Chapter 16

BIOLOGY EDUCATION IN THE PROMOTION OF CULTURE AND SUSTAINABLE DEVELOPMENT IN AFRICA

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Introduction

The focus of this chapter is how biology education plays a role in the promotion of culture and sustainable development in Africa. In doing this, the chapter considered the meaning of biology education, brief history of biology education in Nigeria, culture and sustainable development, role of biology education in promotion of African culture, biology education and sustainable development in Africa. It supports these issues with a report of an experiment on dramatisation and use of analogies in promoting biology education.

What is Biology Education?

Biology is the study of living things which includes ecology and the environment (Okebukola 2011) and therefore encompasses the science of living and life. The process involved in the study of biology is similar to what is obtainable in other sciences. This process includes observation, investigation and testing of facts, drawing of conclusions, making inference and reporting. Bajah, Emeke and Yoloye (1981)

described biology as problem-seeking as well as problem-solving. This description indicates that biology does not lay claim to anything as a fact until such things are identified, examined and tested.

The beauty of biology lies in its language and presentation which are order, sequence and logical in nature. Education according to Daramola (1994) is a process of training individuals in any society to acquire appropriate knowledge and skills in order to live a useful life and contribute to the progress of society through the acquired skills and knowledge. Education may be formal and informal. Biology education therefore is the process of teaching and learning of biological concepts and principles.

Brief History of Biology Education in Nigeria

The history of science teaching in Nigeria dates back to the era of Christian missionaries who introduced western education into the country. The establishment of the Church Missionary Society (CMS) Grammar School in Lagos in 1859 set the pace for science teaching in Nigeria. Other missionary societies that established schools in Nigeria were Roman Catholic Missionary (RCM), Wesleyan Methodist Mission, African Mission, Baptist Convention, United Presbyterian Church and the Qua Iboe mission. Arithmetic, algebra, geometry and physiology (biological science) were rudiments of science education injected into the school curriculum. The colonial government started participating in the development of science in secondary education during the period 1883-1930. The education ordinance of 1930 marked another phase in the development of science teaching in Nigeria. Nature study was made mandatory at primary and secondary school levels and this later gave way to biology and other related sciences. In 1931 Yaba Higher College was established and this marked major development in science curriculum. The college was upgraded in 1963 to Yaba College of Technology. Courses like engineering science, agricultural science and survey were offered at the college. The major aim of the curriculum was for the graduate of the school to fill vacancies in relevant government departments. The first set of graduates from the

college taught science in secondary schools and by so doing, foundation were laid for the development of appropriate curriculum for science in the secondary schools.

In 1948, University College Ibadan was established as an arm of the University of London following the report of the Elliot Commission on higher education. In 1960 it became University of Ibadan and started awarding its own degree in 1962. In 1951 Higher School Certificate (HSC) was introduced and this provided opportunity for students to offer biology, chemistry and physics at higher levels with emphasis on laboratory work to meet the practical requirements in science subjects. Following the Jeffery report of 1950, an examination board was established in 1952. This board later became the West African Examinations Council (WAEC). In its first examination in 1955, science was one of the subjects examined.

Culture and Sustainable Development

Culture provides an individual with a set of common understanding that they employ in fashioning their actions (Hughes, et al 1999). Three component of culture are norms, values, symbols and language. Social rules that specify appropriate and inappropriate behaviour in a given situation is referred to as norms. They are the standard pattern of behaviour that is considered normal in a society. Norms provide means by which we orientate ourselves to other groups. Values according to Hughes, et al (1999) are broad ideals regarding what is desirable, correct and good that most members of a society share. They are general and abstract and do not specify explicitly which behaviours are acceptable or unacceptable.

Objects or acts that have come to be socially accepted as standing for something are referred to as symbols. Symbols can be in different forms. Language is the main vehicle by which ideas, attitudes, emotion and information are communicated by people. The most Important is language. Language is the major means by which culture is created and transmitted from generation to generation.

