

## The Role of Science and Access to Science, Technology, and Mathematics Education in the Attainment of MDGS in Nigeria.

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### Abstract

The educational system, most especially in science and technology, has always played an indispensable role in shaping the economic realities of any society. The state of an educational system speaks volumes on the level of development and complexity of that Society. If Nigeria must meet the vision and mission 2020 millennium development goal's target of reducing poverty and stepping stone for the attainment of seven point agenda then , there is need to examine the education sector and then proffer measure of curriculum review or an enrichment for science and technology. This will grossly cater for producing a responsive education that can serve as a basis for nation's industrialization and subsequent development as well as self employment. It is knowledge of STM education that created the division between the developed and developing world. The only way Nigeria can bridge the wide gap separating her from a sustainable and developed society is to judiciously invest in education. This paper makes a deliberate attempt to look at the local trends and recent developments in science and technology, reviews the problems and challenges, and discusses imperative strategies and opportunities for Nigeria and the way forward for the key factors of STM education in the attainment of MDGs in Nigeria.

### Introduction

The role of science, Technology and Mathematics Education as a tool to sustainable development is no longer in doubt. Indeed, countries of the world are classified as developed, developing or under developed mainly on the basis of their scientific and technological advancement. Science and Technology has drastically and astronomically increased our knowledge of the universe. Scientists have even ventured into the hitherto unknown environments, explored and conquered space, landed man on the moon and put space craft's on other planets e.g. (Mars), expanded the horizon of our perspective and knowledge of the origins and extent of the universe. It has open up dramatically new and improved ways of diagnosing and treating illness. In medicine, man has, also been able to control and conquered the most dangerous and deadly diseases such as leprosy, tuberculoses, cancer, lung and heart diseases, and is making progress in fight against AIDS. In Biotechnology, man has been able to produce babies through artificial insemination of human reproductive cells. Rapid advances in electronics have ushered in the "computer age", which is rapidly altering our lives for the better. This has expanded the horizon of our knowledge of human intelligence, engaged in most incredible solution of mathematical puzzles and calculations, and achieved unbelievable forms of communication across lands, oceans and spaces. Man has built incredible structures in Architecture and engineering, such as dams, pyramids, artificial lakes, canals e.t.c

According to Itamah (2007) "expanded scientific and technological activities are of great importance to national economic empowerment and development through labour force capacities and the creation of new knowledge. The goals of MDGs for national development include: economic growth, employment creation, poverty elimination, gender equity, political freedom and environmental sustainability. Observers (Wasagu 2007, Itamah 2007, and Bensong 2002) are of the view that, to achieve these national development goals, nations must make science and technology their corner stone. Therefore, the need for the world community of scientifically and technologically literate citizens to sustain natural environment and enhance the overall quality of the world population, cannot be overemphasized. It is proper that we learn the skills that have

widened our knowledge of the world around us from minute things to the very complex ones.

### **Strategies for Promoting Access to Science, Technology and Mathematics Education in Attainment of MDGS in Nigeria**

Government at all levels, Industries, Science teachers, women and the professional associations have important roles to play in promoting access and participation in Science, Technology and Mathematics Education by citizens, especially, the youth in the following ways:

#### **Government and Industries**

Government's role in promoting students access and participation in science and technology includes:

The government vision and mission 2020 statement, its national policy on Science and Technology and the National Economic Empowerment and Development Strategy (NEEDS) are all based on the fact that, through embarking on a joint effort to build science, Technology capacity. Nigeria will greatly enhance her prospects of achieving growth; create employment, poverty alleviation, wealth creation and reorienting the value of citizens towards sustainable development (Adewoye, 2009). To achieve this vision Nigeria must focus on such strategies regarding science and technology by the establishment and maintenance of a strong science and technology workforce and offer scientific literacy to all citizens. This can be carryout by paying special emphasis on improved support and encouragement of the study of science in primary and secondary schools. There is need to organize annual seminars and workshops to conduct the citizens on the role of innovation in economic development, focusing on concrete case studies (Shamsudeen 2009). The workshops and seminars will demonstrate the values of adopting innovation policies that are different from traditional science and technology policies. There is also the need for the establishment of advanced laboratories for research and development in key areas of new technologies within existing Universities and research institutes and upgrading existing human and physical infrastructures to manage such laboratories. Priority areas that must be included are biotechnology, laser, nanotechnology, material science, renewable energy and nuclear Technology.

