

**REFORMS AND INNOVATION IN TRAINING AND RETRAINING  
OF SCIENCE AND MATHEMATICS TEACHERS TO MEET WITH  
CHALLENGES OF GLOBAL DEVELOPMENT**

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**Abstract**

The teacher can be seen as the pivot about which factors of education revolve. As it is often said, the quality of education of a particular nation depends on the quality of her teachers. In a world that has turned into a global village as a result of advancement in science and technology, the science and mathematics teachers need be equipped with the latest pedagogy and skills required to meet with global trend of development. This paper focuses on training and retraining of Science and Mathematics teachers to help meet with challenges of global development. The presenters call for update of teachers training curricula. The paper emphasizes training the Science / Mathematics teachers for pedagogical competence. It also stresses the importance of in-service-training and workshops for the teachers. This is followed by recommendations and conclusion.

**Introduction:**

The place of Science/Mathematics teachers cannot be over-emphasized in a world that has become a global village due to advancement in technology. The upsurge in the use of Information Communication Technology (ICT) has

helped a great deal to promote global technology so as to be able to instruct the learners and make them compete with their counterparts in developed and developing nations of the world.

Awah (2006) stated that the slow pace of development in Nigeria and

indeed Africa is linked to the teachers whose pedagogical background are deficient in terms of global development. This being the case, it becomes obvious that the path of achieving the lofty goals set by the Nigeria government is through adequate teacher training curricula and retraining programmes that would set the nation on a pedestal of coping with global challenges. The Science curricula and indeed Mathematics curricula should be improved upon to reflect current innovations in the world of technology. The science and mathematics teacher must be equipped to help him/her impart right knowledge to the learners who are required to utilize current global facilities such as computers, Global System of Mobile phone communication (GSM), Internet Facilities (IF), Automatic Teller Machine (ATM), etc.

The federal ministry of education owe it as a duty to redesign a curriculum that could help the science and mathematics teacher cope with global trends.

Until the teachers in our schools are well trained and retrained the nation with not be able to compete in the world that is daily advancing in modern technology.

#### **The Science / Mathematics Teacher:**

Obaya (1995) in Awah (2006) highlighted some of the roles of a teacher as: a mediator of learning, disciplinarian, or controller of students' behaviour, parent substitute, confidant to students, judge of achievement, organizer of curriculum, bureaucrat, scholar, a researcher and a member of teacher organization. The

teacher is also an expert in some area of knowledge and skills, an agent of social change.

The science teacher provides the pupil the setting that help him / her grow intellectually by enlarging his experiences. He is the centre of knowledge and the frontier of new findings, be it scientific, technological, social, economical, etc.

Okurume(2003) posited that the teachers psychological attitude to teaching should be of high standard. The teacher should be interested in teaching, the more the teacher is exposed to learning, the more he is presumably able to make his teaching effective. The science or mathematics teacher should be stable minded. He gave the conditions favourable for the teaching of mathematics as follow:

- (a) The science / mathematics teacher should be a master of his subject as well as the method of teaching.
- (b) He should be able to relate the science or mathematics concept to real life experience.
- (c) The science or mathematics teacher should not assume himself as an embodiment of knowledge. He should be humble enough to accept criticism.
- (d) He creates an enabling environment that will facilitates effective teaching and learning.

#### **Updating Science / Mathematics Teacher Training Curricula:**

The importance of updating the science/ mathematics teachers training curriculum cannot be over emphasized.

Current trend in global development requires that the science teacher should be equipped and be able to use latest technology. The teacher training programme for Science/Mathematics teachers should include in the use of computer, overhead projector, amongst others. Since Information Communication Technology (ICT) is the current reality the world over, the science and mathematics teachers need to be abreast with the various modes of accessing any information on the global information highway. Annan (1999) sees curriculum as formal; and informal process by which learner acquire knowledge and understanding and develop skills, attitude, appreciations and values under the school. It is made up of all efforts made by the school to bring about worth while behavioural changes in the learners as members of the society. Similarly, Sockette (1976) in Annan (1999) viewed curriculum as a *program of activities designed so that students will attain by learning certain specific aims and objectives*. Both definitions emphasized the role of educational institutions in determining behavioural attitudes of the learner. The teacher training institution, specifically the Colleges of Education and Universities to consciously select and organize situations that will develop the personality of the Science/Mathematics teachers. The curriculum must be seen as the deliberate systematic and planned attempt not only to change the behaviour of learners, but also to enable them gain the social insight and power to build a better society. Ukeje

(2004) revealed that as an instrument of education curriculum should be achieving. After all, it is said that education unlocks the door to modernization, but it is not often realized or appreciated that it is the teacher that unlocks the key to the door.

### **Retraining For Pedagogical Competence:**

The teaching and learning of Science/Mathematics do not require theoretical and lecture approaches. Many inexperienced teachers teach science in abstraction, thereby making the student find it difficult to grasp some scientific or mathematical concepts, skills or principles. The teaching and learning of the subject matter require the use of discovering approach as well as innovative method that stimulates students' interest. Onose (2006) stated that the teaching and learning of mathematics should involve activities and room given to students to think or reason about what he or she is doing in order to look for relationships which may enhance and build up a store of Scientific/Mathematics techniques.

Inability of science teachers to adopt appropriate method/techniques in the teaching and learning process make the learners to lose interest in mathematics and science. Okurume (2002) define the effective teacher as one who learns from teaching rather than one who has finished learning how to teach.

