IMPROVING THE TEACHING AND LEARNING OF MATHEMATICS IN PRIMARY SCHOOLS IN NIGERIA: IMPLICATIONS FOR 21ST CENTURY TECHNOLOGY DEVELOPMENT

P. Obere Abiam

Abstract

At present, mathematics, which provides the necessary tools to actualize the scientific and technological feats in Nigeria is still poorly taught by teachers. This problem, we think may have its root in the primary school level where subject specialization is not in vogue. This research therefore attempts to examine the primary school curriculum and the problems of its implementation by teachers who are still ill equipped. Strategies on enhancing the teaching and learning of primary mathematics are presented. We strongly recommend the humanistic approach and as well as emphasized that: (i) pupils learn mathematics belter by doing mathematics and (ii) the use of heuristic method. Implications of this research for the present century technological development in Nigeria are discussed.

Introduction

According to Bajah (1992:1):

> All though the developed world and in some forward-looking developing countries, brain-storming on the future of education in general and science education in particular has started. National committees for planning education for this century have developed master plans and are already testing educational hypothesis.

indeed, we had frequently heard of "health for all by the year 2000". In 1990, there was a World Conferences on Education For All (WCEFA) held in Jomtien, Thailand which set up a National Curriculum initiative under the American Association for the Advancement of Science (AAAS) titled project 2061. Mauritus, a developing country has also set up a committee which has formulated a master plan for Education for the year 2000. International Council of Association for Science Education (ICASE) deriving its support from UNESCO embarked on Project 2000 which among other things directed attention on Scientific and Technological Literacy for all in the 21s' century.

In Nigeria, we may not be aware of such initiatives, but suffice it to say that Nigeria has gone through a period of drastic educational forms within the past three decades. This, according to Abiam (1993) has had a profound impact on the lives and thought of the entire populace in terms of a shift in emphasis to science, technology and mathematics education. This shift in emphasis has been necessitated by the envisaged challenges of the 21s1 century.

Now, the pertinent question to ask is: what are the mathematical competencies of the Nigerian society? Or what kind of mathematics skills has the Nigerian child acquired for 2P1 century technology world? To develop a sound basis for modern technology, mathematical abilities, which facilitate technology, must be developed. It becomes therefore a necessary requirement for thorough modernization of science and technology education through a re-organization of mathematics education on the conventional, rational and functional basis.

Over the years, student's performance and attitudes towards mathematics have been of great concern. The trend which permeates all levels of educational system is more disturbing at the primary school level. One of the causes of poor performance in mathematics is communication breakdown resulting from poor knowledge or the lack of it of mathematics concepts by our primary school teachers. In fact majority of the teachers at this level are not adequately equipped to give instruction in the subject. With their poor background, they are not able to bring mathematics to the concrete level resulting in poor understanding of the content of the subject. It is therefore not overstressing the fact that good performance at the advanced level of work with mathematical concepts depends on the solid foundation laid at the primary school level. This, according to Okpara (I989:J62) is "logically

so because it has become an axiom that a huge and heavy structure cannot rest on a weak foundation..."

Our attempt here is to address the issue of how best mathematics should be taught at the primary schools in order to meet the challenges of the 21^{s1} century technology development in Nigeria.

Implementing the Primary School Mathematics Curriculum

As a mathematics educator, it would be unwise to start a journey without knowing where one wants to go to, what kind of transportation to select, what direction to take, ... (Lassa, 1981). In education, objectives tell us where we want to go, and what we want to achieve. With this in perspective, we can make decisions such as what topics to include in the curriculum, the learning experiences to select, the teaching strategies to consider and how to prepare teachers. In order therefore that mathematics education may meet the needs of the 21st century Nigerian child, it must be under continual scrutiny and under constant revision. The mathematics conference held in Benin (1977) undertook such revision and came out with the following objectives for mathematics teaching at the primary school level:

i. To generate interest in mathematics and to provide a solid foundation for everyday living;
ii. To develop computational skills;
iii. To provide necessary mathematical background for further education.