Furthermore, Nigeria must maintain a position eminence in basic and applied research, emphasizing areas of scientific challenges, greatest opportunities and potential benefits. These can, however, be achieved via increase research and development allocation as a percentage of GDP to 1% by 2008, 1.5% by 2009, 2% by 2010 and 3% by 2011(RV 2020, 2009). In addition, there must be support for cutting edge experimental capabilities. This support should be in at least one demonstrative project of the application of post harvest technology in each State of the Federation and FCT within the time frame of NEEDS. There must be an establishment of a technology foresight steering committee that will manage the development and implementation of development foresight for the country, support key national technological and applied sciences in research and development that have impact on industrial growth especially in those areas known to invigorate and sustain growth and establishment of national foundation for science, innovation and competitiveness (NFSIC), reviewing the issues and challenges of science, technology and innovations.

There is also a need for Government support for high level training of manpower for science, technology and mathematics by supporting Ph.D. level training in areas related to basic and applied sciences at centre's of excellence both locally and abroad, particularly in key areas of science and technology (Peter 2005). Industries must be involved in training and educational programmes in tertiary institutions. The state

government and private sectors must also be involved in the process of establishing training centres and research and development laboratories. There is need for doubling investments in tertiary institutions that produced scientists, engineers and technicians. Another strategy as maintained by, Donald (2005) is the building of the nation's basic, research capacity through critical investments in infrastructure. These may include investments in advanced instrumentation, increase spending on research and development by public and private sectors, provision of subsidies for industry investment in research and development, especially those that collaborate with tertiary educational institutions and public research institutions. There is need to increase and accelerate the pace of development of information and communication technology (ICT) infrastructures in all educational institutions as well as maintenance and strengthening advanced laboratories at Sheda Science and Technology Complex (SHESTCO), Abuja.

### **Science Teachers**

Science Teachers should re-examine their teaching approaches; the Guided Inquiry, Concept Mapping, Consequence Mapping, Computer Assisted Instructional Strategies etc. of teaching, which require student's active participation rather than passive recipients in experimentation in the laboratory should be employed. This will not only help to bring abstract concepts in science to observational level of students, but also disprove the various cultural beliefs, preconceptions and misconceptions, held by the students that science is very difficult especially to girls.

Teachers should avoid criticism which could affect the students' self-image and perception of their capabilities to learn science. Teachers should work on sex role awareness so that students can understand and question stereotypic attitudes and behaviors, this will enable students (both sexes) to develop the skills required to succeed in science and technology education. High degree of interaction between students should be encouraged in science and technology classes by science teachers, this, which could be achieved through sitting arrangement and grouping of students, will enable females to learn science from males.

### **Professional Associations**

Several women and professional associations which can aid student's access to science and technology education exist in Nigeria. Such association include: Nigerian Association of women scientist (NAWS); Nigerian Association of Women in Science Technology and Mathematics (NAWSTEM); Forum of African Women Education (FAWE) Nigeria chapter; Nigerian Academy of Education (NAE); Science Teachers Association of Nigeria (STAN); Mathematics Association of Nigeria (MAN) etc. these Associations can promote students access to science and technology through:

Organizing conferences and seminars around gender issues in the practice of science and technology education; Granting scholarship to all students in science and technology education; Organizing vocational remedial classes for students offering science and technology subjects and Organizing career talks to feature different women in science and technology education.

### **Generally, the main success factors in STM development in the attainment of MDGS in Nigeria include:**

It is important to remember that there is no single formula for STM based economic growth, henceforth Nigeria should continue to invest in and monitor progress in building STM capacity in order to rise up from the bottom of the technology ladder. Nigeria's STM policy must focus on niches, locations, markets and priorities for prompt execution and a success development.

- Strong emphasis on education, particularly scientific education: Nigeria should place strong emphasis on education at all levels. This is based on the belief that human resources are crucial to socio-economic development and achievement of STM
- Clear Vision and Honest Commitment by Leaders and Focused STM policy: It requires planning on timely basis i.e. two years, five years, ten years, etc as deemed possible with a clear development focus on some particular industries. STM policy in Nigeria can best be productive if properly integrated into the national socio-economic planning of the NPC. This can also be achieved by drawing a formula and identifying applicable technologies for a particular area of responsibility. Ministry of science and technology is to serve as the main scientific advisory committee in individual socio economic ministries for successful implementation of STM policy in Nigeria.
- Creation of Solid Technological Institutions: Another major characteristic of countries that have rapid progress in STM is the establishment of solid and well supported technological institutions and infrastructure.
- Mobilization of Requisite Resources: Whether the pathway taken to implement the STM policy, a common denominator of countries that have advanced in terms of STM is the large-scale mobilization of resources for R and D. this mobilization involves the Government (at all levels), the private sector, and in some cases, external sources.
- Focused choice and pursuit of pathways: To embark on STM programmes the nation needs to focus on a particular programme selected based on availability and accessibility of resources required. A formidable pathway is also chosen for effective development.
- Invitation and Involvement of Citizens in Diaspora: The involvement of citizens in Diaspora has helped and contributed immensely to the development of STM in the countries which have progressed technologically. Example Brazil, Indian and South Korean citizens have contributed a lot to their science and technology development.
- Appropriate Fiscal and Financial Incentives: This will help check the imbalance between the rural and urban sectors and will also help to reduce structural imbalance in the economy, particularly the dependence on external markets.

