Abstract

This paper looked at the challenges facing quality assurance in science and technology teacher education and then proffered solutions to these challenges. The paper particularly addressed what quality assurance is and the need for it in the science and technology education sector of this country. It further identified the period of pre-service training, quality assurance and standard agencies, production of inadequate number of qualified teachers, inadequate funding, inconsistency in education policies, low professional status of teachers and non-availability of instructional materials as some of the major challenges militating against assuring quality in teacher education in Nigeria. The paper therefore recommended tenure elongation, empowering quality assurance and standard agencies, heavy investment in education, making teaching profession attractive, involving stakeholders in policy formulation and integration of ICT in the teacher education.

Nigeria has in the past witnessed a number of strategic steps taken by various governments towards achieving great educational goals for the country. All these were aimed at securing a better future for the people through rapid economic, scientific and technological development. These steps have been taken because government is fully aware of the truism that education is a vehicle of social transformation, national integration and development. As laudable as these goals may be, the system has suffered setbacks which prompted Lawal (1992) to observe that education in Nigeria is yet to satisfy its role in nation building. He argued that the Nigerian education is not succeeding in facilitating required employment opportunities, retention, motivation for the nation's economic self-reliance policy and it fails to provide scientific and technological development.

The inability of the Nigerian education to pave way for scientific and technological development for nation building economically is attributed further to what Udoh (1995) observed, that the crises in education in this country is making the certificate issued by our educational institutions not to be recognized by the outside world. Now, while these assertions are true about our institutions, it is incumbent on us to direct our search lights on the implementers of government policies in the schools to facilitate economic and scientific development. That is for the teachers to find out if there might be grey areas in the practice of the profession. It is stated in the National Policy on Education (NPE), (2004) that teacher education shall continue to be given major emphasis in all educational planning and development since no education system may rise above the quality of its teachers. However, teacher education today is going through rough times in terms of manpower deficiencies, management, infrastructure, policy, leadership in capabilities, students' lack of interest in their studies, underfunding by government, teachers not going for in-service training, government, teachers not going for in-service training, and conferences. Jack of parents' involvement in the stake of education among many other problems.
While we cannot deny the numerous problems listed above, it is obvious that the teacher education is the cornerstone for achieving any meaningful development in the country. Teacher education needs a total overhaul in order to meet the current challenges in science and technology in the world. If teacher education is seen as a set of events and activities which are deliberately intended to help trainees acquire skills, dispositions, knowledge, habits, attitudes, values, etc which will enable them to enter the occupation of teaching, (Fafunwa, 1992), then Maiyanga (2000) is of the opinion that there is need for reviewing teacher education from time to time in order to make it adaptable to the changing needs, interest and attitudes of the society. It is quite true the type of training given to the teacher determines his efficiency, competency and effectiveness and therefore there is no other challenge than equipping the right type of education, skills and strategies for scientific discovery and technology development through learner centred approach method of impacting knowledge and information to students.

The teacher is the producer of human resources, a critical factor in the modern production process. Natural resources are necessary for national development, but human resources are more essential (Okeke 2008). Teacher education by meaning, refers to that type of education given to would-be teachers or those in service, the level of training from the former Grade II to the NCE as the minimum teaching provided by the colleges of education and institute of education and the faculties of education in the universities for a B.Ed/B.Sc Ed degree, Master in education, Ph.D, PGDE and other education related courses meant to produce better equipped teachers for the future. However, there is dissatisfaction with the quality of teachers operating today in virtually all levels of the educational system. Thinking in this direction, Ukeje (1996) in Okeke (2008) observed that:

We have not been producing highly motivated conscientious and efficient classroom teachers generally. Our teachers in general lack the spirit of inquiry and creativity. Most of our teachers do not fit into the social life of the community in the society in which they work and the society at large and commitment to national objectives is lacking in most teachers. Many of the teachers are clearly not committed to the teaching profession, hence the constant exodus to other occupations.

