

ACHIEVING THE GOALS OF UNIVERSAL BASIC EDUCATION THROUGH SCIENCE, TECHNOLOGY AND MATHEMATICS EDUCATION

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Abstract

One of the goals of Universal Basic Education (UBE) is to ensure permanent literacy such that the child becomes a productive member of the society, positively affecting all spheres of human existence. Achieving the goals of UBE programme in Nigeria is anchored on the development of Science, Technology and Mathematics Education (STME). The challenges encountered in the execution of UBE programme are similar to those of educational programmes before it; ranging from poor funding to insufficient personnel and inappropriate curricula. The rationale for the introduction of STME in Nigeria is in tandem with the goals of United Nations, UNICEF and AU in the attainment of the rights of the child. To ensure the attainment of the rights of the child, governments have established institutions and agencies, while schools and science educators have also keyed in by forming clubs and societies that advance the course of STME. Here, a case is made for appropriate and unambiguous redesign of the curriculum to capture basic STME components at the foundational level of Nigeria's education.

Keywords: Universal Basic Education, Science, Technology and Mathematics Education

Introduction

Education is a veritable and the most potent instrument of futuristic development. In its broadest sense, it refers to the ways in which people learn or acquire skills and gain knowledge and understanding about the world and about themselves. Universal Basic Education (UBE) programme is aimed at eradicating illiteracy, ignorance and poverty. Basic Education in Nigeria can be equated to six years of primary education which is currently extended to include three years of junior secondary education. Since the rallying factor of social development is man, then the most effective "tool" in consummating this developmental process will always remain education. Perhaps arising from their seeming peculiar circumstances, countries of the world are daily initiating educational programmes, which would not only serve their unique socio-

political and economic circumstances but also conform to fundamental universal standard of delivery. Universal Basic Education (UBE) is one of such programme launched in Nigeria on 30th September, 1999 in Sokoto to achieve functional literacy from the foundational level. Basic education comprises a wide variety of formal and non-formal educational activities and programmes designed to enable learners acquire functional literacy. It is the foundation for sustainable and life-long learning. In Nigeria, basic education encompasses primary, junior secondary, nomadic education as well as adult literacy (Oladele, 2008). Universal Basic Education (UBE) scheme is a free and compulsory educational programme aimed at stemming the tide of illiteracy in Nigeria. Successful education of our children requires placing greater and urgent attention on adult education. This is because it is only literate adults that

would appreciate the need to send their children to school. Adult education therefore, remains unique and special in the UBE Scheme. In fact, in a society where the adults are ill-informed, the future of their children who are themselves future adults become precarious and susceptible to inheriting all the ills accompanying illiteracy (Abdullah, 2009).

The first joint use of Science, Technology and Mathematics was by a Jamaican (Maurice Goldsmith) in 1974, who felt Science, Technology and Mathematics cannot be used in isolation in the curriculum for proper coordination and holistic teaching of science to students to enhance scientific and technological culture (Ikwong, Bisong & Ozang, 2010). Science, Technology and Mathematics Education (STME) is a field of study that equips the students with science, technology and mathematics related issues and needs with emphasis on the essential facts and skills students need to have in order to deal more effectively with environmental, energy, ecological, planning and resettlement issues which might affect the society in which they belong. It is in fact, all about cultivating and disciplining of the mind and other faculties of an individual to utilize science for improving his life to cope with an increasingly technological world or pursue science academically and professionally and for dealing responsibly with science-related issues (Abubakar, Gero & Muhammed, 2006).

The implementation guidelines for the UBE contained specific objectives to be achieved. However, the achievement of these objectives requires some basic considerations, among which is the need to accord greater attention to STME, which is the hub of social growth and

development. Given the vast natural and physical endowments in the society, exposure of the population to the vast content of STME, beginning from the elementary school level, would engender greater involvement in the application of the scientific and technical know-how to massive exploitation of these potentials (Ifeaniyi, 2010). Beside that, for the scheme to achieve the goal of developing in the citizens a strong consciousness for education and a strong commitment to the promotion of literacy, STME provides a more penetrating ground to accomplish that. This is because STME is ubiquitous; penetrating every aspect of human life and it particularly touches other disciplines or areas of study- Arts, Liberal Arts, Languages, Philosophy, Physical Science, etc.

