

**Improvement of Physics
Education As A Hallmark
For Economic Growth
and National
Transformation in Nigeria**

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Abstract

Physics can function in almost all works of life as its applications is found in medicine, engineering, finance, science, technology, and many other fields. And being useful in many areas of life implies that it has some contributions to

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make to development. Thus, there is the need for a nation that desires development and transformation to make Physics a basic requirement for the study of science and technology because of its positive contributions to the development of mankind. This paper highlights the need for quality Physics education as an essential instrument for economic growth and national transformation. Physics education enables scientists to learn important skills such as teamwork, networking, problem-solving skills, critical thinking, innovations, and self-discipline. These were highlighted to be vehicles that speed up the economic growth of a nation. Also, science, technology, business, and industry were stated to be areas that can bring about national development and transformation through quality physics education. The paper also highlighted the challenges of physics education that could hinder its exploits; it, therefore, suggested that students should be encouraged to apply lessons from physics to real life in a manner that would develop their skills.

Keywords: Physics Education, Youth Entrepreneurship, National Economic Growth, National Transformation, Science.

Introduction

Physics is the father of science with the unique ability to function in almost all works of life as its applications can be found in medicine, engineering, technology, and many more fields of knowledge. Because of its capacity to stimulate reasoning and creativity, it helps greatly in the area of decision-making that has ushered in inventions through technology. Every nation must prioritise Physics for its survival. It is on this note that well-meaning nations like the USA, China, and even Malaysia have made physics mandatory as a course of study and a prerequisite to admission into every high institution of learning (Bajah, 2019).

Indeed, it would not be out of place to say that for any nation to develop, it requires extensive knowledge of Physics as it yields professionals in science and technology. However, in the face of an unprecedented increase in youth unemployment in Nigeria, entrepreneurship development and job creation have become a major source of concern to the Nigerian government, over the years. Thus, it is imperative for physics educators to train students on how to apply physics concepts and skills outside the classroom environment. If an individual has physics concepts and skills, he will be able to make decisions on his own, be a consultant, and will also be able to solve problems (Nwagbo, 2020).

Such an individual can be independent as an entrepreneur and can be an employer of labour. In light of this, physics education should be positioned to train youths on various skills which include entrepreneurial skills, technology, creativity, and innovation. If physics education is coupled with entrepreneurship education, then there will be the development of the potential of youths with skills that can help them to be self-reliant and even create and generate employment for others (Amao & Bakare, 2021). This will play a significant role in the economic development of a nation and has a mandate to equip the youths with functional knowledge and skills to build up their character, attitude, and vision. Entrepreneurship and innovation are increasingly recognised as important drivers of economic growth, productivity, and development (Bird, 2016). Economic development is the process whereby simple low-income national economies are transformed into modern industrial ones involving quantitative as well as qualitative change.

National Development is the improvement of a nation, economically, socially, and politically to better the standard of living for a population (National Development Theory, n.d.). Equipping learners with the 21st-century skills is the current pursuit of nations of the world wishing to maintain global leadership and cutting-edge economic competitiveness. These nations now see science, technology, engineering and physics education as being important for equipping their citizens with problem-solving skills, so that they may have the potential to become innovators and entrepreneurs of tomorrow (Nicole, 2023).

Physics and the Society

Society cannot thrive without Physics. The bedrock of any functional society is technology and other innovations, which can only be achieved via physics knowledge. The following are ways physics has greatly contributed, and influenced our societies:

- a) **Physics Improves Health:** In medical technology, positron emission tomography (PET) lets neurologists see how energy flows inside the brain to see where problems could be occurring.
- b) **Physics Connects the World:** The telecommunications industry, including the development of the internet, has benefited from physics research in telecommunications from radio waves to fibre optic cable.
- c) **Physics Improves Technology:** The computing industry depends on physics research in semiconductors and magnetism in order to build processors and disk ever smaller and denser.
- d) **Physics Drives Progress:** Physics research benefits the transportation industry in everything from what materials to build cars with, to how to build efficient engines to navigating using the global positioning system.
- e) **Physics Clears the Air:** Physics is used in environmental science to both detect problems and to build systems that are better for the environment with technologies such as solar power and plasma physics.
- f) **Physics Fills the Home:** Many consumer goods developed from physics research. CDs are possible because of refinements in laser technology. Many household gadgets have microprocessors such as microwaves and phones.
- g) **Physics Designs the Future:** Physics has led to many innovations in the substances from which products are made. One now-common material is Teflon. Other substances are now used to make many items from sports equipment to earthquake-resistant buildings.

