Appraisal on Effective Teaching and Learning of Science Subjects in Secondary School for Self-Reliance

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Abstract

This paper examined the appraisal of effective teaching and learning of science subjects in Secondary school, tertiary institution for self-reliance. It also examines the concept of self-reliance, education and national development, teaching and learning of science subject for self-reliance and the challenges facing the teaching and learning of sciences in tertiary schools. The paper noted that although the Nigerian education is rooted in self-reliance as stated in the National Development plan and the National Policy on education, the problem is that of poor implementation which resulted from age old mentality of the colonial education system. This has strangulated the nation's quest towards political, economic and human development. The present educational practice stifles the graduates' initiative to apply their theoretical knowledge to practical use. The paper recommends among other things that the Nigerian education should be geared towards self-realization, self-sufficiency and self-reliance and this can be effected through emphasis on science, vocational and technical education.

Keywords: Appraisal, Effective Teaching and Learning, Science Subjects, Self-Reliance

Introduction

Education has been described as a mode through which an individual obtains the requirement physical and social abilities or competencies needed for the development of society (Awotunde et al., 2004). Education is also defined as a system by which the necessary knowledge and understanding are served through the method of teaching and learning. Bassey (2009)**.** Education has been recognized globally as a veritable and strategic venture pivotal to economic transfusion of any nations. The teaching of science subjects in the senior secondary school under the new 6-3-3-4 system of education in Nigeria. Occupies a central position in the National Policy on Education (NPE) published in 1977 and revised 1981 and 2004. It is remarkable for the inclusion of science subjects in the curriculum, which is geared towards producing a group of people who can exploit their environment through scientific natural phenomenon and facts for National development. The study of science at all level of education for self-reliance as a venture, at the end of the study.

Science subjects are basically divided into two. The physical science which includes physics, chemistry and mathematics and biological science which includes Agricultural science and biology. Thus, we can conclusively say that mainly science subjects comprise of five subjects mentioned above (Abubakar in 2014).

The purpose of teaching and learning of science subject in the national policy of education was to build a self-reliant nation and also for the development of our Human technological culture. Now that technology is the modern culture of man there is need to develop more intelligent, versatile creative and hardworking people for realization of self-reliant nation.

Self-reliance on the other hand is the ability of an individual or a nation to stand on their own without looking for help from somebody or other nation.

It is on this backdrop that this paper examined the:

i) Concept of self-reliance
i) Teaching and learning of science subjects and self-reliance
ii) Education, self-reliance and national development
iii) Challenges facing the teaching of science subjects in secondary school

Concept of self-reliance

The Colonial education in Africa, Nigeria in particular was not focused on the production of self-reliant graduates since inception. Akinpelu, (2005) noted that the production of catechists and office clerks did not place any special premium on self-reliance. He further observed that most of the expatriate bosses would in fact not wish to see their junior workers develop minds of their own. Again, the traditional education as an access and passport to government jobs whether as a teacher or as a clerk did not prepare people's mind for venturing out on their own. The unfortunate effect of which is a total dependent attitude of mind in its recipients. They have no idea of education as a liberation of energy and creativity for venturing for oneself. However, the National policy on Education first published in 1977 can be described as the first all-Nigeria effort to forge a new educational policy that can be relevant to her situation (Akinpelu, 2005). In essence, the document represents Nigeria's desire at self-reliance, that is, the shaping of her destiny with her own hands.

A closer reading of the policy will reveal that the spirit of self-reliance permeates the various sections of the (NPE) for example (1) Section (I) Sub-section (iii) which is the five main national goals, (c) part of it states that one of the goals is the building of "a United, strong and self-reliant nation" (2) (i) Section (ii) Sub-section (8) which lists the values to be inculcated at all levels of instruction, the (f) part highlights the "acquisition of competencies necessary for self-reliance" 3. (i) Section (2) Sub- station (13e) states that the purpose of pre-primary education shall be to; "inculcate in the child the spirit of enquiry and creativity through the exploration of nature, the environment" 4. Section (4) substation (18f) states that the goals of primary education are to give the child opportunity for developing manipulative skills that will enable the child function effectively in the society within the limits of the society. 5. section (5), Sub-section (19) states that secondary education shall; provide technical knowledge and vocational skills necessary for agriculture, industrial, commercial and economic development. "Give training and impart the necessary skills to individual who shall be self-reliant economically. 6. section (8), sub-section (59) stresses that the goals of tertiary education shall be to; contribute to national development through high level relevant manpower training", acquire both physical and intellectual skills which will enable individuals to be self-reliant and useful members of the society. 7. section (8) subsection (71)b, states that the goals of Teacher Education are; to "encourage further the spirit of enquiry and creativity in teachers. 8. Section (8) subsection (80) (b and c) stresses that the polytechnics shall in addition have as their specific goals the following; "providing the technical knowledge and skills necessary. And economic development of Nigeria "give training and impart the necessary skills for the production of scientist technicians, technologists and other skilled personnel who shall be enterprising and self-reliant" from the catalogue above, the structure of the -2004 edition of the NPE was implicitly designed to promote education for self-reliance with emphasis on science technical and vocational education so that no child comes off the system at all levels without some knowledge and skills in one or more vocations to equip him or her to be self-employed if need be. In addition to government's desire for the production of citizens with the "right type of values and attitudes as well as the skills and the capabilities for self and national survival, the 6-3-3-4 education system was introduced. This laudable innovation in our educational system was ill-fated and short lived due to numerous constraints.

