

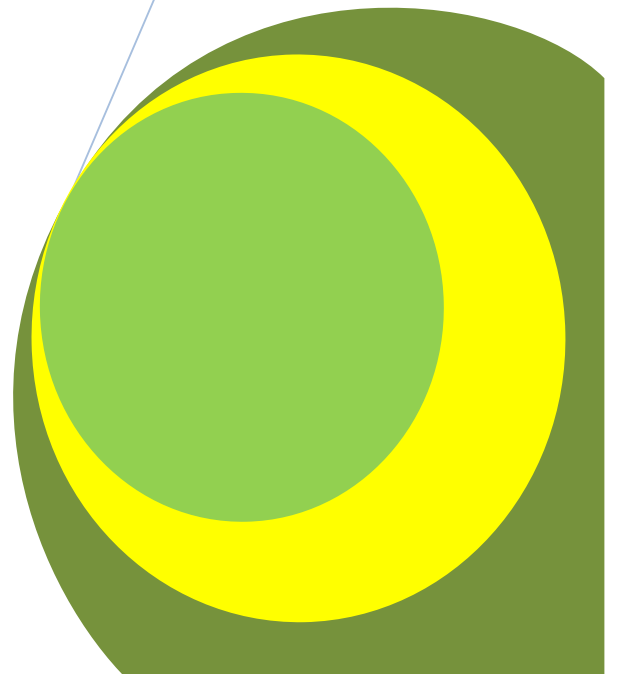
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## **Enriching Physics Education in Nigeria towards Enhancing a Sustainable Technological Development**

By

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*Research Article*

# Enriching Physics Education in Nigeria towards Enhancing a Sustainable Technological Development

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## ABSTRACT

The study discusses the current condition of Physics education in Nigerian Secondary Schools. It highlights the challenges of teaching and learning of Physics in the country towards enhancing a sustainable development in technology. The problems facing Physics education are highlighted and suggestions are made towards improving Physics education in Nigeria.

**Keywords:** Physics Education, Technological development.

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## INTRODUCTION

There is a drastic drive in Nigeria towards technology. This is contained in her National Policy in Education (2004) chapter 5 Section 39, sub-section 1, "A greater proportion of educational expenditure will be devoted to science and technology". The development of any society is judged by the technological level and the category of the people that inhabit it (Adegun, 2003). A society with high level of technology would then be regarded as being developed. Physics education is a major factor in enhancing technology development.

The national education scheme designed for Secondary School Physics (1985) has it that the objectives of studying Physics include, among others, to provide basic literary in Physics for functional living in the society and to acquire essential scientific skills and attitudes as a preparation for the technological application of Physics. Thus, for national development in technology, basic concepts and principles of Physics are indispensable. The teaching of Physics in secondary schools is intended to produce young scientists who would be able to design the technological devices that would make day-to-day activities easier and living more comfortable (Ajayi, 2008). It thus implies that Physics is one of the pivotal subjects in technology. The teaching and learning outcomes of this all important subject need serious attention in order to enhance a sustainable technological development in Nigeria.

## Statement of the Problem

Much as Nigeria advocates for and pursuing development in technology, the result has been both unsatisfactory and encouraging (Adedayo, 2008). The development in technology is poor and contributes immensely to the state of underdevelopment in Nigeria (Ogbazi 1987, Ajayi 2007). There is need to redress and bring about a worthwhile growth in technology. Given that Physics is one of the major subjects meant to provide the basic developments needed in technology, its effective teaching and learning are crucial issues for consideration. Since research reports (Ajayi, 2007; Adedayo, 2012) revealed that the performance of students in Physics is very appalling, this fact calls for attention. This paper therefore aims to discuss the challenges of Physics education in Nigeria and as a means for the country to compete fairly with other nations technologically.

## Problems of Physics Education Presently

A careful analysis and appraisal of Physics education in Nigeria reveals some fundamental problems. These are discussed briefly below.

**a. Curriculum Content:** The Physics curriculum content being used in Nigerian secondary school presently is at par to cope with the challenges of 21st century strive towards technological development. However, despite

the introduction and continuous use of the Physics curriculum in the schools many years ago, Nigeria still lacks the technology that could satisfy her daily needs and comfort (Ajayi, 2008). Perhaps, that was why (Alonge 1982) remarked that the content of science taught in the school is void of local environment and do not identify with the technological needs of the society. The curriculum does not take into consideration the cultural values and beliefs of the society for which it was designed. The result of a study on curriculum carried out by African Development Bank Groups (1991) revealed that African education still reflects the colonial condition. The curriculum and instructions in African schools still reflect the colonial orientation which is devoid of African values and environmental factors. It is only recently that efforts are being geared towards reforming the curriculum to suit the needs of the society for which it is meant to serve (Ajayi, 2000), but the curriculum still lacks the values and materials that connects it to the immediate environment. In such a case, the advocacy of technology as a means to satisfy the society would be a mirage.

