IMPLEMENTATION AND SUSTAINABILITY OF SCIENCE, TECHNOLOGY AND MATHEMATICS EDUCATION (STME) POLICIES INNIGERIA: THE REALISTIC WAY FORWARD

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Abstract

The paper focuses on implementation and sustainability of Science, Technology and Mathematics Education (STME) policies in Nigeria: The realistic way forward. Nigeria is fifty-nine years old as an independent nation, yet it is still being nursed in terms of development. The problem is not as a result of absence of desire to grow or dearth of objectives and plans but as a result of technological backwardness and failure to implement educational policies. In spite of the mouth-watering policies in the nation's science and technology programmes, the implementation has always been stillborn. Therefore, this paper examines government po1icy on Science, Technology and Mathematics Education (STME). It discusses the problems of implementation of government policy on (STME). It also seeks to identify reasons for this unacceptable situation. Finally,in order to chart the way forward in ensuring implementation of STME policies in Nigeria, it is recommended among other things that government should allocate enough fund and be sincere in her commitment to the implementation and sustainability of STME policies.

Keywords: Implementation, Sustainability, Science, Technology and Mathematics Education (STME) Policies in Nigeria

Introduction

Science, technology and mathematics education (STME) has contributed in no small measure to the upliftment of the technologically advanced nationsof the world. Nigeria can only rise to the greatness she aspires to by giving serious attention and priority to science, technology and mathematics education (STME).Science can be defined as a body of knowledge that has been accumulated over time and a process that generates new knowledge (Reeves 2015). Technology on the other hand is considered as the art or craft of "modifying the natural world to meet the needs and wants of people" (ITEEA, 2015). Thus, science is a body of knowledge and the method or process of acquiring knowledge about nature, while technology is the application of science in the solution of practical problems of everyday living.

Mathematics is crucial in the study of science and technology. Agashi (2003) opined that mathematics is the language of science and technology. Mathematics is a language of numbers, operations, patterns and relationships. The application of Mathematics and Science creates Technology (ITEEA, 2015),
Science, Technology and Mathematics Education (STME) according to Ikoku in Eriba (2003), refers to organized instruction both formal and informal, designed to produce people who can utilize the ever increasing body of scientific and technological knowledge in productive endeavor, teaching and skills transfer. This shows the importance of STME and istherefore identified as a key for the sustainable technological development and economic prosperity of any nation.

According toAchor (2003), STME has assumed a standard in terms of it's mode of operation (that is, content and method) as such, most nations struggleto attain this universal standard. According to ITEEA(2015), STEM/STME education that would foster the realization sustainable development goals (SDGs) in the current dispensation should take into consideration the following objectives.

(i) Broadening learners knowledge of scientific concepts and day to day application to real life situation.
(ii) Developing learners' interest and confidence in learning materials.
(iii) Deepening learners understandingby making mathematics and science more relevant in what they are doing.

(iv) Helping learnersresponds to numerous problems facing humanity in a more realistic or authentic way

(v) Encouraging and promoting skills like communication, collaboration, critical and creative thinking in learners for problem solving in the society.

(vi) Assisting learners to learn using STEM curriculum and methodology in order to acquire 21st Century work place skills (UNESCO, (2014).

Thus, to ensure the realization of these noble ideal of STME, there is the need for policy makers and curriculum implementers to bear in mind the relevance, practicability, usability and applicability of this universal standard in the Nigeria contexttaking into consideration the local environment.

According to Onuoha (2007),sustainability means continuation, keeping alive a programme. The thrust ofsustainability is the attainment of a desired quality of life for the present and the future(Anyebe, 2007). Sustainability of STME standards therefore means keeping aliveideals of STME. Nigeria in her attempt to ensure sustainable development have identified STME as a road map to its attainment, just like the highly industrialized nations of the world. One of the major differences between these developed nations and Nigeria is that while these nations pursue their STME policies and implements them; Nigeria with its fine policies on STMEis having problems with their implementation. Thus, this paper takes a look at Nigeria's policies on STME and discusses implementation as vital in the sustainability of science technology mathematics education in Nigeria.