Apart from the formal school system, the (2004) NPE notes that the policy seeks to enlist other non-formal agencies of education, in an attempt to integrate the school with the

community and vice versa as local craft centres and small and medium scale industries are to be used; and the local craftsmen artisans and master craftsmen, are to be employed to teach pupils, which some of polytechnic are trying to implement now and example is Auchi Polytechnic. In close examination of the afore-stated national objectives, Aminigo, (2003) indicated that one major area of need in Nigeria is an understanding of and commitment to the issue of self-reliance that would enhance Nigeria's development as a nation.

Teaching and learning of science subjects and self-reliance

The biological science which includes agriculture science and biology can be used to transform the Nation. The present global trend toward self-reliance through onward approach to national development has made it inevitable for the citizenry to acquire basic education that can transform them into active and participatory citizens in their society. Evidently FRN (2009.b) in the national policy on education has provided enough theoretical frame-work for actualizing self-reliance through education in Nigeria. It states that, one of the National goals for Nigeria as a Nation include a united, strong and self-reliant Nation. One of the national goals of education at all levels which is linked to the philosophy of Nigeria education is the acquisition of appropriate skills and the development of mental, physical and social abilities and competencies as equipment for the individual to live in and contribute to the development of the society (Federal Republic of Nigeria (2009a), it may not be wrong, therefore, to assume that every level of education in the country should be geared towards self-reliance and employment. Agriculture as an aspect of biological science involves the cultivation of land, raising and rearing of animals for the purpose of provision of food for man, feed for animals and raw materials for industries.

The role of agriculture in transforming both the social and economic framework of an economy cannot be overemphasized. It is also essential for the expansion of employment opportunity. reduction of poverty, improvement of income distribution, industrialization and easing the pressure of balance of payments. In effect, it has been the main source of gainful employment and a reliable source of government revenue. About 80 percent of the total population is engaged in agricultural employment in Nigeria.

Agricultural science can be broadly understood as the application of scientific methods and methodologies to improve agricultural practices, including the harvesting, processing, and distribution of food, fiber, and pharmaceutical products (Noll 2015; Olmstead and Rhode 2008). This field historically focused on a wide array of research topics, such as improving production techniques, controlling pests, minimizing the effects of drought, the selective breeding of plants and animals, and research on various socioeconomic topics. It is a multidisciplinary area of research that includes work in both the natural and social sciences and integrates methods originally developed in distinct fields. Indeed, the process of improving agricultural practice often involves the combined efforts of researchers working out of diverse disciplines, such as agronomy, chemistry, ecology, soil science, and the social sciences (Jacobs and Frickel, 2009). By implications, "agricultural science" should be understood as an umbrella term that includes work coming out of various scientific disciplines, with the singular aim of improving agriculture.

The Federal Ministry of Agriculture and Water Resources (1985) noted that agriculture is the mainstay of Nigeria economy with many assigned roles to perform in the course of the country's economic development. Among the roles ascribed to the agricultural sector and those of providing adequate food for an increasing population supplying adequate raw materials to the industrial sector, constituting the major sources of employment and foreign exchange, earning and providing a market for the products of the industrial sector. These important roles necessitate adequate education in agriculture which can gainfully engage the teeming

unemployed population of Nigerian youth. That is why the FRN (2009.b) outlines the seven major objectives of teaching and learning of agricultural science to reflect the;

1. Ability to stimulate students' interest in agriculture
2. Ability to enable students acquire basic knowledge of agriculture.
3. Ability to develop basic agricultural skills in students.
4. Ability to enable students integrate knowledge with skills in agriculture
5. Ability to expose students to opportunities in the field of agriculture
6. Ability to prepare students for further studies in agriculture and
7. Ability to prepare students for occupations in Agriculture.

