

**MATHEMATICS EDUCATION FOR SUSTAINABLE DEVELOPMENT:
IMPLICATIONS TO THE PRODUCTION AND RETENTION OF MATHEMATICS
TEACHERS IN NIGERIAN SCHOOLS**

Azuka, Benard Festus

National Mathematical Centre, Abuja, Nigeria
Kurume, Mary S.: Benue State University, Makurdi, Nigeria

ABSTRACT: *The paper is focused to examine the problems of the shortage of Mathematics teachers at all levels of the Nigerian educational system. The problem of the shortage of mathematics teachers is due to the poor condition of teachers in Nigeria. Students are not attracted to study the mathematical sciences and are rather attracted to more lucrative professions. Therefore, we have our best brains in other professions at the expense of the teaching profession. Shortage of mathematics teachers leads to poor performance of students and shortage of professionals in science and technology which results in low level of technological and sustainable development of the nation. To produce and retain mathematical sciences teachers, the paper recommends that action should be put in place to deliberately improve the salaries and conditions of service of teachers as done in some African Countries and Advanced Countries; arrangements should be made to retrain our unemployed graduates especially those in social sciences to convert them to mathematics teachers; Students wishing to study the mathematical sciences education should be awarded bursary to attract them to the courses; and specialist teachers should be employed to teach mathematics at the Primary School level.*

KEYWORDS: Mathematics Education, Sustainable development, Production and Retention of Mathematics Teachers

INTRODUCTION

The need for mathematics can be said to be as old as mankind. This arose out of man's desire to count and keep records of things around him. Mathematics has helped to transform man's rural society to modern society. This stems from the fact that mathematics is the foundation of science which is the bed rock of modern development. It is well known that the level of social and economic development of any country is intimately connected with the level of development of that country in science and technology. Since mathematics is known to be at the foundation of science and technology, it means that the level of social and economic development is closely connected with the level of development in the mathematical sciences (Kuku, 2012). It has also been asserted that no society can develop without the effective teaching and learning of mathematics in schools (Ukeje, 2002). According to Niss(1996), at international level, the fundamental reasons for teaching school mathematics include: contributing to the technological and socio-economic development of a society; contributing to its political, ideological and cultural maintenance and development; and providing individuals with prerequisites which may help them to cope with life in the various spheres of education or occupation, private life, social life, life as a citizen. Mathematical skills are relevant to a wide range of analytical, technological, scientific,

security, political and economic applications and the solid foundation in mathematics prepares one for other educational and professional challenges(Ambali, 2014).

The production of technicians and technologists in any society depends on the level of the study of mathematics in the society. Hence, it has been asserted that the gap in the level of development between the advanced countries and the developing countries is as a result of the gap in the level of the teaching and learning of mathematics(Ukeje, 2002). Out of all the problems affecting the teaching and learning of mathematics in schools, the teacher factor in terms of quantity and quality appear most prominent. Hence, no nation can achieve effective teaching and learning of mathematics in schools without adequate number of qualified of teachers in the society. Therefore, it can be said that no nation can achieve meaningful development without adequate number of qualified mathematics teachers in the society.

Generally, education is to make one fit to live and fit to live with others in any society. It is to make one live a meaningful life and contribute meaningfully to the development of the society. An educated individual is expected to contribute to the development of the society better than he met it at birth. Education is the aggregate of all the processes which a child or a young adult develops the abilities, attitudes and other forms of behaviour which are of positive value to the society in which he lives(Fafunwa, 1974).

Mathematics Education and Sustainable Development

Development may be defined as the collective of activities by any human society directed at reducing the totality of perceived obstacles to a higher standard of living, thus maximizing the quality of life of citizens(Ikoku, 1988). Development is widely conceived as a " participatory process of social change in the society, intended to bring both social and material advancement (including greater equality, freedom and other valued qualities) for the majority of people through their gaining control over the environment"(Ambali, 2012). Some of the elements of development include high standard of living, high agricultural productivity, high technological productivity, adequate exploration and exploitation of the natural and mineral resources of the society, less dependence on imported materials, presence of heavy industries, high literacy and numeracy rate of the citizens, appropriate health care delivery and low unemployment. Every society aspires to develop and achieve a better standard of living for her citizens and this is only possible with the presence of well trained technologists who can help to transform the society. Therefore, the under development of Nigeria could be readily traced to her lack of economic independence which in turn arise from her backwardness in science and technology.

Development is expected to be purposeful and sustainable in order to be beneficial to the society for a long time. In the words of Ambali (2012) " without sustainability, development itself is ultimately counterfeit and counterproductive". According to the United Nations World Commission on Environment and development (1987), sustainable development is "development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs". The same source also conceived it as "a process of change in which exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are all in harmony and enhance both current and future potential to meet human needs and aspirations". Sustainable development process must reflect and

be dictated by the resource base available to that society and should strive towards optimal utilization of natural and human resources in its environment. Undue reliance on development inputs from extra-territorial sources will result in distorted development(Ikoku, 1989).