Sustainable development

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Two major concepts were identified in sustainable development. They are the concept of 'needs', in particularly the essential needs of the world's poor, and this should be given major priority and the second concept is the idea of limitation brought about as a result of technology and social organisation of the environment.

All definitions of sustainable development require that we see the world as a system – a system that connects space and a system that connects time. When we see the world as a system then it becomes clear to us that our grandparents' decision on farming continuously affects today's agricultural practices. Also, the impact of urban poverty on our children when they become adult depends on the economic policies endorsed today.

Education is central to sustainable development because it empowers people and strengthens nations. It is a powerful 'equaliser' to reduce the destruction made by class, race and culture and it opens doors to all to lift themselves out of poverty (Teng 2012).

The link between culture and sustainable development is strong. Humans respond to natural environment through culture. Observable examples include our mode of dressing, the food we eat and the manner of eating. Other examples include types of house we build and the provision we make for transporting ourselves and our goods from place to place. Our culture is a way of attaining social preservation and perpetuation. This is evident in our customary practices in marriage and the ceremonies accompany birth, wedding or death.

Culture is a means of securing personal and social fulfilment spiritually. This is seen in our various belief systems and the different ways in which we live peacefully. Our culture is a way of attaining social harmony and social progress (Bamisaye 1990). According to Wikipedia,

the principle underlying sustainable development can be separated into social, economic and ecological dimensions. No nation can attain sustainable development if the environment is worsened and if the wealth is not properly distributed. Hence economic factors indicate economic growth. Social factor is a condition for economic growth and environmental conditions are factors in social and economic development.

Quality of life is also a factor in sustainable development. It is desirable to be healthy physically. It is also pertinent to have access to education and have stable income. Freedom of religious expression also contributes positively to sustainable development.

Role of Biology Education in Promotion of Africa Culture

Education about indigenous flora and fauna: Language is the most important component of culture. Education cannot takes place without language of instruction. Education about indigenous flora and fauna will probably be effective in mother tongue of the learner (Banjoko, 2001). The language policy as stated in the National Policy on Education in the use of mother tongue as a medium of instruction in Nigeria has generated considerable controversy among several highly respected intellectuals as well as the general public. Those who support the policy claim that a child learns best in his or her mother tongue. The policy therefore would promote greater comprehension of school subject by the pupil. Those who oppose such a blanket policy on the other hand claim that it would limit the scope of the child's knowledge because many significant modern concepts especially in mathematics, science and technology do not have words representing them in the Nigerian mother tongue (Umeoduagu 1990).

The problem of orthographies for Nigerian language has been tackled fairly vigorously by Nigerian government (Yoloye 1986). According to him the language development centre of the Nigerian Educational Research and Development Council (NERDC) produced orthographics in thirty Nigeria language in six manuals as follows:

Manual 1: Hausa, Efik, Igbo, Yoruba
Manual 2: Edo, Tiv, Fulfude, Kanuri, Izon
Manual 3: Ibibio, Nupe, Berum, Kalabari, Idoma
Manual 4: Ebira, Igala, Isoko, Kaje (Baju) Gbagye (gwam)
Manual 5: Biratye, Esan, Bura, Ikwere Urhobo, Wukare
Manual 6: Lokan, Mbember, Obolo, Tarok, Igede, Mumuye

In general, the glossaries contain both English and mother tongue equivalent of words grouped into mathematical terms, physical science terms and biological science terms. A close study of the glossary shows that terminologies were developed according to the following guidelines (Bajah 1986):

- Direct borrowing of word from a foreign language sometimes with slight changes in words that conform to the pattern of the language. For example the Yoruba word for science is "sayensi", the Edo word for graph and electricity are 'Egiafu' and "eletiriki", the Efik word for insects is insek, the igbo word for insects is insek, the igbo word for force is "fosi"
- Coinage or invention of completely new words in Nigerian language to express a new idea or concept. Examples in biology is the local name for animals as shown in table 1.

