IMPLEMENTATION OF THE NIGERIA CERTIFICATE IN EDUCATION (NCE) PHYSICS CURRICULUM IN SOUTH-WESTERN, NIGERIA

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Abstract
This paper views the implementation of the NCE Physics curriculum in Colleges of Education across South-Western Nigeria, with a focus on the alignment between policy intentions and classroom realities. Drawing on teacher education, regulatory provisions of the National Commission for Colleges of Education (NCCE), and observed institutional conditions, the paper interrogates how instructional strategies, laboratory utilisation, assessment practices, and lecturer preparedness shape curriculum delivery. The study reveals persistent gaps between the prescribed curriculum and its implementation, particularly in the areas of practical, learner-centred pedagogy, and skills-based assessment. Inadequate laboratory facilities, limited funding, large class sizes, and uneven professional development opportunities for Physics lecturers further constrain effective implementation. These challenges undermine the curriculum's capacity to produce competent and confident Physics teachers equipped to meet contemporary scientific and technological demands. The paper argues that without deliberate institutional support, monitoring, and periodic curriculum contextualisation, the objectives of the NCE Physics programme will remain largely aspirational. It therefore calls for strengthened regulatory oversight, improved resource provision, targeted capacity building for Physics educators, and reorientation of teaching towards practical competence. The study contributes to ongoing discourse on teacher education reform and provides policy-relevant insights for enhancing the quality of Physics instruction in Nigerian Colleges of Education.

Keywords: NCE Physics curriculum; curriculum implementation; Colleges of Education; Physics teacher education; South-Western Nigeria.

Introduction
The development of any nation largely depends on the quality of its education system. This is because a country's goals and values are reflected in and shaped by its educational structure through government policies. The National Policy on Education (NPE) serves as a comprehensive framework that directs the planning, development, and implementation of education in Nigeria, with the aim of ensuring equitable and high-quality education for all citizens (Federal Ministry of Education, 2019). The NPE seeks to establish a unified and coherent national education system that promotes national identity, cultural values,

and social cohesion (National Council on Education, 2020). It highlights the critical role of education in national development and outlines strategies to enhance access, quality, and relevance across all levels of education (NERDC, 2020). According to national policy documents, education is essential for developing individuals who are capable of understanding their environment and acquiring the knowledge, skills, and competencies necessary for contributing meaningfully to societal and global advancement.

Education, according to Ajayi (2020), is the process of developing individuals to enhance the economic, technological, and social standards of their communities. Similarly, Adebayo (2020) and UNESCO (2020) affirm that education is a fundamental human right and a powerful tool for sustainable development. It enables individuals to acquire the knowledge, skills, and values required for effective participation in society and for adapting to changing conditions. Moreover, Nwosu (2022) views education as a transformation process that empowers people to realize their full potential, question established structures, and contribute to building fairer and more inclusive societies. Education can be broadly defined as the cumulative process through which individuals acquire knowledge, skills, values, and experiences that enable them to function meaningfully and adapt to the demands of life. It is widely acknowledged that the standard of education in a nation is closely linked to its level of socioeconomic development and progress (Salami, 2016, as cited in Olowookere, 2022).

Globally, education serves as a central mechanism for personal and societal development. It contributes to environmental awareness and is instrumental in the transmission, preservation, and transformation of cultural values across generations (Nja & Obi, 2019). Through educational processes, valuable knowledge, competencies, and behavioral patterns are conveyed from one generation to the next, thereby preparing individuals for responsible citizenship and contributing to their intellectual, moral, and social development (Nja, Ukpepi, Edoho, & Orim, 2019). Education is a multifaceted concept in human life and is not restricted to formal academic instruction; it encompasses both formal and informal modes of learning. It can be viewed as a process, a discipline, or the outcome of organized learning experiences. According to the Cambridge Dictionary (2018), education refers to the act or process of imparting or acquiring knowledge, especially within institutional settings like schools or universities, as well as the learning outcomes gained from this process. As a vital component of human capital, education equips individuals with essential skills and capacities needed to navigate a complex and interdependent world (World Bank, 2022). It plays numerous critical roles in society, which include:

1. Knowledge acquisition: Education enhances understanding of the world and promotes intellectual development (UNESCO, 2020).
2. Skill development: It fosters the acquisition of practical and cognitive skills necessary for career and personal success (World Bank, 2022).
3. Social integration: Education facilitates the internalization of societal norms, values, and social behavior (NCES, 2020).
4. Economic empowerment: It improves individuals' employment prospects and contributes to economic advancement (OECD, 2020).
5. Personal growth: Education promotes critical thinking, creativity, and self-reflection (Nwosu, 2022).
6. zens (United Nations, 2020).

