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10TH
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THE DILEMMA OF THE SCIENCE TEACHER IN THE IMPLEMENTAITON OF SCIENCE EDUCATION CURRICULUM REFORMS AT THE BASIC EDUCATION LEVEL IN NIGERIA

BY

PROFESSOR NICHOLAS AKISE ADA, MSTAN
Professor of Science Education

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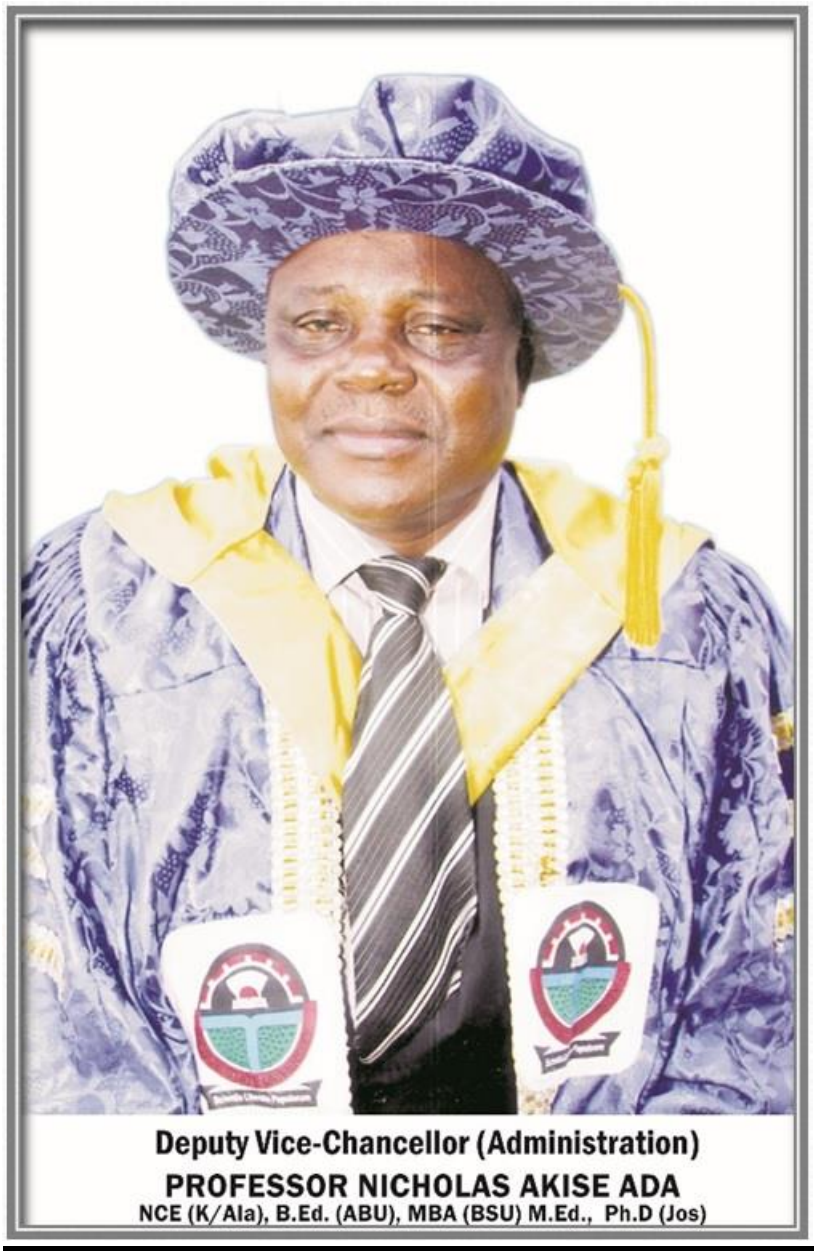

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A journey of this nature to my current status has been made possible due to numerous individuals whose contribution cannot be easily quantified. As a man of the people, as I am popularly called, I hate to offend anybody and as such, I am hesitant to list people's names here, least I omit those who think should have been mentioned and acknowledged. I sincerely appreciate all the good people who are dear to me and you know it yourself. I thank you all.

It is however with a deep sense of appreciation that I extend my profound gratitude to very few individuals and groups whose singular and collective contributions in various forms constituted the foundation which I can proudly say that "Yes I am here".

I must first express my gratitude to the Almighty God whose infinite love for me spared my life to this moment. My children; **Dooshima, Rev. Fr. Emmanuel, Sewuese, Raymond, Basil** and **Doose,** God has blessed you and given you parents you should be proud of.

I appreciate the encouragement, concern, moral, financial and spiritual support and understanding demonstrated by my dear wife, **Mrs. Joan Olanike Ada**, throughout our thirty six years in marriage. Mummy, you stand taller than anybody in my life. You are a model.

My special thanks go to my dear uncle Dr. Iorwuese Viashima formerly of the Presidency, Abuja, whom God used to restore the functionality of my right hand which was used in the completion of my PhD work. His magnanimity to humanity cannot be easily quantified. God will continue to protect you so that you can reach out to as many people as possible who may come your way.

I owe gratitude to Prof. C. T. O. Akinmade and family, who ensured at all times that I was accommodated and catered for during my period of postgraduate studies at the University of Jos. Prof. Mrs. Gyuse has been my mentor and Model whom I cannot overlook in this acknowledgement.

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I express my unquantifiable thanks to Prof. D. I. Ker, the second Vice-chancellor of the Benue State University, Makurdi, Prof. Akase Paul Sorkaa, the third Vice-Chancellor of the Benue State University, Mr. W. I. Mozeh Esq., pioneer Registrar, Benue State University, Makurdi, Prof. (Mrs.) B. O. Ker for their endless concern that the work which finally qualified me today as a professor should come to a fruitful end.

My indebtedness goes to all the pioneer staff of Benue State University particularly the staff of the faculty of Education and indeed the department of Curriculum and Teaching who had faith in this project of Benue State University and have contributed immensely and are still contributing to its continued survival. I can't thank enough all my colleagues particularly the current Dean of the Faculty of Education Prof. Batur Gbenda Laha and my current Head of Department Prof. Emmanuel Achor and my well-wishers who have kept faith with me. I have placed on records the miracle in my life in providing opportunity for me to serve as the Minister of State 1 Foreign Affairs of the Government of the Federal Republic of Nigeria and Member of the Federal Executive Council of the Federal Republic of Nigeria through the instrumentality of God's intervention. I owe gratitude to God.

My ASUU Colleagues, nothing else gives me joy and happiness by my association with this body that has fought for the survival of not only the University system but other levels of educational system in Nigeria

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The Chairman and members of ASUU-BSU,
Visiting Scholars from sister Universities,
Members of BSU Alumni,
All invited guests,
Great students of the Great Benue State University,
Members of the Press,

It is with great pleasure and distinct honour that I stand before my friends, both personal and professional as well as my well-wishers who have supported and encouraged me to always forge ahead at every critical moment in my life in pursuant of academic excellence. I particularly acknowledge and appreciate my Vice Chancellor, my In-law **Professor Msugh Moses Kembe** who has been very close to my family, who expressively gave approval that this inaugural lecture holds.

I owe a lot of gratitude to Almighty God for his mercy and grace, for his love endures forever. If my parents were alive today, they would have stood tall to affirm that, yes, **Professor Akise Ada**, you are our son in whom we are well pleased. Even in the great world beyond, I see and hear them say so. The journey to this destination started in 1969 when I got admission into St. Andrews Secondary School Adikpo when I left in primary six after a successful common entrance into the secondary school, this was very usual. God made it possible for me.

By the grace of God, I have been a teacher since 1976 having graduated from the famous Jesus College Otukpo, after my pivotal course for two years. (What used to be a training programme for graduates of the Secondary Schools who wanted to take up a teaching job). I actually mastered O'level. I have been a trainer of teachers since 1983 when I joined the services of the College of Education Katsina-Ala after my graduation from yet another famous institution, the Ahmadu Bello University Zaria.

Mr. Vice Chancellor, I cannot say, like many other teachers today that becoming a teacher was my dream or choice. It is a common truism that most people do not end with their dream profession. I was a science student and dreamt of reading Phy/Chem 200 at HSC. However I became happy when I met most of my secondary school teachers who were proud of their jobs and really knew their worth, yet they were holders of either NCE, HSC or Grade II (Higher Elementary) Certificate.

The likes of **Ashar Igungu, Hile Ihongo Anenda, Mr. Innocent Ukeli, John Onugwu, Mr. Ahulo, Mr. John Tarhembe, Joseph Apel, Raphael Uchi, Mathew Akpoo (Alias MV), Chief David Amoh, Chief C.K Uganden, Mr Alfred Abela, Mr. Tyoker Abayol.** These were great teachers in their own right.

Having taken to teaching as a profession, I can say with all sense of humour and commitment that I Love teaching, I have compassion for teaching. What I find disturbing over all my years as a teacher are the types of Teachers we have and the kinds of students the education system has produced. I observe student teachers as well as permanent teachers teach. The situation has been pathetic.

I look at the products of our new school system and I ask myself, which way Nigeria? Teachers appear to be in a great Dilemma, because, they were trained for a system that has metamorphosed into an incredible form that they are not

professionally equipped and intellectually disposed to effective implement the new curricula at different levels of the Nigerian education system.

If teachers are messengers employed by the society to deliver the message, then they are like prophets from the Bible who came with a message of salvation to teach mankind to appreciate God and obey the code of conduct here on earth and to qualify for a better life in Heaven.

This means that, teaching is very important and no one knows all. Teachers should see themselves as engineers building new knowledge and skills to enable a country qualify to enjoy tomorrow's better world. These words underscore the importance of education.

This lecture is a response to my worries over the years as a teacher trainer. Nigeria is passing through a number of stages that require interventions to foster development. We are faced with daunting challenges in all spheres of life. It is only an effective education system that will bail us out by responding to issues that are negatively affecting our socio economic developments.

Quality has disappeared in the dictionary of the Nigerian education system. What has gone wrong? Where does the fault lie? Is it with our leadership or government? teachers? students or parents? This lecture will attempt to address these issues.

INTRODUCTION

There is an inherent expectation in every society that education, particularly science education, should equip an individual with skills that will make him not only useful to himself but also to the society to which he belongs. In this consideration, Obanya (2014) views education as performing a trans generational transmission of cultural heritage through systematically encouraging socially acceptable behavior, while systematically discouraging behaviors that the society considers unacceptable. This expectation has even become more crucial in developing nations that are still marching towards a period of sustained scientific, technological, economic and political developments. Most developing nations, particularly African countries are facing a number of challenges with their educational systems. Consequently, curriculum reforms have become a regular feature of their systems of education. Speaking on the importance of education, particularly Science Technology and Mathematics (STM) education, Pollyn (2012) describes STM education as a pivot on which every nation rests to build an unshakable self-reliant manpower base for sustainable development. Pollyn further gives an analogy stating that, STM can be likened to the wheels and engine room of a vehicle which has the capacity to carry its passengers to an expected destination, which in the case is a developed nation. The drivers of such a vehicle are the workforce, trained manpower and the fuel and engine oil, which can be likened to the curricula used in training the potential manpower from the educational system with the hope of finding a viable system that will transform the economies of the Nations. The take-off point of this journey is foundation education at the Basic level, as it is a truism that no building can be stronger that its foundation. The teacher being a critical factor in the implementation process of the curriculum, plays the most significant role in the

entire process of education. What the teacher fails to do can be an irreparable loss to both the child and the society. What he does well, may transform the child and the society, as no system of education can rise above the quality of its teachers. If the teacher is professionally and intellectually equipped to perform his duties and is well-motivated, he can make a difference in the life of both the child and the society.

Mr. Vice Chancellor Sir, success stories of other nations that have used science and technology to transform their economies might be useful. Let us pause here a little and listen to this account of the case of India as given by Agarkar (2013).

India had made a notable economic progress. The country that used to have scarcity of food at the time of independence is now self-sufficient even though India's population has tripled (1,311,050,000 as at 2015). It has a successful Atomic Energy Programme (AEP) and can also boast of successful space programmes in geostationary and polar orbit. The country can also boast of importing software owing to its successful Information Technology (IT) capability.

India is now a major producer of a variety of industrial and consumer goods. The impact of economic recession on India has been almost negligible. India can now take care of its science and technology personnel needs for advancement of her R&D Institutions. In addition, India can also supply trained manpower both to developed as well as developing nations.

The success story of India in her systematic efforts in capacity building in S&T is largely attributed to the following:

Favourable government policies.

Development of relevant curricula.

Adequate and appropriate teacher preparation programmes.

Provision of relevant and quality educational facilities in Science & Technology.

Identification and nurturing of science talent.

Establishment of functional Research and Development (R&D) institutions.

Facilitation of industrial growth.

R&D science education.

Generation of resources.

Promotion of scientific literacy.

Today, Indians that flooded the Nigerian education scene in the 1970s and 1980s as teachers especially at the post primary school level have all gone back to their country.

CHAPTER ONE

IMPORTANCE OF EDUCATION

Education does not only serve as a custodian of the people's culture expressed in the language they speak, their mode of dress, form of marriages, social organizations, political activities and technology, it also, serves as a process through which the society transmits its culture to the young ones.

In recognition of the importance of education in enhancing sustainable development, the United Nations declared 2005 – 2014 as the Decade for Education for Sustainable Development, Okebukola (2007). The World Conference on Education for All (EFA), in Jomtien, Thailand,1990, set the target date at 2000 for the achievement of Universal Primary Education (UPE), which is the foundation of subsequent levels of education. However, the 1995 World Summit for Social Development shifted the date to 2015.

In recognition of its worth and contribution to transformation of the economies of nations, the World Education Forum (WEF) held in Dakar 2000, equally emphasized the need for Education For All (UNESCO, 2000), and more importantly, the imperative of quality education. (UNESCO, 2004).

The challenges posed by the 21st century expressed in the Millennium Development Goals (MDGs), which have now been redefined and designated as Sustainable Development Goals (SDGs), have further heightened the need to use education as a tool for the attainment of these goals. Consequently, in order to improve educational outcomes, curriculum implementation must be reinforced through appropriate reforms, as this would undoubtedly, lead to the acquisition of relevant knowledge, appropriate skills and attitudes needed for living a useful life in the society.

Countries and individuals without access to relevant knowledge and skills provided by quality education according to Adams (1993), will be left out from benefiting from the global economic progress that the world makes.

African countries are equally prioritizing education as a tool for the transformation of their economies. Accordingly, African Governments designated the year 1997-2006 as the Education Decade. The Harare Programme of Action of the Decade of Education in Africa adopted by the meeting of Ministers of Education of member States, was endorsed by Heads of State and Government in Algiers in July 1999.

The Dakar Framework as well as the Harare Programme of Action of the Decade of Education in Africa urges governments to establish broad based partnerships with civil society and to give the ensuing national action plans the strongest political support.

The then OAU Programme of Action recognized the pivotal role played by education in the development of human resource as a basis to galvanize Africa's transformation into the new Millennium. Thus, African governments have committed themselves to make Education for All (EFA) a reality for the African people, yet there are daunting challenges.

A survey by SACMEQ as reported by UNESCO (2015), of the efforts to provide Education for All (EFA) in sub-Saharan Africa reveals that;

Sub-Saharan Africa had about 2.5 Million Primary School teachers in 2005, this figure rose to 3.4 Million teachers in 2012, an increase of nearly 1.5 million since 1999 (UNESCO 2015). This development clearly shows the rapid expansion of educational opportunity to provide access to Basic Education as a necessary foundation for expansion of educational opportunities.

Despite these efforts, there are indications that education has not been successfully used as a tool in meeting the needs of most African countries.

NBS (2016) indicates that 80% of Nigerian youths are unemployed against 54% in 2012. Reference here made to what happened during the immigration recruitment exercise. The inability of education to meet the needs as well as promote the economic self-reliance and sufficiency of nations has resulted into joblessness, unemployment, poverty, unproductivity and increasing incidence of social ills among the youths across the globe particularly in Africa.

Most communities in Africa are thus considered as disadvantaged due to lack of access to education and the poor quality of education received by their citizens. The SACMEQ survey found that half of the Grade six pupils in Kenya, Malawi, Mozambique, Uganda, Tanzania and Zambia had no single book. Between 25% and 40% of teachers in these countries reported that they did not possess a book or guide in the subject they teach. What a dilemma! School buildings were reported to need major repairs, classrooms in most countries were reported crowded.

The disadvantaged group in Africa, constitutes 80% of the Continent's population. This group is Numerically Superior (NS) but Adjectively Poor (AP). Ake (1981) argues that, this group provides labour which is utilized for production but not adequately compensated. Abiom (2007), asserts that the AP is denied access to justice because they cannot pay for it, they have no access to qualitative education and health because they cannot afford to pay for them, and their human labour has made them to quickly wear and tear thus ageing very quickly. The nature of the African continent has placed it in a disadvantaged position, thereby subjecting it to underdevelopment. Efforts to develop Africa through self-initiated programmes and through the intervention of the International Community through programmes such as New Partnership for African Development (NEPAD) and the World Bank assisted projects, have not been sufficiently meeting the developmental needs of the Continent due to high illiteracy level and corruption among African Leadership and elite. (Ada &

Faajir, 2009). It is therefore imperative that curricula at all levels of education must be reformed to meet the current demand of using education as a tool for development.

STIMULANTS TO CURRICULUM REFORMS IN AFRICA.

Developing nations, particularly African countries are facing daunting challenges with their educational systems and are equally devising newer strategies with the hope of finding viable alternative systems that would transform their economies. When the defunct Soviet Union launched into space in 1957, the first man-made satellite called "Sputnik", the development sparked off wide spread curricular reforms across the globe. America felt challenged. America then, ran back to her schools and re-organized the school curricula at various levels in order to meet the demands for space exploration through the provision of relevant qualitative science education. This saw the emergence of alphabet curricula in science across the globe among which were; Physical Science Study (PSCS). Chemical Education Materials Study (CHEM STUDY) all in USA. And the Nuffield Science Projects in the UK. Today, America can compete favorably with any nation in space exploration due to qualitative reforms in science curricula introduced in their schools. Qualitative education is therefore, viewed as an effective tool that can be used to respond rapidly to the changing needs and aspirations of any nation.

Nigerians equally became part of this curricula reform efforts with the development of Basic Science for Nigerian Secondary Schools (BSNSS) and Nigerian Integrated Science Project (NISP) by STAN in 1971 among others.

The 1969 historic Curriculum Conference in Nigeria provided the much needed impetus that gave rise to the involvement of other government agencies to be actively involved in the curriculum development. Such agencies as the defunct Comparative Education Study and Adaptation Centre (CESAC),

the Nigerian Educational Research Council (NERC) which later became Nigerian Education Research and Development Council (NERDC).

The bottom line of these curricula reform efforts according to Ada (2013) hinged on the fact that there were total dissatisfaction with how Science was still traditionally being taught leading to the decreasing popularity of science among students evidenced by declining number of students choosing science subjects. It became obvious that investment in science education would be the only viable option for the nation to make progress.

