THE CHALLENGES OF PHYSICS EDUCATION FOR SUSTAINABLE DEVELOPMENT IN JIGAWA STATE, NIGERIA

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Abstract: The research is aimed at discussing the various challenges of teaching and learning physics in Jigawa State, Nigeria with the view of highlighting the problems facing physics education and suggestion are provided in order to minimize the problems and to improve the quality of Physics Education for sustainable development.

Keyword - Physics Education, Sustainable Technological Teaching and Learning

I. INTRODUCTION

Science and technology are basic tools for national development. Physics as the oldest and most basic pure science find applications throughout the natural science and technology. The study of physics is important to know the world today but people find it easier to participate and contribute on the area of economic, social and political development of the nation/state. And thought that physics has no relevance to the problem of – environment, pollution, agriculture, creating new materials, understanding complex systems, peace etc. the prestige and political power of any nation resides in its level of scientific activities Aliyu [6]. There is, the need to point out that physics education is one of the bedrock in science for sustainable technological development hence its teaching and learning is very important in Jigawa State. Physics education involves the teaching and learning of ideas, concepts, principles and laws of physics and its application in the exploration of the universe, and resolution and management of problems [2]. The national education scheme designed for secondary school physics [8] stated the objectives of studying physics as to provide basic literacy in physics for functional living in the society, to acquire essential skills in the application of physics towards technological advancement. The teaching of physics in secondary schools is intended to produce young scientists who would be able to design the technological device that would make day to day activities easier and living more comfortableAjayi[11]. And Salleh [4] stated the goals of physics as follows:

1. To provide the appropriate education, learning opportunities so that people are able to acquire the basic concepts, ideas, ability, attitude and habits essential to interact effectively and manage in a sustainable manner the material resources.

2. To establish an environment geared towards the realization and interaction that brings about casual effects subjected to natural laws. Being educated mankind can exercise regulatory control on their physical environment.

3. To promote proper and correct use of technology to ensure safety and that the environment is safe and healthy for the population these goals are laudable but unfortunately they are not manifested in the products as apparent in the high number of low performance in the subject. The knowledge they acquire in schools has neither enabled them to apply physics nor has it improved their employability. Obioma [17] in [13] attributed the problems of low performance to:

Physics is crucial for effective living in 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 fraught with challenges which prevent many students for performing well in external examination. The philosophy, objectives and concepts of physics curriculum have been adjudged by professionals in the field to be satisfactory but its implementation has fallen short ofexpectation because of lack of sufficient qualified teachers.

The ever-increasing decline in physics enrolment and achievement Ezeife [18] in [13] points to the fact that there are increasing conditions for underachievement and low learning for training possible failure of previous efforts of science educators in improving the learning situation [19].

This, thus, gives the reason to be concerned about the effectiveness of the teaching-learning of physics since the objectives are not being accomplished. Knowing thatphysics education is one of the major sciences to enhance technological development its sustainability can only be made possible if its teaching and learning become a matter of concern for the government and the people of Jigawa State.

II. PROBLEMS ASSOCIATED WITH PHYSICS EDUCATION

The teaching /learning of physics have been bedeviled with a host of problems that is nagging the fulfillment of the objectives/goals over the years. These are briefly discussed below:

1. Teaching Method

The dominating method of teaching physics in our schools is teacher-centred in [3]. The teacher's method may go a long way in enhancing effective learning by the students. The students neither grasp nor participate actively in the subject taught since the method of teaching is teacher-centred making the classroom to be bored and this does not encourage the development and sustenance of process skills among the student. Therefore there is need to introduce the modern approach to physics teaching in jigawa state with the teacher integrating content knowledge with effective teaching methodology, making the student the centre of learning.

Nwagbo [9] in [3] noted that science teachers shy away from activity oriented instructional method that are more effective and stich to inadequate traditional method of teaching. The use of information and communication technology (ICT) is lagging behind the goal as this will provide knowledge for the learners so as to extend their skills and abilities.