**b. Teaching Methods:** The teacher's methods of teaching may go a long way in enhancing effective learning by the students. The traditional method of teaching science (Physics inclusive) in the schools involves "chalk and talk" activities which is fully teacher-centred. In this case, the students are passive "robots" in the classrooms who regards the teacher as the repertoire of knowledge.

There is agitation to inculcate the 21st century approaches to science teaching in Nigeria. These include inquiry method, collaborative teaching, discovery method etc. They are purely child-centred approaches. Here, the students are guided to discover facts and construct their own idea and understanding of the concepts of the study. However, Nwagbo (1995) noted that science teachers shy away from activity-oriented instructional methods that are more effective and stick to inadequate traditional methods of teaching. The practical activities that could enhance creative thinking in the learners are given "lip-service" in Nigerian schools (Bajah, 1984; Maduabum, 1986; Ajayi, 2000).

**c. Teacher's Quality:** Teacher's Quality: The impact of the teacher in the performance of students in Physics is germane. The teacher is the facilitator who is to impact into the students' concepts expected to be learnt. Research studies (Olawajaju, 1986; Nwagbo, 1995) revealed that most teachers teaching Physics are ignorant of the curriculum content of the subject. The students taught by these rather incompetent teachers would be invariably shallow in Physics concepts and principles. This agrees with the submission of Ogbazi (1987) that one of the problems of industrial development in Nigeria is that of inadequacy of sufficiently trained human resources. This has been a major constraint to the rate of technological and economic development in Nigeria. On another perspective, some Physics teachers who are masters of their subject lack the technical knowhow of impacting the concepts to the students. One thing is to be well grounded in the conceptual understating of a subject; another thing is to be well acquitted with the best method to pass the concepts across to the learners for proper comprehension. A professional teacher would be desirable in this regard.

The need for professional teachers in science has been on stage in Nigeria for some decades ago. Science educators argued the necessity of skilled teachers in education (Nwagbo, 1995; Omolayo, 2009). The situation in most secondary schools in Nigeria is that Physics is taught by graduates in other fields of science such as B.Sc. Physics, Engineering; B. Tech Technology; HND etc. This set of people lacks the skills involved in teaching science since they were not trained on the job. Fajonyomi (2007) argued that the success or failure of any educational programme rests mainly on the adequate availability of well-qualified (professional) and dedicated teachers. The result of a study by Adedayo (2010) showed that professional teachers affect the students' performance in Physics positively more than the unprofessional teachers. Thus, the realisation of the national growth in technology as highlighted in the National Policy on Education hinges largely on the quality of the physics teachers.

**d. Negative Attitudes of Students towards Physics:** To the majority of the students in the secondary schools in Nigeria, Physics is perceived as a very difficult subject (Soyibo, 1985). The impression cuts across the gender. Most parents do not help the situation in that through their comments and reactions, they frighten or scare their children and wards away from Physics.

Ajayi (2000) noted that students generally classified the three core science subjects—Biology, Chemistry and Physics—into level of difficulty. He reported that Biology is considered the easiest, followed by Chemistry and Physics being the most difficult subject. The cause of the negative perception of students towards Physics was identified by Adedayo (2008) to include the fear of the mathematical skills involved, harsh teacher-students' relationship, students' unreadiness to study, preconceived bad information that Physics is a difficult subject and poor method of teaching. This impression greatly affects students' readiness and interest to the study of Physics. The consequence of this is felt on the expected technological growth of the country.

**e. Students' Ignorance of the Relationship between Physics and the Environment:** Students' ignorance of the relationship between Physics and the environment: It is rather unbelievable to remark, based on interview with some senior secondary school Physics students, that most students offering Physics lack the knowledge of the importance and relevance of Physics with their environment and human development. They do

not see the subject as a means of solving practical social problems but rather just the acquisition of abstract concepts that have no bearing with the Physical situation. This is in support of Olarewaju (1986) who reported that “students felt that science curriculum is too rigid and irrelevant to their experiences in Nigeria”.

Going through the pages of the brochure of the Unified Tertiary Matriculation Board (UTMB) for admission into the Nigerian tertiary institutions, it is conspicuously documented therein that Physics is required for any student who wishes to pursue a career in such a course as Medicine, Pharmacy, Nursing, Engineering, Sciences and so on. Despite all these, the students still do not see the correlate that exists between Physics and these courses that are practically based in resolving life issues. Failure of the students to relate Physics to relevant societal problems make them to study the subject without objectivity or interest. Many take Physics perhaps because of peer influence or suggestions by elderly person. Thus, they see the so-called rigorous tasks involved in its study as a mere waste of time and too abstract to study. Thereby, they see no need for such wasted time in doing exercises and eventually make them conceive negative attitude towards Physics. This attitude is a major threat to students' comprehension of the subject.