Akpa (1994), Gusau (2008) argued that, since vast sums of money are being spent by governments, private organizations, individuals and communities on education, it is expected, therefore, that this investment should produce quality educational programmes for students; programmes that would meet the needs of the nations and bring about desirable changes expected in the learner. Quality teaching and learning therefore become prerequisites for improved educational outcomes.

Nations of the world are in a global competitive race for survival in the areas of military supremacy, provision of basic human needs of shelter, food, portable water, improved living conditions, development of new strategies and acquisition of skills for productive purposes, increase in earning power and evolvement of practicable and workable political systems, effective educational systems are therefore viewed as a solution to foster development.

The world population is rising fast and is currently put at 6,894,443,011. This implies that more people need food, health care, education, and housing. There is depletion of bio-diversity hazards of industrial effluent, there is the ozone layer depletion effect, and there is the problem of improved communication and adequate provision of other basic comforts and necessities of life. All these needs can only be adequately met using education, particularly science and technology as a tool. Agbese (2008), a journalist, speaking on the

necessity of science, had argued that, Science and Technology are children of progress and agents of human civilization. With them, man is able to navigate into the empty space and unfriendly oceans. Forces of nature have been bent, tamed and manipulated using scientific research and technological skills for the benefit of humanity. For example, man has evolved, heating system in cold weather to cope with the excessive cold conditions. Equally cooling system has been devised in hot weather conditions to cool the environment.

Education as a social institution is one of man's most potent and enduring instruments used for development. Whether formal or informal, education is capable of catalyzing far reaching transformations in the society. Its' tremendous worth and contributions to the development of individual capacities, institutions, public and private agencies have been fully acknowledged.

A number of reforms have been introduced in the education system of many nations. Typical example of these reforms in Africa as cited by Ijaiya (2012) include: "The Harambee philosophy by Jomo Kenyatta of Kenya meaning "Pulling together" "The Nyanyo" Philosophy by Daniel Arap Moi, meaning "Education for Peace and "Nbewu" an education reform agenda by South Africa, Meaning "Seed". These reforms have resulted in the changing phases and paces of education all over the world. The changes are aimed at finding an education system that is viable, efficient and effective as a tool for effecting development.

Nigeria has equally witnessed several changing phases and paces of education especially after independence in 1960. These changes have been in content, structure and administration.

The reforms are undoubtedly in search of an effective and viable system that would address the needs of an independent Nigeria.

Whereas some of these reforms are orderly and purely based on sound theoretical foundations, others have been on an ad hoc arrangement due to the dictates of the individual who may be in a political position at a given time and the life span of the reform cannot exceed the life span of the initiator of the reform with his cohorts. See the number of Ministers of Education since Nigeria became independent. Over 50 Ministers of Education in the life of a Nation of 53 years.

The reforms in education cut across all the strata of the entire educational system. The idea behind each reform is rooted in the belief that meaningful changes can only be made in a nation through a deliberate and systematic re-engineering of all the processes that are involved in education for increased productivity.

The rapid technological developments which are the features of the twenty-first century in a globalized world are likely to lead to more changes in the world of work.

It follows therefore that human capital development, of which education is a critical tool must keep pace with societal transformation if people are to live productive, peaceful and satisfying lives.

SOME BASIC FACTS ABOUT NIGERIA.

Mr Vice Chancellor Sir, Nigeria is a multinational Nation of great complexity, being the most populous country in Africa with a projected population of 178,525,574 as at 2016 and a land mass area of 923,768 (Sq Km) Square kilometres. There are over 350 distinct languages and Nationalities, distinguishable by geographical locations. Having emerged from a three regional arrangement at independence in 1960 and later four with the creation of a Mid-West region in 1963, Nigeria progressively let go the regional structure when twelve states were created in 1967, followed by 19 states in 1976, 21 in 1987, 30 in 1991 and finally 36 states (and Federal Capital Territory FCT) in

1996. There are presently 774 Local government councils spread across the states. The country now has been carved politically into six geo-political Zones; namely: South-West, South-East, South-South, North-Central, North-East and North-West. Figures 1 and 2 show the geo political zones of Nigeria and the projected populations respectively. www.worldmeters.info

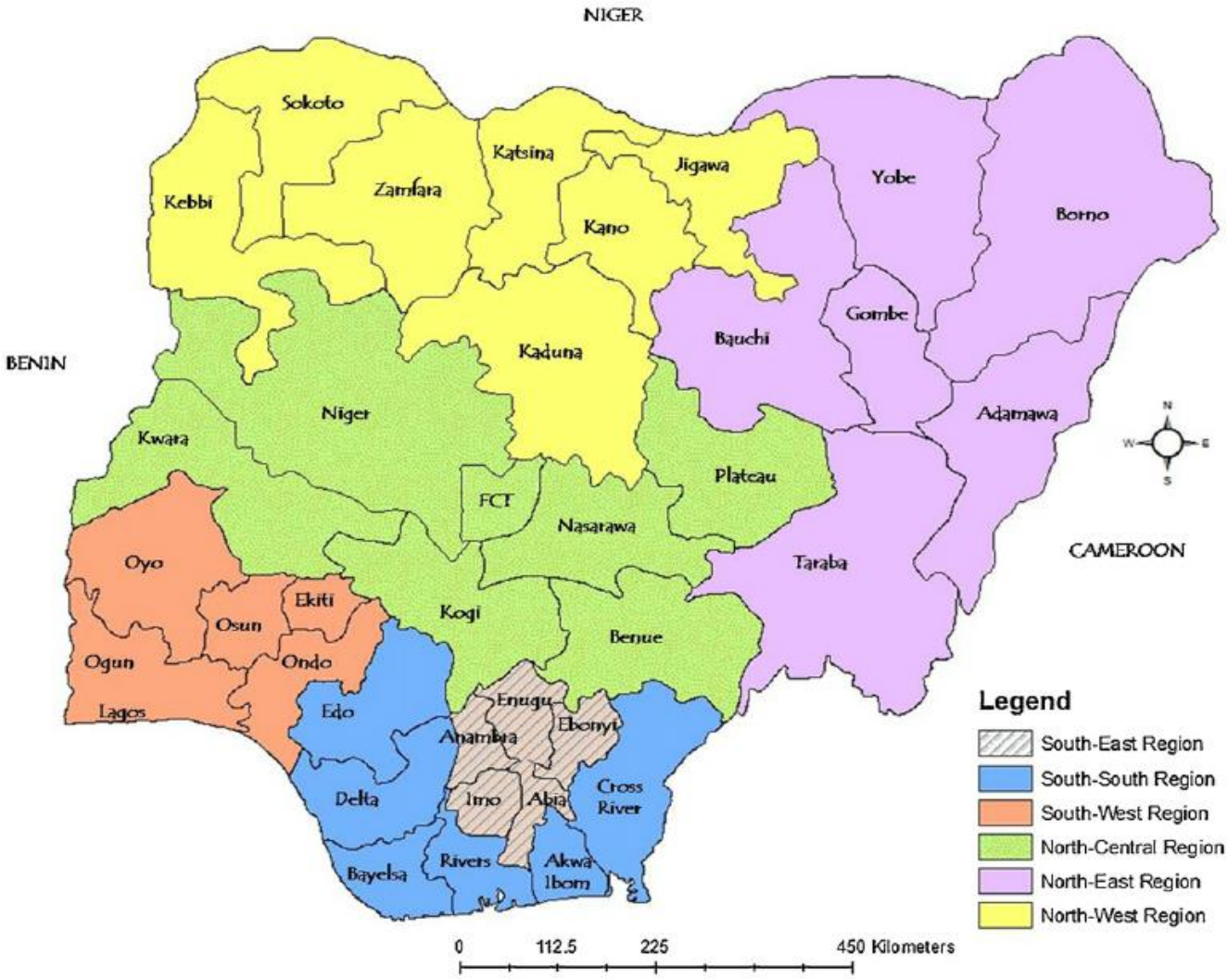

Figure 1: Map of Nigeria showing the six Geo-Political Zones.

Figure 2: Nigeria's Projected population by 2016

The rural urban migration has added to the complex social problems facing Nigeria. Rural Nigeria which forms two thirds of the total national population presents a painful paradox of poverty in the midst of plenty as their income capacity is very weak, thereby preventing most of them from enjoying the minimum standard of living consistent with human dignity.

Statistics available show that the rural dwellers in the country constituting 70% of the total population, generate 40% of the GDP. Most of the people take on occupations like subsistence farming and petty trading. With the overriding profile of petroleum in subsequent years, Nigerians were blind folded with a radical change in the economic landscape of the country to the extent that by 1982, agriculture contributed only 17% of GDP. As at 2001, oil sector still constituted 76.5% of the country's revenue. (CBN, 2001). Today, oil is no longer the main stay of economy in Nigeria. Nigerians now are faced with the stark reality to generate revenue from the non-oil sector. These issues are implicated in the implementation of reforms in education in Nigeria as they directly affect the funding profile of education. The country also lacks basic infrastructures such as good roads, access to clean water, electricity supply and

communication facilities. About 70% of the total population is poor. National Bureau of Statistics (NBS).

The rural sector predominantly agriculture-based, employs about 90% of the country's labour force. A key element in the history of the country's rural development efforts is that agriculture has been viewed as a basis for rural development, an approach which has neglected the contributions of other sectors to improving the quality of life of the rural dwellers. Education thus becomes an inevitable tool for transformation of the Nigerian society.

Education is the biggest industry in Nigeria, patronized by virtually every citizen. Nigeria has witnessed unprecedented expansion of educational opportunities for all citizens at all levels.

It therefore becomes absolutely necessary for Government to articulate its policy towards an education that will be relevant to the needs and aspirations of its own people, hence the need for reforms that will provide relevant education that will be used as a tool for the transformation of the country.

The challenges posed by contemporary society the world over, require formulation of appropriate educational polices and massive redirection of educational practices towards solving contemporary problems.

These contemporary problems, expressed in what is popularly known as the Millennium Development Goals (MDGs) are shown in Figure 3:

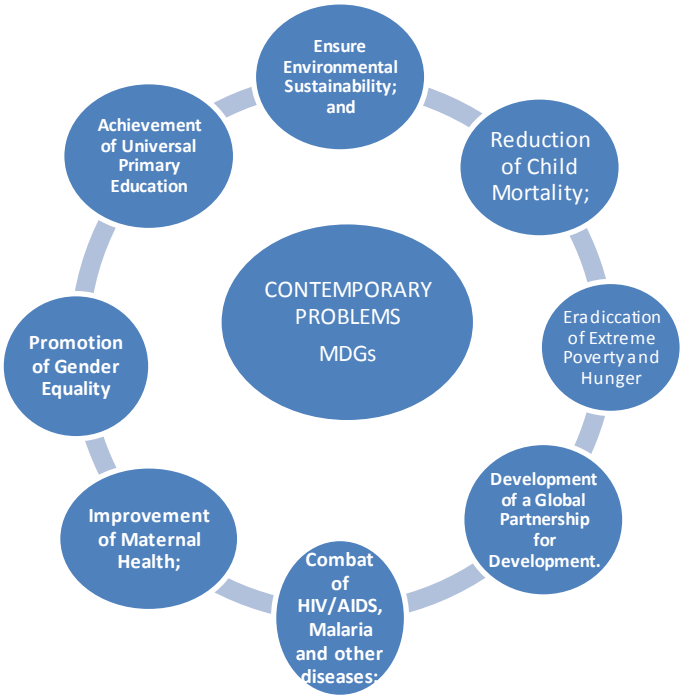

Figure 3. Contemporary Problems (MDGs)

In order to actualise these goals, there is need for a reform in Education.

The burden of the implementation of any curriculum reform lies with the teacher, as he is so central in the implementation of any educational policy. His training is equally important as no nation can rise above the quality of its teachers. (FRN, 2004).

Mr Vice Chancellor sir, the essence of this Lecture is to situate the teacher within the context of the parameters required for successful implementation of the school curriculum against the backdrop of his academic and professional dispositions. This is so because the teacher is the one that bears the burden of the implementation of curriculum reforms

THE TEACHER AND HIS ROLES IN THE PROCESS OF CURRICULUM IMPLEMENTATION.

WHO IS THE TEACHER?

In its simplest form and to a layman, a teacher is anybody who can handle chalk, talk to the learners in an organized classroom situation and can transcribe his speech in a note form on the chalkboard, what is now called the white board for the learners to copy. Viewed against this background, anybody

could be a teacher. However the teachers' role entails much more than standing in front of a classroom. The classroom interaction is only part of his role. Teachers who are effective, realize that a teacher wears multiple hats.

Within the context of the contemporary Nigerian society, the nomenclature of the teacher may change, depending on the level at which he is operating. Thus, at the basic education level, he may simply be called "teacher". At the secondary school level, he may be addressed as "tutor", and at the tertiary level, he is referred to as "lecturer" or as "university don". Despite the differences in nomenclature, the duties performed by this kind of person are basically similar if not the same.

Environmental factors however, may affect the nomenclature of the teacher and the teacher may assume societal definitions or names depending on the circumstances and his attitudes within the society he finds himself.

The identity and nomenclature crisis is more serious with the primary school teacher. Because he operates under humiliating working condition, he is not too happy to be addressed in public places as a 'teacher'.

Before the inception of the National Primary Education Commission (NPEC) now UBEC, in Nigeria, the primary school system was in complete disarray. The meager salaries of primary school teachers in most states and local government staff were in arrears. In fact teachers' salaries were irregular. Even as of now in some instances where teachers were paid at all, such payment came after all the other government staff must have been paid their salaries. It was so strange if any other form of payment was made to the teacher apart from his basic salary. No leave grants, no disturbance allowance, no mileage claims, no hospital bills, no housing allowances even though, his contemporaries in other areas of service were enjoying such facilities.

There are no good housing facilities and policies for teachers. In the primary schools, he may be found teaching under shades of trees as depicted in Figures 4 and 5 respectively.

Figure 4: A Teacher operating under shades of trees.

Figure 5: A typical classroom under the shades of trees.

Where classrooms are available, they are as bare as a football field as shown in Figures 6 and 7 respectively. While other classrooms are dilapidated as shown in Figures 8,9 & 10.

Figure 6: A Bare classroom

Figure 7: Another Bare classroom

Figure 8: Collapsing classroom with children at the background.

Figure 9: Collapsing roof of a classroom.

Figure 10: Another collapsing roof of a classroom.

Figures 8, 9 and 10 above Show Students studying in dilapidated classrooms.

Instructional resources are lacking and the chalk which is the basic working implement of the teacher becomes an essential commodity in many schools.

The situation is not different at the secondary school level either. The learning environments lack all the basic requirements that can make the teaching/learning process conducive due to poor funding of education.

The situation is even more pathetic at the tertiary level of education. Most institutions of higher learning have no welfare programme for their teachers. Under these working conditions, the role of the teacher becomes difficult and this tend to affect his traditional roles keeping him in dilemma.

The following account gives you the picture of the dilemma faced by teachers.

Commenting on the pathetic low funding of the University education and the incessant ASUU strikes, Professor Festus Iyayi, former National President of ASUU commented on the main issues at stake, states that:

- People keep talking about universities rating, but no Nigerian university features among the first 1,000 in the world because of the issue of lack of facilities.
- In response to ASUU demands for increased funding, Government set up a committee called the NEEDS ASSESSMENT COMMITTEE and it went round the universities and what it found was shocking.
    - teachers ratio to students was 1:400 on the average instead of being 1:40

- classrooms were grossly inadequate and could accommodate only about 30 percent of the number of students that needed to enter those classrooms;
- students standing in their lecture theatres with other students writing on their backs;
- they found lectures going on under trees in some of the universities;
- they went to laboratories where they found people using kerosene stoves instead of Bunsen burners to conduct experiments;
- They found specimens being kept in pure water bottles instead of the appropriate places where such specimens should be kept.
- They found chemistry labs without water;
- They found people doing examinations called theory of practicals and not the practicals.
- e-libraries, where they exist cannot be assessed because of lack of light;
- lecturers have generators in their offices to be able to work
- Every department has two or three generators to be able to do their work.
- Is that what a university should be like?
- If you go to the students' hostels, they are in a sorry state, they live 12 in a room; they are like piggery;
- they now have what they call 'shot putts'
- they excrete in polythene bags and throw them through the windows into the fields because there are no toilets

- If you come into this building (faculty building), there are no toilets and, if walk round, you will find faeces sometimes in the classrooms because students have no place to use.
- Against the backdrop of these complaints, more private universities are being approved by government. Will this help to solve the problem?

  Even the National Universities Commission (NUC), which is licensing private universities, has now drawn attention to the crisis of quality in many of these private universities.
- So, what is happening is that government wants to kill the public universities just as it has killed its own enterprises so that it can invite people to come and buy over the public universities? Unfortunately, it will not work because universities are not like enterprises.

THE ROLE OF THE TEACHER.

There are so many roles known and played by human beings that it becomes difficult to define the term role. Afe (1994), had expressed similar opinion when he wrote that: Indeed many types of roles are known to human beings. He outlines such roles as:

i. kinship roles as father, mother, brother, sister;

ii. sex roles as males and females;

iii. social roles as friends, entertainers; and

iv. Occupational roles as teachers, engineers, architects, lawyers, doctors, etc.

According to Afe (1994), roles are "prescriptions" about the behavior of a person occupying a given position, a set of guidelines, which direct the behavior of the role incumbent or the "actor". Roles from this perspective

consist of sets of expectations. Roles may be either ascribed or achieved. Ascribed roles are inherited and cannot be changed. Such roles as sex and kinship are ascribed. Achieved roles can be learned and mastered for differing purposes to effect changes in behavior as well as achievement.

The terms job or function are sometimes conceived as role. Thus educationists write on the teachers' job or function in the process of education.

Akpoo (1994) described teaching in Nigeria as a job and not a profession. On this basis, therefore, teachers in Nigeria at whatever level have been categorized as follows:

(a) Those who view teaching as their calling and they can best serve Nigeria in that capacity.

(b) Those who are in teaching accidentally and are thus satisfied as compared with other occupation.

(c) Those who cannot make it anywhere but because they have the minimum qualification required, joined teaching out of necessity rather than choice.

(d) Those with poor academic records and cannot pursue higher education.

These categories of teachers are found at all levels of our educational system. The influx of this category of teachers into teaching is traceable to the period of the Universal Primary Education (UPE). The implication of the presence of these categories of teachers in the Nigerian educational system is the effect such teachers come to bear on the performance of their roles.

Typically, the Nigerian school teacher at the primary school level for example was conceived as an innovator. He was a "local champion" in the village introducing new modes of dressing. It was the teacher that introduced also the bicycle, the radio, and the gramophone. The teacher was the community scribe, the community lawyer, information and welfare officer, a

counsellor, a political analyst, a special consultant on medical issues, a public and private bureaucrat, a social administrator, or even a journalist. The teacher was indeed described as knowledgeable.