Table 1: Yoruba Names for some Animals

Biological name	Common name	Local name (Yoruba)
Insectivore	Shrew	Asin
Chiroptera	Bats	Adan
Primates	Monkey, man	Obo, eniyan
Largomopha	Rabbit/hare	Ehoro
Rodentia	Rats	Eku/ekute
Carnivore	Dog, cat, lion	Aja, ologbo, ekun
Perisodactyl	Horses, zebra	Esin

Actiodactyla	Cow, sheep, camel	Malu, agutan, rakume
Hyracadae	Elephant	Eerin
Pholidota	Pangolin	Akika

There is also the adoption from another local language when a suitable word does not exist in one language e.g onion in Yoruba language is "alubosa" and in Igbo is "alibosa".

Indigenous education encourages the use of the mother tongue for naming fauna and flora. We should also note that biology education plays a role in the preservation of plants and animals. It has been an agent of change both intellectually and culturally. Culturally, learners are not only made to learn biology and general civilisation of their people, they are also made to learn about those of other nations particularly those of former colonial masters (Bamisaye 1990).

The outlook of the educated elite is a blend of African and European culture and this influences the total life-view in society. Nigerian education not only provides avenue for knowledge acquisition, it also provides for knowledge creation which influences the cultural outlook of the society (Bamisaye 1990). In the area of preservation of plants and animals, the enlightenment is now high that animals and plants should be preserved. Apart from animals in zoological gardens, roaming animals are now seen to be preserved. Several radio and television advertisements are broadcast on the need for preservation of plants and animals in our society. Three planting exercises are carried out at all levels of government for the purpose of preserving natural environment. Forest guards are empowered to arrest and prosecute people found killing animals or felling trees in reserved forest across the country. Environmental protection policy is being vigorously pursued. Safeguarding or preservation of natural animals and resources require intergeneration transmission through language and biology education.

Education about how Living Systems Interact in Cultural Ecology

Transformation of the environment towards improving the general quality of life is one of the purposes of science. Biology education therefore embraces every attempt of humans to explore, interpret and manage the natural world. It is concerned with the search and explanation of both regularities and irregularities in nature. Every traditional society possesses a form of science and technology which if employed in indigenous ways with the sole aim of satisfying its basic needs (Ogunniyi 1980; Samuel 1996). These informal practices according to them may be useful even in the face of modern science and technological advancement.

These practices rather than being rendered obsolete can be refined and integrated in the knowledge and technique of formal science. This practice is linked with the direct experience with the immediate environment and with the natural world. Therefore teachers and learners may find them useful in enriching classroom science experiences and thereby facilitate teaching and learning. Howes, Jones and Rosential (2004) remarked that classroom-bound activities of science teaching should make room for practices that help teachers and students to connect more deeply to each other and the rest of the world. Formal and informal sciences interact with one another in Nigeria both are practised in different contexts and their linkage is advocated (Mejeha 1992; Seweje 2000).

The application of informal scientific knowledge in solving problems in Nigeria also has significant economic value. In the quest for meeting life's challenges and satisfying basic needs, women in Nigeria carry out a number of indigenous science practices. Their involvement is based on their peculiar roles and contributions to life's sustenance. Women are the nation builders and historically, culturally and biologically they are linked to life and nature (Shiva 1997). Women demonstrate informal science in diverse ways in the natural world. It is therefore pertinent to appraise the indigenous practices among women and explore how they can be integrated with classroom

learning. The following are some of the science indigenous practices in Nigeria:

- Taking baby delivery at local level
- Bone setting and treatment of wounds and fractures
- Using herbs for treatment of malaria and other sicknesses
- Food preservation by smoking, salting and other means
- Production of local food additive/spice
- Garri (cassava flour) production through soaking and frying
- Animal manure as fertiliser

These indigenous practices enhance communal harmony and peaceful coexistence. It also enhances interaction of living systems within a cultural ecology.

