

**Physics Education for Wealth Creation:  
Strategy for National Development in the  
21<sup>st</sup> century Nigeria**

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**Abstract**

*The quest for scientific and technological advancement for national development calls for improved method of teaching that provides the avenue for the learners to apply their acquired knowledge to the societal demands for national wealth creation hence national development. The paper discusses physics education as a tool for wealth creation. The paper went further to discuss curriculum reform, man power training and development, provision of adequate resources needed for quality education and proper implementation of the physics education curriculum as the key to wealth creation. It also discussed some practical approaches to the teaching of circuit, electric cell and transformer for wealth creation. The paper recommended inclusion of SIWES in the physics education curriculum, full sponsored manpower training and development, provision of enough resources, proper supervision of the teaching-learning process to ensure effective implementation of the physics education curriculum as a way forward to wealth creation and national development.*

## **Introduction**

Education is the acquisition and utilization of knowledge to solve societal problems. One of the aims of Physics education is to promote the understanding of the concept being taught with a view to applying such knowledge to real life situation (Stephen, 2010). The poor performance of students in secondary school in physics as pointed out by West African Examination Council (WAEC) chief examiners report (2005) points to the fact that physics teaching has not been effective. Martins(1990), cited in Agbayewa(2002), pointed out that two major problems with science education are that too often curricular are not up to date with regard to important questions and applications and too often instructional approaches do not portray an authentic view of science. Ivowi (1997) also attributed the poor performance in physics to ineffective teaching. The resultant effect of these is a deterred national development since the principles of physics required for scientific and technological development are not learnt.

It is therefore, pertinent to look for the type of education that provides the learners with the requisite skills for scientific and technological advancement. This calls for practically oriented method of teaching where learners are actively involved in the teaching-learning process.

### **Physics Education for Wealth Creation**

To make physics education for wealth creation is to teach physics in a way that the learners acquire the knowledge and skills in physics to generate income. It is also to be able to exploit the rich potentials in physics for wealth creation. It is to make physics education students apply their acquired knowledge and skills to the nation's economic development as pointed out in the objectives/goals of the national policy on education (2004) as follows:

- The acquisition of appropriate skills and development of mental, physical, and social abilities and competencies as equipment for the individual to live and contribute to the development of the society.
- To give training and impart necessary skills to individuals who shall be self-reliant economically.

In a like manner, Federal Ministry of Science and Technology (1986), apart from its national objectives outlined some of its objectives to include:-

- Producing science and technology results into actual goods and services.
- Creating, increasing and maintaining an indigenous science and technology base through research.
- Motivating creative output in science and technology.

Nigerian education system should therefore, be able to produce physicists who will be able to apply their acquired

knowledge to real life situation. It should equip individuals with creative, problem solving and innovative orientation skills (Igbo, 2009), People who will make Nigeria a wealthy nation by practicalising their knowledge to device an income generation source. For Nigerians to accelerate Nigeria's development Nigerian physics educationists or teachers must be productive physicists capable of utilizing their acquired knowledge to harness the natural resources (endowment) like the solar energy through solar technology for wealth creation. This can be made possible and easier through proper and practical physics education where teachers utilize the available resources around them to facilitate the understanding of the subject matter. To achieve this, physics teachers must change from method where learners remain perceived listeners to method that portrays real view of sciences.

Physics teachers must make it a point of duty to employ practical method of teaching where the learners are actively involved in the lesson (child-centred lesson) to produce practically oriented students who will contribute to the nation's development by way of creating income general source. The method of teaching employed by science teachers is what determined the type of nation builders we produce. Where the method of teaching does not expose students to wealth creation skills, students will not be able to develop economically hence retarding the rate of the nation's economic advancement.

## **Keys to making physics education for wealth creation**

### **1. Students Industrial Work Experience Scheme (SIWES)**

To make physics education for wealth creation, certain reforms (innovations) have to be made to incorporate students industrial work experience scheme (SIWES) into the physics education curriculum. Curriculum reforms, according to Mbachu (2011), refers to planned and designed change undertaken to tackle deficiencies and needs with the conviction that substantial progress can be made in the developmental process of the nation through this adjustment in education. Introduction of SIWES into the curriculum will give room for the learners to put to practice what they learn in the class room hence induce in them practical skills acquisition and creative ability and thereby enabling them to relate what they learn to real live situation as outlined in the objectives of SIWES that is;

- Provide an avenue for students in the Nigerian tertiary institutions to acquire industrial schemes and experience in their course of study.
- Prepare students for the work situation they are likely to meet after graduation.