The World Summit on Sustainable Development Report (2002) posits that sustainable development operates at three domains. They are Economic domain- aims at reducing and seeking to eradicate poverty, achieving higher levels of prosperity and enabling continued gains in economic welfare; Social domain- aims at reducing and seeking to eradicate other dimensions of poverty, improving the quality of education, health, housing and other aspects of welfare of individuals and communities, and enhancing the quality of social interaction, engagement and empowerment; Environmental domain- aims at reducing pollution and other negative impacts on environment, mitigating the effects of industrialization and human activity, and seeking to achieve sustainable use of resources in the interest of future generations.

For the general development of any nation, mathematics has central roles to play. The effective teaching and learning of Mathematics cannot be achieved without adequate number of qualified and motivated teachers in the school system. Irrespective of the provision of classrooms, instructional materials, facilities and general administration in any school, the effective teaching of Mathematics cannot be achieved without sufficient number of qualified and motivated mathematics teachers. Therefore, one sure strategies for ensuring a sustainable development in any nation is to sincerely address to problems of the production and retention of qualified mathematics teachers in any society.

The teaching and learning of mathematics in Nigeria can be said to unsatisfactory and disturbing. This is evidenced by the declining trend in the performance of students in school and public examinations. The annual releases of West African Senior Secondary Certificate Examination (WASSCE) Mathematics by West African Examination Council(WAEC) indicate the problematic nature and general poor performance of Secondary School students in Mathematics. For instance, Eguridu (2013, 2014) reported that only 36.57% and 31.28% of Nigerian students got five credits or more including mathematics and English in May/June WASSCE in 2013 and 2014 respectively. This situation has to be addressed if the Nation is to achieve a sustainable development. This poor state of the study Mathematics can only be improved upon when adequate number of qualified Mathematics teachers in the Nation.

Problem of shortage of mathematics teachers in Nigeria

In Nigeria today, there are not enough number of qualified teachers in schools. In fact in some schools there are no single qualified mathematics teachers to teach the students. Sometimes, they resort to using graduates in other subject areas to teach mathematics. Of course, this would not result to effective teaching. The shortage of Mathematics teachers is due to the poor condition of service of the teaching profession as many students go for other professional courses that are considered more lucrative and avoid studying mathematics and mathematics education. The problems of the shortage of teachers and the consequences can be illustrated in the flow chart below:

