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An Appraisal of the New Nigerian Senior Secondary School Physics Curriculum

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Abstract
The new physics curriculum for secondary schools in Nigeria has some similarities with the one currently in use. The new curriculum will be implemented as from September 2011. It has six themes instead of the five in the one in use. An additional theme has been added to the new curriculum. It is loaded with teacher and student activities. This is a challenge to the teachers in the field as well as prospective teachers whose training in Physics does not match the job they are going to do. Hence, it is necessary to alert the nation of the need to prepare against 2011 which is at our door step. Hence, recommendations put forward include training and retraining of physics teachers and that relevant teaching materials and equipment be made available both at the faculties of education of universities and in the physics laboratories at the secondary schools.

Introduction
In response to the on- going national and global reforms in the social and economic context, the Nigerian Educational Research and Development Council (NERDC) developed a nine-year Basic Education Curriculum. It is planned that the first products of the new Basic Education Curriculum will 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 governments' seven-point agenda for national development, NERDC developed a new curriculum structure for the senior secondary schools in Nigeria. It has been approved by the National Council on Education (NCE).
The New senior secondary school curriculum structure at a glance shows the five compulsory cross-cutting core subjects which are English Language, General Mathematics, one trade with entrepreneurship studies, computer studies/ICT and Civic Education. The Senior Secondary (Business Studies) are Accounting, Store Management, Office Practice, Insurance and Commerce. The Senior Secondary (humanities) are Nigerian Languages, literature in English, geography, Government, Christian Religions Studies, Islamic Studies, History, Visual Arts, Music, French, Arabic and Economics. Senior Secondary (Technology) are 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 chose one are 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.
The senior secondary (Science and mathematics) are Biology, Chemistry, Physics, Further Mathematics, Agricultural Science, Physical Education and Health Education. All students must offer all five compulsory core crossing subjects. Students will offer 3-4 subjects form their field of specialization. One (1) elective may be offered outside their field of specialization provide the total number of subjects is not more than nine. The minimum number of subjects is eight (National Education Research Development Council, (2008) Federal Government of Nigeria (2008).

The Old and the New Senior Secondary School Curricula
Physics is among the subjects for which the curricula have been structured. The old curriculum (that is, the curriculum which is now in use) has the following objectives:
(i) to provide basic literacy in physics for functional living in the society;
(ii) to acquire basic concepts and principles of physics as a preparation for further studies;
(iii) to acquire essential scientific skills and attitude as a preparation for the technological application of physics and
(iv) to stimulate and enhance creativity. (Omosewo, 1998)
The new curriculum which will be operational in 2011 has the same objectives as above.
The curriculum used is structured with the conceptual approach. The two major concepts that permeate the entire

curriculum are motion and energy. Major concepts which relate directly to these two concepts, their sub concepts and the combination of these have been grouped into five sections and a number of topics. The topics are: space, time and motion, conservation principles, waves, fields and quanta (Omosewo, 1998).

The structure of the new physics curriculum is changed from the conceptual approach to the thematic approach. The former topics have been changed to themes. The thematic approach for this curriculum is to ensure compliance with national and global issues without necessarily overloading the contents. The six themes which have related topics and contents are:

(i) Interaction of matter, space and time
(ii) Conservation principles
(iii) Waves: Motion without material transfer
(iv) Fields at rest and in motion
(v) Energy Quantization and Duality of matter.

(vi) Physics in Technology

Additional topics and contents have been added to existing ones while there is entirely a new theme that has been added. This is physics in technology. The topics and contents added with the relevant themes are written in the table below:

Theme Topics Contents

1 Conservation Principles Energy and Society
1. Sources of energy
2. Renewable and non-renewable energy
3. Uses of energy
4. Energy and development
5. Energy diversification and conservation
6. Environmental impact of energy use.
   Global warming and green-house effect
   Oil spillage
7. Energy crisis

2. Energy Quantization and Duality of matter
Nucleus Nigeria's nuclear energy programme.

3. Physics in technology
1. Battery
2. Electroplating
3. Application of electromagnetic field
4. Transmission systems
5. Users of machines
6. Repairs and Maintenance of machines
7. Dams and energy production
8. Rockets and satellites

Battery-primary cells and accumulators
Electroplating
Galvanometer electric motor, generators
Transformer – step down and step up transformers
1. Need for use of machines in doing work.
* Easier * Quicker * more conveniently
2. Instances of use of machines
* At home * In offices * In industry * In agriculture *In transformation etc.
1. Need for repairs of machine

2. Need for regular maintenance of machines
3. Maintenance schedule of machines
1. Location of dams for producing electricity in Nigeria
2. Principle of production of electricity from dams
1. Component parts of rockets and satellites
2. Functions of rockets and satellites
9. Niger-SAT1
10. NICOM-SAT1
3. uses of rockets and satellites
1. Features of Niger-SAT1
2. Its operation and uses.
1. Features of NICOM-SAT1
2. Its operation and uses.

