- attention, attraction and retention through definitions.

a. Attention: This is simply defined as the action of turning ones mind to something or somebody.

b. Attraction: This is derived from the verb "attract" which means causing someone to feel interest, pleasure, affection or get motivated towards something.

c. Retention: This is equally derived from the word "retain" which can be defined as the continued possession or use of something or continued existence of something.

The lesson that can be derived from these definitions is that, for students to perform well in their studies and particularly mathematics lessons, deliberate effort must be made to turn their minds to feel the interest, pleasure and motivation to the learning of mathematics.

National Development and Developmental Problems of Nigeria

In the first instance, one basic question that needs to be answered is that why growth should be separated from development? The answer to this simple question is that growth is just an observable increase in the number or size of an object. It can as well be described as a quantitative description of an object, economy or a nation. On the other hand, development can be described as growth plus a quality change.

A nation may experience a consistent increase in her Gross National Income (GNI) in terms of budgetary allocation to various sectors of her economy, such as manufacturing, political, economic, social and education, but the increase in GNI may not translate to any quality change in the life of people living in the country. In other words, development can be described as the extent to which a nation is able to overcome her complex socioeconomic, political and cultural issues to ensure progressive changes in the quality of life of all her citizens (Kayode, 2004). The implication of this definition is that a nation is said to have experienced development in her education sector when resources (human, materials, money) that are put in place for the purpose of achieving the ultimate goal of education are potent enough to address various complex educational issues without necessarily relying on foreign aid. With a high level of development in the education sector, there will be a corresponding greater impact on other sectors of the nation because there is a positive relationship between the educational development the rate of structural or national development.

The term national development is very comprehensive. It includes all aspects of the life of an individual and the nation.It includes full-growth and expansion of our industries, agriculture, education, social, religious and cultural institutions. Moreover, national development implies the development of a nation as a whole. It can be best defined as the all-round and balanced development of different components of facets of the nation such as political, economic, social, cultural, scientific and material (natural resources).According to Iheanacho (2014), national development can be summarized as:

i. development through a planned national economy;
ii. increase in agricultural production through the application of modern technical know-how;
iii. harnessing industrial production;
iv. development of human resource;
v. application of science and technology in production sector
vi. provision of mass education; and
vii. provision of various facilities to meet the needs and aspirations of disadvantaged, deprived and poorest of the poor segments of the population.

At the center is the national development with its multiplier effects on other components which will inturn translate better quality of life of people in general. This is depicted in figure 1.

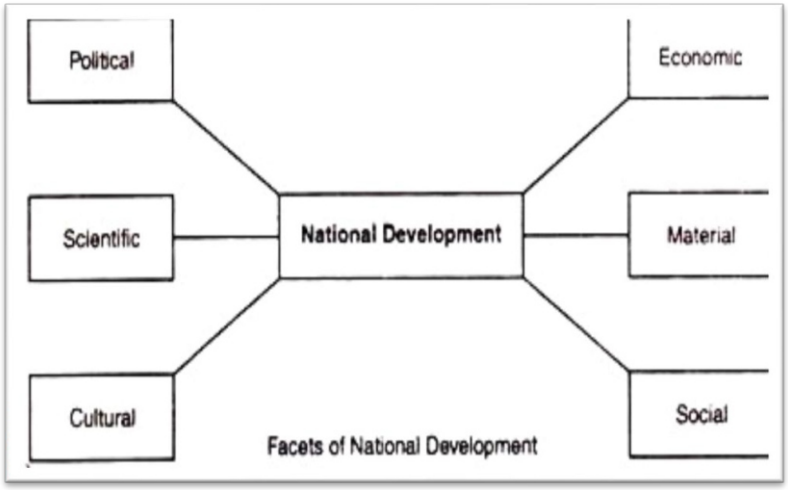

Figure 1: Components of National Development

Contemporary Problems of Associated with Nigeria National Development

Currently in Nigeria, a number of problems are militating against the national development. Trendy among these problems is insecurity of life and properties. For instance, in the year 2018 alone, 1,814Nigerians were killed as a result of farmers-herders conflicts, Boko Haram attacks and armed banditry across various states of the Federation and was more than double of 2017 figure (894) (Amnesty International, 2018). Apart from this, in the 2019 first quarter report of the National Bureau of Statistics (NBS, 2019), it was found that the inflation rate has increased from 9.6% in 2014 to 11.37% in 2019. Also, it was also reported by NBS that unemployment plus underemployment rate has changed from 29.1% in 2014 to 43.2% in 2019. With current population figure based on the United Nations' estimate as of June 21, 2019 was 200,760,054 with high rate of dependency as against 181, 181,744 in the year 2015**.**In addition, The World Poverty Clock has revealed that 91,885,874 people in Nigeria now live in extreme poverty. According to the World Bank, a person can be said to be living in extreme poverty if they live below the poverty line of $1.90 which translates to N693.5 per day. In terms of literacy rate, 34.9% of Nigeria population are illiterate majority of whom are female (70.9) in the 20-24 age bracket. Summarily, the problems associated with National development in Nigeria are many. These among others are:

i. insecurity of life and properties;
ii. increase in the rate of inflation
iii. poor standard of living;
iv. large scale unemployment and under-employment;
v. high magnitude of illiteracy;
vi. rapid growth of population
vii. challenges of national and emotional integration
viii. inertia to change process
ix. problem of evolving a democratic
x. rise of phenomenon of brain-drain
xi. high rate of corruption

The Place of Mathematics in the National Development

Since the creation of man, mathematics has been in the forefront in an attempt to find a solution to many problems in human society and has played many key roles in the over all aspect of human endavour such as science, technology, business, academics, even in the arts. A typical example which is indisputable was when God commanded Noah to build a boat that is 300 cubits long, 50 cubits wide and 30 cubits high in advance of a great flood (Genesis, 6:15). In the African traditional society, the importance of simple counting and the use of cowries for buying and selling of goods cannot be underestimated even with the invention of machines that replaced the old versions of counting. In general, contributions of mathematics to the national development can be used to achieve the developmental goals of Nigeria in the following ways:

Economic Development

Mathematics is of central importance to modern society. It provides the vital underpinning of the knowledge of the economy. In a knowledge-based economy, improvements in mathematics provide problem-solving and analytical skills that create a productive workforce. Such a labor force can tackle the needs of developing countries like Nigeria through domestic-based innovation, which will make them less dependent on developed nations. The investments in math education, in turn, pay for themselves in economic gain, but the pipeline that supplies a nation's innovators must be fed at the training end.With good knowledge of mathematics, it will be practically impossible to estimate the nations degree of inflation, unemployment, balance of trade and payment as well as the working of working of economic structure. That is why in the admission requirement, it is a compulsory subject. Also, the economics of the society are developed by establishment of industries. The applied mathematics like computational science, applied analysis, optimization, differential equation, data analysis and discrete mathematics etc are essential in industrial field. By application of mathematical methods, the exploration cost of oil and communication cost of images could be reduced. Techniques of wavelets and fractals are used for this purpose. Numerical simulation of mathematical models helps to manufacture superconductor cables to reduce the cost of electricity.

Social Development

Human beings are social beings by their nature, and human life is a function of the cooperation and critic made by each other. To live a social life, mathematical knowledge is needed, because of the give and take process, business and industry depends upon the knowledge of mathematics. The change in the social structure with regards to the modern facilities like mode of transport, means of communication and progress in the field of science and technology are results of mathematics. Most of the time, human opinions rely on statistical data, individual health is controlled by the indices of his/her body chemistry, people are socially classified according their income, individuals daily life is paced by schedules, dates and times. Above all, it is difficult to deny that mathematics provides an important instrument for social analyses. Western civilization entirely relies on data control and management. Social critics will find it difficult to argue without an understanding of basic knowledge of mathematics.

Educational Development

The power of a nation in terms of political, scientific and economic depends on her education. Probably that's why the Famous British educationist, Francis Bacon defined education as power. That can be interpreted as the higher the quality of education given by a nation to her citizens, the more powerful advance the nation will become. May be that's why most of the advanced and powerful nations of the world are always in the forefront in terms of scientific and technological innovations, good governance, quality social infrastructures and amenities while countries like Nigeria are still struggling with basic needs of life like food, shelter, good governance and better quality of life. Apart from this, education can be described as the acquisition of knowledge, skill, attitude and value for the purpose of making citizen to useful to themselves and the society they belong. The implication of this is that, any nation that fail to shape her system of education in a way that will allow individuality and self-reliance will eventually end up relying on other nation for survival in nearly all round of human life. With basic knowledge of mathematics education, people in vocations like carpentry, welding and fabrication, bricklaying, house painting will be less stressful and more attractive, and people involved will be more inclined with better knowledge of measurement which will translate to quality service delivery to their customers and nations development in general.