**f. Teaching Materials:** The importance of instructional materials in the teaching-learning process cannot be over-emphasised. Certainly no effective Physics teaching can exist without learning materials, equipment and practical activities. It is therefore expedient that Physics laboratories must be adequately stocked with the necessary facilities for effective teaching and learning of the subject. However, educational researchers reported that most secondary schools in Nigeria have no Physics laboratory and few that have it are rather ill-equipped (Madulum and Akuezulo, 1985; Soyibo, 1986; Ajayi, 2007). There are no enough functioning Physics apparatuses in the schools.

Ajayi (2008) while assessing the level of students' involvement in practical activities in Physics laboratories concluded that only 23.23% of the schools did allow their students to carry out practical activities. The practical activities on various aspects of Physics are inadequately performed in the schools. The neglect of practical sections in Physics contradicts the objectives of Physics education in senior secondary school as stated in the curriculum (1985) and the National Policy on Education by the Federal Republic of Nigeria (2004).

One would expect the teacher, who is the facilitator in the teaching-learning process, to improvise for materials where they are not available or are insufficient. But the attitudes of the teachers towards improvisation of teaching materials is negative. Many of the teachers are not aware of the improvisation method in teaching (Madualum, 1983; Njoku 2000). Those that are aware of the use of local equipment and materials in teaching are hindered by a number of factors such as laziness on their part, lack of funds, time constraints, etc.

### The Way Forward for Physics Education

The relevance of Physics education in sustaining technological development makes it imperative to proffer urgent solutions to the myriad of problems befalling it. A few suggestions are offered here but the list not exhausted.

**i. Curriculum Innovation:** Efforts should be made to revisit the Physics curriculum content with the aim of catering for the needs of the society for which it is designed. Such effort would make Physics education relevant and useful.

**ii. Teacher's Roles:** The Physics teacher should use appropriate teaching methods that are relevant to his/her students. Obviously, no method is the best, but the teacher needs to study the students and identify the best teaching method for them. This calls for expertise in methodology; hence, the need for skilled teachers. The 21st century approaches to teaching science (including Physics) emphasizes child-centredness where the teacher mainly facilitates creative thinking in the learners.

**iii. Teachers' Training Programme:** The teachers' training programme should be extensive enough to produce quality Physics teachers. More emphasis should be placed not only on the mastery of their subject matter but as well as on improvisation methods, methodology, practical skills etc. In-service training in form of workshops and seminars can be organised regularly for non-professional teachers so that they will be able to cope with the present challenges of Physics education.

**iv. Students' Encouragement:** The students are the focus of all activities involved in Physics education. The teacher has a skilful role of making the subject (Physics) interesting and captivating for the students. The teacher's relationship with the students both inside and outside the classroom should not scare them away but rather draw their interest towards the study of Physics. Physics must be presented to the students as a subject that deals with Physical phenomena around them; this is a fact which has been eluding the students. Physics means “physical occurrences”.

**v. Relationship of Physics with other fields** – The students should be sensitized as to the relevance of Physics in other fields of human endeavours such as Medicine, Pharmacy, Sciences, Engineering, etc. The awareness of the link between Physics and other fields of study would leave the students with desire and readiness to learn the subject.'

**vi. Resource Materials:** Physics deals with practical concepts. Hence, it cannot be effectively taught and learnt without involving the practical activities. The school authority and government should make adequate provision for functioning equipment in the Physics laboratory. Where the facilities are inadequate, the teacher should improvise. The teacher is also encouraged to make judicious use of the available materials for effective learning.

**vii. ICT Awareness:** The use of ICT in the teaching and learning of Physics should be encouraged. This would in the first place, serve as excitement to the learners and more importantly makes learning interesting, involving and effective. The use of Computer Assisted Learning (CAL) has many advantages:

- Students can learn at their own pace and at a convenient time.
- Students are exposed to different presentations by different teachers
- Students are not affected/influenced by their peer groups
- The ability to display animated or graphic image presents the students with more teaching aids.
- It is a suitable tool where teachers are not totally adequate
- Noise distraction is eliminated
- Students who feel shy can readily benefit from personal interaction with the computer.

**viii. Government:** Apart from providing adequate relevant functioning materials and equipment for the Physics laboratory, the government also has the responsibility of providing motivation for the Physics teachers through incentives and worthwhile science allowances.

### Implication for a Sustainable Development

The implication of enriching Physics education in Nigeria is to cope with the 21<sup>st</sup> century challenges of development and technology. This is imperative due to the fact that Physics is a pivotal subject for technological development.

### CONCLUSION

This paper attempted to justify the relevance of Physics in the development of technology. It also identified some of the problems militating against Physics education in the Nigerian Secondary Schools and offered suggestions for improvement. Effective teaching and learning of Physics would undoubtedly influence positively the sustainability of technological development in Nigeria.

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