From these assertions, it can be deduced that, teaching generally is accepted as an activity conducted by a teacher meant to teach, instruct or guide a learner. So in a process like this, a harmonious interaction is expected to develop between the two which leads to positive desirable learning outcomes. As true as this statement may be, it is equally very likely that the instructional expectations and learning outcomes may not be desirable at the end of the day since class activities may not be well tailored to achieve the best of results. So many challenges are encountered in the process that the work of the teacher and the training institutions are called to question. Umar (2008) added weight to this thought with empirical evidence from World Bank (2002) research on classroom interaction in primary and secondary schools which indicated that teachers lacked appropriate pedagogical skills that will enable them teach well in the primary schools, especially in the lower grades. There is the predominance of teaching methods that merely engender rote learning and a
dearth of innovative strategies that stimulate creative and active learning and make learning an engaging and pleasurable activity. This may be partly due to factors such as class size, low levels of teacher motivation or preparation etc but it is also attributable to poor teacher quality and performance.

An assessment study of learning achievement of primary four pupils which focused on numeracy, literacy, and like skills as a measure of teacher quality by Rivkin, Hanuskek and Kain (2000) in Umar (2008) indicates that the level of numeracy competence of the pupils was generally low with a national mean score of 36.2% while performance in the literacy test was the worst of the three cognitive tests with a national mean score of 25.2%. The findings of a follow-up study conducted in 2001 which focused on primary 5 pupils indicated that only 20% of the students were able to answer correctly more than 30% of the test items; and less than 1% of the students were able to answer correctly more than half of the test items.

The findings of a similar study conducted in 2003 suggested that there had not been any significant improvement in students performance (Aarons 2003) in Omar (2008) even though the minimum teaching qualification had been raised from Grade Two to NCE and there had been a significant increase in the number of NCE graduates in the school system suggesting low teacher quality. It is against this background that this paper examines the challenges of quality assurance in Science and Technology teacher education.

**What is Quality Assurance and why is it Important in Science Education?**

The concept of quality in academics is the concept of quality of educational input in its entirety. Quality can be considered as a baseline standard in education. These standards imply accepted principles, rules, guidelines, or levels established by groups of people, organizations or societies. Standards address the issue of accountability in educational practice in terms of the use put in materials and personnel. Bisons (2000) is of the opinion that the educational enterprise has to do with establishing and maintaining standards which form the basis for evaluation. The America Society for quality defines Assurance as: the planned and systematic activities implemented in a quality system so that quality requirement for product or service will be fulfilled (Kauffman, 2005) in (Dada and Job 2006). According to Lawal (2008), quality assurance is an inbuilt systemic mechanism aimed at sustaining and enhancing all the key components and processes in system with a view to ensuring that the system progresses towards the attainment of the goals for which it was designed. Stressing this further Walklin (1992) in Akinbobola and Ikotile (2008) sees quality assurance as the avoidance of non-performance by pre-empting failure through proper planning, execution, monitoring and evaluation. This will ensure a way of managing an organization so that every job, every process is implemented right first time and always.

Furthermore, Akinbobola (2008) explained that quality assurance in the school setting is made possible through planning by the management which involves all the staff in the functions of planning, execution, monitoring and evaluation using set standards and objectives. From all these, quality assurance in science and technology teacher education could be viewed as the success with
which adequate, relevant and effective training (teacher preparation) are provided to teachers for the effective conduct of their duties.