Science and Technological Development

Without missing words, life without mathematics can be equated with a society without good health facility, no modern means of transportation, old version of democratic process, zero innovation in science and technology. The "functional" aspect of mathematics stems from its importance as the language of science, technology and engineering, and its role in their development. This involvement is as old as mathematics itself and it can be argued that, without mathematics, there can be neither science nor engineering, and with this, there will not be any meaning development. In modern times, adoption of mathematical methods in the social, medical and physical sciences has expanded rapidly, confirming mathematics as an indispensable part of all school curricula and creating great demand for university-level mathematical training. Much of the demand stems directly from the need for mathematical and statistical modeling of phenomena. Such modeling is basic to all engineering, plays a vital role in all physical sciences and contributes significantly to the biological sciences, medicine, psychology, economics and commerce. Mathematics has been successfully used in the development of science and technology between 20th and 21st centuries.

Conclusion:

The knowledge of the characteristics, uniqueness and features of mathematics as well as competence in the use of its application tools and laws are essential requirements for understanding mathematics. It is certain that ground-breakingdevelopmentcannot be achieved if the students have no enthusiasm for their work, mathematics educationis not well funded by the government, and teachers are not well motivated to do their job.

Recommendations

The following are the various ways that can be implored in encouraging the teaching and learning of mathematics in Nigeria Secondary Schools. These include;

i. Mathematics teachers should study the psychology of the students being taught so as to know which method of teaching should be adopted for the teaching of the subject. This should start from the time the students were pupils in the primary schools.
ii. State's Ministry of Education should organize seminars and workshops for mathematics teachers on how to improvise teaching aids for the teaching of the subject.
iii. There should be adequate provision of instructional materials for the teaching and learning of mathematics by the government to the schools
iv. There should be adequate provision of incentives for the students studying mathematics as a course at both universities and the colleges of education. This will encourage more students to study mathematics as a discipline in Universities and Colleges of Education in order to have mathematics lecturers and teachers in our society.
v. Provision of adequate, current and standard mathematics textbooks into all secondary school's libraries for the use of the teachers and the students at large.
vi. Government should provide mathematics grants for the mathematics teachers as it used to be for the physics, chemistry and biology teachers in our secondary schools.
vii. Non-governmental agencies like United Nations Development Programme(U.N.D.P.), Petroleum Trust Development Fund (P.T.D.F.), National Mathematical Centre (N. M.C.) Abuja etc should be encouraged in the provision of scholarships, awards for the students and organizing seminars and workshops for the mathematics teachers and lecturers.
viii. Parents and guardians should purchase current mathematics textbooks and mathematics equipment for their children to practice at home.
ix. There should be establishment of mathematics laboratory in each secondary school where students can handle materials, perform mathematical experiments, play mathematical games and become involved in other mathematics activities.
x. Qualified teachers with teaching qualifications should be employed by the government for proper imparting of mathematics knowledge to the students.
xi. Mathematics teachers should build pleasurable activities into the teaching and learning of mathematics for their students.
xii. The major barriers of dearth of understanding by the teachers must be removed through periodic refresher training programmes.
xiii. Every mathematics lesson must be pre-planned by the mathematics teachers.
xiv. School administrators should encourage their mathematics teachers to introduce or establish mathematics clubs and associations for their students.
xv. There should be physical presence of regular activities of professional bodies like STAN (Science Teachers Association of Nigeria) and MAN (Mathematics Association of Nigeria) at individual school levels.
xvi. There should be occasional use of interspersing teaching methods e.g. group activity method, guided discovery and laboratory method by the mathematics teachers.
xvii. Mathematics teachers should avoid being rigid to a single method of teaching approach.

xviii. The classroom is a factory where human behaviour is manufactured. Within the classroom environment, students must naturally exhibit pleasant and unpleasant behaviour, attitude and actions. It is the responsibility of the teacher to guide this natural order for learning and knowledge acquisition. He needs to influence the learner and accordingly manipulate the learning environment through observing all traits and potentials and rightly tailoring the students into the expected behaviour for the attainment of the instructional goals.

xix. There should be adequate supply of electricity such that when students are studying mathematics, they will not be discouraged in reading and practicing.

xx. Government should try to reduce the presently high student-teacher ratio in a classroom. This can only be done by building more classrooms and employing more qualified mathematics teachers for the students.

Going by the recommendations made above, this will tend to motivate the teaching of the subject by the teachers and the students will learn with great enthusiasm so that better performance can be achieved in any examination. In addition, it will encourage the students to study more mathematical related courses in the Universities, Polythenics and Colleges of Education in Nigeria and outside the country. In doing so, our science and technological industries will be greatly improved the economy of our country.

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