

Issues in physics education: A major setback in Nigeria's quest for technological growth

Ambrose Mbiam Bawan*, Julian Ogoba Abima and Christopher Ada Ushie

Department of Physics, Cross River State College of Education, Akamkpa, Nigeria.

*Corresponding author. Email: donbalism@yahoo.com; Tel: +234 8066896698.

Copyright © 2024 Bawan et al. This article remains permanently open access under the terms of the [Creative Commons Attribution License 4.0](#), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Received 22nd April 2024; Accepted 8th July 2024

ABSTRACT: The paper is a position paper that addresses issues in physics education and how these issues affect the technological potential of the country, Nigeria. The place of physics education in technological advancement was highlighted and the issues confronting proper physics education in Nigeria were enumerated. Some suggestions were proffered which included the provision of teaching/learning facilities in the secondary school system, use of innovative teaching methods in teaching physics among others. The paper concluded that if these anomalies are corrected and proper attention is given to physics education, the quest for the country's technological advancement is feasible.

Keywords: Physics education, Nigeria, technological growth, school system teaching.

INTRODUCTION

Science and technology are fundamental potentials for the social and economic development of any nation. The current strides made by man in technology are widely attributed to science. Science has been described as a vital instrument for solving socioeconomic problems facing man. These problems include good health facilities, agriculture, employment, property, insecurity communications, energy supply, and good road network, among others. These services are better provided in developed countries than the third-world countries. On the micro-scale, scientific skills enable individuals to fend for themselves and function effectively in today's modern society. The gap between developed and developing countries in the provision of these social amenities is the scientific gap. It is worth knowing that a good part of scientific knowledge and inventions are derived from the laws and principles of physics (Ogundele and Babajide, 2011; Jegede and Adedayo, 2013).

Physics is a branch of science that studies matter and energy and the relationship between them (Agommuoh, 2015). Physics is also referred to as the science of measurement (Omosewo, 2009). This is because the knowledge of physics has contributed immensely to the production of instruments and devices which is of great

benefit to man. Physics is a basic requirement for entry into science and technology courses by implication, therefore physics is a cardinal subject for any country's technology growth. Physics has applications in the life of any nation. Physics is the queen foundation of modern technology. The application of physics to the economic growth of any nation is wide and diverse.

CONTRIBUTION OF PHYSICS TO TECHNOLOGY

The laws and principles of physics are applied to nearly all facets of technology. Nigeria's economy is largely petroleum-dominated. The exploration of this crude oil is based on the principle of physics. Seismic waves are sent down into the earth or water body. The reflection of such waves yields information on what is underneath. In hydro-electric power generation, the potential energy of the water is converted to kinetic energy that turns a shaft that produces electrical energy, nuclear energy produced in nuclear reaction by fission, is also used to generate electricity. Nuclear weapons are also produced by the application of nuclear physics. Solar energy is converted to electrical energy using solar collectors. This source of

energy is always available in utilization Nzan *et al.*, 2017).

In the transport sector, trains, aeroplanes, of all sorts, cars, ships, and motorcycles are all developed from the principles of law and physics. They all apply vibrations or simple harmonic motion and electric motors in their locomotion. Communication has also been made easy. The cell phone uses waves for the transmission and reception signal. The same is applied to radio and television transmission. Satellites have been built and launched to orbit space through the knowledge of physics. These satellites are used either for communications or for space exploration. In navigation, the reflection of sound on the seabed known as echo sounding is used to determine the depth of the sea. The building of the ship itself is based on the principle of flotation (Bawan *et al.*, 2017).

The electronic industries have witnessed great achievements by the development of diodes, transistors, and integrated circuits. These devices are used in the radio, televisions, and computers. In the health sector, x-rays are used to detect the presence of foreign objects in the body and locate bone fractures. Where X-rays could not be used because of the softness of the tissue concerned ultrasonic sounds are used for scanning. The list of applications of physics in technology is endless. Physics has made the United States of America what is today, a superpower and the country with the largest economy in the world (Ibrahim *et al.*, 2020).

Despite its leading role in the development of a nation, physics education is bedevilled with many issues which do not allow it to leap Nigeria into its technological advancement. Some of these issues are considered below:

ISSUES IN PHYSICS EDUCATION

The following issues in physics education have been identified by the authors as challenging Nigeria's quest for technological growth.

The physics curriculum

The curriculum had been found not to identify with the technological needs of Nigerian society (Jegede and Adedayo, 2013). The physics curriculum does not take into consideration the cultural values and beliefs of Nigerian society. All the innovations embarked upon in the curriculum still reflect colonial orientations and are devoid of values and materials that connect it to the Nigerian environment.