Government's policy on STME

According to Alebiosil and Ifamuyiwa (2008), it is widely acknowledge that the in to the survival of a nation scientifically and technologically is scientific literacy which can only be achieved through science education. Since Nigeria does not want to remain backward, there is therefore no justifiable reason to treat STME with levity. The National Policy on Science and Technology (FRN, 2014) shows that to ensure the realization of national objectives through science and technology, the science and technology organ of government should aim at;

i. increasing public awareness in science and technology and their vital role in national development and well-being,
ii. Directing science and technology efforts along with identifiednational goals,
iii. Promoting the translation of science and technology results into actual goods and services,
iv. Creating increasing and maintaining indigenous science and technology base through research and development,
v. Motivating creative output in science and technology,
vi. Increasing and strengthening theoretical and practical scientific basein the society and
vii. increasing and strengthening the technological base of the nation.

According to Achor and Ekuje (2003) the recognition of the importanceof technology for sustainable growth prompted the Federal Governmentof Nigeria to embark on the following;

i. Establisha ministry of science and technology in 1979,
ii. Formulate of a national policy on science and technology in 1986,
iii. Adopt a 60;40 tertiary institution admission policy in favor ofscience and technology,
iv. Emphasize science and technology education in her developmentplans,
v. review science and technology curricula,
vi. establish supervisory bodies such as National Primary EducationCommission and
vii. sponsor the science, technology and mathematics teachers on longvacation training.

The developed countries of the world and those with fast growing economy attained their status by adapting their STME to suit their culture and environment. Nigeria in her bid to follow suit defined her own STME ideals (standards) and recommended that STME should be domesticated. From the discussion above, it is evident that Nigeria has good policies and strategies for achieving the desired objectives on STME in order to ensure rapid growth and development. Also, available evidences have shown that there are many research findings by experts in various fields which, if adopted and implemented will ensure the realization of the desired objectives in STME. For example, Ekwule and Onyenecho (2004) reported that there had been more than 195 researches in science education and 192 in mathematics education between 1992 and 2018 covering various areas such as learning characteristics, variables in teaching, attitudinal studies and learning outcomes, teacher factor, curriculum development and evaluation. Others are classroom and learning environment, research methodologies and paradigms, science and national development and cultural practices and scientific knowledge.In addition, Science Teachers Association of Nigeria (STAN) has madefrantic efforts in

diagnosing the problems and attempting to enhance STME in Nigeria by organizing conferences/workshops and other related activities(Jacinta, 2004).

Implementation of STME Policies in Nigeria

Implementation simply means putting a programme into effect. It involves a chain of activities in which a slack or cut at one point makes a mess of the whole programme. In view of the dismal outcome or result of STME policy implementation, the National Education Technology Plan(NETP, 2017) was set up in recent year time to fashion out plans to ensure proper implementation of science and technology education programmes. The realization of this mission still depends on the sincere commitment of policy makers and curriculum implementers.

Okoye (2004) citing Oriafor listed great plans, wonderful policies, excessive haste, unsatisfactory implementation and defective outcomes as what characterize the educational history of Nigeria up to date.It seems from all indications that Nigeria is yet to realize this truth. Most often the noble ideas and great polices like STME policies are beingapplauded when they were formulated and launched in Nigeria. These high hopes soon become an illusion as policies were abandoned shortly after their launching due topoor implementation.

The best index of success of any innovative programme lies heavily at its implementation stage. According to Oguche and Ramah (2001) a lot of bright ideas have been consigned to the dust bin of history at this stage. The admission policy of the Federal Government of Nigeria into tertiary institutions is one of the policies that led credence to this assertion. The policy adopted 60; 40 in favor of science and technology. But this is not working in our tertiary institutions. For example, in Kogi State College of Education Ankpa, admission to Nigeria Certificate in Education (NCE) of 2018/2019 session shows that out of 3152 students admitted, school of science has 488 students (15.5%) while technical education department has only 102 students (3.2%). That is,Science and technology based courses therefore have only (18.7%) of the totaladmission (Admission's Office of KSCOE, 2017/2018).This is far below the admission policy required for STME as spelt out by the government.

Looking closely at the National Policy on Education (FRN, 2014) and the National Policy on Science and Technology (FRN, 2014) revised documents, one will see that Nigeria has lofty ideals on STME. Therein, STME is emphasized at all levels of education. The standards for the attainment of the desired objectives at each level of education are also clearly specified. All modifications and reforms needed to make STME work in Nigeria have been unraveled through numerous research findings available. The problems only lie with the implementation of our policies. The implementation of these policies is poor. Reasons ice unsatisfactory implementation and defective outcomes of our STME are not far-fetched.

