



Review Article

Solving the Problems of Chemistry Education in Nigeria: A Panacea for National Development

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Abstract: Chemistry has been one of the cornerstones of science, technology and industry, it is apparent that chemistry plays a greater role in national development through industry in the world. As such it helps to provide some social amenities and has been the pivot of science and hence the most needed tool, scientifically, for human, capital and national development. The wheel of progress have in no small way slowed down, thereby hindering the overall development of science and chemistry education in the nation. The concept of chemistry as a science is centered on life and this encompasses the three states of matter-solid, liquid and gas in a give and take processes. The focus of this paper, therefore, is to take a further look at the derivable benefits of chemistry education with a view to repositioning it as a panacea for national development. Among other things, poor power supply / infrastructure, poor academic foundation, poor funding and mismanagement, inadequate manpower, associated hazards, defective curriculum, lack of awareness / counseling are the noticeable factors working against the effective and qualitative chemistry education in the country. All stake holders in this sector including the government at all levels are to ensure and allow chemistry and its education to take and play its pivotal role towards national development. Therefore, it is recommended that the aforementioned problems be tackled in order for chemistry education to play its pivotal role towards national development.

Keywords: Education, Chemistry Education, Chemistry, Problems of Chemistry Education, National Development

1. Introduction

Chemistry has been one of the cornerstones of science, technology and industry, it is apparent that chemistry plays a greater role in national development through industry in the world. As such it helps to provide some social amenities and has been the pivot of science and hence the most needed tool, scientifically, for human, capital and national development. The wheel of progress have in no small way slowed down, thereby hindering the overall development of science and chemistry education in the nation. The concept of chemistry as

a science is centered on life and this encompasses the three states of matter-solid, liquid and gas in a give and take processes.

Education is the process of training and institution especially of children and young people in school and colleges which is designed to give knowledge and develop skills. Panacea is something that provides an answer or cure to all diseases or troubles. Throughout the world, education is considered to be the very important tool for attaining national goals. Education provides learners with skills needed for survival.

Chemistry education is a veritable instrument for national development. According to [1], science is a way of seeking information (process) and also an accumulated knowledge resulting from research (products). Okoro [2] sees Chemistry as a systematic investigation of nature with a view to understanding and harnessing them to serve human needs.

Chemistry plays a central role in global sustainable economic development. It plays the major roles in food (fertilizers and insecticides), clothing (textile fibers), housing (cement, concrete, steel, bricks), Medicine (drugs), Transportation (fuel, alloy materials). Presently, man is experiencing an era in scientific and technological development that affects his life in one way or the other. Virtually everything we use daily involves science.

Chemistry is a popular subject among senior secondary school students in Nigeria due to its nature. It addresses the need of majority through its relevance and functionality in content, practice and application. What many nations like Nigeria need now is a functional chemistry education that will assist in national development. Chemistry education has been identified to be one of the major bedrock for the transformation of our national economy.

Chemistry Education can be seen as the acquisition of knowledge or ideals relevant to chemistry. It is concerned with the impartment of knowledge on properties, components, transformations and interactions of matter.

Chemistry Education is therefore the systematic process of acquiring the fundamental knowledge about the universe. With these indispensable knowledge richly acquired, man can shape and reshape his world for his benefit. Hence, the development of the nation is usually measured by the degree and extent of growth brought to it through the enterprise of science education and a gate way to it is chemistry education. Chemistry education is the vehicle through which chemical knowledge and skill reach the people who are in need of capacities and potentials for development. In addition, chemical education addresses the social objective of substance development as education is now of the primary means for empowerment, participation, cultural preservation, social mobility and equity [3].

The impact of chemistry on technology involves the process of bringing manufacturing inventories and sculpturing, designing etc. Technology can be seen as the application of scientific knowledge, skills, work, attitudes, tools and equipment in evaluation of new processes and adoption of these processes to the production of goods and services for the benefit of mankind [4].