2. Quality of Teacher

The first logistic problem of physics is the teacher. The teacher is the pivot of education life, the success of all field of study revolving round teacher education Udot [15]. Adesina [5] and Adepoju [1] in their research both opined that one of the most effective ways of bring about curriculum change and the attendant improvement in teaching-learning situation is through adequate highly competent and qualified teachers. The quality of physics taught is poor due in part, to inadequate teachers (quantity and quality) in our secondary schools. This is partly responsible for the poor public examination results in the subject. The quality of teacher is known to be a key predictor of student performance.Salihu, Adamu and Shehu [14] pointed out that the simple most important determinant of what students learn is what teachers know. That is, teachers are supposed to be stores of knowledge in order to teach more effectively where teachers are selected with low academic and professional capabilities is bound to enthrone poor outcome. In consequence of these poor outcomes we cannot increase our output of graduates and so the decline will continue. The National policy in Education [8] asserts that no education system can grow beyond the quality of its teachers.

3. Content of the Curriculum

The teacher is the centre figure and live wire of the curriculum implementation. However despite the introduction and continuous use of the physics curriculum in schools many years ago, Nigeria (Jigawa State Inclusive) still lack the technology that could satisfy her daily need and comfort [11]. Alonge [9] remarked that the content of science taught in school is void of local environment and do not identify with the technological needs of the society. Physics education must be relevant to life in society for it to be meaningful. Most teachers do not have copies or look into the curriculum, a situation that lead to the problem of teaching irrelevances and compromising quality of good teaching. There is also the rush to cover the curriculum at the experience of the learner grasping the concept and content of the subject Ajayi [4] cited in [3] revealed that efforts are being made towards reforming the curriculum to suit the needs of the society but the curriculum still lack the values and materials that connects it to the immediate environment. In such a case, the need for technological advancement of the society is only a mirage.

4. Attitudes of students towards Physics

The erstwhile students perception syndrome (physics learning is difficult) seems to linger on defying all possible prescriptions. And the way one perceives something influences ones attitude towards it. Adedayo [20] noted the cause of this attitude towards physics to the fear of the mathematical skills, harsh teacher, students relationship, student not ready to study, bad information that physics is difficult and poor methods of teaching. All these will greatly affect the interest of the student to study physics and the effect will be felt on the technological development of the state.

5. Language Problems of the course

The interference of local language and physics language can influence individual students' preparedness to learn physics. But ideas and concepts are communicated to students using English Language. The knowledge of contents of the subject is transferred to the students at all levels of education through English language medium. If follows that how well students would fare in academic attainment depends on their level of proficiency in the language. When students are deficiency in the language of instruction they would not perform well in the subject. This method of information transmission has limited the ability of students to fluently express their thoughts. The implication of this,is under performance by the learners. Also the students will learn at low speed and have low capacity to grasp the concepts and contents of physics.

6. Mathematical Nature of the Subject

Physics cannot be taught in isolation of mathematics because it is the language of physics and other applied sciences. Sound education in mathematics at lower level of our educational system plays crucial role in the understanding of physics thereby resulting in the development of technical man power. But the quality of mathematics taught in our schools in poor. This is partly due to inadequate teachers which results in low enrolment of students for physics and the inputs of teacher training institutions leading to decline in physics teacher production. The poor knowledge in mathematics made the students not to like problem-solving in subject thus conceiving negative attitude towards physics. This is a major threat to students understanding the subject.

7. Teaching Materials

Non-availability or insufficient instructional materials may affect teaching-learning process in physics.
Physics as practical oriented subject equipments/materials are therefore necessary. Practical work with some relevant equipment is unavoidable if the students are to understand and apply their knowledge effectively. It is therefore necessary that learning facilities are available for use during practical activities. But due to either insufficient or non-availability of these materials in schools, lack of initiative on the part of the teachers to use them or disregard for their usefulness in teaching and learning process most of the teachers are not using them during their lessons.

In some instances the equipment/materials are available but the teachers cannot handle them. And different aspects of physics practical activities are not adequately carried out. The neglect of practical sectors in physics contradicts the objectives of Physics Education in senior secondary school as stated in the curriculum [12] in [3]. Teachers are expected to use alternative materials that is, to improvise, from local materials for the purpose of assisting the students to understand better, but the teachers are either lazy to make use of local equipment/materials or being hindered by lack of funds.

