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RESTRUCTURING SCIENCE EDUCATION IN NIGERIA FOR SKILLS ACQUISITION AND DIVERSIFICATION: A PANACEA IN RECESSING ECONOMY

Moemeke, Clara D. (Ph.D)

Abstract

Today's world has brought to the fore the importance of human capital development on national economic development. Nigeria's struggle for economic growth as seen through her many economic reforms since independence has not yielded expected results. This paper draws a link between adequate science education for skilled manpower production and economic and technological growth. The unprecedented neglect and lip service to skilled manpower development through practical science and laboratory research is seen as the bane of Nigeria's national economy. The paper advocated curricula reforms in senior secondary and tertiary level science to include contemporary science issues in world affairs, encouragement of imaginative thinking and researches into science-related market force dynamics on the economy. The paper calls for a science education plan for Nigeria in this millennium, a science research agenda in line with the lessons of the economic meltdown, the removal of obsolete content from the science curricula, and the restructuring of science outcome assessment patterns against the cognitive stance presently in operation.

Introduction

Nations of the world today are in a dilemma economically in the face of the economic meltdown that has hit the world like a thunderbolt. World economies have slid down with unprecedented force. Nations with strong economic roots anchored in effective science education are rising to the challenge of producing diversified economic bases that will secure national strength and economic life while ill-prepared, ill-anchored, and ill-equipped countries are struggling to avoid the threat of drowning in the sea of economic meltdown.

Apart from the threat to national integrity and sovereignty, the world’s economic situation has exposed nations without solid economic anchors to ridicule and chagrin by those advanced economies with well-planned and well-thought-out recovery indices.

The question that is on the lips of many nationals of developing countries like Nigeria with an economy that is solely dependent on natural resources over the years is why the managers of her economy have sufficed with a one-tracked, one-directional and one-commodity economy for so long. With great and enviable human and natural resources occasioned by her near-perfect climatic situation, there is reason to wonder what has been the bane of Nigeria's economic underdevelopment. Fwatshak (2006) noted that as an underdeveloped country, Nigeria has an unattained potential with her growth rates fluctuating and declining since 1988. Using the World Bank reports available, Fwatshak showed

that the highest growth percentage Nigeria has attained since 1988 has been in 1989 with a growth rate of 8.1%, a direct effect of the structural adjustment programme of that time.

Signs of our poor economy and over-dependence on a one-stock market (oil) have been with us for decades now. The government's response to it at different times has been to institute one form of adjustment or the other. The low profile of the late 1970s, the austerity measure of the early 1980s, the Structural Adjustment Programme (SAP), up to the Poverty Alleviation Programme (PAP) and its accomplice, National Economic Empowerment and Development Strategy (NEEDS) are but a few examples of government policies targeted at reducing poverty and instituting sustainable growth. In all these, the World Bank reports on Nigeria in 1996 that *Nigeria represents a paradox. The country is rich but the people are poor. Nigeria is rich in land, people, oil, and natural gas resources....but poverty is pervasive in all the regimes to different degrees* becomes very informative.

The different regimes over the years have focused on poverty alleviation strategies without casting even a glance at the foundational issues that underlie poverty, underdevelopment and economic submergence. Few lone voices such as Jetter (2002) have said

> *Nigeria must tackle poverty which is a milestone around the neck of too many countrymen. I would like to see a National strategy that focuses on infrastructural and human capital development through education and health care(Pg.13).*

This desire points to education as an important sector, which drives the other sectors of the economy. The greatest asset a nation can have and possibly invest in is its human resources. A country with well-trained and skilled human resources will make adequate use of its natural and material resources for sustainable economic growth. In the globalized world in which we now live, any country with well-developed and skilled human assets dominates in economic strategizing. Rodrik (1997), laying credence to this view, argued that globalization creates problems for low-skilled workers as it also weakens safety nets. Production of skilled manpower in science and technology is thus a necessity for any nation with developmental intentions. A national plan without an adequate plan for appropriate science education for skill development and forthright implementation strategies for its achievement will definitely remain a mirage. This paper, therefore, is a prompt and a challenge for action, especially in the face of the present economic realities of the world.