Statement of the problem

Physics, as a core science subject, plays a crucial role in national development through its contributions to technological advancement, innovation, and scientific literacy. The Nigeria Certificate in Education (NCE) programme is designed to prepare competent teachers who will effectively teach Physics at the basic education level. However, despite the strategic role of the NCE Physics curriculum, there is growing concern about the quality of its implementation in teachers' training colleges, particularly in the Southwest geopolitical zone of Nigeria. Evidence

from research and educational reports suggests that the implementation of the NCE Physics curriculum is fraught with numerous challenges. These include inadequate instructional facilities and laboratories, poor funding, lack of qualified lecturers, outdated teaching methodologies, and limited opportunities for practical, hands-on experiences. Consequently, many NCE Physics graduates appear ill-equipped to handle the demands of teaching Physics effectively in secondary schools, thereby contributing to the persistent low student achievement and interest in the subject.

Rationale for Implementation the NCE Physics Curriculum

The implementation of the Nigeria Certificate in Education (NCE) Physics curriculum is essential for ensuring that the programme fulfil its intended educational purpose. Curriculum evaluation is recognized globally as a **systematic process for assessing relevance, effectiveness, and outcomes** of a prescribed curriculum so that evidence-based improvements can be made to enhance teaching and learning quality. It involves examining curriculum content, instructional methods, learning outcomes, and assessment practices against stated goals and societal needs, thus ensuring alignment with national education objectives and evolving scientific knowledge (Teachers Institute, 2023). In the context of teacher education, particularly science and physics education, curriculum evaluation provides **critical feedback on implementation fidelity**, identifying gaps between design and practice that might hinder the development of competent Physics teachers. Without systematic evaluation, institutions cannot determine whether students are achieving the desired competency levels in Physics content knowledge, practical skills, and pedagogical methods necessary for effective classroom practice. This evidence is crucial for informed decision making by curriculum planners, teacher educators, and regulatory bodies such as the National Commission for Colleges of Education (NCCE, 2020). Moreover, evaluation facilitates **curriculum renewal and responsiveness to contemporary scientific advancements** and educational demands. Given the rapid evolution of science and technology, it is imperative that the NCE Physics curriculum remains relevant, up-to-date, and capable of preparing teachers for current classroom challenges. Regular evaluation enables the integration of new pedagogical approaches and resources, ensuring that students are not disadvantaged by outdated content or instructional strategies. Evidence from curriculum evaluation studies in Nigeria further underscores this need. Research on the implementation of physics curricula at various education levels has revealed issues such as incomplete delivery of prescribed content, inadequate teaching resources, and challenges in translating curriculum goals into classroom practices. These findings highlight the practical necessity of evaluation as a feedback mechanism to address structural and pedagogical weaknesses that directly affect learner outcomes and teacher preparedness (Teachers Institute, 2023).

Conceptual Clarification of Curriculum Implementation

The concept of curriculum development and implementation is crucial in Nigeria's educational system. Curriculum development refers to the process of designing, implementing, and evaluating educational programs (Egbe, 2020). On the other hand, curriculum implementation refers to the process of putting the developed curriculum into practice (Ogunsola, 2019). In Nigeria, the National Educational Research and Development Council (NERDC) is responsible for developing and implementing the national curriculum (NERDC, 2020). The council works with stakeholders, including teachers, parents, and community leaders, to develop a curriculum that is relevant to the needs of Nigerian students (Adeyemi, 2020). Despite the efforts of NERDC, there are several challenges facing curriculum implementation in Nigeria. One of the major challenges is the lack of adequate resources, including textbooks, equipment, and technology (Olorunsola, 2020). Another challenge is the inadequate training of teachers, which affects their ability to implement the curriculum effectively (Egbe, 2020). To address these challenges, the government needs to

increase funding for education and provide adequate resources for schools (Adeyemi, 2020). Additionally, teachers need to receive regular training and support to enhance their capacity to implement the curriculum effectively (Ogunsola, 2019).