Within the context of the school system, the teacher performs several roles. Such roles may relate to both administrative as well as academic issues: He is a facilitator of learning, he substitutes the parents, and he is a judge, a confidant and a surrogate of societal values. Consequently, a teacher is expected to act in certain manners that demonstrate the position he is occupying. The following diagram depicts the role of the teacher in the contemporary society

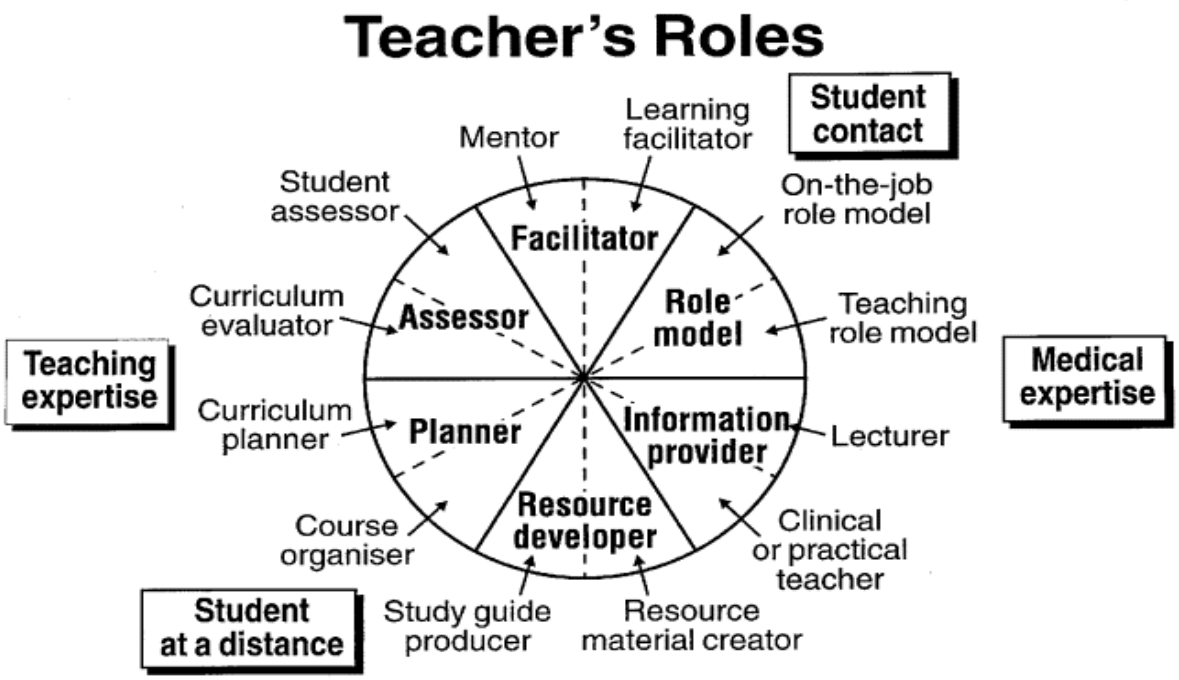

Figure 11: The Teacher's Roles. Retrieved from

https://www.google.com.ng/#tbm=isch&q=Teacher%27s+Roles

DETERMINANTS OF THE TEACHER'S ROLE

Determinants of the teacher's role have been studied and identified. Obanya (2015) affirmed that these roles are dictated by: the teaching tradition, teacher's background, philosophical traditions, teacher's needs, the school

community conditions, and research on the learning process (philosophical and psychological issues in context here).

Afe (1994) identified four determinants of the teacher's role namely: (1) the society, its institutions and sanctions, and its values and mores;

(2) The agencies of education and the educational personnel;

(3) The pupils and their needs. Their performance and level of achievement, the curriculum to be covered and the methodology employed;

(4) The teacher's perception of his roles.

These determinants are illustrated in Figure 12:

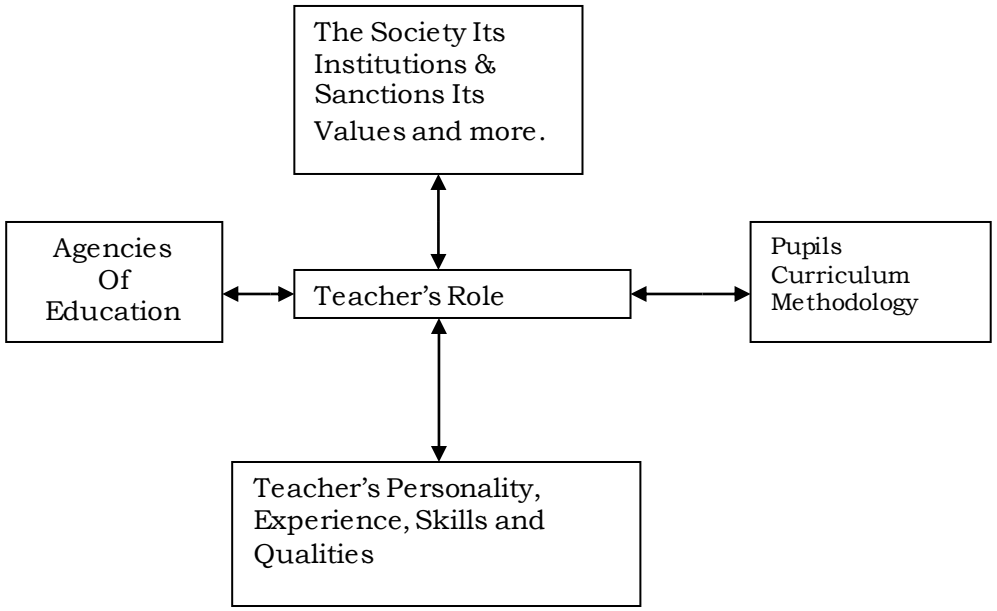

Fig 12: Determinants of the teacher's role adapted from Afe (1994).

Whether the determinants of the teacher's roles are society based, or they are from the learner's or teacher's perspective, the effective performance of his roles must be consistent with the prescriptions in the National Policy on Education about the teacher.

The National Policy document states that: "All teachers in our educational institutions, from primary to university will be professionally trained" (FRN, 2004).

Such a professional teacher is expected to perform academic roles as well as leadership roles. He must have a grasp of the general principles relating to successful teaching and learning. Successful teaching must necessarily be reflected in educational output (students' achievement or performance). Even though there are factors that may affect students' performances, Oladebo (1987) likened the success of any educational system to a "tree". Teacher education is its roots, university education is the stem, secondary, primary and special technical education, and administrators, students, etc. are its branches and the leaves. If the root is harmed, the stem shrinks, the branches wither, the leaves fall and the tree dies.

With respect to the Nigerian system of education, there is evidence to show that the root of our educational system is harmed. There has been wide cry of falling standard of education, (WAEC Chief Examiners report 2014) several factors are said to be responsible; and however, there is no factor that is as crucial as the teacher.

As far back as 1986, the Faculty of Education, University of Ibadan, disturbed by the high rate of failure at the secondary school level devoted a week to provide opportunities for experts to analyze the various factors responsible for the trend. Several other professional bodies (STAN, MAN, NASER, CON) have similarly analyzed the factors responsible for poor performance of students. The consensus was and has always been the teacher.

In 1999 again, an inter-university collaboration teacher education conference took place at the University of Jos under the auspicies of the Faculty of Education of the University. This conference discussed and crystallized ideas on improving teacher education in Nigeria.

Similarly, the Benue State Government felt very concerned about the performance of students in sciences over a period of time and commissioned a

study in 1993 to ascertain students' performance in Science. The findings showed that the performances had been poor.

One reason advanced by the findings is poor quality teachers caused by inadequate teacher preparations in addition to lack of incentives and teacher motivation.

Teachers appear to have deviated from their traditional roles. It is a common practice in Nigeria to engage teachers at very short notice to perform ad-hoc assignments such as: census enumeration, review of voters' registers, elections at all levels and other assignments. The teacher may be assigned as a supervisor of a polling booth. These jobs that do not require special skills and expertise usually take the teacher away from his traditional roles of teaching the children. All these have become the changing roles of the teacher in contemporary Nigeria.

Members of other professions such as doctors, architects, lawyers, etc. are hardly recruited by the society to perform such ad-hoc functions. Schools usually remain either closed or without teachers during the period of these assignments.

Consequently, there are missing gaps here and there in the implementation of the school curriculum. This has grave implication on students' achievements.

In terms of recognition and respect, the teacher ranks lowest. Abenga (1993) has pointed out both inequality of life and role perception in the society. The teacher can never be invited as a chief launcher at any fund raising ceremony. He is not recognized in official church functions because he cannot donate. Ladies in the society show preferences for other professions in terms of mate selection because the teacher is in no position to spread the naira.

With these developments, the teacher's attention, interest, loyalty and dedication to his work become divided. This indeed is the dilemma the Nigerian Science Teacher finds himself. Rather teachers look elsewhere for survival. There is the private practice. The basic aim of teaching is that learning should take place, unless the teacher performs his role creditably, higher achievements in pupils' academic pursuit will be an illusion.

FACTORS STIMULATING THE ROLE OF THE TEACHER IN NIGERIA.

Nigerian society today more than ever before has undergone, is undergoing, and will still undergo "metamorphosis" at a fast speed. The life style of the average Nigerian has drastically changed, particularly for those who are staying in urban areas.

The traditional Nigerian teacher will equally have to change in order to meet up with the present dispensation. This is more so because these changes have effects on the average Nigerian school child who is to be educated.

The impact of science and technology is today felt in all spheres of life. Basic utilities and comforts of life such as light, pipe borne water, telephone and other amenities have found their way into the rural areas. In most cases, some of these amenities fail to function, thus becoming monuments. Yoloye (1982) had pointed out that despite the building of the Kainji Dam, Nigerians still invest heavily in buying lanterns. This situation has not changed even today. The present investment in power generation and distribution has even worsen the situation. Estimated bills have empoverished Nigerians and exploited the citizens as prepaid meters are deliberately not installed in homes and public places. Generators popularly called "I pass my neighbor" are a regular feature of houses and offices. With water system available, Nigerians still resort to digging pit latrines. All these developments point to the necessity of an

effective education system, so as to equip the child to live successfully in the changing world of his time.

In the home, availability of electricity supply means that the households use refrigerators, radios, video cassettes, television, electric fans, pressing irons, water heaters, etc. At work Nigerians occupy air conditioned offices, use complicated gadgets, such as scanners, computers, and photocopiers smart classrooms, we use video conference equipment etc. The rapidly changing economic fortunes of the country demands that technical experts such as engineers, doctors and technologists should be produced to man strategic positions and also to propel our society to an enviable position of greatness.

Various other changes in the society that have direct impact on the role of the teacher in the educational system could be political, socio-cultural and religious.

We can therefore rationally look at the teacher preparation programme in Nigeria and ask pertinent questions as to whether the teacher is put in the dilemma or indeed he feels confident in the implementation of the science education curriculum at the foundation of the educational system in Nigeria bearing in mind that no building can be stronger than its foundation.

CHAPTER TWO

CONCEPTUAL FRAMEWORK

Mr. Vice Chancellor Sir, distinguished audience, the next part of this Lecture attempts a conceptualization of the key concepts embedded in the title of this Lecture, these are: Education, Science, Science Education, Curriculum, Reform and Curriculum Implementation.

This conceptualization is very crucial because a critical discussion of the dilemma of the science teacher in the implementation of the science education curriculum reforms can only be meaningful within the context of a thorough understanding of the issues underpinning the education enterprise.

EDUCATION.

The introductory part of this lecture dealt extensively with the importance of Education and its contribution to development of nations. No attempt was however made to conceptualize education within the context of its meaning and methodology or process.

Let me recall what I learnt in a book titled "Lexis & Structures" several years ago when I was in the secondary school. Education was defined as: "Education is a process through which the intellectual, moral, physical emotional, social and psychological capacities of an individual are nurtured so that he becomes a matured member of the society."

An analysis of this definition brings out clearly what is technically called "Educational Domains", namely: *cognitive, psychomotor and affective,* referring to: knowledge, skill and attitude respectively.

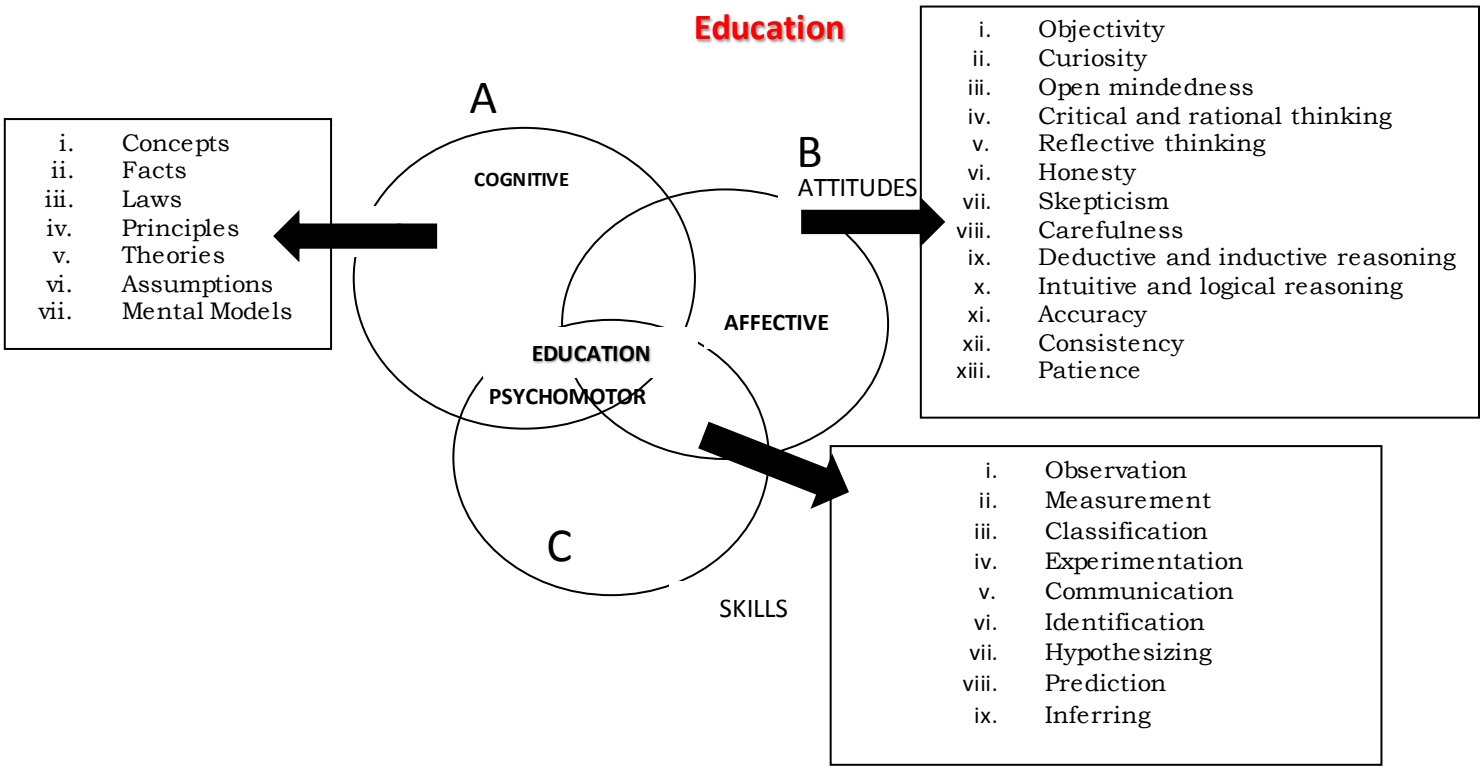

Figure 13 illustrates the concept and content of education.

Circle A refers to the Cognitive domain, circle B refers to the Affective domain while circle C refers to the psychomotor domain. The aspects of each of these domains are contained in the surrounding boxes. It is the teacher that is saddled with the responsibility in the entire process of education, teaching for knowledge acquisition of skills and inculcation of attitudes into the learner.

In its simplest form, education is a process which provides the young ones (youths) and even the aged, with the knowledge, skills and values which the society cherishes and believes are necessary.

All over, the world therefore, education is given priority as a deliberate strategy for reawakening in the citizenry the need for consciousness in its use for effecting national development.

In virtually all nations, education has been recognized as an important determinant of living standards because of its immense contribution in the transformation of societies, through enhancement of the quality of life of the

individual and building up his personality, thereby making him useful to himself and the society he belongs to. It is seen as a continuous process, more than systematized training received in schools. It is a process that starts from crave to grave. In developing countries like Nigeria, education should aim at promoting national unity, removing social inequalities, training for self-reliance, promoting international understanding etc.

As has been mentioned in the preceding discussion, whether formal or informal, education is capable of catalysing far reaching changes in the society. It's immense worth and contributions to the development of persons, institutions of public agencies, nations, etc. have become fully accepted. Nations of the world are therefore laying emphasis on education as a tool for the transformation of their societies.

In recent past, for example Nigeria set an agenda for the year 2000. Everything was possible by the year 2000. That magic year has come and gone, but we have not been able to realize health for all by the year 2000; shelter for all by the year 2000 and education for all by the year 2000. This agenda has again been shifted to the year 2015 and now 2020. Vision 20:2020 is the new development concept for Nigeria.

The onus of the achievement of Vision 20:2020 resides in the education system of the country. Education is therefore, viewed as an effective tool that can be used to respond rapidly to the changing needs and aspirations of any nation.

The MDGS have now been replaced with Sustainable Development Goals SDGS (2015). The school becomes the focus, and the curriculum, the major driving force to provide the needed drivers for the achievement of the vision while the teacher is the main actor. The curricula at various levels must be tuned to lubricate the wheels and make the hub of the Nigerian education system free

and flexible enough to accelerate the attainment of the new aspirations of Nigeria towards the realization of Vision 20:2020.

SCIENCE AND SCIENCE EDUCATION

The focus of the lecture is on Science Education Curriculum reform. It is therefore desirable to clarify these terms within the context of this lecture. The curriculum of the basic education is a variegated cargo of various components of different subjects. Information and Communication Technology, physical and Health Education, Agricultural Science, Mathematics etc. Thus Basic Science and Technology (BST) is sometimes used synonymously with Basic Science. We shall therefore bundle the various components of the Basic Science Curriculum into one: Science Education.

For Okebukola (2007), Science Education is the provision of learning experiences in science in formal, non-formal and informal settings. For the purpose of this lecture, the focus is on formal science education given in schools namely; Lower Basic (Pry 1-3) Upper Basic (Pry 4-6) and Junior Secondary Schools (JSS 1-3), within the 9 – year Basic Education Structure in Nigeria.

To appreciate the dilemma of the science Teacher in the implementation of science education curriculum reforms at the Basic Education level, we will explore the popular view not only of teachers but that of other scholars about Science.