The State of Science Education in Nigeria: Fifty Years after Independence

Every year, Nigerian science teachers rise from their world conference with a call to the government to take very seriously its policy on Education, especially on science education. A constant reminder is made of the innumerable benefits of variable science education on national life. This is because no nation in the world

has been found to attain high standards in technological and economic growth without a well structured, well financed and well anchored science education for her youths.

Science education in Nigeria has remained static and unproductive since independence. Despite the numerous curricular changes and educational reforms, our science education has not been able to lift the country either into industrialization or above the poverty level. Jegede (2002:4) pathetically noted that

From my limited observations of science education and science teaching in Nigeria based upon my comparison of when I was teaching science in our classrooms before I departed the shores and what I have observed since coming back, I find it difficult to claim that science and its teaching in our environment have been of any spectacular advantage to our people. It does appear that while science does not proceed beyond the desks of our bureaucrats, it does not go any distance beyond the lips of the teacher nor does it go beyond students' knowledge of a few disjointed facts of nature that may not have any bearing with what goes on in the larger society.

His assertion is neither a hoax nor a figment of his imagination. He has only spoken patriotically without mincing words. The way it is now, the nation wil1 miss nothing if science education is expunged from the curriculum. What it implies is that our science education has not made any impact on the national economy or development since independence. This sure is a sorry state.

The questions now are: why has our science education failed to produce skilled human resources needed for the transformation of national fortune into prosperity? Why has Nigeria not been able to use the intellectual resources of science to improve the quality of life and living, economy, infrastructure, ailing industries, raw material processing, natural resources management, environmental resources protection, communication, energy, and even information and communication? Why is our economy shrinking like unleavened bread in the face of a global economic crisis? In seeking answers to these questions, several issues come to mind, some of which will be discussed here.

- Lip service to science education policy. No one wants to tell the whole truth about the dilemma of science education. Government and practitioners of science education have converted serious issue that impinges on national sustainability and economic sovereignty as science education into child's play and political toy. Education and particularly science education is erroneously assumed to be like any other segment of national life and as such, deserve no special action.
- Infrastructural decay and non-availability of essential materials for learning science are now synonymous with science education classrooms and laboratories. Learners have come to feel and believe that science is like all other disciplines which can be studied without the necessary

infrastructure, equipment, and materials. After all, certificates that have no bearing on the state of knowledge and skills of the bearers are issued at last.

- There is an embarrassing neglect of education in general and science education in particular. Schools and institutions of learning are mere shadows of what they should be. Financing education as recommended by the United Nations is awaiting consideration. Proposals for adequate funding of science education end on the drawing board. They never see the light of the day.
- Science and its teaching have ceased to be enviable. Science teachers lack the necessary competence, motivation, impetus, and exposure for teaching science at this age. This is expected since teaching generally no more attracts the best heads and hands but those rejected by other professions. Science education is not an exception.
- Access to an electronic library for science teaching has remained a dream.
- Practical science and laboratory work as means of developing skills in investigative science, creativity, and mental skills have been so highly neglected.
- The curriculum of science education lacks an infusion of contemporary science issues and discoveries that entice youths and with little relationship to the needs of the country. Contents of science subjects have remained the same over the decades. Science classrooms are progressively becoming more didactic, lackluster, and uninspiring. The zeal to learn science is gradually dying among youths. This is manifesting in the low enrolment of students in science-related courses and professions.
- Research in our science laboratories are shared illusion. Funds are never ever available. Equipment and materials are obsolete, chemicals are caked and expired, students are expected to purchase chemicals for laboratory research, and energy to power some laboratory activities are never available.
- Science education professionals are theoretical in knowledge and approach and completely deficient in practical knowledge and tenets of experimental and investigative science practice.
- Over-reliance on cognitive instruments as a measure of student's performance and knowledge acquisition, with a. total neglect of skill acquisition, creativity, scientific reasoning, and critical thinking encourages neither productivity nor entrepreneurial skills development. The implication of this is the numerous failed government projects and poor state of small and medium-scale enterprises (SMEs).
- High rate corruption that discourages hard work and dedication.