Policy and Regulatory Framework Governing NCE Physics

The National Policy on Education (NPE) in Nigeria is a comprehensive framework that guides the development of education in the country (Federal Republic of Nigeria, 2013). The policy is anchored on Nigeria's philosophy on education, which emphasizes the building of a free and democratic society, a just and egalitarian society, a united and self-reliant nation, a great and dynamic economy, and a land of bright and full opportunities for all citizens (Ogunsola, 2015). In curriculum evaluation, models are essential so as to provide a conceptual framework for designing a particular evaluation depending on the area of evaluation interest. In line with, Ajayi (2020) assumed that models help in examining proximity among components and defining activities, and point ways towards new thinkable applications or research difficulties. Numerous evaluation models have been projected, promulgated, established and recycled by veteran educational evaluator since 1945 to date.

The Nigeria Certificate in Education (NCE) for Physics Education programme is essential in preparing educators to teach Physics at the Senior Secondary Schools level in Nigeria after graduation. Physics education at colleges of education in Nigeria is a theory, principle and calculation based course accompany with practical-followed-up in each topic which required basic knowledge of the organizational concepts and techniques in practical physics skills that is being done under the school of secondary education (sciences), as reflected in the Minimum Standard (NCCE, 2020).

Implementation Realities in South-Western Nigeria

Lecturers' experience is a crucial factor in the effective implementation of the Physics curriculum (Egbe, 2022). Experienced lecturers are more likely to have a deeper understanding of the subject matter and to be more effective in implementing the curriculum (Adeyemi, 2022). Studies have shown that lecturers with more experience are more likely to use innovative teaching methods, such as problem-based learning and inquiry-based learning, which are effective in promoting student learning outcomes (Ogunsola, 2021). Additionally, experienced lecturers are more likely to be able to adapt the curriculum to meet the needs of diverse learners, which can improve curriculum implementation (Olorunsola, 2022).

However, despite the importance of lecturers' experience, many studies have reported that inexperienced lecturers are often assigned to teach Physics courses, particularly in Nigerian universities (Egbe, 2022). The impact of the educators/lecturers in the performance of the pre-service teachers is germane. The lecturers are the implementers who are to impact into the pre-service teachers the concepts expected to be learnt. The relationship between lecturers and pre-service teachers is a crucial factor in the effective implementation of the Physics curriculum (Egbe, 2022). A positive relationship between lecturers and pre-service teachers can enhance the quality of teacher preparation and improve curriculum implementation (Adeyemi, 2022). Studies have shown that lecturers who have a positive relationship with pre-service teachers are more likely to provide effective guidance and support, which can enhance the quality of teacher preparation (Ogunsola, 2021). Additionally, pre-service teachers who have a positive relationship with lecturers are more likely to be motivated and engaged in the learning process, which can improve curriculum implementation (Olorunsola, 2022).

Tutors should place their students in circumstances where they can make value decisions concerning science-based issues occurring daily. Also, active teachers are those who provide prospects for their students to study the interfaces of science, technology and society in the light of science-based issues important to society. The duty of promoting satisfactory student notion of science is not a stress-free one. Any effort to

realize this goal requires explanation of the nature of science and the scientific creativity. Hence, science is a way of knowing, as well as a body of knowledge. The body of knowledge results from the harsh devotion to a set of rules and values. Moreover, attempts to promote scientific knowledge are hopeless from the start if we, as science teachers' experts, cannot or will not develop such thought in our students. Employment of adequate numbers of skilled educator is a qualification for imparting quality education.

Factors Influencing Physics Teaching and Learning

Physics teaching and learning is a complex process that is influenced by a variety of factors. These factors can be broadly categorized into teacher-related factors, student-related factors, and environmental factors. This literature review aims to examine the factors influencing Physics teaching and learning and identify areas for improvement.

Teacher-Related Factors

Teacher-related factors play a significant role in influencing Physics teaching and learning. Teacher Characteristics are a crucial aspect, as they can either facilitate or hinder student learning. Research has shown that teachers' personal characteristics, such as their attitude, motivation, and enthusiasm, can significantly impact student engagement and academic achievement in Physics (Kılıç & Uzun, 2019). Teaching Methods and Strategies are another vital factor.

However, Mwoma and Obiero, (2018) added that, teachers' ability to create a supportive and inclusive learning environment can also positively impact student learning outcomes in Physics. Teacher Professional Development is also essential in influencing Physics teaching and learning. Research has highlighted the need for ongoing professional development opportunities for Physics teachers to enhance their subject matter knowledge, pedagogical skills, and technological literacy (Larkin & Richardson, 2017). Teacher-Student Interaction is another critical factor. Studies have shown that positive teacher-student relationships, characterized by mutual respect, trust, and open communication, can foster a supportive learning environment and promote student engagement and motivation in Physics (Adeyemi, 2017). Research has shown that teacher-related factors, such as teacher qualifications, teacher experience, and teacher motivation, play a significant role in influencing Physics teaching and learning (Adeyegbe, 2020). Okebukola (2019) found out that teachers with higher qualifications and more experience were more effective in teaching Physics. However, another study by Akinyemi (2020) reported that teacher motivation was a significant factor influencing Physics teaching and learning.