Chemistry education plays important role in enhancing the quality of teaching and research as well as ensuring that students are equipped with good knowledge to produce intensive goods and services to meet human needs for food, health care products and other materials aimed at improving the quality of life. Every single material thing in the universe is a chemical and the ability to understand and manipulate these chemicals is responsible for everything from modern food and drugs to plastics and computers. Conclusively, the ideas of chemistry are not getting the attention they desire in

either formal or informal education provision. It is argued that an improvement in this position requires the further development of the nature and quality of chemical education to chemical industries through intensive and extensive research. Chemistry education is needed in the professional development of chemical industries required in the establishment of modern technology and operation of chemical industries.

The process of chemical transformation involves intra-chemical reactions within the same substances examples, sublimation, radioactive decay like uranium, plutonium etc and other chemical reactions when the substances react with other things which includes the evaporation of volatile substances like fuel, Mentholated spirit and even water when exposed to air. Really, chemistry can be used to find solution to problems of everyday activates in science, industry, technology, government, educational sector and economics. Some of the industries that obviously cannot do without chemistry include; cosmetics industry, brewery industry, chemical industry, textile industry, food processing and technology industry, forestry, Agricultural industry, petroleum, pharmaceutical industry etc. Man's success in the different realm of chemistry provides ones unquenchable source of hope for success in technology. Whatever technology is, be it monster, man is poised to face it challenges having gained courage, built in confidence in himself as he overcomes the seemingly impenetrable mysteries of chemistry. To be able to operate machinery involved in technology, good dosage of simple experimental concept like observation and recording, theory and principles and measurement to take record of events that are needed. Also market forces succumb to the supremacy of social chemistry which includes simple experiment formulation such as record and observation, profit and loss, minimum and maximum, to the more complex ones like optimization theory and also operation research such experimental expressions.

Development is the gradual growth of something so that it becomes bigger, more advanced and stronger [4]. Mohammed and Bello [5], sees development as growing or becoming industrialized. National development is the ability of a country or countries to improve the social welfare of the people. The question is whether this could be done through the knowledge of chemistry education? Educational institutions everywhere are established to carry out the role of teaching, research and community services, thereby contributing meaningfully to the social, economic, cultural, political, scientific and technological development of any nation [6].

According to [7], chemistry is one of the naturally and well established means through which the nation's abundant natural resources can be harnessed into useful ventures for the overall economic and socio-political wellbeing of its citizenry. Okieimen [8] equally asserted that chemistry is all about everything in the world. He added that chemistry is the nucleus of science which ultimately is the foundation upon which any nation is developed. Chemistry certainly cannot be divorced from any today human activities. The N. P. E [9] stated categorically that science, including chemistry

education shall emphasised teaching and learning of science processes and principles leading to fundamental and applied research in the sciences at all levels of education.

Therefore, role of chemistry education in national development with reference to chemical industries in Nigeria will be relevant to the teachers who are mediating factors in the teaching and learning process and will help them to inculcate in their students the vast potentials inherent in chemistry. Particular attention is concentrated on the role chemistry education can play in the much spoken technological development in Nigeria. The society in general will benefit as more people will be employed in this industries, also the government will benefit as the Nigerian economy will increase.

2. Status of Chemistry Education in Nigeria

Chemistry in Nigeria, as a subject is taken by students of the senior secondary schools being termed among others like physics, biology, mathematics etc as science subjects. It is taken either as a single or combined course for the award of NCE by colleges of Education. In the University, degrees of B. Sc, M. Sc and Ph. D are awarded in chemistry in different areas of discipline. Essentially, chemistry form the bed rock subject for all science and science related courses in the tertiary institution as any student wishing to study Engineering, Agriculture, Medicine, Pharmacy, Nursing, Optometry, Medical Laboratory, etc. and even social sciences requires a credit pass in chemistry at the ordinary level. Regrettably, chemistry and its education is yet to make any noticeable impact in the nation due to lack of commitment on the part of the government and all stake holders. Several factors have been identified to have be-devilled the development of science and chemistry in Nigeria [10]. Among the various factors are:

2.1. Poor Power and Infrastructures

The place of adequate power and workable infrastructure in chemistry education cannot be glossed over. Most secondary and tertiary institutions of higher learning lack the basic infrastructure to study chemistry in Nigeria. The absence of regular and stable power supply has makes the use of few equipment where available in the laboratories and workshops impossible. The rudiment of chemistry can only be actualized with functional laboratories/workshops. The absence of basic infrastructure has make science and chemistry education to be abstract as theories taught are not practicalized. The resultant effect of this is lack of or lost of interest by both the parents and students [11] added that the lack of these formidable and essential facilities discourages teaching and learning of science and chemistry education and thus slows the pace of national development.

2.2. Poor Academic Foundation at the Primary School Level

Any structure built on a weak foundation is destined for doom. More so, a weak foundation begets weak development.

Ordinarily, science education at the primary school level is purely elementary and the N. P. E [9] set a goal of laying a sound basis for scientific and reflective thinking. [12] opined that, primary school education is the bedrock of educational hierarchy in Nigeria upon which the other educational levels are built. It stated further that the teaching of science at the primary school level should be by practical, exploratory and experimental methods. Unless these goals are understood by the pupils / students wishing to study science, it is just a fairy tail. Teachers at the primary schools are not conversant with their fields while most still uses the lecture patterns instead of encouraging the pupils to participate in the learning process [13]. The use of non-science bias teachers to teach and demonstrate science has grossly militated against science and chemistry education in Nigeria. All these hindered national development.

2.3. Poor Funding and Mismanagement

Chemistry which is at the Centre stage in the field of science and have in no small way in Nigeria schools been faced with inadequate funding. The funding of schools in Nigeria especially the tertiary institutions has traditionally been from grants, by the government and international agencies which are usually tied to specific projects [3]. High level of mismanagement and corruption in the utilization of the supposedly poor fund provided by the government and other stake holders are also basic issues. This has largely hindered functional laboratories, workshops, equipments, and chemicals from being put in place. For this, there can be no meaningful national development through chemistry education.

2.4. Inadequate Manpower

A significant problem faced with science and chemistry education in Nigeria today is the issue of inadequate manpower. It is doubtful if Nigeria has sufficient and qualified number of indigenous science and chemistry teachers. This has in no small way hindered the growth of chemistry education and by extension affected national development. In most of the tertiary institutions, the number of senior lecturers with Ph. D qualifications is low. Rather, we have most of them in the cadre of Assistant lecturers, Graduate Assistant and lecturer III-I. These crops of lecturers are still learning the rudiments of teaching by the reason of their qualifications and training [3, 7]. Only few of those in the professional rank are available. One major reason traceable to this is as a result of "brain drain" of academic staff which can be traced to the military regime (a period of over a decade) creating a big vacuum which is difficult to fill. Poor salary scale/remuneration is equally associated with teaching job in Nigeria compared with the elected/politically appointed officers. This has led to long period of strike actions by teaching and non-teaching personnel across the educational sector. Teachers reward against all odds is often said to be in Heaven. This is coupled with unnecessary delay of promotions. Still, is the increasing work load associated with

deteriorating staff/student ratio [14]. These are negative factors on the growth of chemistry education, self-reliance and national development. The quality of education rests more on the quality of its teachers [15].

2.5. Associated Hazards

No sane person will live his home for work and anticipate accident. The greatest inherent problem associated with chemistry and its education is hazard. Hazard effects from poisonous emission of gases / fumes, corrosive chemicals, fire burnt, explosion, obsolete apparatus, poor laboratory sanitary condition etc. are very often recorded in chemistry laboratory. Most parents evidently have discouraged their children from studying chemistry due to observed danger effects of the materials involved. In the same vein, most teachers and technologists are scared from conducting chemistry practicals with the students [7].