Physics Education as a Catalyst for National Development and Transformation

Over the years, physics education has played a crucial role in revealing underlying principles that help explain the universe. Physics has become a pivotal subject that finds its applications in diverse fields of science and humanity such as computing and information systems, physical sciences, chemical sciences, mathematics, artificial intelligence, space technology, medicine, engineering, communication, human behaviour, social systems and so on (Jegade & Julius, 2013). Also, physics offers a commitment to technology and science development. Furthermore, it has an important and diverse effect on human communities and a strategic part in the growth of humanity as a whole. Physics also has a vital role to play in the economy and technological development of a nation, as it is the key to the solution of most human problems. Physics is the language of technology and engineering, as it is used to formulate, interpret, and solve problems in diverse fields of economics, seismology, and ecology. Physics provides us with powerful theoretical and computational techniques to advance our understanding of the modern world and societal problems, and to develop and manage the technological industries that are the bedrock of our nation's economy (John et al, 2022). It also helps in combating poverty, crime, and addressing various security problems. The role of quality physics education in the development and transformation of a nation could be seen under the following areas.

Science and Technology

Physics has been the backbone of several human endeavours, notably science and technology, and they are crucial to national development. Science and technology have advanced so much that what is left for man to attain is the creation of man itself. There is no doubt that technology has brought higher standards of living to people, both in advanced countries and developing nations. It is the rising living standard that makes the acquisition of technical competence so attractive to those countries (Ramraj, 2023). Today, the products of science and technology are glaring and enjoyable. The invention of satellites, mobile phones, high-security gadgets etc are the products of physics education. In Nigeria, science and technology have been applied in many spheres, especially, in the oil industry. Physics is an instrument for fostering scientific and technological advancement (Adagonye et al, 2024). The usefulness of physics to the ordinary man is its ability to develop his reasoning faculty to the extent of modifying man's pattern of

reasoning. Hence, the knowledge of physics is most rapid in architecture, surveying, building, modelling, sculpturing and medicine, which include major parts of national development. Internationally, the computer usage worldwide was made possible because of the knowledge of Physics. Computer is a facilitative technology and merely allows those who are already doing something to do more of it faster and more accurately (Ogbe & Omenka, 2019).

Business and Industry

Quantitative techniques are statistical and operations research or programming techniques, which help in the decision-making process, especially concerning business and industry. They involve the use of numbers, symbols and other mathematical expressions (Aminu & Bashirat, 2023). Some of the important operations research techniques often used these days in business and industry are: Linear Programme, Game Theory, Decision Theory, Network Analysis, and Simulation. All these techniques are not simple but involve physics. The tendency today is to combine several of these techniques and form more sophisticated and advanced programming models (Ogbazi, 2021). All these play key roles in contributing to national development. A lot of physics knowledge is used in industries in determining which models of machine would produce greater materials with efficiency.

Entrepreneurship

Understanding physics concepts is essential when undertaking an entrepreneurial endeavour. Most youth entrepreneurship ventures include the development of a business plan. One major component of that plan is creativity (Sajuyigbe et al, 2016). To develop a good business plan, young entrepreneurs need to think explicitly about their businesses in order to thrive. One of the biggest advantages of getting started with entrepreneurship at a young age is the opportunity to learn important skills such as teamwork, networking, problem-solving, critical thinking, innovation, self-discipline, and so on (United Nations, 2011). Youth entrepreneurship is a process whereby creative and innovative ideas are transformed into enterprises initiated and managed by young people with the primary purpose of addressing their socio-economic challenges such as poverty and unemployment (Ndwakhulu, 2019).

Physics, in this instance, is regarded as one of the major tools that can enhance youth entrepreneurship. It helps in the area of decision-making, keeping records and analytical thinking skills. It is important to know that a Physicist is a mathematician. So, physics also helps a young entrepreneur in the following areas:

- i. Making business plan,
- ii. Sales forecast,
- iii. Analysing and optimising the return on investment,
- iv. Estimating the gain from market activities,
- v. Financial analysis, financial ratio and statements,
- vi. Inventory management,
- vii. Marketing and digital marketing,
- viii. Analysis of data,
- ix. Predicting future financial trends, and
- x. Risk management.

