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## The Role of Science, Technology and Mathematics Education in the Achievement of Millennium Development Goals for Sustainability

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### **Abstract**

*In order to achieve Millennium Development Goals there are various ways; first emphasis should be placed on the teaching of mathematics, starting right from the primary school. Qualitative education is the answer for achieving the MDGs and not mere mass production of graduates. It should be noted that most of the MDGs face dead line of 2015. The gender parity target was set to be achieved in full ten years earlier than now. Nigeria has made tremendous progress in the area of Space science and Technology as being the first black Africa nation to launch communication satellite (NIGEOMSAT I) in China. Communication satellite is the backbone for information technology. Another area that requires more attention is vocational education so as to cope with the present challenges facing Nigeria in terms of development and other related areas that require immediate action. The paper concludes that Nigerians should learn a lesson from India and China that were classified as Third world countries years ago but due to their advancement in technology are now heading towards becoming super-power nations.*

This paper focuses on the basic space Technology Programme and Millennium Development Goals. The growth and sustainable development of any country is the nation's access to reliable and sufficient information. For instance, in many developed countries, a large percentage of national and prospective allocation and environmental management, decisions are based on quality and accurate information on national resources and data from atmospheric observations as well as accurate geo-spatial

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information on anthropogenic, coupled with human elements that threaten life support system of planets.

It is evident that one of the roots causes of underdevelopment of the third world countries emanated from a number of factors which include: poor quality data collection, lack of proper organization, and management practices, inadequate infrastructure as well as skilled human capacity to develop the natural resources and manage the environment in a sustainable manner. The consequences of these are obvious food insecurity, hunger, air and water pollution, poverty and disease.

For the purpose of better understanding, it is necessary to explain these words or terms namely: Science, Technology and Mathematics Education. According to Advanced Learner's Dictionary seventh Edition, the term "Science" means knowledge about the structure and behaviour of the natural and physical world based on facts that one can prove, for example by experiments. Webster's New Collegiate Dictionary defined Science as Knowledge attained through study or practice covering general truths of the operation of general laws as obtained through scientific method of inquiry which concerned with the physical world.

Technology, according to the same Advanced Learner's Dictionary is defined as scientific knowledge used in practical ways in an industry, for example in designing new machines. Technology has various definitions; it may be defined as an applied science, in other words, any valid and reliable process or procedure that is derived from basic research using the scientific method of inquiry. According to Iortyer and Achineku (2010) traced the origin of Technology as:

*Technology is traced from the Greek word "Technie" and the Latin word "Technicus". Both words mean art and craft. Another Latin word "Taxcre means to weave or Construct". Another meaning of Technology can be seen and understood from "technologia" Which means systematic treatment. Technology Then can be seen as a systematic way of doing things that will bring solutions to problems of mankind. (P.1)*

**Mathematics:** Using the same advanced learner's dictionary, mathematics is defined as the science of numbers or figures as well as shapes. Branches of mathematics include: Arithmetic, algebra, geometry, statistics and trigonometry. Mathematics is the study of quantity, structure, space and shape.

Having explained the three key words that is science, technology and mathematics, the paper now intends to focus mainly on the following areas; millennium, development goals, space technology as a tool for realization of MDGs in Nigeria, the importance of mathematics education as it affects science and technology, the role of science and technology in achieving the MDGs in Nigeria.

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Millennium Development Goals (MDGs) as defined by UNICEF, MDGs are the Goals and targets which include: To eradicate extreme poverty, Achieve Universal Primary Education, to promote gender equality and women empowerment, reduce child Mortality, improve maternal health, combat HIV/AIDs Malaria and other disease, ensure environmental sustainability and develop a global partnership for development.

These goals as listed above were initiated during International conferences and the world summits in 1990s. Some of these goals as stated were targeted to be completed by 2015 if all things being equal. MDGs are an ambitious intention sometime refers to as proposed agenda, gears towards reducing poverty and improving lives of the people. All the world leaders agreed to these proposed goals during the summit held in September 2000, for each Goal, one or more targets have been set most for 2015 using 1990s as a benchmark. (UNICEF 2009).