Lack of safety awareness due to unsafe acts and unsafe working conditions results to accidents. Victims of chemicals or fire burnt usually present ugly scenes. Often times, large casualties are recorded when accident occur in the field of chemistry. This cannot promote chemistry education, self-reliance and national development.

2.6. Defective Curriculum

School curriculum in the pre-independent Nigeria was not for all-round development of the child as the aspects of science and technology which would have created entrepreneurial skills for self-reliance were ignored [16] (Sabina, 2009). It rather kept on producing subservient Nigerians who were tied to the apron string of white-collar jobs viz: gardeners, stewards, interpreters, catechists, clerks and house-keepers [17]. All these make the people parasitic consumers rather than creative and efficient producers [18]. The curriculum for science and chemistry education in particular is such that is over loaded with much emphasis on theoretical teaching. At the secondary school level where emphasis is supposed to be laid on practical exercise, this is not done. Practical are not well specified in the curriculum. In most cases, schools, teachers and instructors of chemistry only wait till the examining bodies send in practical specimens. This is the only time practicals are taught in a rush, thereby subjecting the students to unwarranted assimilation. The worst is recorded at the tertiary institutions where all the practical requirements are virtually out of place. Here, the students are left to fend for themselves not minding the cost and risk implications. This is certainly a crude way of teaching and learning and can never bring about the most needed self-reliance and national development. There is an obvious relationship between development and the type of educational structures available in any country.

3. Conclusion

Chemistry education plays a vital role in all aspect of technological practices with particular references to chemical

industries. This study shows that the teaching and learning of chemistry is basic for the development of chemical industries. With sound industries in the country the economy will boost, the business will increase, and the environment in which they are processed will employ people in production. Teaching and learning is enormous in the development of chemical industries that is chemical industries employ the knowledge of chemistry in their work for their development.

Chemistry education not withstanding helps in national development because chemistry helps in our daily lives. Without chemistry there is no chemical industry. Without chemical industry there is no productivity and without productivity there is no development. Hence, any government conscious of its responsibility should keep teachers and students at a reasonable motivational level towards learning of chemistry as this will encourage chemistry education which its role in chemical industries cannot be overestimated.

Let it be re-iterated here again that chemistry is all about everything in the world [8]. The importance of chemistry education to the nation and the world at large cannot be glossed over. If the afore-mentioned factors militating against its recognition and propagation are eliminated, Nigeria as a nation would certainly be great and ranked among the first world developed nations in the next fifteen years. All hands must be on deck.

Recommendations

From the fore going discussion, it is quite obvious to say that if these factors among others are well tackled, Nigeria would have started laying concrete foundation towards becoming a first world developed nation.

1. Chemistry education requires a well-designed and equipped laboratory to achieve its primary goals of observation and investigation. A functioning laboratory is such that have the most basic facilities like power and water supply, chemical reagents and apparatus, current analytical instruments, adequate space and ventilation.
2. There should be an enhanced concrete foundation which start at the primary school level. Since primary education is seen as the bedrock of all forms of education in any nation, Nigeria should not be left out [12].
3. The N. P. E (2004) quite acknowledged the huge capital involved in science education. The funding of Chemistry education should be the concern of all and sundry and not to be left for the government alone.
4. Chemistry education in particular will be meaningless for national development if the qualities of the teachers cannot be guaranteed. Chemistry education requires specialist, competent and dedicated teachers therefore colleges of education should embark on producing qualitative chemistry teachers.
5. Enabling environment reasonably free of conditions that might be detrimental to the physical well-being of both students and teachers should be provided.
6. School curriculum in the Chemistry should be reviewed and restructured to meet up with the need and aspirations

of the people. A curriculum that is practically driven and achievable should be put in place.

7. Members of the curriculum drafting committee should be drawn from professional bodies like the Chemical Society of Nigeria (CSN), Institute of Chartered Chemists of Nigeria (ICCON), etc, to enable them restructure the curriculum with the view of meeting the present day reality.

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