The Curriculum Factor

Nigeria's Mathematics Curriculum has undergone various changes. Before 1960s, there was traditional mathematics with its rote learning of formulae. Indeed, the National Curriculum of Conference of 1969 was a key event that brought noteworthy changes in our educational system, ultimately leading to the formulation of the National Policy on Education. The 1969 effort also led to an explosion in curriculum development activities in the 70s and 80s. A wide range of programmes were developed in science, technology and mathematics; and in particular, the present primary school mathematics curriculum is the outcome of these curricula activities (Mailam, 1985)

These changes were necessary in view of the changing needs of the learner and the society, and aims also to use the local environment of the learner as the basis for instructions. It is in response lo the needs of the Nigerian child as well as a sound foundation at the primary level for a better understanding of higher concepts in mathematics in the secondary school that new topics like (i) Practical and Descriptive Geometry and everyday statistics became included in the primary mathematics curriculum (Abiam and Nwagbara, 1993; Abiam and Odok, 1995). -

Problems

The innovations in the primary mathematics curriculum are not in themselves end, but means to an end. This brings in the question of implementation. The realization of the objectives of the curriculum depends on how well it is being implemented by the teachers who are the real actors in the field.

People have been making use of mathematics in their everyday living without knowing it (example, preparing a budget for the week, making a wedding cake). In spite of this use of the subject in our daily activities, our children and even adults continue to fear, dislike and sometimes show hatred in the formal study of the subject. Indeed, a number of questions are raised on why curriculum implementers (teachers) do not perform to the level expected by the curriculum developers. Do the teachers not have adequate competence in the content area of the subject? Are they sufficiently trained in pedagogy to interact confidently with their pupils in the classroom? Do they know and accept the objectives of the subject they are called upon to give instruction? These and other questions are considered relevant in an attempt to assess the success or otherwise of the mathematics teachers.

Teachers, by their training are expected to have adequate knowledge in the content area before they are allowed to give instructions in mathematics. This is not the case in our primary school where subject specialization is not in practice. Most teachers at this level are not adequately equipped to teach the subject. And due to their poor background, they are not able to bring mathematics to the concrete level. This is absolutely correct, as no one gives what one does not possess. In this situation,

most of their teachings remain at the abstract level involving meaningless manipulations of numbers and symbols.

The problems, in the view of Enukoha and Nwaiwu (1992) may as well lie with those teachers who do not understand the structure of mathematics. Lassa (1981) indicated that mathematical structure represents possible abstraction from the concrete problems. The lack of this will.obviously make it difficult for them to teach mathematics at the concrete level, which involves the use of concrete examples and illustrations. And, because the primary school teachers do not have good mastery of the subject matter, they offer the pupils too little, stimulate them too little, an: challenge them too little.

Al this point, you will permit me to tell you the story of two Nigerian children who were out during a class recess after an arithmetic class. The two children were playing in the school yard when an airplane flew by. One child said to the other, "this is a DC10 and he described the characteristics of DC10 in detail. The other child thought "'it was a 747" and equally described the characteristics of a 747 in detail. They were hard at this argument when the bell rang. The first boy turned to the second boy and said, "well, let's go back to 2+2 again (Fafunwa, 1990). Indeed, these children had done high level space science while the teacher was at the 2 + 2 level. This was a pointer to the challenges for the teacher of mathematics, in the 21^{s1} century.