Qualitative Science and Technology Teacher Education

According to Adebisi (2008), the quality of education is weak and varies considerably within and across states. There are inadequate systematic and reliable information on student's learning outcomes. Ciwar, (2005) opined that, "in all forms of education be it formal or non-formal, liberal, professional or technical, the teachers input is undoubtedly a requirement”. In science and technology education as opposed to liberal education, teacher preparation, quantity and quality are critical factors because of the very skills that must be taught and an imperative in the successful implementation of the skill clusters under the Universal Basic Education (UBE) and secondary schools for the nations technology and economic development. The need to meet teacher quality and quantity for Nigerians education and technological development was highlighted by the National policy on Education (FGN, 2004) as observed by Anukanu (2004) in Umar (2008) who stated that, the national policy on education stressed the importance of teacher education in the nations education planning and development by stating that; the purposes of teacher education are;

- To produce highly motivated, conscientious and efficient classroom teachers for all levels of our education system;
- To encourage further the spirit of inquiry and creativity in teachers;
- To help teachers to fit into the social life of the community and the society at large and enhance their commitment to national goals.

The implication of the foregoing, Okebukola (2007) argued, is that any teacher that will teach effectively and efficiently must:

a. Be-well prepared during his/her pre-service days;

b. Possess high morale;

c. Be highly motivated;

d. Have very good knowledge of the subject matter;

e. Possess adequate skills/competence required for teaching and improvisation;

f. Be highly committed to teaching.

Challenges Militating Against Quality Assurance in Science and Technology Teacher Education

The challenges affecting quality assurance in science and technology education are many but in the subsequent paragraphs a few of them will be discussed.

i. The Period of Pre-Service Training

The number of years teachers are exposed to learning skills or arts of teaching is relatively small. Prominent education scholars like Okebukola, (2005) argued that the B.Ed/B.Sc Ed programme in Nigerian Universities are education loaded to the detriment of the teaching subjects and have therefore canvassed for adjustment in favour of teaching subjects. The period for training a graduate teacher in the university is relatively short when compared to those of other such professionals as doctors, pharmacists or engineers.
ii. **Quality Assurance and Standards Agencies**

   It is common place in Nigerian tertiary institutions to find out that they operate freely and independently with very limited supervision by the agencies responsible. Academic programmes are run without periodic checks. Where they do take place, it is common place to find out that, accreditation is granted even when there are noticeable problems. According to Tahir, (2008) we sometimes become laughing stock to bureaucrats and policy makers in government when we fail to establish any harmony between budget requests and accreditation reports. Whereas there is high positive accreditation score of a programme on one hand and a fat budget request for the provision of basic facilities, equipment and personnel for the programme on the other hand.

iii. **Production of Inadequate Number of Qualified Teachers**

   This is a quite noticeable challenge in our institutions of learning. In this regard, Obanya (2006) in Okeke, (2008) opined that the Colleges of Education and University Faculties of Education operate below capacity in terms of enrollment relative to those applying to the universities. Okeke referred to a press release by JAMB in July 2007, in which the registrar regretted that in-spite of the emphasis on technical and teacher education, Nigerian youths are systematically shunning Technical and Teacher programme.

   In a research study by Akinbote (2007), he showed that the few students who opted for teacher education are those who could not secure admission elsewhere or those who wished to use the Colleges of Education as stepping stones to other institutions.

iv. **Inadequate Funding**

   The issue of funding is closely related to the production of poor quality teachers. The lack of adequate infrastructure and facilities for full development of teachers competencies leaves us with incompetent and poor motivated teachers and consequently half baked college products.

v. **Inconsistency in Education Policies**

   It is true that Nigeria has formidable policy to guide the enterprise of education in this country; in fact it may be seen as one of the best things to have happened to strengthen education. However, there are many reviews of National Policy of education (NPC) which took place in 1981, 1998, 2004 and 2008. All these were occasioned to accommodate innovations and changes in the educational system since the society is dynamic. But the rate if too frequent can be a spanner in the wheel of progress. New policies emerging with every in-coming administration. According to Okeke, (2008) a typical example of inconsistency in policy is the education reforms embarked upon by the then Minister of Education Oby Ezekwesili which came with a fire brigade approach and almost threw the education sector into turmoil. During a NBC meeting in Katsina 2007, the new minister was asked if the reforms will be sustained to which she replied that "they will be reviewed to ensure that they conform to the rule of law." Another disturbing issue with regards to policy formulation and regular changes is that most of the policies are usually drawn up without
vi. **Low Professional Status of Teachers**
Teaching has become a dumping ground where specialist and non-specialists move in and out of it freely with little or no control or safe guard. This aside, low-caliber products of the secondary school level have always been selected for the Colleges of Education and universities without ensuring the necessary attitudinal and intellectual screening, and sieving required of a noble and nurturing profession (Lawal, 2008). Let it be quickly added here that of the teachers that are trained, many of them quickly move to other more attractive jobs as soon as they can find one. This can be attributed to the low wages when compared to other professionals, low social status of teachers in the society, lack of career advancement opportunities and poor working environment among other reasons.