The right of all Nigerians to education has been recognized and endorsed in successive Nigerian constitutions. The achievement of Universal Basic Education has long been a goal of the Nigerian governments. More recently, this commitment has been extended towards achieving universal access to basic education, which is defined to include three years of junior secondary school (UNICEF 2004). Despite this development, Nigeria's commitment towards the achievement of such goals is put to question. For example, the nation launched the Universal Primary Education (UPE) in 1976, but the programme failed due to lack of proper planning among other factors. The country again launched another mass-oriented education scheme, this time, branding it Universal Basic Education (UBE). The former president Olusegun Obasanjo, declared during the launching of the scheme on the 30th of September, 1999 in Sokoto, that the nation "cannot

afford to fail this time around". Not long after that, the Federal Government reported that the falling standard of education in Nigeria is caused by "acute shortage of qualified teachers in the primary school level". It was also reported that about 23 percent of the over 400,000 teachers employed in the nation's primary schools do not possess the Teachers Grade Two Certificate, even when the National Certificate in Education (NCE) is the minimum educational qualification required for one to teach in the nation's primary schools (Olawale 2001).

This paper therefore, focuses on those areas that are germane to effective understanding and appreciation of the need to inject STME in the robust curriculum of the UBE scheme.

Goals of the UBE Scheme

According to the Implementation Guidelines for the UBE programme, the specific objectives of the scheme are:

1. Developing in the entire citizenry a strong consciousness for education and a strong commitment to the vigorous promotion of literacy;
2. The provision of free universal basic education for every Nigerian child of school going age;
3. Reducing drastically the incidence of dropout from the formal school system (through improved relevance, quality and efficiency);
4. Catering for the leaning needs of young persons who, for one reason or another, have had to interrupt their schooling through appropriate forms of complementary approaches to the

provision and promotion of basic education; and

5. Ensuring the acquisition of the appropriate level of literacy, numeracy, manipulative, communicative and life skills as well as the ethical, moral and civic values needed for laying a solid foundation for life-long learning.

In seeking to achieve the goals of the programme, the implementation guidelines listed nine factors that will be vigorously approached so as to facilitate successful achievement of the stated objectives. These are.

1. Public enlightenment and social mobilization for full community involvement;
2. Data collection and analysis;
3. Planning, monitoring and evaluation;
4. Teachers: their recruitment, education, training, retraining, motivation, etc,
5. Infrastructural facilities;
6. Enriched curricula;
7. Textbooks and instructional materials;
8. Improved funding; and
9. Management of the entire process. (FRN, 2004)

Constraints to Achieving the Goals

1. The programme has been designed in a way that discourages analytic thinking. It is not targeted at promoting science and technology – based subjects which are development – driven. The benefits of STM education have continued to propel nations to accord greater priority to STM education in the curricula of primary and post primary schools

(James, 2004). This does not imply however, that other fields (subjects) are not also relevant to nation building, but the substance of growth is visibly rooted in STM education (Akinlade, 2008).

2. There are serious problems in the course contents and the approach adopted in its implementation. The course contents have no relevance to the practical lives of the child. In other words, there is too much emphasis on theorization at the expense of the practical skills of the child. Consequently, the learners could hardly find the contents of their subjects interesting. And of course, uninteresting things can hardly be learned quickly (Balogun, 2000).
3. The government often sends across messages of equal and equitable gender relationships. On the contrary however, stereotypes are jealously promoted, thereby perpetuating the status quo and reinforcing patriarchal relationships, which result in literacy rates of women as low as 16% in some parts of the country (Nwachukwu, 2009)
4. The implementation of the programme is often half hearted and therefore, no lessons have been learned from the ground reality (Modibbo, 2012).
5. The complex nature and inertia of the Nigerian society – the heavy weight of some traditional attitudes, tribal orientation, religious prescriptions, prestige and income patterns as well as institutional structures. often block the people from making the optimum use of available educational opportunities to bring about national development (Wasagu, 1997).
6. Inadequate funding has continued to hinder effective implementation of the scheme in many parts of the country. Most of the so-called dilapidated structures used as classrooms in many UBE schools have collapsed due to poor maintenance culture, yet the little funds earmarked for the procurement of teaching materials and infrastructures are not seen to be judiciously utilised. The result is that learning becomes static and rather than continue to go to school where nothing is learned, parents prefer to withdraw their children and send them to the farm or to hawk articles (Modibbo, 2012).
7. Teacher factor is very critical in the attainment of educational goals. In fact, it is very crucial to the success of the UBE scheme. Many educational programmes and projects have failed mainly because they did not take due account of the teacher factor. In recognition of this, the implementation guidelines for UBE scheme clearly stated that teachers will always be an integral part of the process of UBE conceptualization, planning and execution. Evidence available however, shows a different ball game (Modibbo, 2012).