What conception do people hold about the nature of scientific enterprise? This is necessary because the conception people hold especially teachers to a very large extent determines the way science is taught in the school. Ada (2004)

Science Teachers Association of Nigeria (STAN), the authoritative professional body of the science teachers in the country, conducted a research in 1984 to ascertain the understanding of the nature of science by science teachers and their pupils. STAN argued that it was necessary to establish the relationship between the extent of understanding of what science is and the manner of teaching and learning science.

STAN believed that an attempt at improving the quality of science teaching in Nigeria should start with an understanding of how both teachers and students perceive science. This argument can rightly be rationalized on the basis of the knowledge of science which would implicitly imply that instruction by teachers is tailored to suit the child's conceptual understanding of the world.

This approach may also help resolve the problem associated with the manner science is taught. Equally important is the understanding by non-schooling community (other stakeholders) who are known to influence science teaching by virtue of being either parents or policy makers who play active role in collectively promoting education.

This study covered the entire Nigeria, grouped into 5 zones namely; South-West, South- East, Central, North West including FCT and North East. The area covered by the research is shown in figure 14.

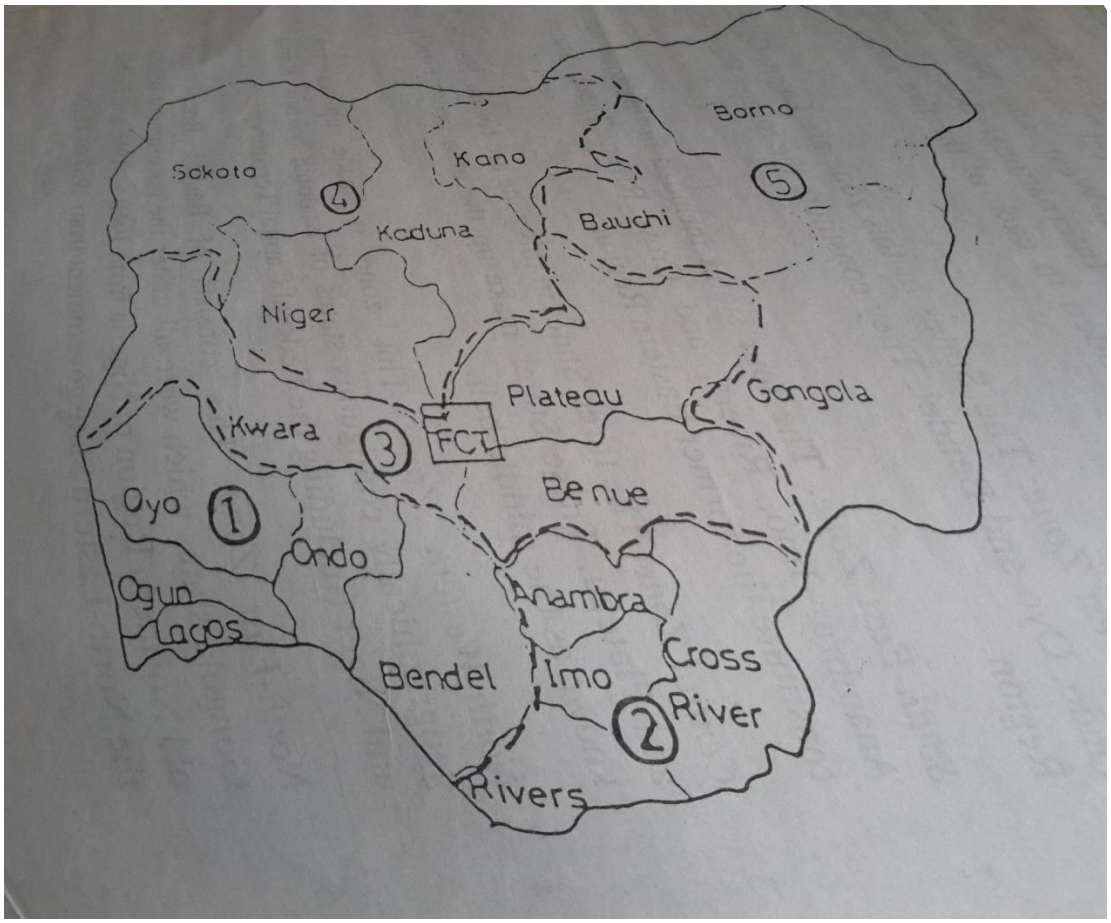

Figure 14. Area of Study by STAN on the Concept of Science.

The population for the study consisted of;

a. Primary Six pupils enrolled in all the primary schools in Nigeria.
b. Classes three to five (3-5) enrolled in all the Secondary Schools in Nigeria.
c. Students enrolled in Science and Science based related departments/Schools/Faculties in all post-secondary institutions in Nigeria
d. All Science Teachers in Nigeria.
e. All Civil Servants, traders, artisans, members of the armed forces and other Nigerians not in categories (a) to (d) above.

SAMPLE

A multi stage random sampling was used in selecting five (5) categories of samples distributed as follows:

- Primary Schools - 3,168

- Secondary Schools - 1,944
- Post-Secondary - 1,836
- Science Teachers - 1,224
- Others - 1,224

Questionnaire was used for data gathering. The questionnaire was designed to seek the opinion of the respondents about science. Test-retest stability coefficients were obtained for all categories of samples, by comparing the responses of a pilot sample. (The R-values ranged between 0.67 and 0.81).

Three independent experts in science were chosen as judges and they read through and obtained common ideas on the frequency of occurrence of the ideas. The judges reached consensus agreement regarding five (5) central ideas as follows:

I. Science described in terms of methods or processes in relationship to what scientists do.
II. Science described in terms of products as mode of study or as a body of knowledge.
III. Science described in terms of motives, ethics or utility value.
IV. Science described as a way of life
V. Science described as a search for meaning or explanations of events in nature.

The summary of the results from the different strata shows that most of the respondents hold the view that science is a body of accumulated facts (product), the implication being that the learning of science begins and ends with the acquisition of facts. This is what Gilbert Osborne and Fensham (1982) described as static view of Science.

OTHER VIEWPOINTS OF SCIENCE.

Let us now seek the opinion of other scholars of the view about science and collaborate this with the views of a cross section of stakeholders in Nigeria.

1. Mbajiorgu (2007) pointed out that the conception of science that a people hold determines the way it is taught in school and may ultimately hold the key to its instrumentality in national transformation.
2. According to the Columbia Encyclopedia (1975), the word science originated from the latin word scientia which means "knowledge". It defines science as "accumulated and systematized learning, in general usage restricted to the knowledge of natural phenomena".
3. Conant (1951) defined science as "a series of interconnected concepts, conceptual skills that have developed as a result of experimentation and observation and these are again fruitful for further observation and experimentation". On the other hand,
4. Pyke (1962) itemizes what constitutes science as;

"The collection of facts and observation; the construction of hypothesis to explain the relations of facts to each other; the selection of further appropriate observation or the carrying of experiment designed to test the correctness of the hypothesis".

5. Ziman (1968) said that "to try to answer the question of what is science, is like trying to explain the meaning of life because science has become part of man's mind and has clearly influenced man in all his ways".
6. According to Jegede (1982), "the best way to describe what science is; is by itemizing what science is;

i) Science is a body of knowledge about the universe. This includes laws, hypotheses, facts, assumptions, definitions and theories. All these are called the product of science.

ii) Science is a process of inquiry for obtaining knowledge, usually called the process of inquiry because we engage in experimentation and observation etc.

iii) Science is a human activity carried out by scientists.

iv) Science is part of man's culture because it pertains to the role of science in improving the conditions of society.

v) Science is a social institution and an important agent of social change".

From all these definitions, it seems that all scientists believe that science should be viewed as an organized body of knowledge and a way of taking an investigatory look at nature.

Scientific training, however, involves a good deal of attitudinal training especially for those who have not grown up in a scientific culture. There are various scientific virtues to be inculcated if a student is to become a scientist. These are industry, patience, curiosity, open-mindedness, detachment (skepticism), self-discipline, rigorous and orderly thinking, and scrupulous honesty in reporting results.

The summary of all these views about science from my perspective is presented as follows:

Science may be viewed from three perspectives as follows: -

(1) Science as <u>knowledge,</u> knowledge about things around us. It is also a process of generating that knowledge and attempting to refine the knowledge so generated. This knowledge takes various forms such as:

(i) Concepts
(ii) Facts
(iii) Principles
(iv) Assumption
(v) Mental models
(vi) Theories
(vii) Laws

This body of knowledge has been generated and documented in written forms scientists call this <u>CONTENT</u> or <u>PRODUCT</u> of scientific enquiry.

(2) Science may also be viewed as a method or means of obtaining knowledge. Scientists achieve this through the use of different skills or processes.

These skills or processes as outlined by AAAS are:

- ❖ Observation
- ❖ Measurement
- ❖ Classification
- ❖ Experimentation
- ❖ Communication
- ❖ Identification
- ❖ Hypothesizing
- ❖ Prediction
- ❖ Inferring

These skills are used in the process of investigation. In doing all these scientists must demonstrate some attitudinal pre-requisites considered in the third aspect of the nature of science.

(3) The third aspect of science is the view that, science is viewed as attitude. Scientists must meet some attitudinal pre-requisites in their investigations or process of inquiry. These attitudinal pre-requisites include the following: -

- ❖ Objectivity
- ❖ Curiosity
- ❖ Open-mindedness
- ❖ Critical and rational thinking
- ❖ Reflective thinking
- ❖ Honesty
- ❖ Skepticism
- ❖ Carefulness
- ❖ Deductive and inductive reasoning

- ❖ Intuitive and logical reasoning
- ❖ Accuracy
- ❖ Consistency
- ❖ Patience

As part of man's culture, science accounts for the role it plays in everyday life and applications to human activity as in medicine, agriculture, communication, health, controlling and maintaining our environment, warfare etc. As a social institution, science is a vital agent of social and political changes. It is also an agent of economic and technological development of a nation.

The perception and knowledge of the nature of science on the part of the science teachers affects the way science is taught. Research evidence shows a positive relationship between the extent of understanding of what science is and the manner of teaching and learning of science. Akpan (1991), Akinmade (2001) and Akpan (2012) accompanying these discussion is a theoretical construct of the nature of science as shown in figure 15 below.

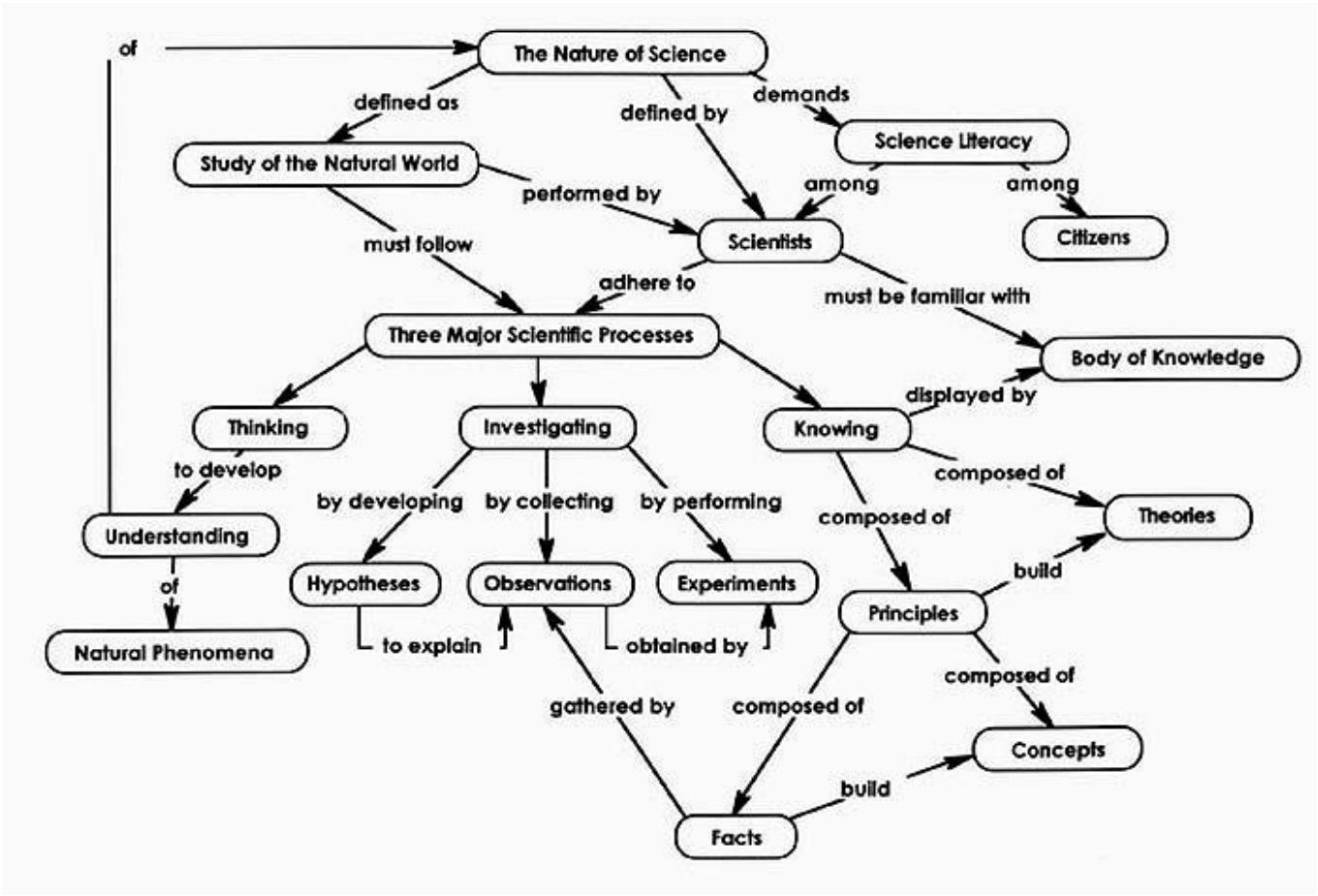

Figure 15: Nature of Science Concept Map

CURRICULUM

Curriculum is the medium through which educational institutions seek to translate the societal values into concrete reality.

Wiles & Bondi, (2007) define curriculum as planned occurrences in the classroom.

Other scholars view curriculum as consisting of three important components;

1. What is intended to be achieved (outcomes).
2. What is taught (content)
3. The manner of implementation (Methods).

Hosp and Howell (2007) view curriculum as the course or path embarked on, reflecting what is taught in the classroom. Hoover and Patton (2005) state that

curriculum must also consider the setting, strategies and management in the context of the content and skills being taught.

Okundaye (2003) in his description of curriculum, sees it as the inner engine which propels education to achieve for the individual and the society what they hold up a prize. Through it, educational institutions actualize what the society considers as desirable learning.

The major variables in the *human endeavor* are:

- Teachers – who implement the curriculum
- Students - who are basically the learners
- The support system – from stakeholders: Government, private, parent, employers of labour etc.
- The planners – who are usually experts that
    - Design the curriculum
    - Recommend implementation strategies
    - Evaluate to ascertain the extent of achievability of the curriculum.

Interactions amongst these categories of people may take place within and or outside the four walls of the classroom. This notion agrees with one of the views which holds that 'curriculum is what happens to students for which the school is responsible'

Curriculum is central to education at all levels in the world. It is indeed an instrument for possible education. Alade (2005) defines curriculum as a programme of education prepared for definite group of learners within a time frame in order to achieve the intended behavioral outcomes.

Adekole and Ajeyalemi (1994) in Ivowi (2009), defined curriculum as a systematic organization of a set of intentions about learning experiences for certain learners in certain justifiable arrangement of sequence and resources.

The above definition and implication imply that curriculum is a documentation, a blue print on which all the activities of the educational systems are based upon. It also means that curriculum is a framework of action for the educational system.

CURRICULUM DEVELOPMENT PROCESS

Curriculum development process begins with situational analysis. The situational analysis provides information based on the need to produce a relevant curriculum for a country.

The following steps then logically follow:

(i) An examination of societal aspirations – this is expressed in the overall philosophy of the nation.

(ii) Goals/objectives – These form the basis for choice of curriculum content.

(iii) Selection of content – This is handled by experts who are involved in the process of developing the curriculum.

(iv) Sequencing/integration – Learning experiences so selected are arranged in sequence and integrated to form the content.

(v) Trial testing – The selected content is trial tested with the hope of determining the workability and identification of possible areas of difficulties.

(vi) Evaluation – Teaching and learning are evaluated and assessed with the hope of determining the achievability and relevance of the curriculum within the context of the aims and objectives of the nation.

Modification (if necessary) – This step involves the implementation of the curriculum at various levels and making adjustments as desirable.

Various authors have adopted different curriculum development models; these models show the relationship between the different components of the

curriculum. Two typical Curriculum Development models are illustrated in the Figures 16 and 17.