### **How to Achieve MDGs in Nigeria**

The objectives of MDGs focus on addressing extreme poverty in many facets which include: hunger, disease lack of adequate shelter (housing). The gender equality in education, employment opportunities and environmental sustainability. In order to achieve the certain goals of Millennium development, the federal government should first of all, diversify the Nigeria economy that is to say instead of putting all the eggs in one basket there is a fear because as of now, the oil sector is the only main source of Nigerian economic or income generation but who knows what would happen to our petroleum in the near future? It is therefore, the opinion of this paper, that Petroleum Trust Fund should be reviewed and bring it back. Petroleum trust fund had been one of the major development in the national fiscal landscape since 1995. Revenues accrue from the petroleum trust fund sales tax and the proceeds were applied mainly to implement key capital projects in designated sectors; while part of the fund was set aside to meet the maintenance needs of the oil refineries.

### **Agricultural Sector**

Despite the public investment priority accorded to the agricultural sector in Nigeria's development and rolling plans and annual budgets, the sector is still very much at the infant stage of development. Productivity that is the yield or output/labour ratio is still very low compared to countries at a similar stage of development as Nigeria and the technology for the preservation of what is produced is still very far from being adequate. The only way to improve the agricultural sector is to grant more credit facilities to farmers to obtain loans and the chairmen of the local government councils should be the main guarantors to the loan. As of now, the conditions for granting loans to the farmers are not easy for the ordinary farmers to meet. But if the chairmen of the local government councils are meant to be the guarantors it will be easy for the farmers to obtain loans.

**UNICEF:** It is on record that UNICEF has been in the forefront in assisting the developing countries such as Nigeria. UNICEF is ever ready to continue to assist in

area of education if only funds meant for the projects are judiciously used. Better still, UNICEF has a strong presence in school based projects such as; water, sanitation, hygiene, supporting initiatives in 93 countries such as supplying hand-pumps to primary schools and training teachers in hygiene education. UNICEF also helps in procuring supplies like school in a-box-prepacked kit of materials for example exercise books, pencil, erasers, scissors, to mention a few. Stated below is the picture of Nigerian child who has benefited from girls education project initiated by UNICEF

### **To Eradicate Extreme Poverty and Hunger**

The target for 2015; approximately half of the proportion of people living on less than a dollar a day and those who suffer from hunger are more than a billion people still live on less than one US dollar a day in sub-Sahara Africa, Latin America and Caribbean and parts of Europe and central Asia are falling short of the poverty target.

### **Achieve Universal Primary Education**

Target for 2015: It is expected that by 2015, all boys and girls of school age might have completed their primary school education. As many as 113 million children do not attend school but the target is within the reach, India for example, should have had 95 percent of her children in school in 2005. Most of the Millennium Development Goals face a dead line of 2015. The gender parity target was set to be achieved a full ten years earlier than acknowledgement that equal access to education is the foundation for all other development Goals. Yet recent statistics show that

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for every 100 boys out of school, there are still 117 girls in the same situation. The present trend demands that until equal number of girls and boys are in school, then it would be possible to achieve the desired goal. **Source:** Retrieved from UNICEF MDGs <http://www.unicef.org/mdg/education.html> dated June 13 2009.

### **Intensifying Partnership for Girls Education**

UNICEF serves as the lead agency to the United Nations Girls' Education Initiative (UNGEI) a group of partners dedicated to achieving gender parity and equality targets in education launched by former UN Secretary General Kofi Annan at the World Education Forum in Dakar in 2000. UNGEI has set a platform for action and a partnership framework for the global girls education movement. UNICEF is also a key partner in the Education for all Fast-Track Initiative launched by the world bank in 2002. And supported by many bilateral donors to help mobilize resources with policy, data, capacity-building and financial support (UNICEF 2007). Women empowerment cannot be possible now unless they are first properly educated hence the issue of girls education becomes very necessary. UNICEF, being a lead agency for ensuring education for all more especially girls, has not relented its efforts for ensuring education for all by 2015.