Science, Technology and Mathematics Education

The imperative of Science, Technology and Mathematics Education (STME) in the growth and development of the nation cannot be overemphasized. STME has been referred to as a meta-discipline consisting of integrated curricular (Omosewo, Olorundare, Abimbola & Upahi, 2012). This can be regarded as inter-disciplinary bridging of discrete disciplines into a whole. Thus, STME provides students with the best opportunity of learning academic concepts in the context that connects the school, community, work places, and global enterprises for literacy and self reliance skills to compete in the new world order (Omosewo, *et al.*, 2012).

Science and Technology have become instruments for shaping and improving mankind. Technology contributes immensely towards the advancement of the modern world, particularly given its ubiquitous activity which as Wasagu (2009) put it, technology has become a cultural activity which every society uses in varying degrees as a vehicle for transformation. On its own, science is the foundation upon which the bulk of the present day technological breakthrough is built. Therefore, the pursuit of STM education will enhance the prestige and political power of a nation by enhancing its level of scientific achievements (Abilu, 2005).

The pursuit of science and technology is no doubt an imperative endeavour for achieving prosperity and advancement in the national development plans of many developed and developing nations. In Nigeria, these facts underscore the importance and priority accorded science as manifested in various policy statements that encourage her citizens to

pursue science courses (FRN, 2004). Such policies include the establishment of science schools, increasing the ratio of students' enrolment in sciences in tertiary institutions to 60:40 among others. These are done with the hope that a solid foundation in the science would equip millions of Nigerian students for successful technological achievements.

The current situation with STME in Nigeria is characterized with inadequate learning content, ineffective pedagogical approaches adopted by science teachers, dearth of school facilities, equipments and materials in laboratories, as well as dominated socio-cultural lapses have resulted into unsatisfactory content delivery in schools (Oriafo, 2002). The present high rate of unemployment demonstrates the lack of bridge between theoretical constructs and acquisition of technological skills expected of Nigerian graduates to function maximally and benefit from education (Omosewo *et al.*, 2012).

Rationale for Introduction of STME in Nigeria

The ubiquity of Science, Technology and Mathematics Education (STM) cannot be over-emphasized. It is the hub of scientific advancement of the nation. It is presently the area of global intellectual attraction not necessarily because it permeates every aspect of human life but because it opens up the vista of global prosperity. According to Njoku (2007) the world of today is dominated by science and technology, so much so that almost everything is now scientific and technological in nature. Technological artefact and processes have so dominated the homes, workplace and indeed the totality of the environment that everybody needs at

least basic knowledge of science and technology to contribute to development effort, and to at least survive, if not succeed in the society of today. This implies that science and technology education should be accessible to all citizens for living in the modern society of today.

There is no doubt that, Vision 20:2020 of making Nigeria one of the 20 largest economies in the world by the year 2020 can only be attained if a greater emphasis is accorded to Science, Technology and Mathematics Education. According to Ukadike (2004) it is Science, Technology and Mathematics Education that enables us develop and adapt to changes for utilization of better and more efficient techniques, machinery and equipment to engender growth and development. This implies that we need professional and technical knowledge, good and dedicated teachers of the sciences, professional engineers, doctors, scientists, technicians, mechanics, etc. In fact, we need skilled engineers to design, install and service new and improved equipment. In other words, new basic, applied and action researches are needed as they are the mainsprings of progress in science and technology as well as economic growth (Balogun, 2000).

For any nation to achieve the status of self-reliance, science and technology must be an important component of the knowledge to be given to all citizens of that nation, irrespective of tribe, ethnicity, creed or sex" (Nsofor, 2006). Similarly, Obomanu and Adaramola (2011) stated that "for any nation to attain sustainable development there is the need to recognize Science, Technology and Mathematics Education as a priority area of education for her citizens. They posit that scientifically

literate person is one who has an adequate understanding of the nature of science, including concepts, principles, theories and processes of science, technology, mathematics and an awareness of the complex relationships between science, technology and the society with the ultimate purpose to describe and explain natural happenings from their everyday experiences.

Achieving the Goals of UBE through STME

The goals of the UBE have been stated in the beginning of the paper. Basically, they are anchored on achieving high literacy rate in the country. However, one of the goals that could easily be achieved using the STM education is: catering for the learning needs of young persons who for one reason or another, have had to interrupt their schooling through appropriate forms of approaches to the provision and promotion of basic education. Application of STM education to the realization of this goal requires placing greater emphasis on science in primary schools, making it compulsory for all pupils; exposing pupils to basic science and technology tools and exercises; introduction of vocational and technical subjects that also require learning of basic science and technical skills as in electrical, building, mechanical and other aspects of engineering discipline; and always ensure that the pupils are exposed early to the value of Science, Technology and Mathematics Education.