In the curriculum in use, physics contents have been organized in a spiral form, that is, the sections occur every year in order to aid learning. As much as possible, mathematics is to be used to clarify the physics objectives and guided discovery method of teaching has been recommended. The spiral approach to content organization has been used in the new curriculum. Also, like the one in use, the guided discovery method of teaching has been recommended.

In the curriculum in use, ample opportunity for laboratory activities and discussions has been provided. To stimulate creativity and develop skills in students, opportunity is provided for the consideration of workable devices 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 student-activity oriented with emphasis on experimentation, questioning, discussion and problem solving. The introduction of the theme; physics in technology provides an opportunity for the construction and operation of workable devices as well as acquaintance with some products of modern technology (NERDC, 2008).

The curriculum in use does not recommend any assessment protocol. But the new curriculum recommends an assessment protocol that takes cognizance of the three domains of educational objectives with assessment instruments that include multiple choice items, structured short answer questions and essay questions. It is pertinent to state here that the new curriculum has been well laid down so that students who offer physics can live effectively in the modern age of science and technology. Given its application in industry and many other professions, it is necessary that every student is given an opportunity to acquire some of its concepts, principles and skills. Unfortunately, the teaching and learning of physics has been fraught with challenges which prevent many students from performing well in external examinations. The philosophy, objectives and content of the physics curriculum have been adjudged by

professionals in the field to be satisfactory, but its implementation has fallen short of expectation because of lack of qualified teachers, inadequate equipment to ensure the performance of related student activities which are aimed at enhancing meaningful learning, and the nature of the subject that appears to voke difficulty.

The following studies support the above claims: Omosewo (1998) found that (1) physics teachers in Kwara State did not possess adequate knowledge to interpret correctly the performance objectives of the physics curriculum. (2) The physics teachers could not distribute the performance objectives in the cognitive domains of educational objectives into the different modes.

Omosewo (2001) found out that teachers that taught physics at the senior secondary school level could not teach some topics because they were not taught while in the Colleges of Education and the Unviersities. Furthermore,Omosewo and Salami (2002) found inadequate number of physics teachers in the senior secondary schools in Kwara State. The needs assessment survey conducted by Okebukola (2005) was to:

(a) determine the knowledge and skills that the Nigerian labour market required of graduate employees
(b) determine the knowledge and skills that Nigerian University graduates bring to the labour market.
(c) determine the gaps in knowledge skill and attitudes of university graduates that should be bridged in order to meet the expectations of employers of labour and the demands of national economy.
(d) Identify elements in the university curriculum that were deficient in assuring a match between what the labour market requires and what university graduates bring to job situations.
(e) Identify skills that can be taught to undergraduates and enhance their job creation abilities and
(f) Propose changes to university curricula on the basis of (a) to (e) above that would ensure a more relevant

curriculum in all disciplines offered in the Nigerian university system.

The study also showed a long list of physics contents that were difficult for physics education graduates to teach at the secondary schools level. Omosewo (2009) also found out that (1) sampled physics teachers claimed that they did not have adequate exposure to physics contents while in training (2) majority of the physics teachers said that there was urgent need for recruitment of qualified teachers.

Recommendations

For the new well laid curriculum to have the desired impact, it is very important for the country to see to the training of physics teachers. The teachers on the ground are not competent to teach senior secondary physics effectively (from the studies cited above and others). This means that prospective physics teachers should be well grounded in the senior secondary school physics contents.

What is currently learnt in the university by physics education students is not reflective of their future encounter. Physics education students offer courses such as plasma physics, special theory of relativity and so on rather than being well grounded in what they would teach at the secondary school level.

Hence I make the following humble recommendations: University physics education students should have as part of their courses, the physics 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 physics educators.

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 physics laboratories can be well equipped in the universities and at the secondary school level. The new physics curriculum is full of teacher and student activities. So, there is no way students can pass without undergoing those activities.

Also, prospective secondary school physics teachers should be well grounded in test and measurement because they will be required to set multiple- choice question which teachers are not used to. They should also be sound in pedagogy since they are expected to use various methods of teaching physics.

As a matter of urgency, seminars and workshops should be organized for physics teachers on the field because 2011 is at our door step. If this country really wants to develop, there has to be proper implementation of the new physics curriculum. An important agent of implementation is the teacher. Efforts should therefore be made to get ready for 2011 by organizing various workshops for the physics teachers in the secondary schools. The physics education students in the universities should be made to offer the physics courses they would teach at the secondary school right now. Physics teaching in the secondary schools could be greatly improved by the provision of well trained teachers to implement correctly the new curriculum.

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