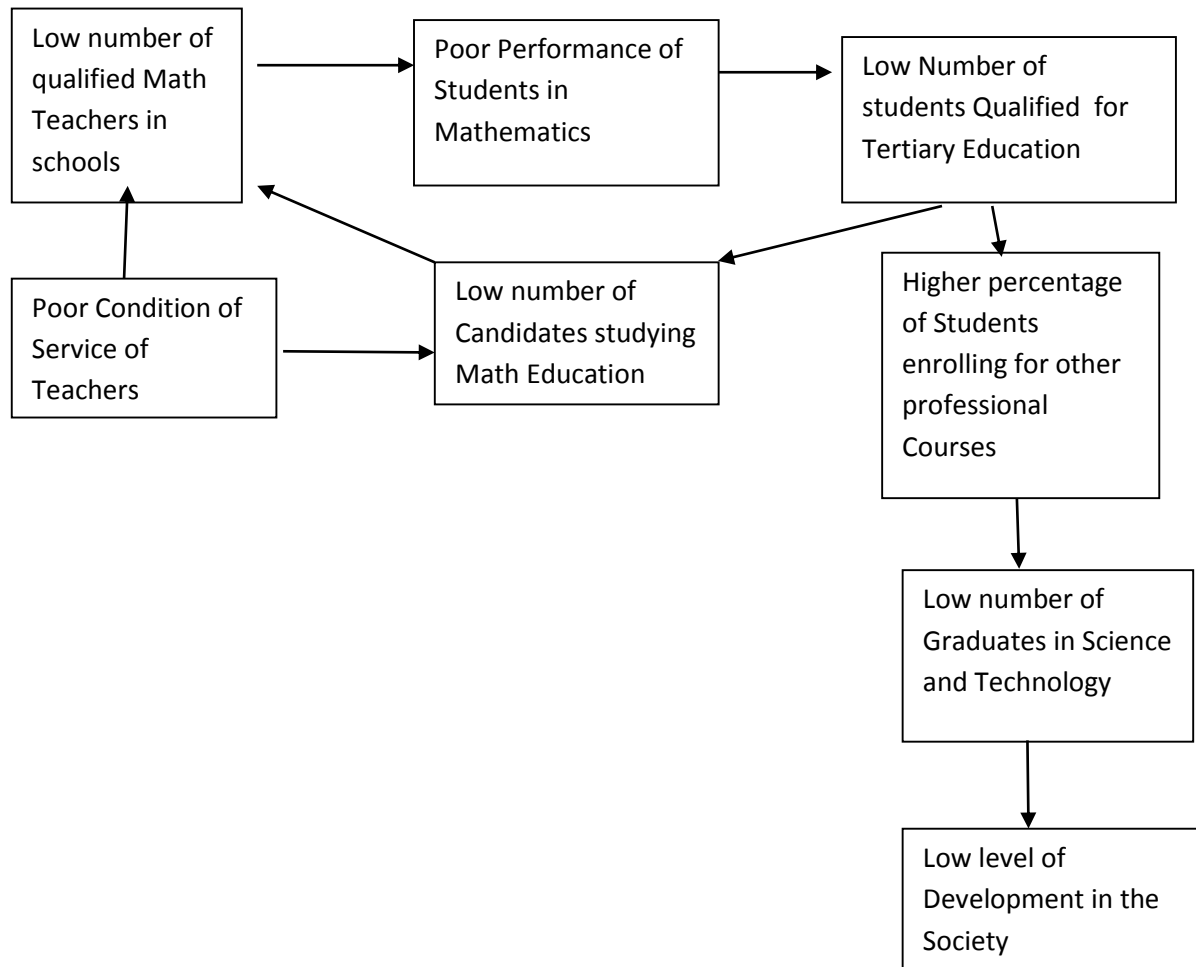


Fig. 1: Flow Chart showing the Problems of Teaching of Mathematics in Nigeria

The teacher is the most important factor that determines the standard and quality of any educational output. One professor Jack Allen in his memorable and historic address to a Conference with theme "The Education of the Teacher" declared:

One of the prime functions of the school, indeed the chief function, is to provide a setting within which boys and girls can grow intellectually, this can only be accomplished through the learners association with information, knowledge, and facts. Books can help. So can laboratories. So can numerous other types of learning materials. But always there stands the teacher, always on the stage, often front and center. What he knows and does can make a difference. What he does not know can be an irreparable loss(Hoderfield & Stinnet, 1961).

Another speaker at the Conference, Professor Randale M. Whaley of the American National Academy of Science had this to say, inter alia

Without adequate number of inspiring, well informed teachers fully prepared to meet their responsibilities in our schools, we cannot have a good education; and without good education, we

cannot hope for long to meet successfully the challenges of a changing world (Hoderfield & Stinnet, 1961).

Strategies for Effective Production and Retention of Mathematics Teachers in Schools

Indeed, good teachers are necessary for good education which in turn is indispensable for change. Therefore, we can affirm that improving the quality of teachers is almost tantamount to improving the quality of our educational system. How then do we improve the quantity and quality of our Mathematics Teachers? We propose the following:

i. Improving the Teaching Service Conditions of Mathematics Teachers:

Condition of Service of any profession determines how likeable the profession would be. The more likeable the profession is, the more attractive it would be to skilled and qualified personnel. Decent and lucrative employment will always attract best hands. If the Mathematics Teaching Profession will attract best hands, then its service condition must be seriously improved upon and its remunerations made very attractive. When this is done, the profession would definitely become competitive and adequately staffed with competent hands which will in turn culminate in the desired outcome from the students. In Nigeria and indeed in most African Countries, many teachers leave the profession to other more lucrative professions few years from the date of employment. Teaching is regarded as a "stepping stone" or a "half-way house" to other more lucrative professions. Teaching of Mathematics is worst hit by the problem of mass exodus to other professions.

Due to the poor condition of teachers, many students do not apply to study mathematics or mathematics education in our Tertiary Institutions. Rather they prefer to apply to study Medicine, Engineering, Pharmacy, Accounting and other Professional courses that are seen as being more lucrative in the society. Then those students who could not get admission to study those choice courses take up the study of mathematics and mathematics education as last resort. Thus, in our society we have our best brains treat the sick; build our roads and bridges, manage our finances, but we have our worse brains to bring up our children who hold the future of the Nigerian economy. So where lies the hope of our technological development?

ii. Improving the Competencies and Proficiencies of Mathematics Teachers

There must be a total divorce and disconnect from the old methods of teaching Mathematics. Mathematics must be presented in such a way that it becomes real, concrete, attractive, interesting, captivating, motivating and directly related and relevant to life. This can only be achieved by employing a new method of teaching which is termed 'Activity Based Learning'. This method involves students actively in the teaching and learning process. This is a globally acceptable method which has proved to be very potent, efficient and productive. Therefore, a Programme should be put in place to train and retrain teachers on how to improve their competencies and proficiencies in the area of actively involving students in the teaching and learning process. Therefore, there should be regular workshops and seminars for mathematics teachers to improve their competencies. This would improve the productivity of the teachers and the quality of our school graduates in the mathematical sciences. In the long run more qualified teachers of mathematics would be available in the educational system.