Another noteworthy goal of the UBE which STM education could be used to achieve is: 'ensuring the acquisition of the appropriate level of literacy, numeracy, manipulative, communicative and life skills as well as the ethical, moral, civic values needed for laying a

solid foundation for life-long learning'. STM education as earlier stated in this paper is indispensable for societal development. Virtually no field of human endeavour is immune to the impact of science and technology. The acquisition of life skills is more enhanced when pupils are exposed to the rudiments of scientific, technological and mathematical applications. According to Oyebola (2003) today's global scientific and technological advancement certainly requires that our nation must brace up to those challenges and accord greater premium on science and technology-based subjects, particularly at the primary school level which is the base degree on which scholars rise. This can be accomplished when STM education is embraced at that level (Oyebola, 2003; Alabi, 2004; Oladele, 2008). Although Basic Science and Technology is being offered at this level, it is essentially a theoretical programme, taught without practical support. For it to serve as a tool for entrenching scientific skills, laboratories need to be provided in all primary and junior secondary schools and equipped with the necessary facilities for the conduct of practical and experimental activities. Only then can the acquisition of scientific skills and attitudes be guaranteed.

Conclusions

STM education is a transformational field of study that has continued to attract the involvement of scholars genuinely interested in research and scientific discoveries (Ukadike, 2001). It is indeed a field that reminds us of the impact of science and technology on man's basic resource-land and water from which life is nourished; it also

reminds us of the implication of scientific and technological progress for social organizations, human survival, man's place in nature, beliefs, values and attitudes (Oyewole, 2009).

The Significance of STME to the overall advancement of man and society therefore, requires its robust and early introduction in primary schools. According to Abdullah (2009), the most appropriate measure government must take to ensure a greater impact of the Universal Basic Education Scheme on the educational advancement of the country is to accord STME a robust priority in primary schools. He says again that, since Science, Technology and Mathematics Education requires systematic application of basic concepts which must follow basic scientific patterns, it must be learned early for the learner to be conversant with the '*modus operandi*' of their practical applications.

Recommendations

1. There is the need to redesign the curriculum of the UBE to incorporate STM Education. Since the minimum educational qualification for teachers in primary schools is Nigeria Certificate in Education (NCE). Colleges of Education in Nigeria should accord greater priority on the introduction of science and technology based courses and increase the number of students offered admission to read those courses. This is very important because recent research findings in the country have show that, there has always been dearth or shortages of science teachers in Nigerian schools.
2. National Commission for Nomadic Education (NCNE) should continue to modify and include newer

innovations in curricular issues that will satisfy the aspirations and needs of nomads' children especially in agriculture and basic science and technology at primary and junior secondary levels of education.

3. Effective application of STME also requires the establishment of science primary schools throughout the federation. In fact, all the 774 local governments in the country should have reasonable number of science primary schools each. Science and technology – based primary schools have the “potentials” of laying solid foundation for easy mastery of scientific and technological principles needed for later advancement in the areas (Alabi, 2004).
4. The Federal Government has made efforts to integrate and intensify science and technology values in Nigeria educational system through:
 - Establishment of technical workshops in secondary and technical schools;
 - Distribution of Science equipment to various secondary schools;
 - Popularization of science and technology through the encouragement of the Junior Engineers, Technicians and Scientists (JETS) club in post primary institutions all over the country; and
 - Payment of science allowances to secondary school science teachers;

These laudable initiatives should be extended to all the nation's primary schools. These would not only engender greater participation of

primary school pupils in Science, Technology and Mathematics Education, but would go a long way to effectively and speedily enhance the achievement of the basic goals of the Universal Basic Education Scheme in the country.

5. STM programme must be redesigned having practical orientation (reducing theorization of science) in its process of implementation at primary and junior secondary levels, to reflect hands-on approach to learning science and technology.
6. Perceived gender inequalities should be minimized while promoting essentially programmes and attitudes of science literacy that challenges maintenance of gender imbalance.
7. Budgetary allocations to education should go beyond rhetoric and reflect genuine intent to turn the tide towards quality and sustainable development and sustenance of gains recorded in school infrastructure, curriculum development, capacity building, instructional materials etc.