Biology Education and Sustainable Development in Africa

Biological and cultural diversity that exist in Africa can be channelled towards sustainable development of the continent. In Africa, distinct ecological and animal resort centres exist in several countries notably Nigeria, Ugandan, Guinea Bissau and Zambia. These centres attract tourists from different parts of the world. Economic resources of such country are enhanced as a result of the presence and use of these resorts. The issues worth considering in our discussion on sustainable development in Africa with regard to biology education include the following:

Ecological Management: ecological and resource management is crucial to sustainable development in Africa. This is necessary in agricultural practices, forestry, animal husbandry, fishing and aquaculture.

Plant and Animal Domestication: This practice is common in traditional African settings. Animals commonly domesticated include dog, cat, birds and pigs. They are typically nurtured for breeding

Subsistence Farming: Farming on small scale to cater for the needs of the family.

Biotechnology: Biotechnology applies in procedures for handling natural materials and resources.

Language and Linguistic Diversity: In Nigeria alone there are more than 20 major languages. The same pattern exists in other African countries. This diversity can be put to advantage in designing curriculum that will adopt local language in the use of terms, biological concepts and categories relating to natural phenomena.

Material Culture: Different cultural heritages abound in Africa and these cultural heritages can be found useful in the area of biological models.

Experiment on Dramatisation and use of Analogies Promoting Biology Education

A quasi-experiment was conducted by Okebukola et al (2013) to investigate the influence of analogy and dramatisation strategies on students' achievement in ecological concepts in biology. The study was conducted in Lagos state, south western Nigeria. Two group pretest-posttest non-equivalent quasi experimental design was employed. All SSI biology students in district I and V formed the study population. Four schools were randomly selected using stratified sampling techniques. A random sampling technique was used to select two intact classes each from the four selected schools. Three research hypothesis were set:

H_o1: There will be no statistically significant difference in the academic achievement of students in the experimental group and control group after the treatment.

H_o2: There will be no statistically significant difference in the academic achievement of boys and girls the experimental group.

H_o3: There will be no statistically significant difference in the academic achievement of students in mixed and girls' only schools.

Biology Achievement Test drawn from past questions of the West African Senior School Certificate Examination was used to collect data for quantitative analysis. Data resulting from interview were also coded and transcribed. The result reveals that group has a significant effect on the post-test achievement scores of the students F(206) = 39.60; p<05). This shows that the use of analogy and dramatisation strategies were found to be effective in promoting students; achievement in biology.

The result further revealed that gender has no significant effect on the academic achievement of students exposed to analogy and dramatisation strategies. This result infers that both male and female students gained academically from the use of analogy and dramatisation strategies. The result also shows that type of school (mixed and girls only) has no significant effect on the academic achievement of students. These results clearly indicate that the use of analogy and dramatisation strategies will go a long way in promoting biology education.

Conclusion

This chapter looked at biology education in the promotion of culture and sustainable development in Africa. It provided the meaning of biology as knowledge arranged in orderly manner especially knowledge obtained by observation and testing of facts. Biology is also described as study of living things which include ecology and environment. The chapter also looked at the brief history of biology education between 1859 to 1963 in Nigeria. Culture and sustainable development was mentioned. Culture provides individuals with a set of common understanding that they employ in fashioning their actions. Education about methods of preservation of plants and animals were mentioned. Tree planting exercises and animal preservation in zoological garden and resort centres were mentioned. Education about how living systems interact in cultural ecology were highlighted.

Peaceful coexistence and harmonious living were also mentioned. The chapter also attempted to highlight areas of sustainable development through biology education. Such areas include interdependence between biological and cultural diversity, language and linguistic diversity, traditional and local knowledge. An experiment confirming the use of dramatisation and analogies in promoting biology education was discussed. Conclusively the chapter submitted that biology education promotes culture and sustainable development in Africa.

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