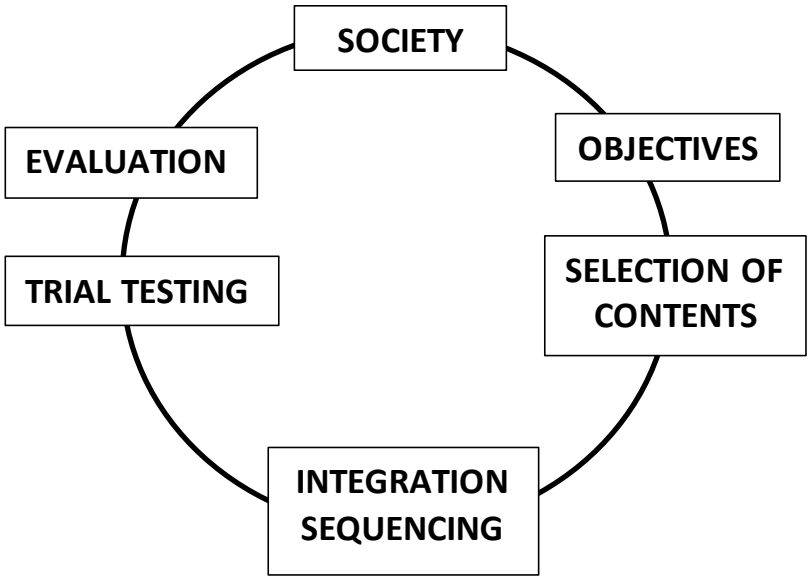

Figure 16: A typical curriculum Development Model

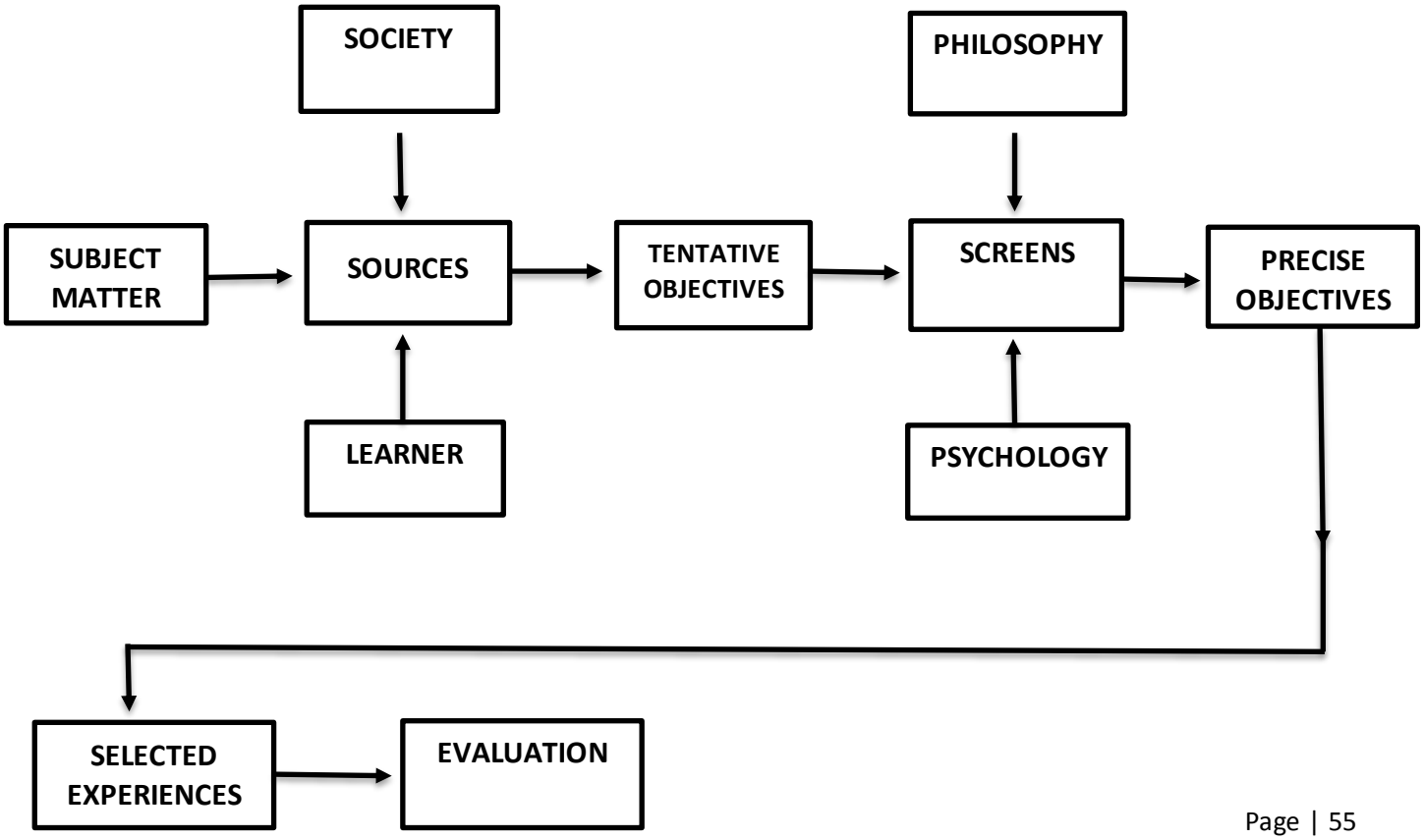

Figure 16: Tyler's Curriculum Development Model

The relevance of each curriculum is determined by the extent to which the products of the school system using such a curriculum are useful to both themselves and the society in which they find themselves. The failure of the school system in meeting the objectives and aspirations of a country usually calls for curriculum reforms. The critical questions to ask at this stages are:
Who are involved in the Curriculum Development process?
Is it the experts who are the Subject Specialists or the teachers who implement the curriculum.

Teachers in most cases are far from curriculum development process. They are however expected to implement the curriculum.

CURRICULUM IMPLEMENTATION

Curriculum implementation is one of the steps in the process of curriculum development. It involves the actual execution of the plan in a typical classroom setting. In implementing the curriculum, a network of interactions takes place between the teacher who is the implementer of the curriculum and the learner who is to benefit from the program.

Ivowi (2009) states that, curriculum implementation involves the dissemination of the structured set of learning experiences, the provision of resources to effectively execute the plan, and the actual execution of the plan in the classroom setting where teacher-learner interactions take place. For (Mkpa and Izuagba) (2009), during curriculum implementation, the learner for whom the program is planned, interacts with the contents and materials in order to acquire the necessary skills, attitude and ability. From these views, it is clear that curriculum implementation involves actual engagement of the learner with the planned learning opportunities under the guidance of the teacher.

The outcome of these interactions is the noticeable change in the behavior of the learner and new approaches to issues. At the center of this stage of the process of curriculum development is the teacher. It is the teacher who knows the right approaches, strategies, methods or techniques which are appropriate for dissemination of knowledge in the classroom setting. The teacher is the one who communicates and engages the learner during the teaching learning process. The outcome of the teaching learning process is the achievement or performance recorded by the learners, which educationists call Education Production Function (EPF) this is a theoretical construct which is derived from the process of education. EPF is a function of various factors namely; "The inputs and the process" illustrated in Fig 21

The interaction profile of the teacher and the students during implementation of the curriculum is discussed in the next section of this lecture.

CLASSROOM INTERACTION PROFILE

A number of models are available to explain what typically goes on during classroom interaction in a teaching learning situation. Two of these models have been chosen and discussed here for the purpose of this Lecture.

(a) Teaching learning process as a process of communication; and

(b) Teaching Learning process as engagement or involvement of the teacher and the students in purposeful activities.

As a process of communication, teaching involves transmission of information from the sender to the receiver and from the receiver to the sender. The teacher here is referred to as the sender of the message. He may have the message in form of facts, concepts, laws or theories. In conveying the message, the sender chooses the medium through which the message may be deciphered. The sender is required to formulate, encode and transmit the message to the receiver, who in turn decodes and interprets it. The sender then receives a feedback, i.e. the students' reactions. Through the feedback,

the teacher can determine whether his message is effective or not. The feedback from the students may come in different forms such as facial expressions, behaviors, body movements, performances in tests, examination, etc. an effective teacher should therefore be sensitive during classroom communication in order to detect negative or positive signals of his efforts in the classroom.

The components of the communication process are illustrated in Figure 18

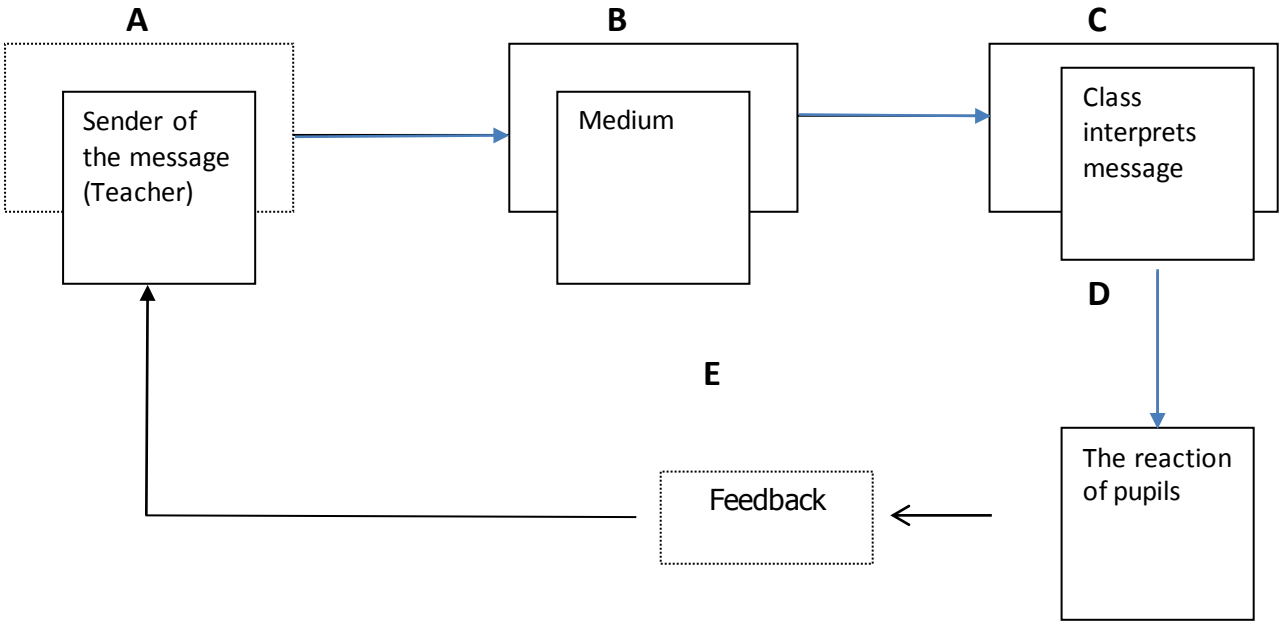

Figure 18: Components of the communication process

There are five components, A: B: C: D and E

HOW DO TEACHERS COMMUNICATE IN THE CLASSROOM?

Classroom communication exists in three categories: verbal, nonverbal and written. Verbal communication means anything that a teacher or student speaks aloud. Nonverbal communication refers to body language that people express. Written communication is writing directed at a specific audience, such as comments on student assignments. Teachers and students interact with one another in many different contexts, and use all three of these types of communication.

i. TEACHER/CLASS COMMUNICATION:

Teacher/class communication exists when a teacher communicates with the entire class. Verbal communication involves telling the students information they need to know. There are various ways teachers communicate nonverbally with their classes, such as through their posture, gesticulations. Instead of telling a student to stop talking, a teacher could use nonverbal communication by moving toward the disruptive student's desk. Not only does the disruptive student receive the message, but other students in the class who observe the intervention receive it as well. Written instructions for an assignment are given from the teacher for the whole class.

ii. TEACHER/STUDENT COMMUNICATION:

Teacher/student communication occurs when a teacher interacts directly with a particular student. Since a teacher interacts with the students mostly in front of the whole class, it can be difficult to distinguish teacher/student communication from teacher/class communication. Teacher/student communication requires that the teacher acts one-on-one with a student, such as during class activities, before or after class or after school. This type of communication is effective for teachers who want to communicate a private message, such as a talk about constant inappropriate behavior or about taking more of a leadership role in class.

iii. STUDENT/TEACHER COMMUNICATION:

Student/teacher communication is also direct communication between a student and the teacher, but this time it is the student who initiates the conversation. Also, this can occur during whole-class participation. For example,

a student who asks a teacher a question during class discussion engages in student/teacher communication because it is a single student communicating with a single teacher. The reason the reverse situation constitutes teacher/class communication and not teacher/student is that the teacher's actions and messages are directed toward the whole class while the student's questions here are only directed at the teacher. When students write emails to their teacher on graded assignments, this constitutes a written form of student/teacher communication.

iv. STUDENT/STUDENT COMMUNICATION:

Student/student communication occurs when two or more students interact with one another. Successful whole-class discussion stimulates student/student communication because students should talk to each other and not just to the teacher. Two students may disagree and talk back and forth to each other during such discussions. Student/student communication also occurs when students work in groups or pairs to complete assignments.

v. STUDENT/CLASS COMMUNICATION:

Student/class communication exists when a student or group of students direct their messages to the entire class. Whole-class discussion can also stimulate this type of communication. For example, if a student asks the class a question during a discussion, the student's message is directed at the entire class. Individual or group presentations also constitute student/class communication, and it is this type of communication about which students feel most nervous or self-conscious. Nonverbal communication often includes fidgeting or looking away.

Source: http://www.ehow.com/

THE TEACHING-LEARNING PROCESS AS INVOLVEMENT OF TEACHERS AND PUPILS IN DELIBERATE ACTIVITIES

The teaching-learning process as classroom instruction may also be viewed as involvement of teachers and students in three purposeful activities that are goal directed. In summary, the activities are:

i. Teacher's own activity: this involves planning, designing, writing and presentation of information etc.
ii. Pupils/students own activities: these involve independent study by the pupils or students, working out assignments, recording and interpretation of information etc.
iii. Interaction activities: these could be interactions between the teacher and the learner, the teacher and the materials, the learner and the materials and the learner and the learner. This is similar to the types of communication earlier discussed.

Diagram of Activities

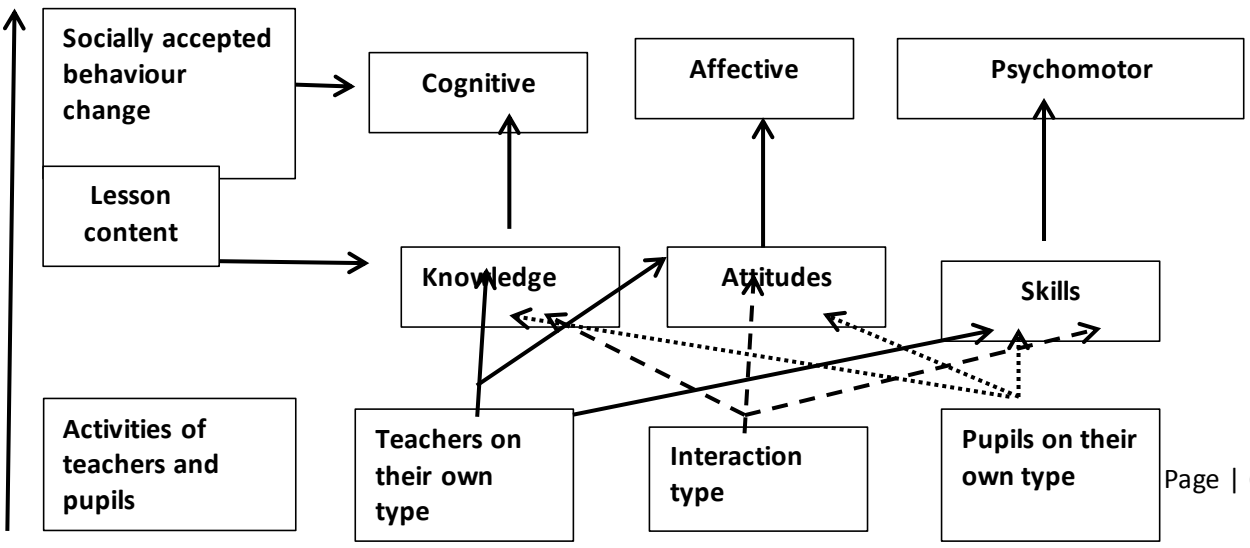

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Figure 19: The teaching learning process as the involvement of the teachers and the pupils in three types of purposeful activities.

Adopted from Mani T.C (1979).

Classroom interaction profile in the process of curriculum implementation is faced with a number of challenges. The detailed discussion of these challenges are made under the dilemma of the science teacher.

REFORM

The term 'REFORM' connotes the following as illustrated in Figure 20.

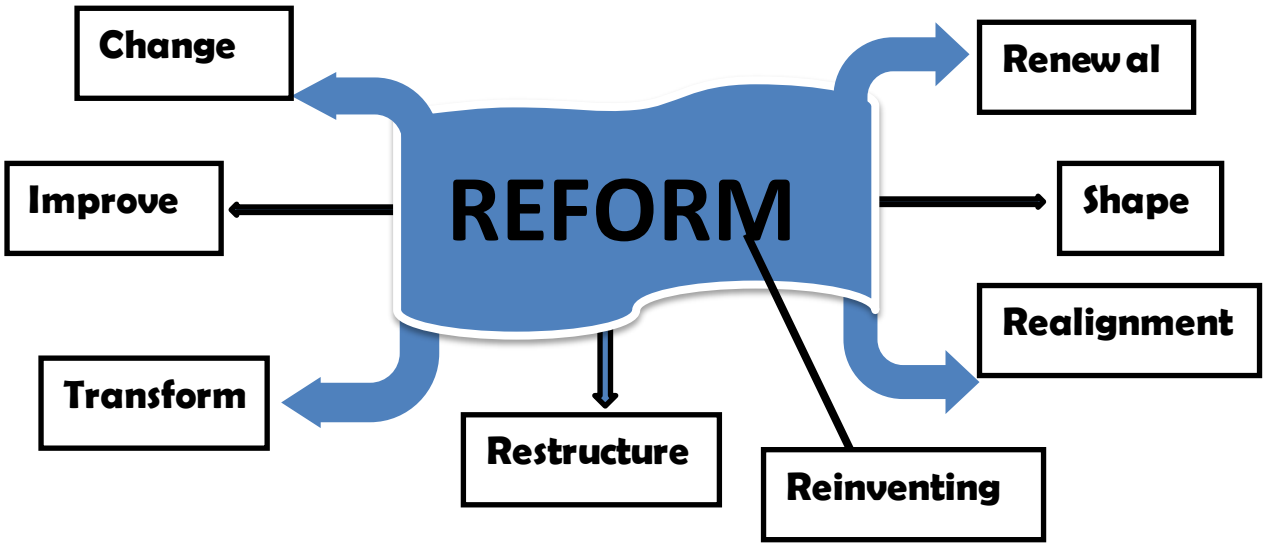

Figure 20: Reform as a concept.

Reform in the true sense according to Obanya (2014), addresses a genuine problem that reform tackles, as its root cause on the basis of strategic interventions that impact positively on the entire education system. From Obanya's point of view, reform in education would therefore mean attempting to evolve a strategic intervention that will address a genuine problem in education. Such an intervention it is hoped would impact positively on the entire education system, by responding positively to the needs and demands of

the changing nature of the society. The reform may be focused on the content of the curriculum which may lead to the modification of the components of the existing curriculum, such as the objectives structure and organisation, the methods of instruction or the inputs. All these are done with the sole aim of providing a better programme and achieving improvement in the education system (Gusau 2008). Attempting to differentiate between change and reform in education, Obanya (2014) points out that, change refers to alterations that do not have any profound effect on the system. Rather, such changes result in disruptions in the system. Such changes include;

i. Unsustainable rules and directives which are usually obeyed more in breach than compliance. For example, a number of regimes in Nigeria had introduced free and compulsory education at certain levels when it is practically impossible to achieve free education.
ii. Routine administrative interventions.
iii. Changes merely decreed into existence, e.g. in 1978, soldiers were deployed to schools in Nigeria to instil discipline in students. The action was tactically withdrawn and the reform died a natural death when it became impossible to implement the reform.
iv. Face-Saving changes: usually reforms are announced today and reversed the following day due to the difficulty in the implementation.
v. Politically motivated shake-ups.
vi. Ill-thought/feebly implemented ideas.

Reforms could focus on the entire process of education. The following diagram shows the various components in the process of education that may be reformed.