### **Engaging in Out-reach and Advocacy by UNICEF**

UNICEF stages global information campaigns on the importance of getting children to school especially girls and has committed 233 million dollars to those efforts for example UNICEF's goal for Girls Education for every child campaign is about raising awareness generating public support and mobilizing resources for 25 percent by 2005 an accelerated effort to get girls in school in 25 countries. Such campaigning involve a wide range of partners from children and teachers up to religious leaders and popular sports such as soccer and cricket to help get the word out. UNICEF also works directly with governments to highlight and address issues of gender discrimination such as fees or forced child labour. Time factor will not permit me to discuss other Millennium Development Goals in detail.

### **Ensure Environmental Sustainability**

The principles of sustainable development into national policies and programmes and reverse the loss of environmental resources is one of the factors. Another striking point is by 2015, at least half of the proportion of people without access to safe drinking water would be also to get good drinking water. Sustainable development is defined by the United Nation Commission on environment and development as a development that meets the needs of the present without compromising the ability of future generation to meet their own needs. It takes into account the need for the consideration and plan the short and long terms economics, environment and technological programmes based on the availability of resources in order to find solution to their present and future problems. Sustainable environmental development demands that, the monitoring and management of natural resources such as solid minerals, water resources, and agricultural land etc.

### **Space Technology as a Tool for Realization of MDGs in Nigeria**

The significant role of technology for the attainment of rapid sustainable socio-economic development is very important. The former head of State General Obasanjo took a bold step by embarking on satellite system development through the establishment of national space research and development agency (NASRDA). President Obasanjo at the Commissioning of the National Space Technology Centre on the 30<sup>th</sup> April 2007, made the following remarks:

Today's event marks another milestone in the quest of our country to use space and technology to promote sustainable national development and improve on the quality of live of our people. Nigeria is committed to the realization of the Millennium Development Goals (MDGs) in line with the United Nations Millennium Development adopted in September 2000. The national economic, empowerment and development strategy for example is part of government reforms to achieve the MDGs...

The initiative of the Federal Government in agreeing to the establishment of National Space Centre (NSC) has resulted in the launching of the 1<sup>st</sup> Earth Observation Satellite (Nigeria-Sat 1) in September 2003. By this unique achievement which is the first of its kind in Sub-Sahara black Africa. Nigeria has registered not only her footprint in space but also her name as satellite data provider. The satellite in question has captured well over 2000 images covering almost the entire country and different parts of the world. Obasanjo further noted that:

We are embarking on initiative and development agenda that would address and readdress the problems of poverty, wealth creation, food security, infrastructural development, sustainable energy, affordable health and housing and protection from natural and man induced disasters.

Nigeria has taken further steps towards the provision of communication satellite backbone to promote the revolution of information communication in Africa. As reported by Felix (2007:9) Chief Olusegun Obasanjo could not hide his joy at the occasion following the successful launch of Nigeria Sat 1. Obasanjo described it as monumental achievement in the departmental history in Nigeria and indeed Africa. He paid glowing tribute to the management of NASRDA for being partners in progress with the government.