Inadequate laboratory facilities

Physics is a subject which is activity-based. The teaching/learning of physics requires instructional materials. Instructional materials are equipment and materials used

in the teaching/learning process to stimulate self-activity in students. Researchers such as Igwe (2003) and Folorunso (2009) showed that physics instructional materials are lacking in the school system. Ibitoye and Fape (2007) attributed the poor academic achievement of students in physics to a lack of instructional materials. Thus, the inadequate use of instructional materials has constituted a cloak on the wheel of students' achievement in physics and a major barrier to the quest for the technological advancement of Nigeria (Fasanya and Abdulwaheed, 2023).

Inadequate and qualified physics teacher

The teacher is the facilitator of learning and is expected to impart to the students the concepts and skills. Field experience showed that most physics teachers are ill-equipped for the job. Most classroom physics teachers are graduates of other fields such as engineering, mathematics, and agriculture. These types of teachers lack the skills of teaching physics and they have shallow knowledge of the subject matter. The success and failure of any educational programme rest on the adequacy of well-trained and dedicated teachers. The study by Adedayo in Jegede and Adedayo (2013) showed that academically and professionally trained teachers affect students' performance in physics positively.

A well-trained teacher academically and professionally is vested with the knowledge of pedagogy, develops good teacher and student relationships, has good knowledge of classroom management and is always enthusiastic on the job. The growth of the education sector and the overall development of the nation depend on the quality of instruction received in the classroom. Nigeria's quest for technological growth depends on the adequacy and quality of dedicated physics teachers in the classroom (Ibrahim *et al.*, 2020).

Students' attitude towards physics

Most students at the senior secondary school level perceive physics as a difficult subject. Jegede and Adedayo (2013) enumerated factors that account for this difficulty including the mathematical nature of the subject, unhealthy teacher-student relationship, and preconceived bad information that physics is difficult. This is why physics has the lowest popularity index among secondary school science subjects (Oladele and Lasisi, 2006). This negative attitude also leads to a lack of commitment in the students with underachievement being the end result Bawan and Udo, 2017.

Teaching method

The method in which the teacher uses to deliver his/her

subject could enhance or mar learning. The National Policy on Education recommends activity-based instruction as the method to be used in teaching physics. Contrary to this, the physics classroom is dominated by “talk and chalk” or traditional teaching methods. This method has been criticized because it is teacher-centered. This method makes the students passive listeners and creates a boring environment. The constructivist or innovative teaching methods such as inquiry, cooperative learning and discovery teaching methods which evoke creativity in the students are disregarded. The innovative teaching methods enable students to construct their ideas which leads to a better understanding of the learned concepts (Bawan and Udo, 2019).

Examination malpractice

The issue of examination malpractice has even attracted the attention of the Federal Government of Nigeria. This is why the Examination Malpractice Act of 1999 was enacted. By this act, examination malpractice includes cheating in the examination hall, stealing of question paper, impersonation, disturbance in an examination hall, misconduct in an examination hall, obstruction of the supervisor, forgery of results, breach of duty, and conspiracy of aiding candidate (Federal Republic of Nigeria, 1999). In all these cases the Act stipulate a fine and a term of imprisonment depending on the age of the culprit. The principals and school teachers are not exempted (Bawan *et al.*, 2024).

Despite the law and stiff penalties, examination malpractice is embraced by all and sundry. The law had been shelved aside and examination malpractice is now seen as the way of achieving success in the school. Parents, school principals and teachers are all involved. External examinations such as WASCE and NECO are copied on the blackboard for students to write. Students could now score grade “A” in the sciences but opt to study social studies at the tertiary level. This is an issue that must be addressed by all and sundry using a moral approach since legislation has failed (Ibrahim *et al.*, 2020).

Politics/Funding

Government functionaries have consistently played politics when it comes to education. According to Chukwu in Umah (2018), education has consistently become a subject of politics. Teachers’ salaries had been highly politicized. The recruitment of teachers into the school system is at the hands of politicians (Udo and Ubana, 2017). Letters of introduction are gotten from politicians before an applicant is considered. This does not allow room for good-quality physics teachers to be recruited into the school system.

The funding of schools is also under politics. Promises to schools had never been met. The school system is

observed to be underfunded. This has greatly jeopardized the achievement of national educational goals. Science education is capital intensive in that laboratories have to be built and equipped. The inadequate funding of schools has led to the poor state of our schools and the laboratories. The little money that will be released into the school system will suffer in the hands of our corrupt politicians. This is a major issue that confronts physics education and the entire science education (Bawan *et al.*, 2024).