These are:

i. In adequate infrastructural facilities
ii. Poor implementation of research findings
iii. Lack of motivated and dedicated champions.

Inadequate infrastructural facilities

To reduce who can utilize scientific and technological knowledge in productive enterprises as stipulated in our national policy on science and technology, there is the need to provide the learner with the necessary facilities, which make learning in this field real. STME curricula require theoretical experiences. The infrastructural facilities needed to achieve this are not available and where available at all, are grossly inadequate. It is only when these facilities are available in schools and students exposed to laboratory and workshop experience that the gap between the classroom and real life experience can be narrowed. Non-exposure of students to such experiences is responsible for the poor performance of graduates in the practical application of knowledge (Shehu, 2011). The National University Commission document on minimum standards for STME has some useful guidelines on infrastructural facilities. But quite often, these standards are not met. Claims of meeting NUC standards on many occasions are deceptive.

Poor implementation of research findings

Maintenance of indigenous science and technology base through research and development is one of the policy statements on the policy document of STM. Though research is poor in Nigeria, individuals andorganization have made sacrifices to research on various issues that will make our STME suitable and functional in the Nigeria context. These research findings are abandoned and the status-quo maintained. Given this scenario, there is no way we will not witness defective outcome of our science, technology and mathematics education (STME).

Lack of motivated and Dedicated Champions

Dedicated champions according to Oguche and Rabah (2001) are indispensable in the implementation of innovative programmes. Without them, innovations cannot advance beyond their blueprints. In the education context, these dedicated champions are the teachers. Nigeria in her policy statements das adopted education as an instrument per excellence for national development and STME as a means of achieving her national objectives. With such high regard for education in general and STME in particular, one would expect that teachers who are at the core of implementation of educational programmes will be accorded the same recognition and motivated. But alas, teachers are the most disdained in Nigeria and the profession most relegated. Their remuneration is the least compared to their counterparts in other professions. This neglect accorded to Omede (2003), is responsible for shortage of teachers as many competent hands are vacating the profession to other sectors where the pasture is greener. Those left in the profession are not motivated to perform but rather are enduring their job till the opportunitycomes for them to leave. This is unlike other nations such as Germany, Japan, and United Kingdom (UK) among others; where their investments in STME have caused them to become technologically advanced. Their teachers are held in high esteem and the best brain goes for teaching profession. The prevalent situation of teachers' in Nigeria makes the realization of the desired outcome of STME an illusion.

Apart from the poor policies implementation in STME in Nigeria there is also of deficiencies in terms of curriculum content and organization. The following critical areas that make up for a functional and dynamic curriculum are begging forattention. For example,obsolete, outdated and irrelevant curriculum, inadequate and unqualified science and technology teachers, poor funding of science and technology programmes,obsolete instructional and pedagogical approaches, poor study environment and dilapidated school infrastructures, poor . Based on the foregoing discussion, the way forward on the issue of STME policies implementation is for the government to consider and adopt the following recommendations

The way forward for implementationof policies of science and technologyeducation in Nigeria

Since STME has been rightly identified as the means of attaining on national goals; and many factors are hindering the implementation of policies on it, the following recommendations are made to ensure sustainable standards in science, technology and mathematics education (STME).

i. The government should be sincerely committed to science technology development instead of paying lip service to it as it has been the case.
ii. Government should provide enough fund and suitable infrastructural facilities to all the level of our educational system. The use of these facilities will expose learners to practical and workshop experiences needed to face challenges in everyday life.
iii. Critical emerging issues that should be considered in current STME curriculum include;security, climate change, energy shortage, HIV/AID pandemic, food security, Information, communication, technology (ICT) challenges, modern instructional approaches and poverty in Nigeria.
iv. Research findings in the country should be considered and those found suitable should be implemented.
v. STME teachers on whose shoulders the implementation of STME policies should be adequately remunerated like their counterparts in other professions.
vi. Teaching profession should be accorded the prestige it deserves.

Conclusion

There is no need formulating a policy if the will or desire to implement it is not there. STME, laudable and commendable as the programme is, is yet to yield the desired result. Commitment on the part of the government to the implementation of the programme as recommended in this paper will go a long way in using science, technology, mathematics education to place Nigeria on the pedestal of greatness.

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