Attainment of the above objectives depends on teachers' factors and pedagogical approaches. Teachers in this case are agricultural science teachers. Agricultural science teachers are trained and groomed from teacher preparation institutions for quality impact of agricultural skills, knowledge attitudes and values for self-reliance, promotion of agriculture and food security in their future lives and that of the society at large. It is therefore the duty of this set of teachers to; stimulate and sustain student's interest in agriculture, enable students acquire basic knowledge and practical skills in agriculture, enable students integrate knowledge with skills in Agriculture, prepare and expose students to take agriculture as and occupation. Attainment of the goals and objectives of agricultural science depends on effectiveness of teaching and learning in our secondary schools.

Self-Reliance Opportunities through Agricultural science Education

Self-reliance is the ability of an individual to stand on their own without looking for help from some body. Ijere (1995) asserts that, unemployment is among the greatest plagues of Nigeria society and it is therefore not surprising that one of the efforts of government is the provision of educational training for her citizens to be able to face the world of work. Training in vocational agriculture in institutions of learning should be seen as with specific knowledge and skills as to be able to employ themselves on graduation. Vocational agriculture programme is designed to provide knowledge and practical skill in areas of agriculture such as crop production, animal's husbandry, soil science, horticulture, agricultural economics and extension, fishery, forestry and wildlife. Other areas include agricultural Engineering, Agricultural Extension. Aghimien and Nosa Ojo (2001) opined that, a well-trained vocational agriculturist who has the zeal and commitment can use the knowledge and skills acquired in any of the above branches of the subject areas to provide not only self-reliance but can on the long run be an employer of labour in the following fields:

i. Crop Production: Food crops like rice, maize, guinea corn, bean, yam, groundnut and cassava can be embarked upon by graduate of vocational agriculture. These crops have short production cycles which make it possible to produce them at least two times a year under natural rainfall. These crops are also of great demand throughout the year as they form the staple food of many Nigerians. Huge capital outlay is not required before one can go into the production of these crops. It can be carried out under subsistence agriculture, where family members can do all the farming operations.
ii. Production of vegetable crops: Gainful self-employment skills can be undertaken in the production of vegetable crops such as tomatoes, pepper, amaranthus, fluted pumpkin, cabbage, lettuce and others are of great demand every day for different purposes. Another advantage of vegetable production is that production can be carried out throughout the year especially with the adoption of simple irrigation procedure with good production plan; a vegetable producer can generate income all year round.
iii. Livestock Production: In the areas of pigs, goat, and poultry, somebody who chooses to engage in the production of poultry- birds such as fowls, turkey, duck and guinea fowls either for eggs or meat and also pigs, will be fully occupied throughout the year which

also guarantees income at regular intervals. Moreover, these enterprises can be undertaken with little and small space of land. In some cases, already built poultry or pig houses can be rented for a fee. After few years of steady growth, these projects are capable of employing not only the livestock, keeper, but other persons in order to cope with husbandry and other activities so as to meet consumers and market demands for products. Other livestock which could be reared include; sheep, and cattle but they require huge capital outlay which a beginner may be unable to provide and large expanse of land which is not easy for a young graduate to provide.

iv. Fish production: As a part of an integrated farming approach, a graduate of vocational agriculture involved in poultry production can be more gainfully employed through the rearing of fishes in ponds and/or tanks. Fishes such as catfish and tilapia can utilize waste food materials for good thereby reducing cost of feeding to low minimum. Moreover, fishes are of high demand to market with no discrimination of any kind. More importantly, (hat ponds can be constructed within a living environment is enough encouragement to persons who wish to be engaged in fish production as means of substances.
v. Establishment of Horticultural gardens: The establishment of flower gardens where different flowers species are raised for sale to individuals, corporate organizations for beautification of compounds and living environments is becoming a very good source of self-employment. A specialist that operates horticultural gardens can also be involved in landscaping of compounds for private individuals in the raising of seedlings such as those of oil palms which are great demand. The establishment of horticultural garden does not require heavy capital outlay.
vi. Agricultural products processing: This is another area of agriculture that is capable of generating good employment for young school leavers. This includes the processing of ripped oil palm fruits and palm kernel, processing of cassava into garri and starch, processing of rice, timber logs and others. With little capital, local processing plant can be fabricated and installed for farm products processing business that will yield regular income.
vii. Provision of farm services: A graduate of agricultural education can lie engaged in the provision of farm services such as pest and disease control, transportation of farm commodities, land preparation and with special machines and veterinary services

Young person's belief about a career's value is influenced by the perceptions, attitudes and expectations of others such as parents, teachers, guidance counselors. It could be implied from the point view of Dick and Rallis that parents play a greater role in their choice of career, some parents look at agriculture as job for the common man in the society thereby discouraging their children from taking agriculture as an occupation.

Education, self-reliance and national development

The importance of education in the overall development of a nation cannot be over emphasized. Osokoya, (2008) has rightly observed in this direction that more than ever before, nations and international Organizations are spending vast amount of money on education on the main assumption that educated population contributes to the socio-economic development of the society as a whole and to the well-being of individuals within the society. He further observed that this widespread belief that education is a major means of achieving industrialization permeates the world, and both technologically developed and developing countries attempt to design education programmes to achieve their economic goals.