On Sunday 13<sup>th</sup> May, 2007, the Agency kept faith its prediction and promise as the much awaited launch of the Nigerian Communication Satellite the first of its kind in Africa took place in China. According to source, it was really a moment of joy. The excitement of the successful launch of NIGCOMSAT in China it was electrifying across the country as observers perceived it as a monumental technological leap and victory for Nigeria and Africa. Professor Ajayi Boroffice (the Director General) arrived from China; he was accorded a horoic welcome by the entire staff and management of

the Agency. **Source:** National Space Research Development Agency Magazine Vol. 2 of July, 2007 p. 9

### **Proposed New Satellite Launch**

As reported by Kunle Azeez in the National Mirror Newspaper of July 4<sup>th</sup> 2011 p. 22

The Nigeria communication satellite (NIGLOMSAT) limited said it is currently putting necessary arrangements in place towards ensuring a successful launch of its new satellite expected to hit the orbit before the end of this year. As part of such efforts, the company in a statement issued on Friday, said it would hold a pre-launch conference on the proposed Nigeria Comsat IR satellite this month with the theme “optimizing satellite communication” for national development. The conference is expected to hold at the international conference centre Abuja on July 28<sup>th</sup> 2011.

The NIGCOMSAT spokesman Sonny Aragba is quoted as saying:

*The conference will serve as a prelude to the launch of Nigeria communication satellite, the replacement satellite is due for last quarter of 2011. He further stated that the conference will also address salient issues including stake holders’ expectations, the critical need of communications satellite and its collaborative potential with other information and communication technology tools that could aid national growth: source: National Mirror Newspaper of July 4<sup>th</sup>, 2011 p.22*

Aragba further commented that the confab industry players regulators of telecommunication, broadcasting and information communication technology (ICT) sectors are expected to beam light on the issue at stake at the conference. He stressed the key chiefs of bluchip companies, the academia, the politians among others will be the participants at the forum.

### **Economic Benefits of Space Technology in Nigeria**

Satellite will enhance government’s reforms particularly in the areas of

- i. E-learning
- ii. E-commerce
- iii. E-government
- iv. Tele medicine
- v. Tele education
- vi. Rural telephony etc.

The federal government is trying to shift its attention more to Space Technology so as to meet countries like India and China that were one time classified as the third world countries but now had advanced very high in technology.

### **The Importance of Mathematics Education**

Mathematics Education is necessary in science and technology as both require the ability of calculation as such; the two variables need the services of mathematics education. It has been observed that many students are afraid of mathematics and that is why there are few students in science more especially pure science. For any nation to develop technologically there must be a scientific base that demands the use of mathematics. Nigeria can borrow a leaf from China and India as they are fast moving in areas of technology. To make discussion more meaningful see the diagram below:

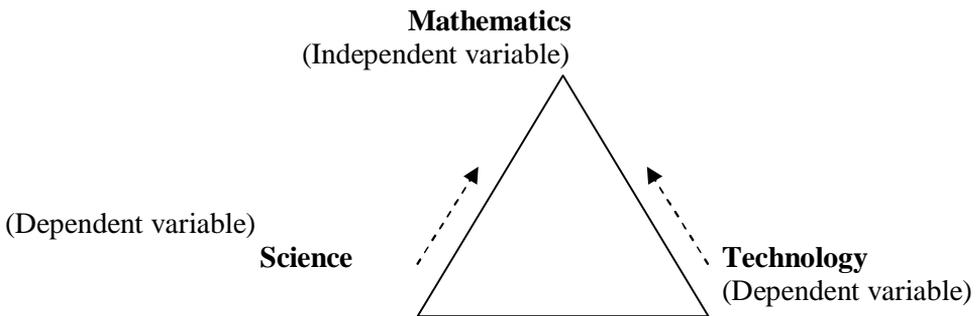


Illustration 1.1

The diagram as shown above, explains the inter-relationship among the three variables. Science as one can see, depends on the services of mathematics like wise the technology. The broken lines with an arrow pointing towards mathematics, shows that sciences needs the knowledge from mathematics. The same thing is applicable to technology. In summary, they complement each other.

### **The Role of Mathematics**

First, without mathematics, Science is reduced to simply cataloging observations and phenomena. Mathematics plays several roles as a part of the tools of a scientist. The role of mathematics include:

1. To provide information on the statistical significance of a measurement
1. To describe a functional relationship between a measured quantity and one or more of the three parameters associated with it.
2. To provide a layer of abstraction for exploring underlying relationships. (Emaikwu, 2007).
3. Mathematical applications are used in the development of computers, counting machines, traffic control system. (Emaikwu, 2007:7).

