MATHEMATICS EDUCATION AND NATIONAL DEVELOPMENT

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Abstract
Mathematics education is the foundation of science and technology without which a nation can never become prosperous and economically independent. This paper attempts to highlight the need for mathematics education as vital ingredients for national development, as the knowledge of mathematics facilitates knowledge in other fields of study to stimulate national development. The paper examines the possible strategies for mathematics education and policy implications.

Introduction

Mathematics has been described as a precision tool used by all scientists in their search for a clear understanding of the physical world. The Encyclopaedia Britannica (1981) defines mathematics as the science of structure, order and relation that has evolved from elemental practices of counting, measuring and describing the shapes of objects. Mathematics as a school subject is recognized as the foundation of science and technology without which a nation can never become prosperous and economically independent.

The Nigerian government has demonstrated this by adopting education as an instrument par excellence for achieving development. Nigeria's hope in the crucial role of science, technology and mathematics education to national development is reflected in the pronouncements in two major policy documents namely: National Policy on Education {revised 1998) and the National Policy on Science and Technology (1986).

The National Policy on Education recommends the teaching of mathematics at all levels of education. In a similar vein, the National Policy on Science and Technology envisages an education system that shall emphasize all levels and re-orient the entire society towards scientific thinking in order to develop new technologies and adapt existing ones to improve societal well being and security. The government has demonstrated commitment to this end by among other things, directing that university admission into the science and liberal arts disciplines should be in the ratio of 60: 40 percent respectively, and have even gone further to establish Universities of Science and Technology (Maduabum, 1999). According to Obanya (1990) a group of specialists in 1980 at UNESCO headquarters in Paris deliberated on the goals of mathematics education and drew attention to some of the following points.

Mathematics permeates the whole of society, and its role would appear to be one of ever-increasing importance as its help is sought in handing situations and problems, which arise outside the field of mathematics itself. Mathematics methods are no longer the prerogative of scientists, engineers and technologists, they are increasingly being used to analyze individual behaviour, to study attitudes and trends in opinion within the society as a whole. This shows that there is no way a society or individual can develop without the knowledge of mathematics. Mathematics is at the heart of every development in any country of the world.

Unifortunately, in spite of the place of mathematics in the national development the achievement of students continues to be low from year to year as has been reported by Ugwu, (1993), and Ezike, (1980). This paper therefore examines how mathematics can be used as an instrument for national development.

The Concept of National Development

When national development is mentioned there is the tendency for one to equate it with economic development. National development is not synonymous with economic development rather it is a part or dimension of total development of the society. According to Achimugu (2000), it is the extent to which a nation is able to overcome her complex socio-economic, political and cultural issues to ensure progressive changes in the quality of life of all her citizens. Nwosu (1990: 195) defined development as a continuous improvement of material and human resources of a nation in order to maximize and manipulate the physical environment for the benefit of the citizenry".

To this extent national development connotes improvement in the living standard of each

citizen. It is necessary to mention that personal development is the starting point for societal development. This not withstanding there are shapes known problems that has been a clog in the wheel of development in Nigeria. These obstacles are low gross national product, low level of technological development, low standard of living, very low level of industrialization, low per capita income, high level of unemployment and under employment, dependence on agriculture that is not even mechanized. Others are low quality of education, lack of capital for investment as well as lack of skilled manpower, near absence of social amenities, political instability, high mortality rate as a result of poor nutrition and poor medical services, leadership incompetence, corruption, inequality and general poverty are also present in Nigeria.

The National Policy on Education (1981) rates education very highly in the national development plan. This was as a result of the role of education as an instrument of radical change in the society. Today this is no longer the issue with the embarrassing developments in education. The federal government views education with neglect and does not give it the necessary attention. This is either because of the economy or lack of commitment on the part of the government to education. Also political instability is the order of the day and most of the time people who accidentally find themselves in government may be those who do not understand enough to appreciate the contributions of education to overall national development and progress. In our universities, the situation has assumed crisis dimension due to lack of fund. This also made teachers to always go on strike and this destabilized the school programmes. As a result students stay more than necessary in school with half-baked knowledge.

In Nigeria, the equipment, facilities and materials needed for meaningful education are either lacking or grossly inadequate. This is particularly in the field of science, where lecturers cannot find a single microscope in good working condition or the commonest chemical to undertake routine experiments even for their students. Where some of those equipments and facilities exist, they have either become obsolete or are in very bad state of repairs.

The society is disillusioned with mathematics because of its perceived difficulty and abstractness. It is now commonly viewed as a difficult and dull subject, which consists largely of memorization of formulas and devoid of understanding. In schools the subject is not taught well because of lack of suitable mathematically trained teachers who will use the right methods and materials to teach the subject. As a result, performance in mathematics has degenerated so badly (Adesida, 1990).

In Nigeria today, a science and technology culture is totally lacking. A nation that keeps issues of scientific and technological development foremost in its mind must pay attention to how its citizens are brought up. The above are some of the obstacles to national development.

Role of Mathematics Education in National Development

All through the history of man's intellectual growth, mathematics has always been a peculiar subject both in the role it has played in its practical application in many aspects of human activities and in the development of other areas of learning or academic subjects. Mathematics contribution to national development could be seen under the following areas:

Science and Technology

Mathematics has been the back bone of several human endeavours notably science and technology, and this is the life wire of national development. It has advanced so much that what is left for man to attain is the creation of man itself. There is no doubt that technology has brought higher standard of living to people both in advanced countries and developing nations. It is the rising living standard that makes the acquisition of technical competence *so* attractive to those countries. (New Encyclopaedia Britannica, 1981).