Education has therefore become one of the major areas of investments for economic development. In Nigeria's philosophy of education, NPE (2004:6) it is believed that (a) "education is an instrument for national development in this end, the formulation of ideas, their integration for national development and ideals are all aspects of education; (b) education

fosters the worth and development of the individual for each individual's sake, and for the general development of the society. The policy further states that "education shall continue to be highly rated in the national development plans because education is the most important instrument of change; any fundamental changes in the intellectual and social outlook of any society has to be preceded by any educational revolution. It is indeed this revolution that motivated this writing.

On the other hand, contrary view exists on the subject. The belief that education is a panacea, a solution to the problems of the world has recently been called to question, because as Osokaya, (2008) has observed, such assumptions are clearly over simplified and exaggerate the potency of education as a vehicle for achieving all round development. He further observed that indeed, education sometimes act as an impediment to development, and when education does not cause development, its influence is often complex and very subtle. Expressing a similar view, Noll, (2015) argued that educational expansion as we now know, 'does not necessarily make people of countries more prosperous, instead it may and does leave the former without jobs and the latter with increasingly burdensome claims on public funds.' The above views are very cogent to Nigerian educational system right from the colonial education system to the present one. In the Nigerian nation, as Aminigo, (2003) has noted, that the past three and half decades have seen the rapid development of formal education. He further noted that higher enrollment rates, abundant provision of facilities and institutions have been the order of the day. But unfortunately, however, these increases have generally neglected economic and local realities and considerations. As a result, a lot of the products of our institutions presently amount to surplus and unemployable manpower. Yet there are many areas of economic activities and production lacking viable hands and manpower. The key question now is what kind of education and education for what does our system of education strive for? In order to provide appropriate education, there must be relevant philosophy of education. This issue has been taken care of in the Nigerian NPE. However, in NPE, determining the nature and character of our philosophy of education, the African traditional philosophy of Functionalism should be re-examined more closely.

In the traditional African set up, the educational philosophy was geared towards making every citizen useful and self-reliant. This brings us to the issue of education and national relevance. According to Kosemani (2001), for any education to be of value, it should be relevant to the experience and to the real world in which the people live. National relevance, he further observes, does not simply mean that education must be Nigerianized, but that it should involve intellectual knowledge and practical application of the fruits of education in such a way to enhance the quality of the individuals' lives and national development. The full meaning here is that the wrong graduate manpower as is the order of the day in Nigeria should no longer be produced. Also, there should be greater stress on vocational and technical skills that would meet our productivity needs as a nation.

The wide economic gap between developing and developed countries is traceable to their level of technological development and the extent to which vocational and technological education is encouraged and pursued. In a similar view, Fofunlex (2004) believes that any education which has to do with the development of skills, attitudes and knowledge necessary for gainful employment is vocational education. It is in this regard that the authors propose the issue of education for self-reliance in this paper. Education for self-reliance should form the basis of the national development plan.

Challenges facing the teaching of science subjects in secondary school

There are many challenges facing the effective teaching and learning of agriculture science in Nigerian secondary school which have invariably leads to poor participation of secondary graduate taking agriculture as an occupation. identified seven major challenges

facing Agricultural science education in their quest to achieve effective teaching and learning of the subject that could lead to self-reliant. These are:

i. Inadequate qualified science teachers
ii. Absence of farms for practical
iii. Inadequate technical know-how
iv. Inadequate teaching methods
v. Inadequate instructional materials
vi. Poor funding
vii. Poor attitudes of students towards Agriculture

Conclusion

The paper, has analyzed the vital role of education especially; education for self-reliance. Among other anomalies, it was observed that although Nigeria has a laudable educational programme as indicated in the National Policy on education towards self-sufficiency and national development much has not been achieved as words have not been matched with action. The crises being experienced by Nigeria today is traceable to the deep-rooted Colonial educational mentality for white-collar jobs. For functional education to replace this trend, there is an urgent need for the acquisition of science, vocational, technology education and their effective application to the meet the needs of the nation.

Recommendations

The paper has made the following recommendations towards effective education for self-reliance;

1. A national sensitization campaign to create awareness on the importance of vocational education should be undertaken to ensure self-reliance.
2. More vocational schools should be established to expand enrollment and to de-congest the existing few.
3. Awareness of agriculture science created at all level of Education for self-reliance
4. Professionals in business and industry should be part of any team for curriculum development in the country.
5. Good governance is very necessary for a successful vocational and technical education programme. There is need for political will to be able to match words with actions especially in terms of finance.
6. Communities, individual, industries and other organizations and agencies outside the government should assist to fund vocational education.
7.

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