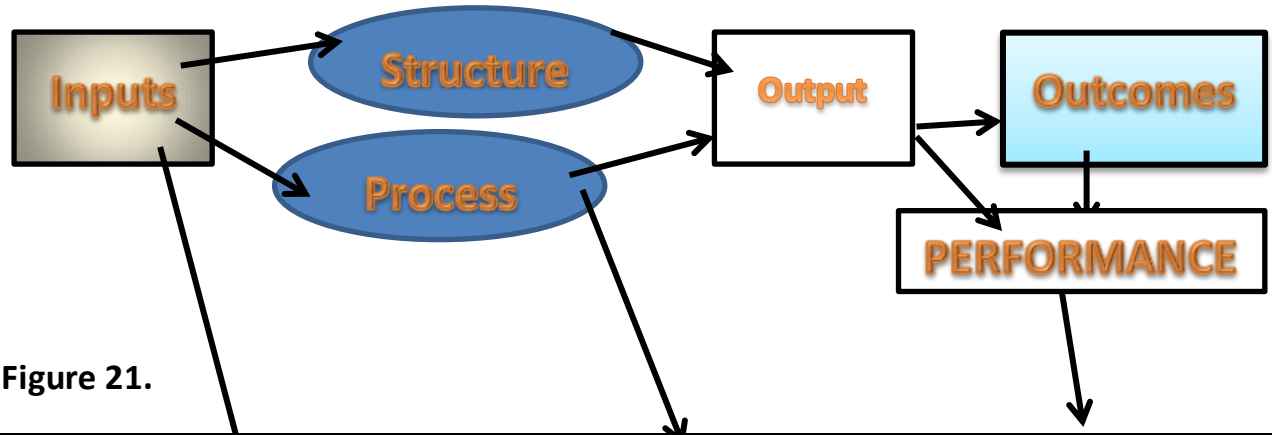

Figure 21.

STUDENTS	WHAT GOES ON	QUANTIFIABLE, MEASURABLE
The Nature of the Student or Learner admitted. TEACHERS. Leadership: Quality of Leadership. TEACHING RESOURCES: ○ Human and Non-Human e.g Craftsmen. ○ Textual and Printed.	○ Classroom (Interaction Profile) ○ Quality Assurance Mechanisms. ○ Teaching Strategies	○ Achievements. ○ Practical capabilities.
Time available for actual teaching and other activities.		
THE SCHOOL PLANT		
○ Classroom. ○ Seats.		

○ **Lab Facilities** ○ **Workshops.** ○ **Sanitary Conditions etc.**		

CHAPTER THREE

THE NIGERIAN SOCIETY AND THE NEED FOR REFORM OF THE SCIENCE CURRICULUM

Nigeria could be a great country in any way. The country is rich in human and material resources, and can rightly be described as one of the greatest potential countries in the world. Unfortunately, it has been argued correctly too that Nigeria is not sufficiently taping her potentials. The major reason for this seems to exist in a paradox; that Nigeria also has all the elements that can dwarf, if not drown the progress of a nation. This negative aspect of Nigeria is brought out by Tamuno (1982) who aptly put it:

From one institution to another,
From one sector of our national activities to the other
From one community to another
From one generation to another.
We observe this pathetic phenomenon
All things bright and beautiful,
All creatures great and small,
All things wise and wonderful,
Nigerians kill them all.

A foreigner once described Nigeria as one of the greatest countries in the world because of her immense capacity to absorb mismanagement. Whatever image has been created for Nigeria, right or wrong, it is the belief of most people that the Nigerian society is decaying. The Nigerian society has unfortunately been mercilessly raped, bastardised and almost completely destroyed through decades of insensitive regimes ranging from the military dictatorship to the civilian Governments. Nigerians themselves as citizens have destroyed Nigeria. Even the former Head of State, General Yakubo Gowon, stated publicly in 1997 that Nigeria was sick. He then organized a National System of prayer, ostensibly for Nigeria to recover from her sickness. Since then, Gowon is still the leader of the prayer group for Nigeria. The Catholic Bishops of Nigeria have composed two prayers called *"Prayer against bribery and corruption in Nigeria" and "Prayer for Nigeria in distress".* These prayers are recited in churches every Sunday. Various regimes at different times introduced various programmes to redirect Nigerians in their way of life: viz; War Against Indiscipline, War Against Indiscipline and Corruption, National Rebirth, ethical orientation, the rebranding saga, etc. This is the picture of Nigeria as a nation aspiring to greatness.

Consequent upon these emerging scenarios, education, particularly science education becomes a viable tool for bringing about desirable positive changes in the society through curricula reforms and their effective implementation.

THE NEED FOR NEW CURRICULAR OFFERINGS FOR NIGERIAN SCHOOL SYSTEM.

The desire and need for new curricular offerings in the Nigerian school system was deeply anchored in the belief that the colonial system of education was no longer relevant to an independent Nigeria with her own philosophy and

national aspirations and therefore needed to be cleaned off. The hope in the educational reforms continued to rekindle after independence. The freedom of self-rule Nigeria was enjoying had to match with educational progress. In September 1969 there was a National Curriculum Conference. Participants at the conference were eager to see Nigeria chart a new course in its educational system. Such a system they reasoned, will empower the country towards the path of scientific and technological development. They criticized colonial education system as lacking in vitality and relevance. The conference recommended changes in the system, from 6-5-2-3 system to 6-3-3-4 system; that is 6-year primary, 3-year junior secondary, 3-year senior secondary and 4-year university education

All the educational policy proposals in form of reforms in Nigeria have a link to the 1969 National Curriculum Conference. This Conference attended by stakeholders all over the country marked the turning point in the policy initiative of the Government, as it was the first attempt at national level to change the colonial orientation of the Nigerian educational system. The recommendations of this Conference were however left in abeyance for years.

Eventually, in 1977, the Federal Government issued its first white paper to make official and public, Government views on these recommendations, which became Nigeria's first National Policy on Education. This policy gave birth to the new system of education called the 6-3-3-4 system. Under this system, there is provision for six years of primary education, three years of junior and three years of senior secondary education (the first nine years of schooling up to the end of junior secondary education is what now constitutes the basic education segment) and four years of higher education. The new structure now is 9-3-4 system of education. This is a departure from the formerly operated 7-5-2-3 system (seven years of primary school, five years of secondary school, two years of Higher School Certificate and three years of university education).

The National Policy on Education enunciated in 1977 has been revised in 1981, 1998 and 2004 respectively. These changes among others are tilted towards meeting the needs of the use of science and technology and Information Communication Technology (ICT) where communication infrastructures like telephone, fax, E-mail and computer net-working have turned the world in to a global village. The Nigeria civil war which took place between 1967 and 1970, adversely affected Nigerian socio-economic development and consequently the country's educational system especially as many educational institutions in the old Eastern Region which served as a battle field were closed for a very long time.

The Second National Development Plan (1970-1974) which was put in place after the civil war, had as its main thrust, the overall national objectives to make Nigeria:

= A free and democratic society;
= A just and egalitarian society;
= A united, strong and self-reliant nation;
= A great and dynamic economy; and,
= A land full of bright opportunities for all citizens.

These national objectives were endorsed as a necessary foundation for a new national policy on education in Nigeria. A new educational national policy proposal was therefore the only re-kindled faith in Nigerians in the use of education as a major vehicle for national rehabilitation, reconstruction and reconciliation.

The National Educational Policy document prescribes that, education shall continue to be highly rated in the national development plans because education is the most important instrument of change. Any change in the

intellectual and social outlook of any society has to be preceded by an educational revolution.

In the present National Policy on Education, Government has stated that, "for the benefit of all citizens, the country's educational goals shall be clearly set out in terms of their relevance to the needs of the individual and those of the society in consonance with the realities of our environment and the modern world" [FRN, 2004 P. iii].

ANALYSIS OF NATIONAL PHILOSOPHY

An analysis of the national philosophy and objectives reveals that education should provide drivers for the attainment of the nation's philosophy. These drivers include:

- ⇨ New knowledge base – in this case with emphasis on Science Education.
- ⇨ Economy driven by new technologies
- ⇨ Emphasis on science and technology as a basis for development of skills of production
- ⇨ Expansion in types of education through establishment of more educational institutions
- ⇨ Emphasis on girl-child education
- ⇨ Provision of adequate resources (both human and non-human) for the implementation of the national policy
- ⇨ Provision of opportunities for advancement and professional growth of the teacher
- ⇨ Democratization in all our educational practices
- ⇨ Use of students-friendly teaching strategies
- ⇨ Inculcation of appropriate desirable attitudes that are cherished by the society.
- ⇨ Development of the individual into a sound and effective citizen
- ⇨ The full integration of the individual into the community and

- ⇨ Provision of equal opportunities for all citizens of the country at the primary, secondary and tertiary levels – both inside and outside of the school system.

How can the new curricular offerings be effectively implemented? The answer of course lies with the quality of teachers for the School System.

CHAPTER FOUR

NATIONAL POLICY ON EDUCATION AND TEACHER QUALITY.

Effective implementation of any educational reforms policy requires that human and non-human resources must be provided in sufficient quantity and quality. Teachers who constitute the human resource base for effective implementation of educational policies are the crucial inputs into any educational system. The National Policy on Education enunciated by the Federal Republic of Nigeria (2004) stresses that no system of education can rise above the quality of its teachers.

Similarly, various scholars, committees and conferences in the history of education in Nigeria have stressed the significance of the teacher. Ukeje (1991), for example stresses that teachers are the hub of any educational system. He concludes that it is upon their number, quality, efficiency and effectiveness that the success of the educational system and indeed the future of the nation depend. Teacher education is considered to be the foundation for quality and relevance in education at all levels. The problem of quality teachers in all fields of discipline seems to be an acknowledged one among educators and the general public at large. The higher elementary teacher of the 1960's became a misfit in the 1990s, the highly valued Grade II and I teacher of yester-years became irrelevant in the 20th Century and is still not relevant today. The Nigeria Certificate in Education (NCE) qualification for teachers of the Junior Secondary School is the most common qualification among teachers today, this qualification again is no longer adequate and relevant at this level, and rather the national policy on education recommends that NCE will untimely become the minimum qualification for entry in to the teaching profession.

The changing phases and paces of education in Nigeria require that teachers must also change if they will continue to be relevant and also serve as an effective implementers of the national curriculum.

What does the National Policy on education say about the teacher preparation in Nigeria to meet the demand for the implementation of reforms in education?

Mr. VC Sir, the National education policy document on issues and practices, is like the Bible to the teacher. Let us therefore turn to the Policy document which serves as a guide to all educational practices in Nigeria. It is important at this point to highlight the goals of teacher education in Nigeria as contained in the Federal Republic of Nigeria (2004) National Policy on Education:

GOALS OF TEACHER EDUCATION

The goals of teacher education in Nigeria are to:

1. Produce highly motivated conscientious and efficient classroom teachers for all levels of our education system;
2. Encourage further the spirit of enquiry and creativity in teachers;
3. Help teachers to fit into the social life of the community and society at large and enhance their commitment to national objectives;
4. Provide teachers with the intellectual and professional background adequate for their assignment and to make them adaptable to any changing situation not only in the life of their country, but in the wider world;
5. Enhance teacher's commitment to the teaching profession; FRN (2004)

If the training programme achieves these objectives, then Nigeria can proudly land into the arena of sustainable development because the type of

education given by teachers produced through this system will ultimately be qualitative.

Qualitative education presupposes that the teacher who is ultimately at the Centre of the entire education system becomes a determining factor in the implementation of the curriculum. It is therefore expected that the Nigerian teacher of the 21st Century with a new curriculum in science education was going to be an ideal teacher, produced by an ideal teacher education programme. However a number of pertinent questions have arisen considering the current quality of education offered in the country today.

PERTINENT QUESTIONS.

Mr. Vice Chancellor, at this juncture, it might be necessary to ascertain the extent to which the aims and objectives of teacher education as spelt out in the NPE have been achieved. The following pertinent questions become necessary as a basis for identifying objectively verifiable indicators (OVI) to the quality of the offerings of our education system:

1. How motivated and conscientious are the Nigerian teachers?
2. Do our teachers fit into the Nigerian society?
3. Are our teachers intellectually and professionally sound and adequate for their assignment?
4. Are our teachers committed to the teaching profession?
5. Has the Nigerian society prepared the enabling environment to enable the Nigerian teacher function effectively?

Answers to these questions can be found when we take a look at the Nigerian Teacher Education Programme in perspective and the Nigerian teacher.

NIGERIAN TEACHER EDUCATION IN PERSPECTIVE.

From historical perspective, the main concern of the teacher training institutions established by the Missionaries was to produce "teachers" who could serve as: Catechists, Deacons, Priests and Interpreters mainly for the purpose of evangelization.

What was the curriculum then?

The curriculum was centered on: the study of the Bible, Christian faith, preaching, theology, hygiene, history and geography.

Phelps Stock Commission of 1922 criticized this curriculum and called it irrelevant. An improvement on this was the establishment of Elementary Training Centre (ETC) in 1922 for the training of elementary school teachers for a 2-year course for certification as Grade II Teacher.

AFTER INDEPENDENCE IN 1960.

Nigeria got independence in 1960. Between 1967 and 1970, Nigeria experienced a civil war that destroyed both economic and socio-political lives of Nigeria as well as its education system.

There was therefore need for National rehabilitation, National reconstruction and National reconciliation. Education was therefore viewed as a tool for achieving all these. Universal Primary Education (UPE) was therefore launched in 1976 by the military. The unprecedented growth in population of pupils at the primary school and the corresponding increase at the secondary school level lead to enormous demand for teachers. Teachers' colleges were therefore taken over by the Federal Government while new ones were equally established for production of grade II teachers. The teacher quality therefore became greatly diluted by the introduction of a "Crash" programme for the training of teachers with varying entry qualifications at very short and limited period. Crash programmes were mounted for training of that has crashed on education system.

This development saw the entrants into teacher education programme who were to be trained as teachers (Variegated and assorted entry qualifications). These crops of teacher trainees were those that were not genuinely interested in the teaching profession. The reason for their opting as entrants into the teaching arena was anchored on the ease with which those who were trained as teachers automatically got employed after completion of their training classrooms were empty therefore teachers were needed. This approach over-produced teachers of low quality especially at the primary school level. There was therefore, outcry for reduction in the number of teachers produced. Consequently, Government embarked on the gradual phase out of teacher training colleges by replacing these teachers colleges with junior secondary schools JSS (now UPPER Basic Education Segment). The effect of this has continued to manifest in the present quality of teachers in the Nigerian school system.

This situation is not different from the other levels of the school system in Nigeria. This therefore, calls for reform in teacher preparation programme for the school system at all levels.

EMERGING REFORMS IN TEACHER EDUCATION

The statutory responsibility of producing teachers in Nigeria is vested in the following institutions:

i. National Teachers Institute (NTI) – by distance learning approach.
ii. Colleges of Education (These offer training in either single or double major areas).
iii. Institutes of Education (usually Part-time or Sandwich or Long Vacation approach).
iv. Polytechnics (NCE Technical, B. Sc. (Ed) Technology
v. Faculties of Education (These offer PGDE certificate, B.Ed., B.Sc (Ed), B.A. (Ed), M. Ed and Ph.D degrees).

At each of these levels, the component of training involves:

a.) General studies

b.) Education studies

c.) Specialized studies relating to the field of specialization

d.) Teaching practice.

The quality of teachers produced by this arrangement apparently does not seem to meet the demands of equipping the teacher trainees with knowledge, skills and attitude to enable them perform effectively their roles. This has therefore, led to the following fundamental questions about the teacher training programme in Nigeria.

A closer look at the graduate teachers being produced by the teacher education arrangement in Nigeria raises a number of fundamental questions about the institutions charged with the responsibility of training teachers:

(i) Are the Faculties of Education in Nigerian Universities, National Teachers Institute (NTI), Colleges of Education (COE) and Polytechnics properly positioned to carry out the business of training teachers that are of high quality?

(ii) Can these institutions reverse the current trend by removing the weaknesses at their various levels of the training programme? Or even correct the defects at the lower level?

(iii) Where does the fault lie? With the Inputs? or process? Can the system be rectified?

There are Objectively Verifiable Indicators (OVI) to accept the assertion that our educational system is not achieving the philosophy and objectives of our country as a nation. This assertion is supported by the following fundamental issues revolving around our educational system:

- Why are the current waves of examination malpractice in our educational system? Who is to blame: the teacher? The society? The government? The parents? The students?
- Why are Nigerian youths vandalizing oil pipe lines and cutting electric cables meant for provision of light for the people?
- Why is cultism striving in our educational institutions?
- Why are Nigerian girls involved in all forms of prostitution in and outside Nigeria?
- Why is sorting prevalent in Nigerian institutions of learning, manifested in:
    - Offer of money by students to lecturers for higher grades,
    - Sale of hand outs by lecturers to students,
    - Sale of 'yahoo-yahoo' publications (cut and paste publications) by lecturers,
- Why do parents hire/recruit people to write public examinations (JAMB, SSCE and NECO) for their children?
- Why do parents have to pursue admission of their children or wards into various institutions at all levels?
- Why bribery and corruption in Nigerian educational institutions?
- Why is there a mismatch between students' performance in SSCE/NECO, JAMB, and aptitude test scores emanating from screening introduced by Universities and other higher institutions?

These and many more are the gaps that have separated effective implementation of curricula at various levels of our educational system. Ironically, despite the fact that Education Production Function (EPF), is a product of various inputs into the educational system, the teacher factor appears to occupy a very central position in the entire process. This perhaps

justifies the reason for an examination of implementation challenges of teacher education reform in Nigeria.

The Education Sector Status Report also notes that there are complaints that the teachers produced by the part-time and sandwich programmes mounted by both the universities and colleges of education in the country can barely write an assignment (Federal Ministry of Education, 2003). The products of teacher education programmes of Nigerian universities and colleges of education are bound to be of low quality as the three major factors that determine quality (i.e. the process of selecting teacher education candidates, the programme of study during the training of the student teachers, and the institutional factors which include staffing, physical facilities, and funding) do not work in favour of academic excellence in most Nigerian teacher education institutions.

Quality in this respect refers to the steps taken by higher education institutions responsible for producing teachers to make sure that they are able to perform their jobs or render their services effectively. In other words, the steps they take to ensure that they produce 'quality teachers' instead of the more traditional 'qualified teachers' who just meet certain certification requirements.

If teachers are not able to teach primary school pupils well, as is presently the case with many of the Nigerian primary and secondary school teachers, or if they are not able to impart useful skills to them, then the MDG and the SDG of achieving universal primary education will be an illusion. This and other education related MDGs can hardly be achieved if there is no change in the present approach to the recruitment and training of teacher education candidates.

Current reforms introduced by the National Commission of Colleges of Education (NCCE). In response to the changing needs of the Nigerian society and the wide spread criticisms of the existing teacher education programme.

The National Commission for Colleges of Education (NCCE) updated its existing NCE Minimum Standards document.

The following is culled from the NCCE Minimum Documents for the training of teachers.

With the introduction of new programmes, it is hoped that the inadequacies inherent in the present arrangement for teacher education would be addressed especially with respect to basic education.

The new NCE Minimum Standard document is more focused towards the attainment of Education for All (EFA) and the MDGs. This is the component of the basic education sub-sector. Accordingly, in addition to the two subject combination in the NCE programme, which is suited for the preparation of the B.Sc (Ed) / B.A.(Ed) degree programmes, the new Minimum Standard document is now targeted at producing specialist teachers for:

(i) Pre-primary Education or Early Childhood and Care Education
(ii) Primary Education
(iii) Junior Secondary Education
(iv) Adult and Non-Formal Education
(v) Special Needs Education

(Source: NCCE Curriculum Implementation framework for NCE 2012 edition).