The implication of this state of science education is stagnancy, depression, non-functionality, and production of non-science scientists. This state of affairs

has no solution to offer in a period of economic crisis such as the world is going through now.

Restructuring Science Education for Relevance

In order to produce capable science personnel to stir the various technology-driven aspects of the economy, science education, the bedrock of technology must be restructured and redirected toward skill development.

Fola Daniel in the Vanguard newspaper of 9th March 2009 cautioned that the period of economic recession is not the time to cut spending but rather to step up investment in human capacity as a means of sustaining poverty reduction efforts as well as spurring human-capacity-driven economic growth. The paper warned against shrinking the education budget in sub-Saharan Africa (Nigeria included) where it has been observed that budgets for education are falling below the UNESCO recommendation of 4 to 6 percent of the GNP or 21% of the budget. The major roles of science education no matter the level are teaching and research. Reconstructing science education for relevance must look at these two roles in relation to their contribution in national economic strategizing and human resources development. Onwu (2004) stressed that the impact of science education must create research agenda that will be relevant in providing solutions to problems, such as evidence-informed advice to teachers and policymakers on practices that are effective. In order to do this, appropriate research focus on the science needs of the country in different areas of the economy and the creation of synergy between the science research community and economic agencies should become priority. Empirical evidence from researches in support or against some government practices or policies should gain focus in the revitalized science education research.

Curricula issues in science education practice especially in the design and implementation strategies that encourage creativity or possess relevance in terms of content must be addressed. There is a need to adapt science curricula to equip learners with strategies, attitudes, and skills to live effectively in society and enable them to respond to exigencies that may arise from time to time (Opara, 2004; Jegede 2002). Science and technology have implications for every aspect of national life. Reconstructing science education curricula to include responses to stimuli for adapting to changes within the value system and promoting alternative strategies for cushioning natural forces effects is of great importance. The science curricula of secondary and tertiary institutions have been the focus of this call for reconstruction. Okwu (1981) suggested the inclusion of several scientific activities that have remained untapped due to poor scientific knowledge and inadequate manpower. Ikoku (1973) had long ago advocated the inclusion of raw materials processing and utilization into the senior secondary school curriculum in Nigeria while Jegede (2002) has made a call for the inclusion of contemporary science issues and knowledge that control world affairs but which are not known to most science teachers and students at the secondary school level.

Adequate science teaching and learning environments such as well-equipped laboratories, functional libraries, classrooms, and the use of modern materials for teaching create more concrete knowledge and a positive attitude toward the discipline; encourage the application of imaginative thinking and scientific reasoning skills (Moemeke,2007) as well as link classroom science to everyday life in society. Most societal changes are responses to scientific and technological developmental stimuli, the effect of which have economic implications for any nation. Science classroom environments and laboratories that provide materials and opportunities for learners to develop skills relevant to real life strengthen the human resource base of society and prepare citizens for the development of quick adaptations to unforeseen change. Exposure to technological equipment in learning such as computers and the internet, video automated teaching, etc will expose learners and teachers to think in the same direction as their counterparts in other nations of the world so as to match action with action. Rather than devoting time to remediation of the effects of other nations' forces on the country, the need to put in place an environment for planning to forestall such effects will be more beneficial to economic and national growth.

Science education researchers in Nigeria seem to exist in a different milieu from the dynamics of the world economy. There is a need to understand that just as scientific research and the results of experiments create new forces that direct economic activities as seen in the e-commerce, e-banking, globalization, and ICT revolution, market/economic issues also shape scientific thinking and research. Thus scientific and economic forces function in dynamics, with each impinging on the growth and stability of the other. A scientific study of Nigeria's exports commodity market and natural resources/income management strategies is most likely to forewarn economic and scientific communities of any impending problem in advance so as to facilitate a planned response.

