A CRITIQUE OF THE 2009 FEDERAL MINISTRY OF EDUCATION BIOLOGY CURRICULUM FOR SENIOR SECONDARY SCHOOLS 1 – 3

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Abstract
This paper is a critique of the 2009 Federal Ministry of Education Biology Curriculum for Senior Secondary Schools 1 – 3. It enumerated various definitions of curriculum by different scholars and objectives of the new biology curriculum. Biology, which has been the most preferred general science subject offered by all students, has now been restricted to science students only. The qualities of both old and new biology curriculum were enumerated and the new topics added were itemized. Recommendations were made such as: seminars, workshops and training should be organized for biology teachers on the field. For the new well laid curriculum to fulfill its purpose, it is very important for the government to see to the training of biology teachers and equipping the science laboratories because this new curriculum is an activity oriented one for both teacher and the learners. The teachers to implement the curriculum should be properly prepared with adequate knowledge on biology entrepreneurial skills to implement the new biology curriculum. Also, pre-service teachers should offer a compulsory course on entrepreneurship in biology such as snailery, bee keeping for honey production, etc. This will promote economic self sufficiency. Biology teaching in the secondary schools could be greatly improved by the provision of well trained, motivated teachers to implement correctly the new curriculum.

Keywords: Curriculum revision, Biology curriculum, curriculum evaluation.

Introduction
Curriculum has been defined by various scholars as the total learning experience provided by a school. It includes the content of courses (the syllabus), the methods employed (strategies), and other aspects, like norms and values, which relate to the way the school is organized. The aggregate of courses of study given in a learning environment. The courses are arranged in a sequence to make learning a subject easier. In schools, a curriculum spans several grades (Wikipedia, 2013). Tanner (1980) defines curriculum as "the planned and guided learning experiences and intended outcomes, formulated through the systematic reconstruction of knowledge and experiences under the auspices of the school, for the learners' continuous and willful growth in personal social competence" (p. 13). Also, Goodlad and Su (1992) define curriculum as a plan that consists of learning opportunities for a specific time frame and place, a tool that aims to bring about behaviour changes in students as a result of planned activities and includes all learning experience received by students with the guidance of the school. Furthermore, Cronbelth (1992) defines curriculum as answering three questions: What knowledge, skills and values are most worthwhile? Why are they most worthwhile? How should the young acquire them? Curriculum means two things; the range of courses from, which students choose what subject matter to study and (ii) a specific learning program. The latter case, the curriculum collectively describes the teaching, learning and assessment materials available for a given course of study.

In response to the on- going national and global reforms in the social and economic contexts, the Nigerian Educational Research and Development Council in 2007 developed a nine-year Basic Education Curriculum. It was planned that the first products of the new Basic Education Curriculum would proceed to the Senior Secondary Schools in 2011. To further consolidate the gains of the new Basic Education programme as well as ensure the actualization of the then governments' seven-point agenda for national development, NERDC developed a new curriculum structure for the senior secondary schools in Nigeria approved by the National Council on Education (NCE) (Daramola & Omosewo, 2012).

The purposes of this paper are, therefore, to:

(a) describe the basic features of the 2009 Federal Ministry of Education Biology Curriculum for senior secondary schools 1-3,
(b) compare and contrast the new and old Biology Curricula for senior secondary schools 1-3 to locate their strength and weaknesses,
(c) recommend what we believe would contribute positively to sustainable development of science and technology in Nigeria.

The New Senior Secondary School Curriculum Structure at a glance shows the five compulsory cross-cutting core subjects, which are English Language, General Mathematics, and one Trade/entrepreneurship studies, computer studies/ICT and Civic Education. The Senior Secondary (Business Studies) is Accounting, Store Management, Office Practice, Insurance and Commerce. The Senior Secondary (humanities) is Nigerian Languages, Literature in English, Geography, Government, Christian Religions Studies, Islamic Studies, History, Visual Arts, Music, French, Arabic and Economics. The Senior Secondary (Sciences) is Biology, Chemistry, Physics, Further Mathematics, Agricultural Science, Physical Education and Health Education. The Senior Secondary (Technology) is Technical Drawing, General Metal Work, Basic Electricity, Electronics, Auto-Mechanics, Building Construction, Wood-Work, Home Management, Foods and Nutrition and Clothing & Textiles. The trade subjects out of which students will choose one is 35 in number. Some of them are Auto body repair and spray painting; Auto Electrical Work, Auto Mechanical Work, Auto parts merchandising, Air-conditioning Refrigerator, Radio, TV and Electrical Work, Plumbing and Pipe Fitting, Carpentry and Joinery, Furniture making, Upholstery, Animal Husbandry, Fisheries, Marketing, Salesmanship and so on.