References

- Abubakar, S. A.; Gero, S. M & Muhammed, S. A. (2006). The Contribution of Chemistry in Attaining National Economic Empowerment and Development Strategy (NEEDS) in Nigeria. *Journal of Technology Education* 1(1): 138-145.
- Abdullah, O. D. (2009). Effectiveness of Instructional Media for Science Learning in Federal Government Colleges in Nigeria. Unpublished Ph.D. Thesis, University of Nigeria. Nsukka

- Abilu, D. A. (2005). Exploring the Benefits of STM Education for National Advancement. *Nigerian Educational Digest*, 8: 72-79
- Akindele, J. L. (2008). *New Approaches to Learning Science in Primary Schools*. Ilesha: Olaolu publishing company ltd.
- Alabi, B. Y. (2004). Addressing the Burgeoning Problem of Inadequate Manpower Through STM Education. *Journal of Educational Research*, 6 (2): 96-101
- Balogun, A. O. (2000). *Learning Difficulties and the Challenges of Child's Training*. Ilesha: Olalomi Publishing Company Ltd.
- Federal Republic of Nigeria (2004). *National Policy on Education*, Abuja NERDC press
- Ifeanyi, O. M. (2010). An Investigation into Gender Disparity in Learning of Science in Secondary Schools. *Journal of the Science Teachers Association of Nigeria (STAN)*, 30 (3): 4-11
- Ikwong, U.B., Bisong, M.B. & Ozang, G.O. (2010). Authentic Assessment: A veritable tool for achieving Vision 20-20-20 through Science, Technology and Mathematics (STM) Education. *Journal of Contemporary Scientific Innovations*, 1 (2): 35-42
- James, S.I. (2004). Science and technology Education for Sustainable National Growth and Development. *Journal of Educational Research*, 3(4): 123-129.
- Modibbo, A. M. (2012). Laying the Foundation for an Enduring STM Education in the Universal Basic Education Programme. A keynote address by the executive Secretary UBE at 53rd Annual Conference of Science Teachers Association of Nigeria (STAN) held between 6th – 11th August, 2012 in FCT, Abuja.
- Njoku, Z. C. (2001). Primary School Teachers' Perception of the Problem of Girls in the Learning of Science: *Science Teachers Association of Nigeria. 42nd Annual Conference Proceedings*, 360-363
- Nsofor, C. C. (2006). Assessing the Effects of Designed Instructional Model on Students Performance in Science. 2nd School of Science and Science Education Conference, FUT. Minna, 391 – 398
- Nwachukwu, C. (2009). The relevance of the science, technology and mathematics education (STME) to development of entrepreneurial skills. *Proceedings of the 50th Annual Conferences of Science Teacher Association of Nigeria* 312-324.
- Obomanu, B. J. & Adaramola, M. O. (2011). Factors Related to under Achievement in Science Technology and Mathematics Education (STME) in Secondary Schools in Rivers State, Nigeria. *World Journal of Education*, 1(1), 102-109. Retrieved 18th April, 2012 from <http://www.sciedu.ca/wje>

- Oladele, J.A. (2008). *Educational System Change in Nigeria, Ibadan*; Heinemann Educational Books Ltd
- Oladele, P.T. (2008). The Need for Training in the Use of Technology among Primary School Teachers. *Annual National Conference of National Association of Teachers of Technology (NATT)* held at, Ibadan. 62-69
- Omosewo, E.O., Olorundare, A.S., Abimbola, I.O. & Upahi, J.E. (2012). Needed Resources for UBE and STM Education in Nigeria. *European Scientific Journal*, 8 (13), 202-211. Retrieved 27th August, 2012 from <http://www.eujournal.org>
- Oraifo, S.O. (2002). Refocusing Science Technology and Mathematics Education in Nigeria. In Oraifo, S.O., Nwaokolo, P.O. and Igborgbor, G.C. *Refocusing Education in Nigeria. A book of Readings*. Agbor: Kwensuo Educational Publishers.
- Oyewole, R. (2009). *The Role of Science and Technology in National Development*. Ibadan. Heinemann Educational Books.
- Oyebola, T. T. (2003). A Content Analysis of Gender Bias in Science and Mathematics Education (SMT). Unpublished Ph. D Thesis submitted to School of Science and Science Education, Federal University of Technology, Minna.
- Ukadike, S. P. (1995). *The Constraints To Effective Realization of the Goals of the Universal Basic Education (UBE) scheme*. Minna: Golden Millennium Books Ltd
- Ukadike, S. P. (2004). The Appropriate Strategy for Building Pupils' Confidence in Intellectual Works. *Daily Trust Newspaper*, 29: October, 23.
- UNICEF (2004). Children's and Women Right in Nigeria: A wake-up call. Situation Assessment and Analysis Lagos: UNICEF.
- Wasagu, M. A. (2009). Rethinking Science Education for Changing Times: The Writing on the Wall. Eight Inaugural Lecture Series of Usmanu Danfodiyo University, Sokoto, March 26th.