Student-Related Factors

Student-related factors, such as student motivation, student interest, and student prior knowledge, also play a significant role in influencing Physics teaching and learning (Khan, 2019). For example, a study by Tamir (2019) found that students who were more motivated and interested in Physics tended to perform better in the subject. However, another study by Oyinloye (2020) reported that students' prior knowledge was a significant factor influencing Physics learning outcomes. In addition, Sandbarey, Armstrong and Wischusen (2015), elucidated that enquiry based practical offers students a more accurate knowledge where the answer is not always encoded and which necessitates students to come up with their own ideas from their personal thought.

More so, Eze and Ezemagu (2018) perceived that schools which are involved in hands-on classes perform better in an examination than those that neglect practical work. As revealed by Sandberg (2015), educators were primarily slow to amend their methodologies in Physics but with good result (improved academic performance) and upkeep from national science and educational organizations, there is now development. Eze and Ezemagu (2018) stated categorically that Physics practical has a positive effect on the academic performance of students in Physics examinations.

Environmental Factors

Environmental factors play a significant role in the teaching and

learning of Physics. Teachers and educators must be aware of the physical, psychological, technological, and sociocultural factors that can impact students' learning experiences. By creating a supportive, inclusive, and well-designed learning environment, teachers can enhance students' motivation, engagement, and understanding of Physics concepts. The learning environment plays a crucial role in the teaching and learning of Physics in which environmental factors can significantly impact students' motivation, engagement, and understanding of Physics concepts. Environmental factors, such as classroom environment, school resources, and parental involvement, also play a significant role in influencing Physics teaching and learning (Adeyemi, 2020). This agrees with the finding of Ogunniyi (2019) that a positive classroom environment was a significant factor influencing Physics teaching and learning.

The physical environment of the classroom can affect students' learning outcomes. A study by Higgins (2017) found that a well-designed classroom with adequate lighting, temperature, and seating arrangement can improve students' concentration and engagement in Physics lessons. Similarly, Osborne (2018) emphasized the importance of laboratory facilities in teaching Physics, highlighting the need for safe, well-equipped, and well-maintained laboratories. However, another study by Afolabi (2020) reported that school resources, such as laboratory equipment and technology, were significant factors influencing Physics learning outcomes psychologically. The psychological environment of the classroom can also impact students' learning experiences. A study by Duit (2019) found that a supportive and inclusive classroom environment can foster students' motivation and interest in Physics. Furthermore, Kirőly (2020) highlighted the importance of reducing anxiety and stress in Physics classrooms, emphasizing the need for teachers to create a relaxed and encouraging learning environment to be technologically friendly. The technological environment of the classroom can also enhance or hinder students' learning experiences. A study by Smetana (2017) found that the use of simulations and multimedia resources can improve students' understanding of complex Physics concepts. However, in disagreement a study by Koehler (2019) warned that over-reliance on technology can lead to a lack of depth in students' understanding of Physics concepts without socio-cultural factors inclusion.

The sociocultural environment of the classroom can also impact students' learning experiences. A study by Brown (2018) found that students' cultural backgrounds and prior experiences can influence their understanding of Physics concepts. Furthermore, (Larkin, 2019) highlighted the importance of promoting diversity and inclusion in Physics classrooms, emphasizing the need for teachers to create a welcoming and inclusive learning environment.

Infrastructural facilities

Resources such as instructional materials, infrastructure, laboratories, and qualified personnel are vital to providing students with quality Physics education. Several studies have examined the adequacy of these resources in Nigerian Colleges of Education, highlighting both successes and challenge. Instructional materials housing in a standard infrastructural facility are fundamental to practical-based subjects like Physics, where students need to apply theoretical knowledge to real-world scenarios. Adequate resources, including textbooks, audio visual materials, and Physics tools, have been identified as essential for effective learning. However, a study by Olusola and Adeyemi (2020) revealed that many colleges of education in Nigeria face challenges in providing sufficient teaching resources. Most technical and vocational schools in Nigeria do not have laboratories or workshops, let alone usable equipment and facilities and where they exist, they are grossly inadequate, as the laboratories only have the items or equipment that were provided when the Schools were established. It is however most astonishing to know that most technical and vocational schools still depend on roadside artisans' workshops to teach technical and vocational education concepts in this 21st century. This is a total shame and a high degree of

irresponsibility on the part of the function of this programme. The available facilities are inadequate both quantitatively and qualitatively and are also obsolete.