All students must offer five compulsory cross-cutting core subjects. Students will offer 3-4 subjects from their field of specialization. The minimum number of subjects to be offered by the students is eight, One (1) elective may be offered outside their field of specialization provided the total number of subjects is not more than nine (NERDC, 2008) cited by (Daramola & Omosewo, 2012).

Biology, which has been the most preferred general science subject offered by all students, has now been restricted to science students only. Removal of science subjects from the list of core-crossing subjects will lead to reduction of scientific literacy among the students which can has a negative effect on the non- science students. Scientific orientation, adequate knowledge on and importance of public health, sex education, micro-organism and its importance, sex selection in marriages, effect and control of pollution, all these pieces of knowledge are provided for in Biology.

The Old and the New Senior Secondary School Biology Curricula

The new Biology curriculum was adapted and revised from 1985 edition developed by the Comparative Education Study and Adaptation Centre (CESAC). The objectives of this old curriculum were derived from the National Policy on Education (2004) and the main objectives are to prepare students to acquire:

(a) adequate Laboratory and field skills in Biology

(b). meaningful and relevant knowledge in Biology
(c). ability to apply scientific knowledge to everyday life in matters of personal and community health and agriculture
(d). reasonable and functional scientific attitude (NERDC, 2009).

The objectives above are also the same as in the old curriculum. In pursuance of the stated objectives, the contents and context of the curriculum places emphasis on field studies, guided discovery, laboratory techniques and skills along with conceptual thinking. The new biology curriculum for senior secondary school 1-3, has an intention to provide a modern biology course as well as meet the needs of the learner and the society through relevance and functionality in its contents, methods, processes and applications, unlike the old curriculum that met the needs of the society alone. It also pays particular attention to the achievement of the Millennium Development Goals (MDGs) and the critical elements of the National Economic Empowerment and Development Strategies (NEEDS). The new Biology curriculum reflects depth, appropriateness, and interrelatedness of the curricula contents. Also, emerging issues which covered value orientation, peace and dialogue, including human rights education, family life (HIV and AIDS education), entrepreneurial skills etc. were infused into the relevant contents.

The structure of the new Biology curriculum is changed from the conceptual approach to the thematic approach. The thematic approach for this curriculum is to ensure compliance with national and global issues without necessarily overloading the contents. Unlike the old curriculum with seven concepts (Concept of living, Basic Ecological concepts, Plant and Animal nutrition, Conservation of Matter/Energy, Variations and Variability, Evolution, and Genetics), it covers four major themes which have related topics and contents, these are:
(a) Organization of life
(b) Organisms at work
(c) The organisms and its Environment
(d) Continuity of Life

Both old and new curricula were planned on the spiral (Concentric) approach to sequencing a science course. The topics to be taught were arranged in such a way that they ran throughout the three-year post basic courses, with the topics being discussed in greater depth as the course progresses.

The old curriculum was organized into five sections; Topics, Performance Objectives, Contents, Activity and Notes while the new curriculum was organized into six sections; Topics, Performance Objectives, Content, Activities- Teacher and Students, Teaching and Learning materials and Evaluation guide. In the old curriculum, ample opportunities for laboratory activities and discussions have been provided, to stimulate creativity and develop skills in pupils, opportunity is provided for the consideration of learning materials in appropriate units of the content (FMEST & CESAC, 1985). In order to stimulate creativity and develop process skills and correct attitudes in students, in the new curriculum the course is teacher and student-activities oriented with emphasis on experimentation, questioning, discussion and problem solving (NERDC, 2009). The old curriculum does not make use of any assessment protocol, but the new curriculum recommends an assessment protocol (Evaluation guide) that takes cognizance of the three domains of educational objectives with assessment instruments that include structured short answer questions and essay questions.