iii. Engaging Adequate Qualified Hands to Teach Mathematics

There is gross inadequacy of competent hands to teach mathematics in our schools. Therefore, there is an urgent need to recruit enough qualified personnel in the teaching of the subject. This can be achieved by the recruitment of Mathematics Education Graduates. The recruitment exercise should be such that Mathematics Education Graduates are subjected to Aptitude Tests and successful ones are subsequently made to undergo interviews so that best candidates can eventually be recruited for the job. Another dimension of the problems of shortage of mathematics teachers is that while there surplus and unemployed mathematics and mathematics education graduates in some states, they are grossly lacking in some other states of the Federation. This is due to the problem of ethnicity as non state indigenes if at all recruited in other states are appointed as contract staff and usually have their appointments terminated after few years. This is happening among states in the same Federal Republic. A policy should be put in place to have mathematics teachers given permanent and pensionable appointment in any part of the country. This would definitely improve the supply of mathematics teachers in Nigeria.

iv. Conversion of Non Mathematics Graduates to Mathematics Teachers

One of the ways to increase the number of Mathematics teachers in Nigeria is the introduction of Post-Graduate Mathematics Education Conversion Programme for Graduates of Mathematics Related Disciplines. The Programme should involve Graduates of other Sciences and Social-Sciences disciplines who are willing to be converted to Mathematics Teachers. The course should be for about a twelve months intensive course after which the Graduates would be certificated and employed as Mathematics Teachers. The programme for the education of good mathematical sciences teacher at all levels should consist of three basic components: General Education; Specialized Education and Professional Education. The general education should include English Language and Sociology of Education. The specialized education component consists of the main topics in Mathematics. The Professional component include child growth and development, Theories and principles of learning, curriculum theories and practice, teaching strategies and methodologies, Assessment and Evaluation, and principles and Theories of school management and supervision(Ukeje, 2002). The course should cover basic education courses and mathematics courses emphasizing mastery of the subject matter from primary to senior secondary school level and elements of post secondary mathematics topics. Such converted teachers should be given appointment with good conditions of service. This will ensure uninterrupted supply of mathematics teachers to schools.

v. Attraction of Good Students and Personnel for Careers in Mathematics and Mathematics Education

Most Tertiary Institutions in Nigeria record very low enrolment of students into Mathematics and Mathematics Education annually. In fact, many of the Universities in Nigeria do not graduate up to five students in Mathematics and Mathematics education annually at the Master and doctorate degree levels annually. The number of specialists in Mathematics and Mathematics Education is dwindling and on the decline. Hence, specialists in these areas are gradually becoming endangered species because those on ground cannot be adequately replaced their retirement(kuku, 2012). Now, good students in mathematics at the secondary school are attracted to more lucrative careers in Engineering, Medicine and Banking and Finance. There is urgent need for a special incentive package inform of generous scholarships to attract talented students to study mathematics and

Mathematics education. When scholarships are provided, students are attracted to apply for such courses in Tertiary institutions. Besides, qualified Mathematics and Mathematics education graduates should be offered special remunerations on employment. When many prospective students are attracted into the study of mathematics and mathematics education, in the long run the nation shall have enough personnel as teachers at all levels and a good number of them in Science and technology for the development of the Country.

v. **Recruitment of the best Brains into the teaching of Mathematics**

Generally, the best graduates in all the subject areas should be identified and recruited in the teaching profession as practiced in some other African and advanced countries such as Finland. The best brains in any subject discipline should be the teachers of such a discipline at all levels. This is the only way of ensuring quality control and development in that subject area. Best brains in a subject would be enthusiastic about the teaching, research and development in the area of study.

CONCLUSION

Mathematics is the bedrock of the economic and technological development of any Nation. The study of mathematics at all levels of our educational system is faced with so many problems. Of all the problems, the most important one is the problem of the quantity and quality of mathematics teachers in our school system. The best way to address the problems of the teaching and learning of the mathematical sciences is to address the problems of teachers especially their condition of service. With attractive condition of service, many students would opt to study the subject, more qualified teachers would be available in the school system, and then the performance of students would improve.

We therefore recommend that:

- Action should be put in place to deliberately improve the salaries and conditions of service of teachers as done in some African Countries and Advanced Countries,
- Arrangements should be made to retrain our unemployed graduates especially those in social sciences to convert them to mathematics teachers,
- Students wishing to study the mathematical sciences education should be awarded bursary to attract them to the courses,
- Specialist teachers should be employed to teach mathematics at the Primary School level,

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