### **What are the problems and challenges of STM Education in Nigeria?**

The followings are the main problems and challenges of a formidable STM for the country:

- Political will and support: the Political class and to some extent, the government seems to lack necessary/required Political will to support and encourage STM. This is largely supported by insufficient financial allocation of resources to STM by government in Nigeria since independence.
- Policy consistency and continuity: Inconsistent STM government policies (from one administration to other) as it affects STM are also big issue and challenge to STM government in Nigeria. An offshoot of this is often discontinuity of programmes aimed at advancing STM in the country.
- Non- availability of STM supporting infrastructure: - the infrastructure that would play supporting roles to STM in Nigeria are simply not there. These include foundries, versatile, iron and steel companies, rolling mills, extracting mills etc.
- Underfunding of research activities in Nigerian Universities and allied institutions: - the underfunding of research activities in Nigeria universities, polytechnics and allied institutions, is a major issue and challenges to STM progress in the country.

Many research products are often left on shelf due to non availability of funds to develop them to valuable commercial products.

- Unfavorable legal framework in the country. There is at moment, unfavorable legal framework governing Nigeria. This discourages investments in new Research and Development products.
- Inadequate manpower:- there is a dearth of manpower in some critical area of STM. This is not being helped by the fact that the FME policy of 60:40 (science: non-science) admission ratio of students into the nations tertiary institutions is largely being ignored. The non-implementation may be directly linked to inadequate facilities in the science engineering departments. This may be directly linked to inadequate funding.
- Absence of motivation to study science and technology: - It is generally believed that Science and Technology is more rigorous than other subject areas. The reward system and employment opportunity after graduating, however, does not reflect this. Many young Nigerians are thus not attracted to study Science and Technology. A larger percentage of the few young Nigerians scientists and engineers prefer administrative jobs to science and enquiry jobs after graduating because of the reward system.
- Cultural beliefs and superstitions: - our culture and traditions are saddled with the burden of superstitions that retard scientific and technological adventures. This is a major issue and challenge to the advancement of STM. We need to re-orientate and reshape our mind-set for scientific and technological adventures.
- Non appreciation and application of modern technology by general citizenry:-the general populace has not taken advantage of modern technology in their daily activities, the demand for technological products are relatively minimal. This in turn has affected the development of technological products and services in the country. For instance, the vast opportunities created by the internet and allied products and services have not been fully exploited in the country. This may in part be attributable to poverty.
- Lack of linkages between Research and Development and manufacturing firms: - there is a persistent lack of linkages and cooperation between R and D efforts and manufacturing firms in the country.
- Non identification of areas of comparative advantages: - it is required to identify our scientific and technological areas of comparative advantages and exploit such advantages. For example, Japan does not have substantial natural resources while Nigeria is blessed with both agro and mineral resources. It will thus be advantageous for Nigeria to focus on technologies that will add values to its natural resources.
- Non-identification of Competition and Role Models: - Inability to identify competition and potential competition is an issue and challenge. Countries considered as role models should be identified.

### Conclusion

Nigeria cannot achieve scientific and technological growth without the full access and participation of youth, who represent half the population of the country in science and technology education. Over the years, cultural barriers and poverty held down most young citizens' access to scientific and technological studies. Fortunately the trend is now changing as various governments now recognize the importance of youth contributions to nation building. Everyone has to make his or her contributions in words and actions, in work place and home, to promote youth access to science, technology and mathematics education in attainment of MDGS in Nigeria.

## Recommendations

- Government must formulate policies that will increase enrolment in science in both primary and secondary schools;
- Giving scholarship to males and females who demonstrate capability in science and technology education;
- Recognizing and publishing the contributions of male and female scientists and technologists through the award of national honors;
- Making concrete moves to remove sex stereotyping in science textbooks;
- Providing adequate laboratory facilities in schools;
- Adequately remunerating science and technology teachers to boost their morale and increase their level of commitment
- And funding research projects on various aspect of the problems of men and women access to science and technology education.

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