Igwebuike(1995) enumerated some of the attributes of an effective teacher to include:

- (1) **Mastering of Subject Matter:** A teacher who has masters the subject matter will impart the right knowledge to the learner. The teacher training institutions should ensure that the science teachers they turn out should such that can defend their field of specialization.
  - (2) **An Effective Teacher Should be Proficient and Articulate:** He should be able to communicate the right knowledge to his students.
  - (3) **He Should be Flexible** so as to present the idea in various ways to suit different situations or class settings. A rigid or stereotype teaching does not promote learning in the classroom.
  - (4) **The Teacher Should Exhibit Originality:** He should be able to create and develop his own unique idea and method of passing knowledge across to learners. This can only be done through wealth of experiences that he gained during training and other wise.
  - (5) **He Should be Resourceful:** This is the ability to generate and improvised relevant instructional material that would help to aid teaching and learning. Most of the science and mathematics teachers in our school today teach in abstraction and thereby making the teaching and learning process boring.
  - (6) **A Teacher Should use Effective Teaching Technique/Methodology** during the teaching and learning process. The teaching of Science/Mathematics should employ methods such as learning by discovering, guiding learning instruction, synthetic/analytic, inductive/deductive which are best for the age of science and technology.
  - (7) **Self Evaluation:** The teacher should evaluate himself through a collection of feedback from learners' interest and performances.
  - (8) **He Should be Good Time Manager:** The teacher should make good use of the time allocated for the lesson for optimal result.
- The Place of In-Service Training.**
- Simon (1993) emphasize that the amount of training beyond the minimum requirement for the job, amount of recent in-service training are effective means of measuring the success of a science or mathematics teacher. The in-service is that, given to acquit him with recent developments in his field of training. In-service training could be organized by a school community, local education or non governmental agencies.
- The need to organize in-service training for science/mathematics teachers cannot be over emphasized.
- (1) It broadens teacher's knowledge of subject matter.

- (2) It helps the teachers to learn and master skills, principles and techniques.
- (3) It makes the teacher more effective in the classroom.
- (4) It helps the teacher correct area of weakness.
- (5) It makes him proficient and a master of his discipline.
- (6) It helps teachers to use practical approach to solving problems.
- (7) It helps him to be abreast with recent developments in his field of study.

In-service training enhances the competence of the science and mathematics teacher. Not until of recent, many teachers of Science/Mathematics have no access opportunity for in-service training.

The government and non governmental organizations should encourage in-service training for teachers in Nigeria schools. The ministry of Education at the state levels should allocate a good percent of their budget for this course.

### Workshop for Science/Mathematics Teachers:

Workshop is a programme put together to help the science teachers to learn skills, techniques through practical activities. The science and mathematics teacher can be very effective in the classroom if he attends workshops that will help him teach his subject matter effectively. In a workshop the teacher is taught how to construct and build instructional materials that are not readily available in their schools. Examples of

materials that can be improvised in a workshop include:

**Two Dimensional Shapes** e.g. square, rectangle, triangles, parallelograms, trapeziums, kite, etc.

**Three Dimensional Shapes** such as cuboids, cylinder, cone, prisms, globe, etc.

Other instructional aids that can be made in a workshop include: flannel board, graph board, abacus, etc.

Knowledge gained by the mathematics teacher in a workshop helps him in making his lesson more practical and interesting to learners.

Workshop affords the science teacher to be trained in construction of test, typical of this is the table of specialization also known as test blue print. The teacher learns how to state the objective of the test in the terms of remembering (knowledge), understanding (comprehension) and thinking (application, analysis and evaluation). He is taught how to specify the content of the subject matter to be use and finally the construction of test items.

A table showing a test blue print is shown below:

CONTENT OBJECTIVE	Numbers of place value 20%	Fractions 30%	Factors and multiples 20%	Percent ages and decimal 30%	Total 100%
Remembering 20%	2	3	2	3	10
Understanding 30%	3	5	3	4	15
Thinking 50%	5	7	5	8	25
Total 100%	10	15	10	15	50

A table of specialization in mathematics for primary five.

Most science and mathematics teachers today do not know how to construct a test blue print. This brings about poor assessments of learning in our

schools. A teacher who has opportunity to go for workshop and in-service training becomes proficient and effective in the field of specialization.

### Recommendations

The presenters of this paper recommend the following to enhance reform and innovation in training and re-training of Science and mathematics teachers in Nigeria schools.

- (1) The curriculum for the teacher training programme of Science/Mathematics teachers should be updated to include use of ICT so as to enable them access information that is current in their field of studies.
- (2) Although, the Ministry of Education at all level recommends in-service training, the implementation is not done. The officers in charge should endeavour to see that money voted for this purpose is judiciously used from time to time.
- (3) Educational institutions should embark on workshops that could train the science and mathematics teachers on skills required for effective teaching and learning for modern technology.
- (4) The federal and state governments should provide facilities in every local council where science teachers can go to access information that would help them improve in their fields of study.

### Conclusion:

The presenters of this paper believe that over hauling of the curricula of the teacher training programme for science and mathematics teachers to meet with global challenges cannot be over emphasized in Nigeria educational system. The federal Ministry of Education (FME) in conjunction with Non Governmental Organizations (NGOs) involvement in organizations of in-service training and workshop would go a long way in helping the science and mathematics teachers to be abreast with global development.

The presenters of this paper hope that the recommendations given above would help bring about reforms and innovation in the training and re-training of the science and mathematics teachers in Nigeria educational system.

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