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Review of the Impact of Chemistry Education in Scientific Research and National Development

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Abstract:
This paper re-examines the position of chemistry as the core of sciences and therefore the most needed and desirable scientific tool for the socio-economic, technological well-being and by extension for national development. Factors such as insecurity, poor funding and mismanagement, job hazards, lack of motivation, inadequate science teachers, and economy among others were observed to have bedeviled chemistry and scientific development. Solutions were proffered asking the government and all stake-holders to ensure that the educational sector should be topmost priority after agriculture in policy making. Adequate security, payment of salaries and allowances as at when due, investment in infrastructures and self development on the part of chemistry teachers should be put in place to allow for rapid growth and development scientifically.

Keywords: *Chemistry education, scientific, innovations, hazards, insecurity*

1. Introduction

According to Okon – Enoh (2008), science is a way of seeking information (process) and also an accumulated knowledge resulting from research (products). Okoro (2013) sees science as a systematic investigation of nature with a view to understudy and harnessing them to serve human needs. Science may be regarded as the body of related courses concerned with knowledge. It consists among other components; Chemistry, Physics, Biology, Mathematics, Astronomy, Agriculture, among these, chemistry is vigorously described as the queen of science. Education involves the socialization of individuals to become an integral part of the society in which they live. In the pre-colonial era, science education was mainly regarded as informal and indigenous, yet it was stimulating, informative and useful to all and sundry. It provided a lead way for the understanding, interpreting and relating with the world and nature. It was however unable to provide science and adequate scientific explanation for causes and events observed in the natural world (*Garuba et al, 2012*).

The National Policy Education (2004), stated categorically that sciences including chemistry education shall emphasize teaching and learning of processes and principles leading to fundamental and applied research in sciences at all levels of education. However, this lofty policy is yet to be complimented with effective implementation. If this trend is not checked and changed, it would continue to mar Nigeria growth, resulting in the non-attainment of the millennium goal of being a developed nation by 2020 (vision 2020) (Uwague and Ojebah, 2008). Throughout the modern period of its development, chemistry has contributed largely both to broad improvements in human well-being and to wealth creation for individuals and nations (Javier and Elena, 2011). Chemistry is a popular subject among senior secondary school students in Nigeria due to its nature. It addresses the needs 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.

2. Innovations and Impact of Chemistry

Innovation which may operates in both technological and social fields (*Gardner et al, 2007*), encompasses not only the birth of an idea but its application in practice-taking the outputs of research and invention and using them to put new goals, services or processes into use. Chemistry may be involved not only in the initial stages of research, but also in intermediate stages as well as in the evaluation of impact, thus contributing in key ways at every stage of the technological innovation chain (Javier and Elena, 2011). The role of science and technology in a future Nigerian society may be broadly stated as one of meeting with felt needs by technological innovation, scientific research and development towards realizing long-term national goals for the next century. That is, towards ensuring national security and social stability, for a resource-poor developing nation like Nigeria conserving energy and oil-substitutable energy is very vital. Food technology is similarly important to maintaining social stability (Choi, 1983). All this is to sustain the growth of the nation's economy and to improve its efficiency.

Chemistry as a ''science concept', has and is still the pivot of all-natural sciences and as such the most desiring tool scientifically for human, capita and national development. It certainly cannot be divorced from any today human activities. Chemistry is all about everything in the world (Okiemen, 2007). The truth about the nature and concept of chemistry is that, it is an experimental science (Holderness and Lambert, 2001). Scientifically, chemistry and its education embrace

every attempt of humans to explore, interpret and manage the natural world. It is dynamic and essentially concerned with the search and explanation of both regularities and irregularities in nature (*Garuba et al, 2012*).
The purpose of science is to transform the environment towards improving the general quality of live, thus making the world a better place in which to live. Science is primarily concerned with the intellectualization of facts and values in an unbiased manner. Okiemen (2007) asserted that chemistry is the nucleus of science which ultimately is the foundation upon which science and technology (S&T) is built.