Restructuring science education calls for a rethink in the mode of assessment of science outcomes. The continued dependence on cognitive instruments for the assessment of skill-oriented, creativity - laden and reasoning-related science outcomes do nothing but kill innovativeness in teaching, creativity, and skill impartation. The need for alternative, process-oriented, and divergent assessment techniques in evaluating science outcomes and a radical departure from the age-long examination and elitist styles of assessment have been suggested by Jegede (2002) and Moemeke and Omoifo (2003). A renewal of this call has become important in light of the present realities: many certificate-carrying- scientists but very few practical, creative, and skilled scientists.

In addition to all these, the teachers' knowledge of science requires review and restructuring. The content of the teacher education curriculum in science and the quality of graduate science teachers call for an inspection. The sensitivity of science education to economic and national life calls for the best hands in terms of skill, training and knowledge. Poorly equipped science teachers will definitely produce non-science scientists. There is a need to produce a blueprint for the

training and admittance of science teachers into practice. Adequate retraining of teachers, especially in modern science teaching strategies (process-oriented approaches) and expansion of teachers' content knowledge in areas of specialization need to be addressed. The inclusion of contemporary science and market issues of our present-day world into science teacher education curricula at different levels has become more urgent than ever. The plan by the National Educational Research and Development Council (NERDC) to include studies in the stock market in the senior secondary school curriculum may just be the prelude to that diversification. An action plan for science teacher education is, therefore, a necessity.

Economic Meltdown: Lessons for Science Education

Evidence of the lack of preparation by Nigeria for the economic exigencies of the present time is written boldly in the present panic measures to stern submergence. Over-reliance on a trade-driven economy, particularly as it concerns one-stock export and multiple imports, spells doom for any nation's economy and nationhood. Allowing the economy to be controlled by oil forces will not lift the country above poverty since oil pricing is determined by the same forces that strive to pull the producers down and perpetuate economic colonialism. The new turn of events should therefore sensitize government and curriculum planners as well as all stakeholders to restructure science education machinery to exploit opportunities in

1. Raw material research, expedition, mining, and purification.
2. Agricultural improvement through the adoption of new farming techniques for greater and faster food production, modern methods of preservation, crop and animal improvement, and genetic engineering. Also, the education of citizens and the production of manpower in canning and other methods of preventing food wastage should be entrenched.
3. Exploitation of natural gas reserves and foreign exchange earnings through its exportation should become a science education plan in the millennium.
4. Study of local industrial activities and teaching of principles to enhance growth and productivity in the sector should become the present-day concern of science education. For example, the local textile manufacturing industry, soap industries, local tool making of the Edo and Awka people, dairy industries, and a host of others should receive attention
5. Redesigning, recycling, and waste management and the scientific principles surrounding the processes should be included in the curriculum.
6. Emphasizing curricula principles for small-scale energy production in synergy with appropriate agencies and parastatals.
7. Designing strategies and producing manpower for reawakening and improving local manufacturing industries by checking indiscriminate importation, foreign exchange racketeering, and other forces that strangulate them.

A more robust and diversified economy is a direct extrapolation of effective and dynamic science education. A deficient and ineffective science education results in stagnancy, fragility, and retardation of the national economy. Teaching principles that are obsolete in terms of modern science education realities are inimical to economic growth and resistance to eventualities. These should be the particular focus of science education in the face of world economic recession.

Conclusion

Many issues have been raised in this paper about the state of science education in Nigeria since independence and the struggle to make science education relevant to national life by restructuring it for skill development. Dependence on a one-stock market and lip service to science has been identified as the bane of national economic growth. The call for greater and more purposeful funding of education for human resources development as well as energizing other aspect of the national economy has been stressed. It is therefore the desire of the author to suggest and propose a strategic plan to revitalize and refocus science education at all levels for skilled manpower development, as this is expected to produce the needed hands in times of economic recession.

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