Today, the products of science and technology are glaring and enjoyable. The invention of satellite, the mobile phones, the high security gadgets etc are the products of science and technology. In Nigeria, science and technology have been applied in many spheres especially in the oil industry. Mathematics is an instrument for fostering scientific and technological advancement. The usefulness of mathematics to the ordinary man is its ability to develop his reasoning faculty to the extent of

modifying man's pattern of reasoning. Hence, the knowledge of geometry and trigonometry are most rapid in architecture, surveying, building, modelling, sculpturing and medicine, which consist major parts of national development.

Internationally, the computer usage worldwide was made possible because of the knowledge of mathematics. Computer is a facilitative technology and merely allows those who are already doing something to do more of it faster and more accurately.

Business and Industry

Quantitative techniques, which are an aspect of mathematics, are those statistical and operations research or programming techniques, which help in the decision-making process especially concerning business and industry. They involve the use of numbers, symbols and other mathematical expressions, According to Kothari, (1978:8) some of the important operations research techniques often used these days in business and industry are as here under explained: (1) Linear programme: This technique is used in finding a solution for optimising a given objective such as profit maximization or cost minimization under certain constraints.

(2} Game theory: is used to determine the optimum strategy in a competitive situation.

(3) Decision theory: It concerns with making sound decision under condition of certainty, risk and uncertainty

(4) Network analysis: This involves the determination of an optimum sequence of performing certain operations concerning some jobs in order to increase over time and/ or cost.

(5) Simulation: This is a technique of testing a model, which resembles a real life situation. And several other techniques. All these techniques are not simple but involve higher mathematics. The tendency today is to combine several of these techniques and form into more sophisticated and advance programming models. All these are aspects of national development.

A lot of mathematical knowledge is used in modern industries in determining which models of machine (s) would produce greater materials at a maximum profit within minimum time. This phenomenon was demonstrated by Hicks (1955).

Other Areas

In banks, basic knowledge of mathematics is needed for effective and efficient transaction between the bankers and their customers. Good knowledge of basic mathematics is essential for the manipulation of building blocks into dams, construction, machines and structures.

Indeed without quality education system which is rooted in mathematics we invariably have unimaginative and unpatriotic engineers with roads that wash away after the first rains; doctors that kill more than they can cure, pharmacists that can mix inappropriate drugs that can kill thousands. Of course the cumulative effect would be non-development rather than development, and at times national retrogression instead of progression and development. Mathematical concepts are general ideals that first become apparent in one area can be readily be transferred to another. Examples include new development in Knot theory, arising, from mathematical physics and applied to molecular biology, a musical problem whose solution has illuminated the theory of waves, an optimisation problem that has led to fundamental questions about computability, and a new kind of geometry that originated in classical mechanics and is now of central importance in quantum physics (New Encyclopaedia Britannica, 1968 Vol. 23).

Federal Government of Nigeria in the National Policy on Education made mathematics compulsory for both primary and secondary school curriculum. It is also needed in every level of education. Over 90% of the courses in Nigerian universities, mathematics is an admission pre-requisite. Even after graduation, employers demand good performance in selection aptitude tests. Such tests. Such tests have heavy dose of mathematics. As we can see, like a person's shadow, mathematics is applied to every human activity, and virtually every profession expresses some degree of numeracy. Mathematics is used in arts, business, commerce, law, medicine, politics, religion, sociology, war and so on,

Since man cannot do without the basic ingredients for survival, coupled with the elementary

fact that mathematics is the core ingredient of all these, man must as a matter of necessity, learn, understand and apply the language of mathematics to sustain and maintain his existence.

From the foregoing, the contributions of mathematics to other subjects and hence to everyday life in national development could be seen.

Recommendations

In the developed nations of the world, mathematics has come to assume an indispensable status in national development. Mathematics serves as a facilitator to other fields of study and aids them to attain an enviable height. The indispensable role of mathematics in bringing about national development and progress is well recognized. As would be expected, mathematics have helped advanced nations to attained impressive heights in food production and conservation, energy production and conservation, waste management, health, robotic technology, nuclear as well as space technology. The third world or developing countries must pay serious attention to mathematics if they hope to get anywhere near the heights so for attained by the developed nations. To do this, the serious problems, which plague mathematics education in these countries, must first be tackled.

1. Education must be properly funded by both federal and state governments.
2. There must be adequate plans to ensure training and retaining of mathematics teachers.
3. Teachers should also let students conceive and perceive the mathematical concepts, which they want to teach.

Both parents and government must show sufficient concern for the teaching of mathematics at all levels of education and encourage children to learn the subject. This concern must be fully supported with all the essential ingredients such as the provision of adequate equipment and materials.

5. Teachers should strive to improve their classroom performance by employing learning enrichment materials, and should also develop effective methods and skills that can stimulate students' interest in the subject.

Conclusion

Every society needs to uphold mathematics as a discipline that is indispensable to scientific progress and national development. With the advances in science in the knowledge of mathematics, the role of mathematics has greatly increased from simply to complex. This helps to bring the whole world to our doorstep. Equally both literate and illiterate are making extensive use of calculators in their business and everyday life. Infact no industry can function effectively without science, technology and mathematics in this modem days without the knowledge of mathematics. This not withstanding many people have negative attitudes towards the subject couples with other predicaments that inhibit the learning of mathematics. Therefore, the study of mathematics must be encouraged at all levels of the educational system.

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