3. Draw Back to Chemistry Education and Scientific Research

Unmet commitments, inadequate resources, lack of focus and accountability and insufficient dedication to sustainable development have created short-falls in many areas and without a major forward many of the millennium development goals targets are likely to be missed in most regions including Nigeria (United Nations, 2010). Among other problems associated with chemistry education, scientific research and development are:

3.1. Poor Funding and Mismanagement

Chemistry education which is the center stage in the field of science and study have in Nigeria schools been faced with poor funding. Besides, it has been observed with total dismay the high level of mismanagement and corruption in the utilization of the supposedly low fund provided by the government. This has hindered functional laboratories, workshops, equipment, and chemicals from being put in place (Uwague and Ojebah, 2008). Purchases of science equipment to schools are never done transparently as it is either the Chief executive of the school or an unqualified agent of the same government releasing the fund that will do the bidding and supply. To this end, they neither supply the required specification nor the required quantity, and in most cases, they don't even supply anything (Aina, 2013).

3.2. Insecurity

The Spate of killings and deaths from bomb explosion, gunshot, kidnappings, robbery and terrorist attacks has kept many Nigerians in constant and perpetual fear. Where and who is the next victim is better imagined than described. The lives of teachers/lecturers, students and nationals living in Nigeria are in constant danger (Aina, 2013). A notable university in the northern part of Nigeria is at the point of total close down as it has become a den of terrorist attack, killing students and teachers on a daily basis. In the mist of this, a professor of chemistry was killed in cold blood. This is very unhealthy in an academic environment. Besides, hard earned science equipment and infrastructures are being destroyed and others vandalized. Young secondary school students are not spared from the hands of kidnappers. Many schools are currently under lock and key and parents losing their jobs due to total insecurity of lives and property (Aina, 2013). Cattle movements are now common sites within university campuses and even in class rooms of some primary and secondary schools in most parts of the country.

3.3. Job Hazards

Several and deadly hazards are associated with chemistry education in particular and sciences in general. No sane person will live his home for work and anticipate accident. The greatest inherent problem associated with chemistry education is hazard. Hazardous effects from poisonous emission of gases, corrosive chemicals, fire burnt, explosion, obsolete apparatus, poor laboratory sanitary condition etc., are very often experienced during practical exercises. Most parents evidently have discouraged their children and wards from studying chemistry due to observable danger effects of the materials involved. Even teachers, lecturers and technologists are scared of conducting chemistry practical with the students. This certainly cannot promote scientific research and national development. Lack of safety awareness due to unsafe acts and unsafe working conditions can results to accident. Victims of chemical or fire burnt usually present ugly scene. Often times, large casualties are recorded when accident occur in the field of chemistry.

3.4. Unqualified Science Teachers

One major problem that has hindered rapid growth of chemistry and science education in Nigeria is the lack of qualified/professional teachers. The absence of sufficient and qualified number of indigenous science and chemistry teachers has hampered students' zeal and interest in this study area (Uwague and Ojebah, 2008). Science teachers are key factor to be considered when talking about the development of chemistry education, scientific research and national development (Aina, 2013). In most of the tertiary institutions, the number of senior lecturers with PhD qualification is low. Instead, we have most of them in the cadre of Assistant lecturers, lecturer III to I. These groups of lecturers are still learning the rules by the reason of their qualification (Emumejaye, 2006). They may have the knowledge of the subject but lack the technological know-how. Attitude of many chemistry and science teachers towards teaching and quality service delivery can also be discouraging. Many claimed to have been teaching for many years yet do not up-grade their knowledge by going for an in-service training (Aina, 2013).

3.5. Poor Incentives and Motivation

Lack of motivation on the part of government is another major setback in the development of chemistry, science education and national development. Teachers salaries and allowances are not paid as at when due and their promotion delayed unnecessarily (Uwague and Ojebah, 2008). Gone are the days when teachers reward was said to be waiting them in heaven. Let heavens come down for the teachers.

3.6. The Economy

Ngozi (2012), opined that Nigeria is already feeling the effects of the global uncertainty. Adding that the weak global demand is putting downward pressure on the price of oil and consequently on our growth numbers. She called for short-term and long-term buffers in the form of diversifying our economy away from oil dependency by prioritizing investments into key sectors like agriculture, power, housing and construction, solid minerals, education, health, ICT, and others that can drive growth and job creation.

