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# CHALLENGES AND PROSPECTS IN INNOVATION IN MATHEMATICS EDUCATION IN NIGERIA

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By

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## **Abstract**

*This paper studied the challenges in mathematics education and prospects in innovation in mathematics education. Specifically, it studied what constituted challenges to the achievement in mathematics based on policy statements of the National Policy on Education. Several factors such as: teacher, teaching materials, interest, government etc, were seen as challenges to the achievement in mathematics education in Nigeria. It was seen that both teachers and the different arms of the government have serious roles to play in order to achieve performance in mathematics. It was recommended among others that seminars, workshops and in-service training should be staged for teachers from time to time. Both the State and Federal governments should encourage the study of mathematics by supplying mathematics teaching materials to schools and staging mathematics competitions.*

Mathematics is the science of numbers and shapes (Hornby, 2006). It has been recognized as the most potent instrument that can be used to sharpen the mind. Ukeje (1990) saw mathematics as the queen of the sciences. He noted that no nation can hope to achieve any measure of scientific and technological advancement without proper foundation in school mathematics. In affirming Ukeje's assertion, Nwosu (2000 - 2002) in Ohakwe (2006), stated that mathematics is the basis for scientific theories and experiments used in everyday lives to solve personal and social problems. This is because when the environment is observed, some studies will be carried out; experiments would be performed and analyzed so that the exact causes or effects are obtained. Furthermore, no scientific investigation can be successfully carried out without the knowledge of statistics (a branch of mathematics). Modern technology relies heavily on mathematics for its continuous growth. For instance, the Launching of Russian Space-ship "Sputnik" into space in 1957 prompted the American government to initiate science policies which led to the development of their mathematics and science curricula in the early 1960's (Ukwungwu, 1997). Therefore, for any government, awareness of the importance of mathematics and science education for national development should be its focus for prompt formulation of policies that would enhance the study of mathematics and science education.

## Academic Excellence

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Mathematics is the pivot on which all scientific and technological development stand. This, notwithstanding, science is widely used by just a few top individuals. This is despite the fact that the elementary part of it is supposed to be used by everybody for solving his/her everyday life problems. For instance, one can use the knowledge of area, volume and geometric shapes to build one's local houses.

Again, it is through the knowledge of mathematics and its application that manpower training and development which lead to the production of capital goods, processing of raw materials, effective utilization of agricultural and energy resources, dissemination of information, manufacturing and engineering design can be achieved.

This situation seems to pose challenges in mathematics education. What then would be the prospects considering the fact that some new ways were introduced for better performance in mathematics yet poor performance persists. This paper will study: Challenges in mathematics education and Prospects in innovation in mathematics education.

What constitutes the challenge is how performance in mathematics could be achieved. This could be looked at from two different perspectives:

### **General education Policy and the Factors that Inhibit the learning of Mathematics**

In the National Policy on Education (2004) section 1 No. 9, some of the policy statements are as follows:

- a. Education shall continue to be highly rated in the national development plans because education is the most important instrument of change; any fundamental change in the intellectual and social outlook of any society has to be preceded by an educational revolution;
- b. Life-long education shall be the basis of the nation's educational policy;
- c. Education and training facilities shall continue to be expanded in response to societal needs and made progressively accessible to afford the individual a far more diversified and flexible choice;
- d. Educational activities shall be centered on the learner for maximum self-development and self-fulfillment;
- e. Universal Basic Education in a variety of forms, depending on needs and possibilities, shall be provided for all citizens;
- f. Efforts shall be made to relate education to overall community needs;
- g. Modern educational techniques shall be increasingly used and improved upon at all levels of the education system; (FRN, 2004:8-9)

These policy statements pose a lot of challenges to Nigeria as a nation. For instance, one may ask oneself how is our primary schools organized and managed? This question is pertinent since the primary education is the basis upon which all other educational system are built upon.

In our primary school system, teaching is organized in such away that a particular teacher teaches all the school subjects meant for a particular class whether he/she is knowledgeable in the field or not. This is one of the striking problems that might cause pupil's poor achievement in mathematics. For instance, it was found that irrespective of curriculum reforms, that primary school teachers operate at the same level as the pupils they teach (Ogomaka, 1988; Ali, 1989; Ohuche and Obioma, 1983) in Igbokwe (1997:10). In fact, one cannot give what one has not. Therefore, specialist teachers especially those of mathematics, English and science should be sent to teach each class in the primary school as at when due. This is very important as the study of mathematics is cumulative. In mathematics, some basic concepts are required to be known at each stage to prepare the child for a better understanding of the subject in the next stage. This will bring about both intellectual and social development in the child and hence the learning experiences would be a long lasting one.

Apart from some shortcomings, in the organization and management of the school system, the lack of teaching materials and infrastructural materials seem to constitute another challenge. The role of teaching materials (both improvised and ready made) in the teaching and learning mathematical concepts cannot be over emphasized. Children learn from concrete to abstract. At the initial stage, every mathematical concept taught must be represented by concrete objects. Thus, in teaching counting of numbers, improvised materials such as bottle corks, sticks and other objects are used to perpetuate the concept of numbers. The problem is that because the teacher/pupils can produce some teaching materials then improvisation of materials which is the ability to manage or make – do with little resources becomes the bane of education in the country.