These programmes are thus level specific and suited for those who are aspiring to go further for B.Ed degrees. With this arrangement, institutions charged with teacher education will be preparing specialized teachers for each of the five levels of the basic education.

The present basic principles of emerging reforms in teacher education as proposed by the current dispensation are that:

i. The Nigeria Certificate in Education (NCE) curricula courses are to be age and level-specific, that is
   a. Early Childhood Education (ECE) and
   b. Primary Education (PE) – this is divided into Lower Primary and Upper Primary streams.

   The ECE and PE streams shall include the learning of the language of the environment.

ii. The minimum entry requirement into the NCE programme is four relevant subjects (as against the current three) in WASC, SSCE/TC II/NTC and NBC obtained at a maximum of 2 sittings.

iii. Bachelors of Arts, Science or Education (B. A., B. Sc. or B. Ed programmes are now to last for five years.

iv. Special incentives have been recommended for teachers posted to rural or disadvantaged areas.

v. Candidates studying courses that are under-subscribed such as Science, Technology, Mathematics and French in the country are also to enjoy incentives.

SOME CURRENT AD HOC ARRANGEMENTS FOR TEACHERS' TRAINING.

Teacher education programme in Nigeria has been a problem especially with the introduction of ad-hoc arrangements for training of teachers. These ad hoc arrangements include:

i. Expansion of the initial mandate of NTI which was mainly concerned with the training of Grade II teachers to cover the production of NCE.

ii. ETF intervention programme focused on Special Teacher Upgrading Programme (STUP) a programme which trains holders of SSCE/Pivotal Grade II who were currently serving as teachers and being trained as NCE holders after a period of 2 years.

iii. Federal Government in collaboration with the Universal Basic Education Commission (UBEC) to train serving teachers in the five core subjects: English, Mathematics, Social Studies, Primary Science and Introductory Technology.

The obvious worrisome issues in this ad hoc arrangement are:

i. that consultants are involved in the handling of the training programme who in turn engage trainers that are poorly remunerated.

ii. There is therefore no motivation of those who are involved in this process. In most cases, both trainers and trainees resort to protest before they are even paid their remunerations and course allowances.

The second issue is that of duration for the training programme which does not provide sufficient time for adequate coverage of course content materials.

This arrangement was witnessed during the 'crashed' teacher training programme during the UPE era. This arrangement is again in place with the introduction of the UBE programme. Teachers are therefore poorly trained. The end result of the poor preparation of teachers is that, many of them are not able to give their pupils quality education after the completion of their courses. Commenting on the quality of the present day teachers, one of the Vice-Chancellors of one of the Nigerian universities said that, the teacher of today is hardly a teacher because teachers are not as knowledgeable as they ought to be and that they cannot transmit knowledge as they ought to (*Daily Sun*, May 2, 2008).

CHALLENGES OF IMPLEMENTATION OF CURRICULUM REFORM IN NIGERIA.

A number of challenges tend to affect effective implementation of curriculum reform in Nigeria. These are:

i. Lack of consultation.

Reforms are supposed be discussed at various fora. Unfortunately, there is evidence of lack of consultation in the decision process as each Minister that takes over from his predecessor sometimes enunciates a policy overnight.

Let us share here the comments by Omolewa (2007), on how the education reforms in Nigeria went wild during the obasanjo regime.

> "The *reforms in education which in most cases probed disastrous to the system continue in the wrong direction. The success which Government credited to Bureau for Public Enterprise (BPE) for its ability at selling public goods at giveaway prices was to be extended to education. Remember sell of refineries, fertilizers, insurance and steel companies. There were talks of privatizing campuses of Federal universities and other tertiary institutions, as they said for greater efficiency of the resources. It was due to the concerted opposition of lecturers and students that finally laid to rest the impending doom. The planned privatization of Federal institutions continued to rage; this time around government targeted 102 unity schools in the country for sale as public private partnership (PPP). Opposition to the programme especially by the Association of Senior Civil Servants of Nigeria (ASCSN) did not deter the government from its intended course. The former Minister of Education then Dr. Mrs. Oby Ezekwesili defended the Government with all the market forces jargons, thinking that all of us can be cajoled into accepting what was a public rape of trusteeship. As expected, Unity schools were sold in the eleventh hour of the Obasanjo administration; quite predictably to select few in Government. It is unfortunate government in Nigeria mistook education for manufacturing industry. Education is much more than*

a refinery, Cement Company or what. Education deals with a totality of humans, it is a right not a privilege. To privatize education is simply to render large segment of our society illiterates because poverty would not allow them access to quality education. The damage does not stay there; the unity schools actually promote unity in the country's diverse ethnic and religious groups. Students who live and study together are most likely to tolerate and respect one another as compared with those students who were raised and nurtured in their ethnic enclaves.

In its excessive form, Obasanjo's educational reforms as championed by Ezekwesili became a cult; anyone who disagreed was shown the way out. It was not a surprise that senior civil servants in the Federal Ministry of Education kept mute, a wait and see attitude. The reverse of the transactions of the unity schools by the new Minister of Education Dr. Igwe Aja-Nwachukwu is certainly a relief to many of us who believe education is a right to all.

From the foregoing, one can discern the inconsistence and confuse nature of the Nigerian educational reforms. In the 70s government took over all voluntary and mission schools on the pretext of free universal primary education, this reform collapsed in less than a decade. Now the reincarnated Obasanjo administration gambled to sell the Federal Government Unity Schools to private capitalist, a complete 360 degrees U-turn. Then, what is the essence of educational reforms in Nigeria?'

Take a look at the number of ministers of education in Nigeria over the years and you will appreciate the magnitude of the reforms at different times in the history of this country.

The following people acted as Education Ministers of Nigeria, including Ministers of State for Education

With 46 ministers in the life of a country of 56 years old today, it is obvious that reforms in education have been short-lived to have positively impacted on the lives of Nigerians.

S/N	MINISTER	PERIOD
1.	Aja Nwachukwu	(1958 to 1965)
2.	Richard Akinjide	(1965 to 1967)
3.	Wenike Briggs	(1967 to 1970)
4.	A. Y. Eke	(1970 to 1975)
5.	Ahmadu Ali	(1975 to 1978)
6.	G. B. Leton	(1978 to 1979)
7.	Sylvester Ugoh	(1979 to 1982)
8.	Alhaji B. Usman	(1979 to 1982)
9.	Elizabeth Iyase	(1979 to 1982)
10.	I. C. Madubuike	(1982 to 1983)
11.	L. A. Bamigbaiye	(1982 to 1983)
12.	Sunday Afolabi	(Sept to Dec 1983)
13.	Alhaji Y. Abdullahi	(1984 to 1985)
14.	Alhaji Ibrahim	(1985)
15.	Jubril Aminu	(1985 to 1989)
16.	Babs Fafunwa	(1990 to 1992)
17.	Ben Nwabueze	(Jan 1993 to Aug 1993)
18.	A. I. Imogie	(Jan 1993 to Nov 1993)
19.	Alhaji Dongodaji	(Jan 1993 to Jan 1994)
20.	Iyorchia Ayu	(Jan 1994 to Feb 1995)
21.	Alhaji Wada Nas	(Jan 1995 to Feb 1995)
22.	M. T. Liman	(Feb 1995 to Dec 1997)
23.	Iyabo Anisulowo	(Feb 1997 to Dec 1997)

24.	Alhaji D. Birmah	(Dec 1997 to June 1998)
25.	A. N. Achunine	(Dec 1997 to June 1998)
26.	Olaiya Oni	(Aug 1998 to May 1999)
27.	Alhaji S. Saadu	(Aug 1998 to May 1999)
28.	Tunde Adeniran	(June 1999 to Jan 2001)
29.	Alhaji Lawam Batagarawa	(June 1999 to 2001)
30.	Babalola Borishade	(Feb 2001 to June 2003)
31.	Alhaji Bello Usman	(Feb 2001 to June 2003)
32.	F. N. C. Osuji	(July 2003 to Feb 2005)
33.	Hajia Bintu Musa	(July 2003 to June 2005)
34.	Chinwe Obaji	(June 2005 to June 2006)
35.	Halima Tayo Alao	(June 2005 to 2006)
36.	Grace Ogwuche	(Feb 2006 to June 2006)
37.	Oby Ezekwesili	(June 2006 to April 2007)
38.	Sayadi Abba Ruma	(June 2006 to April 2007)
39.	Adewunmi Abitoye	(June 2006 to May 2007)
40.	Igwe Aja Nwachukwu	(June 2007 to Dec 2008)
41.	Jerry Agada	(June 2007 to Dec 2008)
42.	Hajia Aishatu Jibril Dukku	(June 2007 - 2008)
43.	Sam Egwu	(Dec 2008 to March 2010)
44.	Ruqqayat Rufai	(April 2010 – Sept 2013)
45.	Mallam Ibrahim Shekarau	(2014 - 2015)
46.	Adamu Adamu	(Nov 2015 – Present)

CHAPTER FIVE

SCIENCE EDUCATION CURRICULUM AT THE BASIC EDUCATION LEVEL IN NIGERIA

Efforts to reform science education curricula in Nigeria with specific emphasis on reforming the teaching of science at the lower level of secondary education started in the 1970s after the curriculum conference of 1969. Prior to this, the country inherited a colonial system of educational where only bits of science teaching in the form of hygiene, nature study, Botany and natural philosophy were studied. The fact was that the missionaries did not have priority for science teaching. They were more interested in training clerks and evangelists (Abdullahi, 1982; Fafunwa 1974).

However, some notable events in the history of science teaching during the period were the beginning of governments' participation in education which saw the establishment of more universities. These universities were able to produce teachers that could teach science. Another notable event which occurred to promote science teaching was the inauguration in 1957 of the science Teachers Association of Nigeria (STAN). This organization has continued to popularize science teaching till today through conferences, text material publications and curriculum reforms in science. Specifically, STAN is the body that developed the first integrated science curriculum as well as the curricular (review) in Biology Chemistry and Physics among other science subjects. This development has the advantage of ensuring a smooth transfer of learning from integrated science to the separate science subjects of Biology, Chemistry and Physics. Reforms in science education curriculum in Nigeria saw the evolution of basic science from general science through integrated science

to what is now taught as basic science at the junior secondary school (JSS) level.

As Nigeria looks forward to a scientific, technological and economic development, it becomes imperative to start planting the seed of success in science at the childhood stage comprising of primary and junior secondary school because of the influence on the early education of the child. Since children begin career exploration at a very young age, the teaching of primary science is expected to be the starting point to a longitudinal pathway to a science career. Primary science learning is expected to provide the background for achievement in integrated science at JSS level which in turn should lay the foundation for achievement in science at the SSS level.

The task before integrated science curriculum, according to Abah (2004) is, therefore, two-fold, namely; to provide a sound general education for all Nigerian children; and, to lay an adequate foundation for those children who would further their education in the sciences.

The trend in curriculum development in Nigeria over the past years, show, however, that a lot of efforts are being put in place to improve the school curricula in relation to the happenings in the society. Such efforts saw significant improvements in the curricula of science and technology with a view to providing learners with life coping skills. The laying of emphasis on science and technology is understandable because of its capacity to raise the country's rank in global competitiveness.

In 2011, the National Council on Education (NCE) directed the Nigerian Educational Research and Development Council (NERDC) to carry out a review of the nine - year Universal Basic Education (UBE) Curricula. One of the outcomes of that review is the change in nomenclature and content of junior secondary school science. The subject hitherto known as basic science is now to be known as basic science and technology and is to be implemented this

academic session starting September, 2014. The reviewed curriculum, according to the Nigerian Educational Research and Development Council, which is the government agency in charge of curriculum development, the reviewed curriculum incorporated all observations, suggestions and new ideas noted in the implementation of the phased out curriculum. However, instead of proffering solutions, the review created new problems than intended to solve.

STRUCTURE OF THE NEW BASIC SCIENCE AND TECHNOLOGY CURRICULUM

The new Basic Science and Technology Curriculum, like the preceding one, is organized around themes which formed the integrating threads. The revised Basic Science and Technology Curriculum (NERDC, 2012) is a product of the restructuring and integration of four subject curricula previously taught at primary and junior secondary school (JSS) namely Basic Science, Basic Technology, Physical and Health Education, and Computer Studies/Information Communication Technology (ICT).

The Federal Government of Nigeria took a decision to introduce the Universal Basic Education programme in September 1988. This decision led to restructuring and realignment of all the extant curricula at both the Primary and Junior Secondary School (JSS) levels collapsing the duration into a 9 year Basic Education Curriculum with the implementation target set with effective from 2008.

The emphasis of the 9 year Basic Education Curriculum is on re orientation of values of the Nigerian School going children leading to the employability arising from generation of capacities among the learners Eradication of Poverty.

Of great interest to this lecture is the emphasis on reform initiatives designed to provide contents with emphasis on education that will provide experience and skills for socio-economic transformation of the Nigerian Nation.

The 9 year Basic Education curriculum is such that provides that Nigerian children will be in school for 9 years of continuous schooling made up of 6 years of primary education and 3 years of junior secondary education. The programme is targeted at improving relevance, quality and efficiency in education, reducing school dropout and promoting the acquisition of functional, literacy, numeracy, life skills and values for life long education and useful living. (NERDC, 2007). It lays emphasis on communication and entrepreneurial skills.

The place of science and technology in this programme is amplified in the lower basic education class (primary 1 – 3) where basic science and technology is one of the core subjects. At the middle (primary 4 – 6), and upper (junior secondary 1-3) classes, computer studies and ICT are compulsory. The programme stresses that instructional strategies that are activity based and ICT driven will be adopted. (NERDC, 2007).

The Objectives of Basic Science and Technology Curriculum

The Basic Science and Technology Curriculum (Revised: 2012) is expected to enable the learners:

- Develop interest in science and technology;
- Acquire basic knowledge and skills in science and technology;
- Apply scientific and technological knowledge and skills to meet contemporary societal needs;
- Take advantage of the numerous career opportunities provided by science and technology;
- Become prepared for further studies in science and technology;
- Avoid drug abuse and related vices; and
- Be safety and security conscious.

The National Economic Empowerment and Development need strategy (NEEDS) recognizes that Nigeria's economy could only be transformed and sustained through and effective education that empowers the people and assures the technological development of the country. (Igbokwe 2015)

Education is undisputedly the foundational component of Nigeria Transformation Agenda and Vision 202020. In Igbokwe's (2012) account. Between 2008 and now (2016), Nigeria has witnessed two major curriculum reform initiative at the Basic Education Level.

The thematic approach to content organization was adopted in order to achieve a holistic presentation of scientific and technological concepts and skills to learners. The Themes and Sub-Themes that formed the integrating threads for the Basic Science and Technology Curriculum are:

The Conceptual framework identified and grouped related disciplines, thereby, achieving (so to say) a reduction in subject listings. For example, basic science, basic technology, physical and health education (PHE), and Information Technology now combine to form a new UBE subject to be known as basic science and technology.

The Structure of the Basic Science and Technology Curriculum

Theme	Primary	JSS
	Sub-theme	Sub-theme
Basic Science	• Exploring our environment • Living and Non-Living things	• Learning about our Environment • You and Energy • Science and Development
Basic Technology	• Understanding Basic Technology • You and Energy	• Understanding Basic Technology • Materials and Processing • Drawing Practice • Tools, Machines and Processes • Safety

Physical and Health Education	• Fundamental Movements • Basic Movements • Athletics • Games and Sports • Health Education • Pathogens, Diseases and Prevention • Drug Eradication • Responsible Parenthood	• Basic Human Movement • Sports and Games • Health Education • Moving our Body Parts • Athletics • Contact and Non-Contact Games
Information Technology (IT)	• Basic Computer Operations and Concepts • Basic Concepts of Information Technology	• Basic Computer Operations and Concepts • Computer Ethics • Computer Application Packages • Basic knowledge of Information Technology

While selecting the contents, major issues shaping contemporary growth and development of nations, and influencing knowledge driven societies were identified and infused into the curriculum content at every level, from primaries one through to junior Secondary classes one to three; with a progress in infusion of concept as class advance. These include, but are not limited to:

a. Environmental Education
b. Climatic Change
c. Drug Abuse Education
d. Food and Drugs Safety Education,
e. Disaster Risk Reduction Education
f. Consumer education
g. Safety and Security
h. Entrepreneurship

The topics in each theme are spirally sequenced, from simple to complex across the 9 (nine) years of schooling in order to sustain the interest of learners and promote meaningful learning and skill development. In addition, the curriculum promotes guided inquiry and activity-based teaching and learning using locally sourced materials. Furthermore, the contents of the adapted curriculum are enriched with examples that are not only indigenous and familiar to learners, but also engender the development of relevant attributes and survival strategies for living successfully in contemporary and global world.

It is important to stress that for effective implementation of this curriculum, teachers must be trained and retrained, and resources provided for the acquisition of consumables and non-consumable items required for teaching and learning of the curriculum contents.

IMPLEMENTATION CHALLENGES OF THE BASIC SCIENCE EDUCATION CURRICULUM.

Successful effective implementation of the new science education curriculum must necessarily start with a radical reform of teacher education program.

This reform requires collaborative efforts between the three key Federal Agencies that have oversight responsibility for teacher education, these are:

i. National Commission for Colleges of Education (NCCE)
ii. The National Teachers' Institute (NTI) and
iii. Teachers' Registration Council of Nigeria (TRCN)

These bodies must play a critical role in ensuring the continuous development of the teachers.

The guidelines for the implementation of the new teacher education programme highlight the major areas required for effective implementation as follows:

1. Evolvement of new methods of instruction
2. Creation of child learning friendly environment
3. Minimum professional standards for teacher educators with emphasis on:
   - What they should know
   - What they should do
   - Their expected dispositions
4. Need to review evaluation techniques to align with the new dispensation hence the introduction of the New Quality Assurance Toolkit which includes institutional evaluation.

   This is where the proprietors of institutions must note for support purposes of teacher training institutions to enable them acquire both institutional accreditation as well as programme accreditation by the regulatory bodies.

With the introduction of the Universal Basic Education, the curriculum of teacher education obviously must be fine-tuned to meet the demand of the new dispensation. In an attempt to intervene in the current state of teacher education in the country, the then Minister of Education, Professor Mrs. Ruqayyatu Ahmed Rufai, unequivocally stated that "The Nigerian Vision 20-2020 Economic Transformation Blue Print states in very clear terms that "*education reform is fundamental to human capacity building*". The intention of the Vision document is to refocus the education system in terms of access and equity, quality, infrastructure, teacher quality and development. As it relates to teacher education and development, the Hon. Minister laments thus:

The teaching profession in Nigeria has suffered a serious decline over the last two decades and more. Unfortunately, no education system can rise above the quality of its teachers as the standard of its teachers invariably affects the performance of the students. The major challenges faced include:

- Inadequate number of qualified teachers with a large number of unqualified teachers teaching;
- Uneven distribution of teachers between urban and rural schools;
- Poor remuneration and motivation and low teacher support. A large number of teachers with certificates below the NCE (38.75%) still abound in the system. In the North-East and North-West regions, the figure is about 70%.
- Another major challenge in the alarming discrepancy between teacher certified qualifications and their actual teaching competence and performance on the job.