- Expose students to work method and techniques and handling equipment and machine that may not be available in the polytechnic.
- Provide students an opportunity to apply their theoretical knowledge in real work situation thereby bridging the gap between higher education and actual practice.

**2. Man power training and development**

Manpower needed for proper implementation of the curriculum must be provided and developed through proper organization and sponsorship of workshops, seminars and conferences to acquaint them with the necessary skills required to meet up with the current technological challenge.

**3. Provision of adequate resources**

Resources needed for teaching and learning must be made available to enable effective leaning to take place. The resources needed are human resources and material resources.

- a. *Human resources*: This is sensible and knowledgeable people that can impact foundation of basic rules, principles, attitude, values and skills to students (Asoegwu 2011). These are the teachers/educationists who are directly involved in the curriculum implementation (teaching/learning) process. Adequate

human resources must be provided to ensure proper implementation of the physics curriculum for wealth creation. Such human resources must be developed and equipped for service through fully sponsored workshops, conferences, seminars etc.

b. *Material resources*: Are materials in the teaching-learning process. Asoegwu (2011) classified material resources into:

- Project materials e.g films, transparencies, slide etc and non-projected materials e.g graphics, boards etc.
- Hardwares e.g television, projectors, audios and video machines. And software e.g Video films, slide films, audiotapes, stripe film or roll film.
- Two dimensional materials e.g graphics and pictures and the three dimensional e.g globes, models and real things.
- Print materials e.g magazine, textbooks, newspapers etc. Non print materials e.g chalkboard, concrete things.
- Mass media e.g newspapers, television and radio.
- Audio e.g tape-recording, microphone etc. visual e.g pictures, graphics, charts etc.
- High technology materials e.g video machine and computer and low technology materials such as specimen, boards, pictures etc.

Apart from the above mentioned materials, infrastructural materials such as building and

electricity are essential things needed. Electricity helps in the use of electronic machines which are used to demonstrate, explain and display in teaching and learning process.

**4. Use of effective methodology in teaching – learning**

The teacher is- the key factor in curriculum implementation. Teachers must employ methods of teaching that expose learners to learning experience that can meet up with the current technological challenges. The methods employ should provide avenue for learners to acquire skills and mine of creativity. They should employ practical methods of teaching that warrants teachers to be actively involved in learning by doing hence child centred lesson. Acquisition of necessary skill, knowledge and attitude for coping with the current technological challenges will contribute to the nation's development.

**5. Provision of well equipped workshops**

Well equipped workshops should be provided in the school system apart from the laboratories to provide the learners with the opportunity to get acquainted with the use of tools to design, construct and test the functionality of what they have constructed. For example, things like electric fan, electric heater, ray box, transformer, telescope etc. which when sold can



serve as income generating source, can be designed and constructed in the workshop.

### **Practical/Activity Approach to the Teaching of Electric Circuit For Wealth Creation**

**Topic:** Electric circuit.

**Objectives:** Students should be able to

- Define electric circuit
- Know the types of circuit
- Connect simple electric circuit

**Items required:** connecting wires, battery, lamp/galvanometer, ammeter, voltmeter, key circuit diagram.

**Step I:** Teacher define circuit as a part along which electric current flows

**Step II:** Provide the learners individually or in a group of not more than 3 with the items above and:

- Provide them with a circuit diagram.
- Provide them with instructions on how to connect the circuit.
- Guide the learners to connect the circuit provided following the instructions with the key open.
- Ask them to close the key.

### **Observation/Discovery**

Learners will be able to observe current flowing through the galvanometer or lamp.

**Conclusion:** when circuit is connected, current will flow through the connections.

### **Knowledge Application**

When given the free hand to practicalize their acquired knowledge through SIWES, learners will be able to apply this knowledge to circuit connections such as radio receiver/transmitter circuit, electric belt, electric sign post, electric lamp, electric heater, battery charger and transformer which when sold will serve as income generating source, hence making a vocation or self employment.

Apart from that the knowledge of electric circuit will enable them to be employed in organization such as PHCN, ICT centres, electronic centres etc.

### **Teaching Electric Cell for Wealth Creation**

**Topic:** Electric cell.

**Objectives:** Students should be able to

- Define and explain electric cell.
- Explain components of a cell.
- Produce electric cell.
- Connect electric cell in circuit.