III. THE WAY FORWARD

The enrichment of Physics Education will make the state to stand to the challenges of technological development. If Physics Education is to succeed in the state as the foundation of life-long learning in the context of sustainable technological development the following recommendations are made:-

i. **Teachers Roles:** The Teacher should use appropriate methods of teaching to sustain interest and concretize learning in students. There should be evaluation of particular method in terms of how much the learners have been able to learn and how they react to the physics being taught. The teacher should base the teaching and learning on guided discovery, inquiry-based methods, his/her rosting knowledge his developmental needs and his/her arrive to understand and make sense of the world

ii. **Resource Materials:** The school authority and government should make fund available to schools to purchase functioning equipment for the physics laboratory or for the teachers to improvise materials needed. Also the teachers need to up to date themselves to acquire knowledge and skills required for the preparation and application of physics equipment is the practical activities. They should provide a stimulating and conducive environment through the employment of various materials/equipments for practical. Such practical activities should encourage critical thinking and use of knowledge by the students.

iii. **Teachers training programme:** With the training of teachers more qualified teachers will be produced. The training program of a prospective physics teacher should be expected to allow more sufficient exposure to relevant subject matter content and to include their application in the resolution and management of their both immediate and global environment changes. And those with experience can help the non experience teachers with effective use of modern technologies of teaching/learning in order to meet the challenges of rapidly technological society. With this a new generation and quality teachers will be produce.

iv. **Curriculum:** The role of teacher in ensuring the implementation of the curriculum is so significant that its success depends on how prepared the teachers are in both ability and willingness to have the students experience all the activities embedded in the curriculum. There is need for refocusing or reforming the physics curriculum that reflects the thinking of the society based on what they want to achieve through physics education. The curriculum must not only change the behavior of the youth for good but also enable them gain social insight and powers to be productive members of the society. The curriculum needs to be learner centred simplified and harmonized for it to achieve the goal in Physics. The teachers should be committed to consistent and continuous curriculum development to cater for learning experiences that will appeal to

the different nature and abilities of individual learners.

v. **Student's encouragement:** Since the environment influences learning outcomes, conducive learning environment where facilities are available for students to learn in practical terms should be provided. This will ensure better comprehension of concepts that has made the learner perceive that physics is difficult. The teacher/learner/classroom interaction pattern needs to shift from therigid and regimented posture to a much more dynamic and friendly way. The attitudes and dispositions of physics teachers should be more dynamic and positive before the students this will enhance their urge to study physics. The teachers should endeavour to think always about how to make physics teaching less cumbersome and more purposeful to the students that physics deals with the physical phenomena around them. Physics students association should be established to serve as a forum for the discussion of simple physics issues, organization of quizzers, simple project, and physics bulleting. The relaxed but exciting atmosphere created during any one of these activities facilitates understanding of concepts.

vi. **Relationship of physics with other field**:The physics educators should garnered their efforts towards educating young people and the general public about the irrefutable and incomparable importance of physics. The student should be sensitized about the relevance of physics in other fields such as sciences, engineering, medicine, agriculture pharmacy etc. This awareness of the relation of between physics and other would desire to study physics.

vii. **ICT Awareness:** the teachers should be encourage to attend courses in power point, data logging, flash animation, excel and software CDs, this will impact significantly on the subject delivery. The use of ICT in teaching physics will provide knowledge for learners in order external their abilities and skills. Also the teachers are provided with intellectual and professional background adequate for their assignment in order to make them participate in a rapidly changing world. It is the tools that can be used to find, explore, analyze and present information. The students can also learn at their own pace and convenient time.

viii. **Government**: The government should take the responsibility of providing motivation for the physics teachers to ensure job satisfaction and raise their social prosperity. And accord more ICT for education advancement.

CONCLUSION

Physic is key to technological development and every means to sustain it must be explored and fully utilized. At the secondary school, the students should be made to realize the indispensable role of physics in human life and that difficulty ascribed to physics are things of the past, modern approaches to teaching learning and the use of modern gadgets are available making the learning easier and interesting to the student. Physics education provides the appropriate education, learning opportunities and facilities so that people are able to acquire basic concepts, ideas, abilities, attitudes and habits essential to interact effectively and manage in a sustainable manner the material resources. Steps should therefore be garnered towards restoring, promoting and popularizing the image, public perceptions, understanding and interest in physics education for all and sundry through adequate funding, encouraging industries to support long term and curiosity-led physics programs. Teaching and learning of physics would influence positively the sustainability of technological development in Jigawa State.

IMPLICATIONS

Physics education as a pivot for technological development has to be physics education properly revamps to reflect the 21st century challenges of development and technology. Sustainable curriculum requires rethinking and revising of the curriculum of physics education at all levels of education to include a clear focus of current and future societal needs on the development of knowledge, skills, perspectives and values related to sustainability.

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