The system and process of training and developing our teachers is seriously deficient and some of the problems which need to be addressed include:

a. The fact that our teacher education is based on out-dated practices, child centred learning is not practiced and context-based learning through problem solving approaches hardly occurs;

b. Colleges of education produce very weak teachers. The intake levels at colleges are too high and a significant number of the students do not meet entrance requirements in the Colleges of Education hence the introduction of Pre-NCE programms.

c. Currently, there is no link between college Curricula and the Federal Teacher standards for Nigerian teacher's standards first formulated in 2007 and further developed in 2009. These standards for Nigerian teachers are yet to be disseminated and disintegrated into the Teacher development framework. The National Commission for Colleges of Education (NCCE) and the Teachers Registration Council of Nigeria will play a critical role in this regard.

d. Quality assurance of colleges is weak and focused on quantitative indicators rather than qualitative indicators

e. Teacher motivation, training and remuneration are critical for efficiency and productivity. Unfortunately, teacher supply at all levels of education in the country has fallen short of expectation. The teacher-student ratio is high and is far above that recommended by the national policy of education. Some primary school teachers are stark illiterates as they hardly make correct sentences in English.

f. The supply of teachers for all the levels of the school system is inadequate.

In furtherance of my research on quality and quantity of teachers for the Nigerian school system, it is established that;

- At the university level for example, the National Universities Commission(NUC) policy on staffing is as follows:
- Professors – 20%
- Senior lecturers- 35%
- Lecturers I and below – 45%

These percentages have never been met due to brain drain. Nigerian teachers have migrated to other countries where conditions of service are better. One therefore, finds visiting lecturers in almost all Universities, especially during accreditation of visits by the Regulatory Body (NUC). How can these teachers be effective? Teachers are poorly paid at all levels. In comparison, teachers from public schools are paid between 8,000 and 10,000 naira per month (PTA teachers receive less). The amount of money paid to a member of National Assembly for one days' lunch is equivalent to 14 months salaries of a teacher in that category.

- Lecturers in our tertiary institutions are also poorly remunerated. Investigation revealed that the basic consolidated monthly salary of a professor at time of this lecture is less than N500, 000 whereas that of a Senator is 36 million per annum apart from other allowances; that of the national assembly member is 21 million. The salary of an ordinary supervisory councilor is N809,549, and a special adviser to the chairman of a local government council, N760,076 is more than that of a professor. How can these teachers perform to their optimum capacity with salary packages that cannot take them home? How can political violence stop since it is more lucrative in politics than education?

g. Low Level of ICT:

A teacher of the 21st century must be ICT compliant. The issue of illiteracy even among teachers is a worrisome one.

We are today in a new World. A century where information technology will dictate the pace of development. A century where communication infrastructures like telephone, fax, E-mail, and computer networking will turn the world into a global village. A century where you will simply press a knob and information and knowledge will be made available in a matter of seconds. The influence of the World Wide Web, which provides ready access to information wherever it is situated in the world cannot be ignored. The Nigerian teacher needs to equip himself adequately.

One of the targets of the new system of education is the emphasis on information technology. The UBE targets that between 2007 and 2009 which has come and gone:

- 10% of Basic Education graduates are computer literate.
- 50% of school managers are computer literate and
- 50% of Basic Education teachers are trained in computer skills.

Unfortunately the current realities show that the level of computer literacy among the Nigerian teachers is very low.

The science teacher in the 21st Century Nigeria faces the challenge of having to update his/her knowledge to be able to use ICT either as one who uses ICT in the classroom or as an e-facilitator or e-moderator of open and distance learning. Teacher educators and teachers are concerned more with efficiency rather than effectiveness when they adopt ICT in education. Thus, ICT is used to make their jobs easier instead of making learning more effective. As a result, the teaching/learning process has not embraced current educational paradigm which emphasizes student-centered instruction with the teacher as the facilitator rather than teacher as the source of knowledge (FME 2010).

Hamza & Mohammed (2012) Fage local government area of Kano State showed that Basic Science teachers are not computer literate. Ada and Taangahar (2011) conducted a research in Benue State on the ICT knowledge possessed by teachers in the implementation of the new curriculum and established that, the level of knowledge of ICT possessed by teachers is very low. The story is not different in most of the other states in Nigeria, in some cases it might be worse.

At all levels in Nigeria, lecturers/teachers have generally been polarized in their acceptance of the new technologies, while some have enthusiastically integrated technologies into their classrooms, others have totally rejected it. Also Adams (2000) showed that many beginning teachers do not feel adequately prepared to use ICT in the classroom. Otuka (2010) has observed that over 80% of teachers at the Post- basic and Basic levels who attended the Science Teachers Association ICT Annual Workshops (2004- 2010) had no knowledge of the basic applications of the computer. No wonder (Bates, 2009) stated that teachers act as roadblocks against the implementation of new technologies and often not ready to accept any changes in their role.

The Universal Basic Education (UBEC) in collaboration with the National Teachers Institute (NTI) carryout teachers development workshop for over 300,000 basic education teachers every year, unfortunately, the acquisition of ICT skills has never been a major part of the training. The exposure of these teachers even to computer appreciation only will make a lot of difference as it will at least arouse their interest.

Nigeria is yet to grasp the rudiment of information and communication technology. The only common means of information dissemination, which is the radio, is yet another sad story. Educational Broadcasts are no longer featured regularly on radio, rather airtimes are commercialized and heavily patronized by politicians. Addressing an international conference on the role of the media in the implementation of UBE programme through distance learning, the Director General of the Federal Radio Corporation of Nigeria (FRCN) then Mr. Eddie Iroh, (2000) had this to say:

"The ideal facility for broadcasting effectively to every corner of Nigeria is the short wave (AW) transmitters. Presently, the FRCN has 19 SW transmitters in its broadcast inventory but the newest of them is 30 years old against the normal life span of 15 years. All of them are radiating at 20-30% of their normal 100% power. The implication of this situation is that Radio Nigeria cannot be received clearly and cleanly in all parts of the country. He concluded by saying that educational studios from which educational programmes were once produced are now in a state of dilapidation, thus, educational broadcast are rarely done. The Television as a means of information dissemination in Nigeria presents another sad study.

In comparison with other countries, Nigeria is yet to record achievements in the area of popularizing education through mass media. It is reported (Ojo, 2000. P. 3) that mass media has been instrumental to the phenomenal growth and popularity of distance education in countries like South Africa, the United

Kingdom, China, India, Indonesia, Iran, Korea, Span, Thailand and Turkey. Available data (Ojo, 2000, pp. 2-3) show that the UK Open University established in 1969 has a population of 157,450 students; the China TV University system established in 1979 has over 500,000 students in degree programmes with about 101,000 graduating every year. The Korean Open University can boast of 242,000 students. South Africa's Open University has a student population of 130,000 graduating about 10,000 yearly. What is the situation in Nigeria? The Open University of Nigeria was short-lived and resurrected like Jesus Christ. The University according to the recent convocation ceremonies has grown. Again, the issue of infrastructure is another daunting hurdle to cross in order to make it successful.

h. Pathetic Low Funding of Education

Skilled manpower production for accelerated development through education resides in the higher education. Unfortunately, education in general has suffered the neglect of proper funding. This is reflected in the decline in yearly budgetary allocations. The pathetic low funding of education is a major challenge in meeting institutional requirements for the training of teachers.

i. Professionalization Issues

It is most likely that there will be a gradual but more and more decrease in the number of Nigerians wishing to pick up teaching appointments. The Faculties of Education of Nigerian Universities and the Colleges of Education are likely to continue to experience a continuous fall in the enrolment of students, which in turn will affect the number of teachers available for the education system. This is not unconnected with unattractive conditions for teaching profession. What is witnessed in students admission is however, rather unfortunate. Students who initially never applied for admission into Faculties of Education are given

admissions. In colleges of Education, a similar situation occurs all in the name of boosting the Internally Generated Revenue (IGR) of the institutions. The challenge of ensuring professionalism in teaching profession must be confronted headlong.

j. Inadequate Resource Base

When all said and done, it is human efforts that create quality. Quality delivery in teacher education will be elusive and practically impossible without the existence of an adequate supply of competent and qualified personnel in the school system. People with critical minds, intellectual capability, and appropriate productive skills must be supplied in quantity and quality. This role scan only be adequately played by an effective higher education which resides in the Universities, Polytechnics, Colleges of Education and Colleges of Science and Technology. These institutions constitute the most effective means of providing a large human resource base with the skills and training necessary in modern societies.

k. Politics and Corruption

Politics usually puts government in place for the people. Governance refers to the manner in which power is exercised in the management of affairs of a nation. It is usually embodied in well-defined institutional arrangements, consultative mechanisms as well as policy-making and implementation process all set within the framework of state apparatus of overall political control. The essence here is to provide the needs of the people by raising their standard of living.

Unfortunately, the political ruling class in Nigeria has defiled all meaningful efforts that may promote development. Ehwaha (2005) captures the issue of what he calls the politics of deception. In his words: "*Before the president travels, there is usually an advance team; he gets there with a large entourage and leaves behind some people who will*

clear up things… all of them are collecting estacodes in foreign exchange. Calculate the money… the executive arm alone has sent on estacodes since 1999, and you will begin to understand (how?) grievous the waywardness of this people is. By the time you add the money the legislators are spending in this regard to that of the state governors who travel abroad just as frequently as the president, Nigerians will lynch them, if they know what these so-called public officers are wasting. The money they spend in each of these trips will provide pipe-borne water for several communities… electricity for many of our villages… the money they are spending on airfares and estacodes will go a long way in rehabilitating our roads… I have not seen a more irresponsible set of people in my life. Even countries that are more developed and have more resources, the leaders don't behave in such a wasteful manner".

Politics has intruded into our ways of life and has influenced our plans and actions to such an extent that the way Nigerians relate with one another and indeed take certain actions is dictated by political affiliations.

l. Inconsistency in Policy Formulation and Lack of Data

Inconsistency in policy formulation and haphazard implementation of such policies have affected the quality of education delivery in Nigeria. The current implementation of the Universal Basic Education (UBE) programme is the issue in question. Government as a major stakeholder has the responsibility of enunciating and enforcing implementation of any educational policy at any given time. This must be backed up with clear vision and mission as well as a contingency of support system. Statutory bodies charged with the responsibility of policy-formulation and implementation should be in a position to provide adequate data to enable government plan ahead of time whenever a new policy is being launched.

CHAPTER SIX

THE DILEMMA

The dilemma of the science teacher in the implementation of the Science Education Curriculum Reforms revolves around a number of issues which must be resolved in order to strengthen the competences required of the Science Teacher.

The issues around the fulcrum which the Dilemma revolves include;

1. *The competency needs of the teacher*
2. Resources for Teaching
3. Pedagogical issues relating to strategies, approaches and teaching techniques as well as approach to content knowledge possessed by the teacher.
4. The issue of discipline of both the teachers and the learners
5. *Teacher's over-dependent on texts books due to absence of other teaching facilities*.

In discussing the dilemma of the teacher, it is important to revisit the national policy on education and its provisions in the training of the Nigerian teacher. Accordingly, the following pertinent questions become necessary.

- How motivated and conscientious are our teachers?
- Do our teachers fit into the Nigerian society?
- Are our teachers intellectually and professionally sound and adequate for their assignment?
- Are our teachers committed to the teaching profession?
- Has the Nigerian society prepared the enabling environment to enable the Nigerian teacher function effectively?

Answers to these questions can be found when we revisit our earlier discussion about the Nigerian society and the Nigerian teacher.

The Desire and hope of Nigeria for the use of Science and Technology as instrument of development and the collective efforts of the stakeholders in the education sector to improve on the quality and quantity of those who teach and learn science and other related subjects have placed the science teacher in a difficult situation which is referred to in this lecture, as the dilemma. The diverse expectations for the science teacher as the central figure in curriculum implementation are far beyond that of a single individual. Science teachers are expected not only to teach the pupils science but they are also expected to produce Nigeria's manpower in science for developments in all spheres of economic sector, be it the social sector, the health sector etc.

The science is therefore, not just to be a science teacher, but *effective* science teacher. Teacher effectiveness implies and requires that the teacher must bring about the expected behavioral changes in his students at the end of the instructional process (Interaction). The expected changes are in the direction of the learner's experiences in *knowledge* (Cognitive domain), *attitudes* (affective domain) and *skills* (Psychomotor domain.

Akpan (1991) affirmed that the qualities of such a teacher could be considered under four (4) cardinal areas, namely: his knowledge, skills and attitudes and experiences as suggested by Linskie (1977) and implied by some Nigerian science and mathematics educators, Odunusi (1981), Ali (1984) Ogbazi (1987), Gyuse (1988).

Teacher's knowledge which is a product of his training background affects both the contents and the processes of his interaction with the learner. This influences what he teaches and how he teaches. Teachers' poor knowledge of the subject matter leads to low self-esteem on the teacher and lack of self-confidence. The science teacher must have knowledge of a psychological knowledge for science teaching and should be able to apply it successfully in his science classes. He must also have adequate knowledge of the learners he

teaches so as to improve their attitudes towards the learning of science and as a career. He must possess knowledge of contemporary pedagogical techniques.

As emphasized earlier, the teaching-learning process as a process of communication depends on the number of factors such as, the capability of the teacher to use the language, clarity of instructions and correctness of facts are necessary. The Nigerian teacher, because of his training background, his ability to use English as a foreign language to teach science which is also foreign leads to distortion of facts, consequently, the student ends up learning science is a distorted form. Pronunciations of scientific words are hardly correct, spellings are also wrong scientific symbols are inaccurately written. Neither does the teacher know nor the students, this is indeed a dilemma. This results to mutual difficulty, mutual understanding and mutual dilemma and rote learning as opposed to meaningful learning.

Planning skills, organizational skills and implementation skills are critical in classroom interactions.

The attitude of the science teacher is one dimension that is important in the teaching-learning process. The science teacher should be a source of encouragement to his students. His attitude towards the subject he teaches and the students must be positive enough to improve their own attitudes and aptitude for it. He should be proud of his abilities and aware of his short-comings and must therefore, constantly try to be better. How proud are our science teachers? This question can only be addressed if we link this with what the national policy on education stipulates about his training programme and the practical realities he faces in the performance of his duties within the context of Nigerian environment.

The national policy on education as relates to the training background of the teacher highlight the goals of teacher education in Nigeria as contained in

the Federal Republic of Nigeria (2004) National Policy on Education: These goals are to:

- produce highly motivated conscientious and efficient classroom teachers for all levels of our educations system;
- encourage further the spirit of enquiry and creativity in teachers;
- help teachers to fit into the social life of the community and society at large and enhance their commitment to national objectives; provide teachers with the intellectual and professional background adequate for their assignment and to make them adaptable to any changing situation not only in the life of their country, but in the wider world;
- enhance teacher's commitment to the teaching profession;

If the training programme achieves these objectives, Nigeria can proudly land into the arena of sustainable development. However, to achieve these objectives in this century, it is important to look at the retrospective century.

ix. Discipline and academic performance

The quality of implementation of reforms that would yield academic excellence in school today is greatly diluted by both internal and external forces influencing the school. Ironically, social demand for education today has placed tremendous pressure on the school system causing it sometimes to yield to this unnecessary pressure from both within and outside the school. School administrators, particularly the Principals who resist these unnecessary pressures are given names and branded insensitive and wicked.

The pressure exerted by the society on educational institutions begins with the admission exercise. Most of the secondary schools today and even the universities and other higher institutions are flooded with poorly educated youths, whose entry qualifications are doubtful.

Investigations by Ada (2009) have shown that both parents and teachers are found implicated in facilitating cheating in public examinations to ensure

that the students pass at all cost, as a sure passport for obtaining admissions at subsequent higher levels of education. Thus, right from the secondary school to the university, we find youths with questionable credentials or to flush out those without requisite qualifications for entry into the university; those who might have found their way into such institutions through unacceptable means become a public issue.

The consequences of admitting ill equipped student into the school are that the youths lack confidence in themselves; they lack academic capability to pursue sustained academic work. They tend to lose faith even in the school which is supposed to help them and therefore, they also lack the discipline to pursue academics. They can hardly settle down for serious school work. The resultant effects are obvious. The youths embark on cheap blackmail and are manipulated by politicians who enjoy their gossips. These students spend most of their useful time shuttling from one city to another extorting, money from these people who enjoy the game. There is declining trend in students' performances in public examinations due to indulgence of students in social vices that are completely devoid of discipline. Such as arrogance, violent protests on issues that seem not to affect only the students but also ordinary Nigerians. There is usually disruption of normal academic activities of educational institutions. Certainly, academic excellence cannot strive under such unfavourable conditions.

The problem of discipline has assumed a national significance and has over the years been receiving governments' attention. Prompted by gross indiscipline in the wider society as manifested in such forms as bribery and corruption, crime and contempt for long standing traditions and values, schools are in consequence held responsible and accused by the society of abdicating their responsibility of educating and disciplining the youth when indeed the same society severely undermines the authority of the school. It

therefore, becomes difficult to conceptualize how the goals of educating and disciplining the youth in schools can be achieved.

There is need for educational reforms in order to cope with the ever changing the dynamic nature of the society.

Education is central to society so is curriculum the heart and life wire of education (Alade, 2006).

CONCLUSION AND THE WAY FORWARD

Mr. Vice Chancellor, distinguished audience, the irresistible benefit of science cannot be controverted. All over the world, Science has been used as a tool for the transformation of economies of nations. Curricula reforms have become a regular feature of the education systems of countries that are in constant search of new knowledge. Teachers who are the most critical inputs into the process of education must as a matter of necessity be professionally and intellectually equipped to enable them cope with demands of their roles. Available evidence shows that our teacher education is archaic in terms of content and methodology.

The support services for teachers are not adequate where they exist, they are weak to make impact. The problem of ineffective education system may persist unless drastic measures are taken to produce teachers that are professionally and intellectually equipped.

The grade II teacher training college should be reintroduced as a basis to produce quality teachers for the foundation level of our education system.

Teachers reward must be here on earth and not in heaven as there are too many obstacles on the way to heaven. Those who may not reach heaven should have the opportunity to enjoy theirs here.

I may not be competent to suggest totally the way forward. However, if I may suggest, the way forward should revolve around the following key areas:

i. Comprehensive implementation of teacher-education reform programme in Nigeria as no system of education can rise above the quality of its teachers. The current ad *hoc* arrangement for teacher preparation is not adequate.

ii. There is need for continuity in policy implementation, irrespective of who is in-charge at any given point in time. The philosophy and objectives of Nigeria as a country is in variance and can only change, if there is need for the change.

iii. There is need for change in attitude of Nigerians (valued orientation).

iv. Accountability in education must be continuously emphasized and enforced.

v. Effectiveness and high productivity is the only basis to justify Government huge investment in education.

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