There is provision for teachers in the new curriculum to adapt it to their special needs and aspirations such as nomadic education, non-formal education and education of the physically challenged, while this is absent in the old curriculum. In the old curriculum, there used to be thirty topics while in the new curriculum there was forty-two topics, the newly included topics are:

1. Recognizing living things
2. Classification of living things; kingdom (Monera, Protista, Fungi, Plantae and Animalia)
3. Energy transformation in nature
4. Reproduction in unicellular organisms and invertebrates
5. Classification of plants
6. Nutrients cycling in nature
7. Pests and diseases of crops
8. Reproductive system in vertebrates
9. Reproductive system in plants
10. Pollination in plants
11. Reproduction system and reproduction in human
12. Development of new seeds
13. Variation and evolution

Based on recent discovery about classification of organisms, classification of living things which used to be two kingdom (Animalia and Plantae) has been modied into five Kingdoms (Monera, Protista, Fungi, Plantae and Animalia), while reproduction in unicellular organisms and invertebrates are purely new topics and the following under listed topics are derived from some topics in the old curriculum. They are:

1. Recognizing living things derived from Biology and living things
2. Energy transformation in nature derived from Functioning Ecosystem
3. Classification of plants derived from Relevance of biology to agriculture
4. Nutrients cycling in nature derived from Functioning Ecosystem with additional contents which are oxygen cycle and process of oxygen cycle.
5. Pests and diseases of crops derived from Relevance of biology to agriculture
6. Reproductive system in vertebrates derived from Reproductive system with additional content which are structural differences in the eggs of vertebrates, comparison of reproduction in fish, reptiles and mammals.
7. Reproductive system in plants derived from Reproductive system
8. Pollination in plants derived from reproductive behaviour
9. Reproduction system and Reproduction in Human Reproductive system derived from Reproductive System with additional contents which are fertilization and development of embryo
10. Development of new seeds derived from Development of new organisms
11. Variation and evolution derived from variation in population

Some of the topics in the old curriculum were retained in the new curriculum with few or no additional contents.

Recommendations

For the new well laid curriculum to fulfill its purpose, it is very important for the government to see to the training of biology teachers and equipping the science laboratories because this new curriculum is an activity oriented one for both teachers and the learners.

Hence, we make the following humble recommendations: University biology education students should have as part of their courses, the biology contents that they are going to teach at the secondary school level. Such courses can constitute four credits and they should be taught at the Faculty of Education by biology educators in order to learn different methodologies that are suitable for each content. These students should also offer another compulsory course tagged ‘improvisation’. This is deemed fit for us in Nigeria because of the huge amount of money needed to buy foreign equipment. The Educational Resource Centres in the country, including the one in

Oshodi, Lagos should be made more functional so that science laboratories can be well equipped in the universities and at the secondary schools level. The new biology curriculum is full of teacher and student activities. So, there is no way students can pass without undergoing those activities.

The teachers to implement the curriculum should be properly prepared with adequate knowledge on biology entrepreneurial skills to implement the new biology curriculum. Also pre-service teachers should offer a compulsory course on entrepreneurship in biology such as snailery, bee keeping for honey production, etc. This would promote economic self sufficiency.

The Millennium Development Goals (MDGs) and the National Economic Empowerment Strategy (NEEDs) are used as main objective of this curriculum; hence, schools should translate and customize these goals to their locality to make implementation sustainable.

Government should include science subject (Biology) into the list of core – crossing subjects in order to enhance scientific literacy among the learners who are future leaders.

As a matter of urgency, seminars, workshops and training should be organized for biology teachers on the field. If this country really wants to develop, there has to be proper implementation of the new biology curriculum. An important agent of implementation is the teachers. Biology teaching in the secondary schools could be greatly improved by the provision of well trained, motivated teachers to implement correctly the new curriculum.

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