Some of the Challenges of Physics Education in Nigeria

However, although physics has important contributions to make to national development, it is confronted by some challenges in Nigeria. Some of these challenges are identified and discussed below.

Quality of Teachers

The impact of physics teachers in the performance of students in physics is germane. This is because physics teachers are the facilitators who are to impact to the students the concepts expected to be learnt. Research has revealed that most physics teachers are ignorant of the curriculum content of physics education (Nwagbo, 2020). These students taught by these rather incompetent teachers would be invariably shallow in physics concepts and principles. It has indeed been pointed out that one of the problems of industrial development in Nigeria is that of inadequacy of sufficiently trained human resources (Ogbazi, 2021). This has been a major challenge constraining the rate of technological and economic development and transformation in Nigeria.

Teaching Method

The teaching method of a discipline is a catalyst for effective learning by the students. In Nigerian schools, the usual and traditional methods of teaching science (physics inclusive) involve chalk and talk which is a purely teacher-centred method of teaching. In this case, the students are unavoidably passive in the classroom. However, there are suggestions and agitations to inculcate the 21st-century approaches to science teaching in Nigeria. These include, but not limited to: inquiring method, collaborative teaching, discovery method, group discussion method etc. Most of these 21st-century approaches are student-centred and as such can enhance effective learning by the students (Odeh, 2019).

Negative Attitudes of Students Towards Physics

Many students for fears of mathematics and calculation-related works perceive and conclude that physics is difficult. In as much as some physics teachers teaching physics and parents are not helping the situation via their comments and reactions, students' nonchalant and lukewarm attitudes toward learning physics are worrisome. This hinders the effective delivery and learning of physics in Nigerian schools which in turn affects the technological advancement that impedes national development (Akano, 2018).

Lack of Modern Laboratories

Our schools are full of outdated science laboratories. Most physics laboratories are either in a dilapidated state or there is a serious lack of modern equipment and materials for experimental purposes. This affects the learning outcomes of physics students and has led to the production of incompetent teachers both at secondary and tertiary levels.

Use of Complex Scientific Language in Class

In as much as this is similar to issues relating to the method of teaching, it is an issue that should stand on its own for emphasis's sake. There is no point in using complex or complicated scientific terminologies in the delivery of education generally, and more specifically physics education. Students end up not getting anything reasonable or lose interest in learning as a result of the ambiguous uses of scientific languages (Kavita, 2020).

Difficulties in Understanding Physics Concepts and Principles

This could affect both physics teachers and students. We often recommend teamwork on the part of teachers and encourage students to ask necessary questions to curb this problem.

Recommendations for the Improvement of Physics Education in Nigeria

1. The methods of teaching physics should be activity-oriented. It is widely accepted among physics educators that physics should be taught using methods such as guided-discovery, demonstration, laboratory, inquiry, and project methods among others. The use of these methods is now fully recognised as being potent in physics teaching. The employment of these methods should therefore be enforced.
2. The training programme of a prospective physics teacher should be expanded to allow more sufficient exposure to relevant subject-matters and to include existing innovation and creative opportunities (Yousef, 2022).
3. Improvisation should be encouraged among physics teachers and students for inadequate laboratory facilities and lack of instructional materials to be resolved. Improvisation is the practice of acting, singing, talking and reacting in response to the stimulus of one's immediate environment and inner feelings. This can result in the invention of new thought patterns (ideas), new practices, new structures or symbols and/or new ways of acting.
4. There is a drastic drive in Nigeria towards technological transformation and development. This is captured in her National Policy of Education (2004), Chapter 5, Section 39 and Subsection 1 that points out that: "A greater proportion of educational expenditure should be devoted to science and technology." This very portion of the policy in education was calved from the fact that development of any society is judged by the technological prowess and the category of the people that exhibit it.
5. Provision of basic social amenities, Access to uninterrupted electricity, all-encompassing good health programme and government policies that would boost the standard of living of the

generality of people would no doubt gear up people towards innovation, creativity, and hence entrepreneurship.

Conclusion

This research has been able to establish that Physics has the capability of playing a major role in finding solutions to many problems facing the human race. Of course, it does not have all the answers, but the science is developed enough to have created nuclear weapons which remain a global threat, then surely it can be used for the betterment of all people around the globe. In this paper, it is clear that physics education is a hallmark of economic growth and national development. This is extensively explained under physics education as a catalyst for National Development and Transformation. It was suggested that emphasis be placed more on developing physics education for socio-economic growth and national transformation, because, it is the answer.

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