### **The Roles of Science and Technology**

Science and technology are said to be water-tight compartment that cannot be easily separated from each other. Science is based mainly on using experimental method of inquiry for further better analysis.

### **Uses of Science Include**

- ❖ Science provides the foundation for credible decision making and deals mainly with theories and laws.
- ❖ Science provides the basis for better understanding of environmental risks to people.
- ❖ Science produces practical results which are the bases for technological development that can be used by Engineering, Medicine, and Agriculture etc.
- ❖ It provides programme of high quality i.e National Academy of Science (NAS).
- ❖ Prevent pollution and reduce risk. This becomes possible with the knowledge of science.
- ❖ Science, Technology and Mathematics are inter-related in the area of production and Science theories that are manipulated for use.
- ❖ The role of Science environmental pollution Agency (EPA) are determined by the nature of scientific information and how it would be treated within the agency.

**Technology:** Technology generally affects human as well as other animals species' ability to control and adapt to their natural environments. The human species use of technology began with the conversion of natural resources into simple tools. The prehistorical discovery of the ability to control fire increased the available sources of food and the invention of the wheel helped humans in traveling in motors and controlling their environments. Recent technological developments including the printing press, telephones and internet have actually lessened physical barriers to communications and allowed humans to interact freely on a global scale. However, not all technologies had been used for peaceful or positive purposes for instance the development of modern weapons tend to be destructive for example inter-continental ballistic Missile, Atomic bombs etc.

### **Concept of Space Technology**

Space technology is the key to the realization of the MDGs and needs objectives as it guarantees the availability and speedy success to real time data and geospatial information as well as the availability of relevant infrastructures. It is the back-bone for information communication, therefore it becomes imperative to integrate space technology applications into various stages of sustainable development efforts.

The significant role of space technology is for the attainment of rapid sustainable socio-economic development. The Federal Government of Nigeria under the leadership of president Obasanjo took a bold step by embarking on satellite system development through the establishment of National Space research and Development (NSRD) in 1999 was not only to join the league of space industry but to consolidate all space science and technology related activities in order to make a greater impact on development efforts in the country. To show a high degree of seriousness, in December 2006 , the former Head of State Chief Obasanjo approved the signing of an agreement with surrey satellite Technology in United Kingdom for the development of second Earth observation satellite.

### **Conclusion**

Nigeria has witnessed a great achievement in space technology. On Sunday 13<sup>th</sup> May, 2007, NAGRDA launched Nigeria communication satellite the first of its kind in Africa took place in China. The excitement of the successful launch was electrifying across the nation as observers perceived it as a monumental technological leap and victory for Nigeria in particular and Africa in general. Science and technology are the guiding hallmarks for achieving the Millennium Development Goals, for that reason, mathematics education becomes the basic tool for sciences and technology.

### **Recommendations**

After a discussion on the role of science and technology and mathematics education in achieving the MDGs in Nigeria, the paper comes up with the following recommendations:

- Investment in human development will accelerate progress towards the Millennium Development Goals and also stimulate economic growth, create more jobs, enhance people's productivity.
- Generate additional fiscal revenue, thereby making macro-economic stability a more feasible goal.
- Nigeria should focus more on qualitative education rather than mass production of graduates as it is the case now.
- Education sector must be adequately funded so as to enable them build more physical structures.
- For the education goal to be met, actions need to be addressed both human material needs like, books buildings, teachers and other organic requirements.
- Serious emphasis should be placed on science and technology and all other segments of education that were neglected in the past for example vocational education.
- Address the problems of unemployment of youths by way of empowering them to engage themselves in useful productive venture.
- As noted by UNICEF, the World Bank and World Health Organization (WHO) there is need for demanding additional amount to the tune of fifty billion US dollars per year as development assistance.

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