**Items required:** Dry cell, wit cell.

**Step I:** Define cell

**Step II:** Identify and explain the components of cell.

**Step III:** Explain how electrolyte and other things (cell) can be produced.

**Knowledge application:** They will be able to produce electric cell that can be sold to earn a living.

**Note:** When teachers are well trained, they will establish their own functional private schools which will serve as

man power generating/development centres as well as income generating sources which will enable them earn a living.

### **Practical Approach to the Teaching of Transformer for Wealth Creation**

**Topic:** Transformer.

**Objectives:** Students should be able to.

- Define transformer.
- Explain the primary and secondary coil.
- Produce transformer.
- Calculate EMF in transformer.

**Items required:** Coils of wire of low resistance, laminated soft iron core.

**Step I:** Define transformer as a device used for changing the voltage of an A.C supply.

**Step II:** guide the learners to wind the coil round the lamination soft iron core such that number of turns in one side is more than the other.

**Step III:** connect one of the turns to the A.C source and the other to the output.

**Step IV:** Explain that the primary is connected to the a.c source and the secondary to the output.

**Step V:** Explain that the coil with more turns has more voltage.

**Step VI:** EMF is calculated using the formula  $E_s/E_p = N_s/N_p$  where  $E_s$  and  $E_p$  are electromotive force in

secondary and primary respectively, and NP and NS are number of turns in primary and secondary respectively.

When the coil with less turns is connected to the AC source and that with more turns to the output, it shows that more voltage is produced at the output (i.e step up) vice versa.

### **Knowledge application**

A stepped down transformer has more turns in primary than secondary while a stepped up transformer has more turns in secondary than primary. The learners will be able to apply the acquired knowledge to produce transformers that can be sold to generate income.

### **Conclusions**

Poverty eradication/wealth creation can easily be achieved when education system is improved through curriculum reforms/innovations, manpower training and development, provision of adequate resources, provision of workshop, proper curriculum implementation through child-centred teaching-learning. This will enable learners to apply their knowledge to wealth creation hence national development.

### **Recommendations**

- Physics education curriculum (NCE curriculum) should be reviewed to incorporate students industrial work experience scheme (SIWES).

- Fully sponsored man power training and development by the employers of labour such as government and private organization should be put in place.
- Provision of enough resources required for improved educational system by proprietors of schools will enhance physics education for wealth creation.
- There should be proper supervision of the teaching-learning process to ensure effective implementation of the curriculum to ensure effective learning.
- There should be construction of well equipped workshop which can serve as practical centres for the students in the school system.

## References

- Agbayewa, J. O. (2002). Developing secondary school physics research experiences: the way forward for sustainable development in Africa. In M.A.G. Akale (Ed.) *STAN 43<sup>rd</sup> National Conference of CASTME Proceedings (413-416)*.
- Asoegu A. O. (2011). Challenges and prospects of environmental science education innovation in Nigerian educational system. In Stephen Olubadewo, E. C. Onwuka & D.I Ajaegbo (Eds), *Issues and Challenges in Nigerian Education in the 21<sup>st</sup> Century*, 2(1), 274-289. West and Solomon Corporate Ideals Ltd.

- Federal Ministry of Science and Technology (1986). *National Policy on Science and Technology*. Ibadan: Nirhot.
- Federal Republic of Nigeria (2004). *National Policy on Education* NERDC.
- Igo, C. A. (2009). VISION 2020. *A challenge for entrepreneurship in vocational education and enhancement strategies*. A lead paper presented at the 1<sup>st</sup> National Conference of Vocational and Technical Education, Nwafor Orizu College of Education, Nsugbe June 2009.
- Ivowi, U. M. O. (1997). *Redesigning school curriculum in Nigeria*. WCCI Region 2 Seminar, NERDC. Conference Centre, Lagos.pp.2-21
- Mbachu, C. E. (2011). Curriculum reforms and innovation in Nigeria Education: issues and challenges in the 21st century. In S. Olubadewo, E. C. Onwuka & D. I. Afaegbo (Eds). *Issues and Challenges in Nigerian Education in the 21<sup>st</sup> Century*, 2(1), 274-289. West and Solomon Corporate Ideals Ltd.
- Stephen, A. S. (2010). Integrative strategies for effective teaching of density and pressure in secondary schools. *STAN Journal of Physics Panel 1(1) pp53-65*.
- West African Examination Council (2005). Chief examiners report.