Scientific research brings about technological advancement. According to Akoh (2007), God Almighty endorsed the "chemists" out of all other professionals with the skills, knowledge and competence to **recreate** the world by converting one form of material substance to another. This provides the chemists the greatest opportunity of using the skills and knowledge of chemistry to bring about the most needed scientific and technological growth of the nation (Uwague and Ojebah, 2008).

3.7. Unstable Educational Policies of Government

There is no gain saying the fact that the government has laudable and fanciful policies on education, but lacks the focus and managerial tendencies for achieving the set goals. The policy of government as to who owns, funds and control certain levels of the educational sector have been a major controversy (Ohoba and Omoregie, 2006). Government equally lacks the spirit of consistency in policy implementation as every new administration always comes up with her own ideas and policies.

4. The Way Forward

- No meaningful development can be achieved in an atmosphere devoid of peace and tranquility. The high level of terrorist attacks in the nation coupled with robbery and kidnapping will not give room for chemistry education, scientific research and national development. To this end, the government as a matter of urgency should rise up against this dastardly act. Peace should be allowed to reign in our educational sector.
- The quality of any form of education is a function of the quality of its teachers. Chemistry educators need to be constantly kept abreast of the current trends due to its dynamic nature (Akubudike, 2003). Hence, according to Ogodo and Peretomode (2007), the need to train and re-train the trainer cannot be glossed over. Dedicated and committed specialists are required to guarantee quality services in scientific research and chemistry education in particular for national development. Lapkin (2000) asserted that teachers should aspire to acquire some professional knowledge and certificate in terms of educational training. Science and chemistry teachers should train and re-train through seminars, workshops and conferences on innovative teaching.
- Safety cautiousness should be the watch word in the mind of every chemistry (science) students and teachers. According to Omokwale (2007), prevention is often said to be a better cure from an accident. Laboratories should be well illuminated and ventilated as well as carry precautionary signs at strategic points.
- No gain saying the fact that chemistry in particular and sciences in general is highly capital intensive. Its funding should be the concern of all and sundry and not to be left for the government alone. Competent and reliable financial agency should be put in place by the government to monitor and ensure judicious use of fund meant for educational projects. Anyone found mismanaging such fund should be persecuted accordingly and even be given a life jail term. The educational sector should be armed with adequate and solid database with respect to the number of students across all levels of education such that foreign grants/aids, incentives and scholarships can readily be made available to the nation. This will enhance national development scientifically.
- Chemistry being a practically oriented programme requires practical teaching. This can only be achieved with functional laboratories/workshops. Onuka (2002) asserted that the absence of basic infrastructures makes science and chemistry education to be abstract and research impossible. Taofiq (2002) added that the lack of these formidable and essential facilities discourages science and chemistry education and by extension slows down the pace of national development.
- School curriculum in sciences, particularly chemistry should be reviewed and restructured to meet up with the present-day reality. A curriculum that is practically driven and achievable should be put in place (Uwague and Ojebah, 2008). The Nigerian University Commission (NUC) and National Board for Technical Education (NBTE) should as a matter of urgency review all academic programmes being run in Nigeria Universities and Polytechnics with a view to weeding out courses not relevant to developmental needs.
- Policy makers at all levels in Nigeria need to be keenly aware that few countries can achieve development goals of economic diversification, food security, improving health systems, cleaner energy, generating wealth and jobs, and reducing absolute poverty, without the right scientific tool, engineering, and technical capacity to handle these challenges. Government should formulate and implement policies that would encourage industrialization of the nation (Uwague and Ojebah, 2008).

5. Conclusion

From the fore-going, it is quite obvious that the impact of chemistry education for scientific research and national development cannot be glossed over. If the above-mentioned factors working against its recognition and propagation are eliminated, Nigeria will experience a tremendous growth in its entire ramification. It is the responsibility of all and sundry to overcome these problems. Government should ensure the security of life and property of the citizenry, the fight against corruption should be total and with all sincerity of purpose; while the teachers should align themselves with the current

trend in scientific research by using models and multimedia's for effective teaching and learning. Adequate funds should be made available for the development of chemistry in particular and science education in general.

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