This problem could even be seen from the statement of Nwokolo(2011) in Nnadi(2011) who pointed out that a visit to any of the primary or secondary schools would make one appreciate the level of decay in infrastructure and academic facilities caused by improvisation. He further talked about the deteriorating conditions of city schools and compared their conditions to those yesteryears when pupils study under tress. (Nnadi and Zadok, 2011:37). Improvisation has taken up the fact that teaching materials like the projectors, slides, computers, televisions and many others which will help in reducing the abstractness of mathematics could not be supplied to schools. Lack of mathematics teaching materials has been affirmed by Ugwu (1999, and 2002). She found that out of 28 secondary schools used in her study that only 8 schools possessed new media. Also, such infrastructure as library, classroom blocks, electricity, tap water, desks/chairs and lockers are needed in every school for conducive learning environment.

For the policy statement of section 1 No 9f and h, most of the time, when educational objectives are formulated, it seems that the end users are not involved, that is the community for which the educational policies are meant for. In this case, the beliefs and norms of the community may be neglected such that at the level of implementation the community might resist it. For example, some communities may

abhor the use of certain objects or things (snail, rats etc) which the teacher may use in the class or a particular behavioural pattern that may relate to religion or social ethics.

Another challenge to the teaching and learning of mathematics is the teacher factor. The teacher is all and all in the classroom. Therefore, since the teacher is the central focus in the classroom as far as the child is concerned, it becomes important that experienced and professional teachers of mathematics should be employed in both primary and secondary schools.

Again, interest is one of the factors that affect students' performance in mathematics. It becomes necessary that teachers should use both intrinsic and extrinsic motivation to arouse the pupils/students' interest in mathematics. A student can only learn that which he/she is interested in. Arousing and sustaining students' interest in mathematics will help the students' form a positive attitude towards the subject.

However, no matter the styles the teacher uses to arouse and sustain the pupils'/students' interest in mathematics, and the teaching method used is not the required method at the point in time, it might be difficult for the student to learn. Although there is no sharp division between one teaching method and the other but certain methods might be required in transmitting certain concepts. Therefore, teaching method is a very important factor in the teaching and learning of mathematics.

Statements of the National Policy on Education (2004) section 1 No. 9 shows that teachers are required to use modern teaching techniques which would be pupil centered. But even in this computer age teachers still use expository teaching method which does not encourage curiosity in learning instead it encourages memorization and drill. Pupils are inactive during the teaching-learning process.

### **Prospects in Innovation in the Teaching and Learning of Mathematics**

Prospects in innovation in mathematics education could be seen as the possibility of introducing new ideas or ways of using some new ideas in mathematics education to improve the teaching and learning of mathematics.

It has been observed that Nigerian students are well known for their negative attitude towards the study of mathematics. (Ohakwe, 2006). Thus, they see mathematics as meant only for the gifted children. Students therefore perform poorly in mathematics at the primary and secondary school that affects the number offering it in tertiary institutions. For instance, ABU (1991) in Eniayeju (2000) noted that Ahmadu Bello University, Zaria in the 1990/91 session graduated 20 (B. Ed mathematics), 5 (B.Sc mathematics), 6 (B.Sc statistics), and 14 (National Diploma in mathematics). This gives a total of 45 mathematics graduates. This number is nothing to be compared to the number of primary and secondary schools that need them in that year. The downward in the students' achievement in mathematics could be improved by the application of new techniques and methods in the teaching/learning of mathematics. For instance, in the

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teacher/pupil's relationship, the teacher has to humble himself and come down to the level of the students in terms of social relationship in the classroom. He sees the learning environment as student centered rather than the teacher centered learning. He avoids anything that will make him bully the students or call them "names" like "you idiot, fool, big for nothing etc". He ensures that he appears friendly to the students and makes them curious about the learning experiences.

The teachers' methods and techniques of teaching should be most of the time, discovery method where the students are allowed to explore their environment and discover new rules in solving problems that may arise. The teacher serves as a guide most of the time. The teacher use questions that will at least give clue to what the process should be rather than using expository (drill, memorization, lecture) method. The discovery method (Heuristic, laboratory, inquired etc) of teaching and learning mathematics if effectively and promptly used might bring about achievement in mathematics.

Teaching materials and infrastructural materials should be supplied to schools. This will help to some extent is achieving performance in mathematics because students tend to retain learning experience when they hear, see and touch.

Furthermore, if there should be prospects in innovation in mathematics, teachers who are the implementers of mathematics curriculum should be adequately trained such that they would be conversant with the new methods and strategies of teaching mathematics, use of teaching materials (projectors, sliders, cassettes, computers etc) and well exposed to the content of the curriculum. This could be achieved by staging seminars and workshops and by sending teachers to in-service training.

Again mathematics curriculum should as much as possible relate to the local environment so that the students could always go from known to unknown. Also, the issue of learning experiences being at variance with the culture of the people could be avoided. If people are at home with what they are learning, they will appreciate the learning outcome and there would be prospects in learning.

### **Conclusion**

The importance of mathematics to the individuals and the nation in general have been highlighted by the study. Also, the statements of the National Policy on Education pointed out what should be done to achieve required objectives but even at that, performance in mathematics is still poor. On how to achieve good performance in mathematics becomes a challenge. The paper studied challenge in mathematics education, prospects in innovation in mathematics education.

### **Recommendation**

Based on the findings of the study, it is recommended that teachers should improve on their relationship with pupils/students while in the class.

Teachers should attend seminars, workshops and should be sent to in-service training to up-date their knowledge in relation to both content and teaching materials. Also, both state and Federal governments should supply teaching materials and infrastructural materials to schools.

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