vii. **Non-Availability of Instructional Materials**
Tahir, (2008) painted a graphic picture of lack of instructional materials by referring to a study conducted by the UBE programme in 2003 which was designed to measure learning achievement at primary school level nationwide. The findings indicated a national mean score of 40.3% in English and 34% in mathematics. The low performance was attributed to several factors prominent among which were poor quality instruction and non-availability of instructional materials. For effective teaching and learning, Nigerian teachers cannot shy away from having materials to work with. Pupils and students alike learn faster when they work with concrete materials. Of necessary importance today is ICT compliance which is a dire need of all components of learning but lacking in majority of our institutions today.

**The Way Forward/Recommendation**

i. **Tenure Elongation:** The period spent in acquiring the Bachelor of Education degree for science technology and mathematics teachers should be extended to 5 years, and for NCE let it be 4 years. This will enable the trainees to be well grounded in their knowledge of content and pedagogy. Also, ICT should be incorporated in the curriculum to make it dynamic/up to date with happenings globally.

ii. **Empowering Quality Assurance and standard Agencies:** Quality assurance and standards agencies like NCCE and NUC should as a matter of urgency deliberate and implement policies that are of standard and expose those anomalies in the system that hamper progress from time to time. Where saboteurs are discovered then let them be shown the way out. There should be a dynamic teacher curriculum to guarantee a conducive learning environment, subject teachers should be trained and re-trained for them to be effective and conduct their responsibilities well.
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iii. **Improved Funding:** The issue of inadequate number of qualified teachers has a bearing on funding existing institutions for mass production and well trained teachers. The laboratories are in shambles, workshop studios and libraries are in a sorry state. There is no gain saying the fact that institutions for training are in a bad state, begging for attention. Lecturers from these institutions have gone on strike for poor infrastructure. It is therefore advocated that government should invest massively in the education sector. In the same light, agencies like UNESCO and the private sector of the economy should be encouraged to participate in financing education. Government should think of upgrading more colleges of education to decree awarding institutions. The required number of teachers and their competencies cannot be achieved in science and technology without substantial investment in education.

iv. **Involving Stakeholders in Policy Formulation and Encourage Consistency:** All stakeholders in the education enterprise like parents, teachers. PTA, AMCOPPSS, NUT,TRC, STAN, Provosts, Rectors and Vice Chancellors should be involved early enough in policy formulation to chart a way forward. Also the usual practice of successive government in power abandoning previous governments' policies, projects and programmes irrespective of value should be avoided as much as possible. Unless and until we learn to sustain good policies and programmes, the education sector will continue to suffer.

v. **According Teaching Profession Respect:** This paper is of the opinion that entry requirement into colleges of education should be 5 credits and above, just like in any other higher institutions of learning and not for low caliber products or dumping grounds. If quality is maintained in the system then employers of labour will have no reason what so ever not to accord teachers respect, pay them well, improve the work environment and conditions of service, making the curriculum more attractive, nominate teachers for national award and appoint them into education governing councils and boards. Teachers registration council should equally as a matter of urgency ensure professionalism in the system and clear it out of non-professionals.

It is therefore obvious that assuring quality in Science and technology teacher education requires among others; the review of the entire teacher education policy and curricular to include ICT education.

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