Strategies for **Enhancing the Understanding** of Primary School **Mathematics**

Of all levels of education, it is the primary level, one strongly believes, that should be approached with the most humanistic touch by way of instruction. The primary school child with highly malleable and impressionable mind should be taught mathematics with his point of view in mind as the humanists propose. Humanistic mathematics teaching demands that the teacher should put himself in the environment space of the learner. Indeed, instruction should involve responding to the immediate and long term needs of the child. The teacher should take into consideration the pupil's level of motivation, socio-economic background, experience, state of health, attitude and interest. At this level of education, the teacher is expected to make effort to see things through the eyes of the pupils and not through adult's eyes. Most importantly, he should be seen as a facilitator of learning rather than a reservoir of information that spins out facts to be learned during every lesson.

As a point of emphasis, there is no one method of teaching any topic in mathematics that fits all situations. We do not subscribe to the view that there are those who will eventually understand mathematics and those who will never. Selden (1981:43) sees the "teacher's job as one of nurturing minds, not of culling out and discouraging those unsuited for mathematics".

Primary mathematics needs to be seen as a practically oriented subject that can be learned through well-chosen activities within which a pupil can develop useful skills" and imbibe necessary concepts.

In the leaching and learning of primary mathematics therefore, we shall propose as ideal, the heuristic method which the teacher of mathematics should strive to adopt most. In this method, the pupil is guided by means of well-chosen questions and problems to discover facts, relationships (mathematical structure) and principles for himself, rather than being a mere passive recipient of knowledge. Teachers of mathematics in primary schools should avoid employing what Bishop (1965) referred to as the 'jug' and 'mug[1] technique where, the teacher, like the jug, merely pours knowledge into the mug, the learner.

Instead of illustrating the topic by means of data/figures taken from textbooks, the data/figures should relate to the pupil themselves. For example, in drawing statistical graphs, it is proper to use children's height, weights, classroom test scores, temperatures, among others, could be the results of observations made by pupils. This will help to add interest and vitality to the subject, as much as possible,

i. The pupils should be led to overcome the difficulties themselves; the teacher should avoid doing everything for the pupils.

ii. We learn mathematics better by doing mathematics. Pupils learn better by doing and must therefore be kept constantly occupied during a mathematics class. Teachers need to be reminded that activity and curiosity are natural instincts in children and provide the most effective means for arousing interest and sustaining attention span.

It is the duty of the teacher of mathematics to assist pupils know both 'what' to do and 'why' they do what they do-here referred to as 'rational understanding' in mathematics and as much as possible disregard 'instrumental understanding' in mathematics - implying knowing the 'what' to do without necessarily knowing 'why'. Here rules are applied without reasons. For instance, the area of a rectangle is given by:

Area	=	L X B, where
		L - Length
and		B = breath

However, in so far as rules are indispensable, the reasons for rules should be set forth by whatever means that will readily appeal to the child's mind.

From the aforementioned, we shall therefore propose, at least for the singular purpose of improving the teaching and learning of primary mathematics, the following methods: demonstration, discussion, questioning and activity oriented approach (or the learner - oriented approach).

Evaluation

The problem of understanding primary mathematics may not be that of the curriculum content, nor one of approach, but it could be that of assessment. For, where the pupils are not correctly assessed, decisions on pupil's progress are bound to be incorrectly made. Evaluation needs therefore not only to be built into the teaching and learning process but must be effectively utilized. Emphasis should be on formative rather than summative evaluation. In which case, for every important concept that is taught, there must be assessment so that necessary correction can be made before we have a build up of errors that may not be easily overcome in the long — run. The teacher should strive to find out where the learner is at any point in lime. This can be carried out with questioning, assignments, tests, among others.

Implications and Conclusion

The research has implications for the $21^{5'}$ century technological development in a developing country like Nigeria. Indeed, the primary mathematics by the way it is being implemented may not move the country forward, scientifically and technologically. The continued use of poorly equipped teachers to teach mathematics to primary school pupils will further mystify the subject. There is no disagreement today, nor will there be in the foreseeable future that no system of education can rise above the level and quality of the teachers in the system.