THE WAY FORWARD

Based on the issues enumerated above, good laboratories should be built and equipped. Teachers should be encouraged to improvise some of these equipment locally. Well-trained laboratory technologists should be recruited and deployed to schools to manage this equipment. Guidance and counselling services should be strengthened in the schools. The school counsellors should be able to counsel the students on the importance of physics. Physics teachers should be given enough incentives to motivate them to put in their best. Use of innovative teaching methods in teaching physics should be adopted by physics teachers. In-service scheme for the continuous professional development of physics teachers should be put in place. This will help the serving teachers upgrade their knowledge from time to time. The recruitment of physics teachers should be based on merit and not man-know-man. Recruitment interviews should be both written and oral and only those with professional and academic qualifications and who exhibit competency in the subject should be considered. Government at all levels should stop their lip-service syndrome in the education sector. The education sector should be devoid of political deception by our politicians. E-library should be built in all the schools. This will give the students wide access to information on the subject. This will also enable the teacher to study online, search for new ideas and even embark on e-tutorials. This will help teachers find the best teaching tools and practices that could facilitate learning.

Conclusion

This paper highlighted the contributions of physics in technology. The issues militating against the proper development of physics education were enumerated and solutions proffered. There is no doubt that if these suggestions are strictly adhered to, it will bring about effective teaching and learning of physics in our schools. This will in no small measure positively influence the technological growth that Nigeria is yearning for.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

REFERENCES

- Agommuoh, P. C. (2015). Enhancing the teaching of physics through the use of ICT in senior secondary schools. *Proceedings of the Annual Conference of the Science Teachers Association of Nigeria*. Pp. 274-283.
- Bawan, A. M., Kamgba F. A., & Obi, D. O. (2024). Refocusing the teaching of physics for the technological development of Nigeria. *British Journal of Education, Learning and Development Psychology*, 7(2) 465-473.
- Bawan, A. M., Obi, D. O., Abima, J. (2017). *Acoustics. Fundamentals of Physics for Colleges NCE1*. Pp. 153-169.
- Bawan, A. M., & Udo, N. N. (2019). Effect of innovative teaching methods in physics on the academic performance of secondary school students in Akamkpa Local Government Area. *British Journal of Education, Learning and Developmental Psychology*, 2(1) 89-99
- Fasanya, A. G., & Abdulwaheed, O. I., (2023). Physics education: A bedrock for achieving security and sustainable national development. *Journal of Science, Technology and Mathematics Pedagogy*, 1(1), 50-58.
- Federal Republic of Nigeria (1999). Examination Malpractice Act 1999. Retrieved 18th February 2019 from <https://nairametrics.com/wp-content/uploads/2013/10/EXAMINATION-MALPRACTICES-ACT.pdf>
- Folorunso, B. (2009). Selection and use of instructional materials and resources. *Basic Education Teacher's Handbook of Nigerian Educational Research and Development Council*. Pp. 176-182.
- Ibitoye, J. O., & Fape, M. N. (2007). Instructional materials utilization for effective teaching and learning of Introductory Technology in the Universal Basic Education (UBE). *Nigerian UBE Journal*, 1(2), 351-354.
- Ibrahim, A. I., Esaduwha, S. O., Shitu, M. (2020). The problems and prospects of physics teacher education program for sustainable development in nigeria. *African Journal of Research in Physical Sciences*, 10(1), 2117-2213.
- Igwe, I. T. (2003). Enriching science education: The place of improvisation in the classroom. *Science Teachers Association of Nigeria 41st Annual Conference Proceeding*. Pp. 51-53.
- Jegede, S. A., & Adedayo, J. O. (2013). Enriching physics education in Nigeria towards enhancing a sustainable technological development. *Greener Journal of Educational Research*, 3(2), 80-84.
- Nzan, N. N., Bawan, A. M., & Abima, J. (2017). *Basic and digital electronics. Fundamentals of Physics for Colleges NCE1*. Pp. 111-127.
- Ogundele, B. O., & Babajide, V. F. T. (2011). Commitment to science and gender as determinants of students' achievement and practical skills in physics. *Journal of the Science Teachers of Nigeria*. 46(1), 125-135.
- Omosewo, E. O. (2009). Views of physics teachers on the need to train and retrain physics teachers in Nigeria. *African Research Review*, 3(1), 53-60.
- Udo, N. N., & Ubana. U. A. (2017). Challenges to effective implementation of the Universal Basic Education (UBE) Science Curriculum in Cross River State. In: Ekong, A., & Amanchukwu, R. (eds.). *Basic Education in Nigeria*. Pp. 197-217.
- Umah, S. S. (2018). Reform and innovation in Nigeria education: Implementation problem. In: Azare, G., & Arokoyo. S. B. (eds.). *Reforms and innovation in Nigerian education. the journey so far*. Pp. 237-250.