We are aware of the initiatives by both developed and very few forward looking developing countries at revolutionizing the teaching and learning of science, technology and mathematics to meet the current challenges of the century. Nigeria needs to evaluate the impact of the emerging trend, and determine a mathematics education programme consistent with their science and technology realities.

The use of humanistic approach in mathematics teachings throws a lot of challenges to the mathematics teacher. The needs of the teacher to meet the challenges cannot be overstressed. The needs of pupil, his interest cultivation and ultimate in school depend to a large extent on the guidance given by the teacher who must have and display expertise knowledge of mathematics. The teacher has a great challenge of creating and sustaining a conducive classroom environment to develop the child with all the desirable traits he brings to the class. Indeed, the primary mathematics teacher should be seen to function as a facilitator, encourager and helper (Ogwuazor, 1992).

Government and agencies concerned with educational planning and administration should carry out more investigation to determine the way the primary mathematics curriculum is being implemented by teachers in the classrooms, and the role of extraneous factors, such as public examinations in their interpretation of the curriculum. This would provide further guidance in redefining the extent to which the primary mathematics curriculum could be made more effective in providing worthwhile or satisfactory educational experiences for pupils.

In conclusion, it is strongly recommended that subject specialization be introduced in the preparation of primary school teachers. This recommendation is informed by the current objectives and contents of the primary mathematics curriculum in Nigeria. This curriculum expects of the teachers a certain level of cognitive and pedagogical competence which can only be obtained

according to Qyedeji (1992:69). "through undergoing carefully articulated initial and in-service teacher training programme'.

It is only such well-trained teachers that can ensure that all children entrusted in their care achieve the aim of instruction and develop mathematics potentials fully.

References

Abiam, P. O. (1993). Professional development and retention of personnel for effective STM. education in Nigeria: Implication for learners. A paper presented at the 34th Annual conference of STAN. Katsina

Abiam. P. O.; and Odok, J. K. (1995). Improving the leaching and learning of some identified difficult topics in primary mathematics curriculum. A paper presented by UNICEF - assisted training workshop for teachers in UNICEF Experimental Primary Schools, CRS CEO Akamkpa.

Abiam, P. O.; and Nwagbara, A, C. (1993). Improving the teaching of statistics in primary and junior secondary schools. A paper presented at 1993 National Mathematics Subject Panel Workshop of STAN, Kaduna.

Bajah, S. T. (1992). Public understanding of science: Seeing with both eyes. A paper presented a; 33rd Annual Conference of STAN, Enugu.

Benin Report (1977). Report on the Mathematics Conferences held in Benin, January 6, & 7.

Bishop. G. D. (1965). *Teaching mathematics in (he secondary school.* London: Collins.

Enukoha. O.; and Nwaiwu, S. I. (1992). *Teaching mathematics in the primary schools.* Zaria: Tamaza publishing company.

Fafunwa. A. B. (1990). Keynote address at 31s1 annual conference of STAN. *Conference Proceedings,* Benin.

Lassa. P. N. (1981)- Goals for teaching mathematics. *ABACUS: Journal of MAN: An Extra-ordinary Issue 13,* 23-30.

Mallam, W. A. (1985). Implementing the mathematics curriculum: Meeting the needs of female students. A paper presented at the workshop organized by the faculty of education, UNUOS: Jos.

Ogwuazor, K. E. (1992). Introducing the human angle into the teaching of science and technology i;: schools. *Journal of the Science Teachers Association of Nigeria, 27(2),* 81-22.

Okpara, U. E. (1989). *A Search for a realistic means of achieving minimum of instruction question.* Lagos: NERC.

Oyedeji, U. E. (1989). Areas of difficulties in primary mathematics curriculum as perceived by Jr. service mathematics teachers. *Journal of the Science Teachers Association of Nigeria. 27* (2L 66-76.

Selden, A. A. (1981). Teaching the doing of mathematics. ABACUS: *Journal of the Mathematics Association of Nigeria: An Extra-ordinary Issue,* 13,41-61.