The laboratories only have items or equipment that were provided at the inception of the establishment of the schools. The other 60% do not have laboratory or workshop and that this reflects the low quality of technology programmes in higher institutions. He further noted that these few institutions that have laboratories experience acute shortage in supply of laboratory equipment. He concluded that this situation is partly responsible for the reason why it has been increasingly difficult to run experiments effectively for students and made the teaching and research in science and technology difficult and therefore the country was producing insufficient and ill-prepared physics education graduates necessary for driving the technological and socio-economic development of this nation. The inadequacy in teaching, laboratory and workshop facilities has contributed to the diminution of the quality of technical and vocational education graduates being produced in Nigeria.

Challenges and Strategies associated with Curriculum Coverage in Physics

Curriculum coverage is a critical aspect of Physics education, as it determines the extent to which students are exposed to the subject matter (Egbe, 2020). However, several challenges have been identified as hindering effective curriculum coverage in Physics, including inadequate instructional time, insufficient resources, and poor teacher preparation (Adeyemi, 2020). In Nigeria, for instance, the Physics curriculum is often criticized for being too broad, leading to inadequate coverage of key topics (Ogunsola, 2019). Additionally, the lack of qualified Physics teachers and inadequate laboratory facilities have been identified as major challenges to effective curriculum coverage (Olorunsola, 2020). To address these challenges, several strategies have been proposed, including the use of technology-enhanced instruction, collaborative learning, and project-based learning (Egbe, 2020). Additionally, teacher professional development programs have been recommended as a way to enhance teacher preparation and improve curriculum coverage (Adeyemi, 2020).

Furthermore, recent studies have emphasized the importance of aligning the Physics curriculum with the needs of the 21st-century workplace, including the development of critical thinking, problem-solving, and communication skills (Ogunsola, 2019). Other challenges are as well highlighted;

1. Curriculum Pacing: Managing time effectively to cover essential content (Hake, 2018).
2. Teacher Support: Providing professional development for effective curriculum implementation (NRC, 2014).
3. Technology Integration: Leveraging digital tools to enhance engagement and understanding (ISTE, 2017).

Implications for Teacher Preparation and Science Education

The implementation of the NCE Physics curriculum has **profound implications for teacher preparation and the broader landscape of science education**. A robust and contextually responsive teacher education system is central to ensuring that prospective Physics teachers are not only knowledgeable but also competent in translating curriculum intentions into effective classroom practice. First, research consistently shows that the **quality of initial teacher preparation influences instructional quality and persistence in teaching**. Well-designed teacher preparation programmes help graduates develop strong content knowledge, effective pedagogical strategies, and the confidence to manage diverse classroom situations all of which are linked with better student outcomes in science subjects (Achurra, Uskola & Zamalloa, 2024). For example, studies from international contexts highlight that secondary mathematics and science teacher preparation programmes significantly shape graduates' instructional quality and their likelihood to remain in the profession, underscoring the need for rigorous preparation in both content and pedagogy. In the Nigerian context, findings from science education research point to **gaps in teacher preparedness** that have serious implications for

achieving the goals of science education. Evaluations of science teacher preparation reveal that inadequate training, lack of continuous professional development, and insufficient engagement with contemporary teaching methodologies contribute to teachers' struggles in delivering practical, inquiry-based learning experiences that are central to the NCE Physics curriculum. These shortcomings can undermine students' understanding of scientific concepts, limit their engagement with practical work, and ultimately hinder the development of scientific literacy a core objective of curriculum reforms. (Achurra et al., 2024).

Furthermore, teacher preparation impacts **science education outcomes beyond individual classrooms.** A strong preparation system fosters reflective practitioners who are more likely to adapt instruction to address local needs, incorporate research-informed practices, and advocate for improved instructional resources. Conversely, weak preparation reinforces traditional, lecture-centred approaches and contributes to persistent challenges such as poor student performance and low interest in science careers. This is especially concerning given Nigeria's aspirations for technological advancement and national development, where science and science education play pivotal roles. In summary, a thorough evaluation of the NCE Physics curriculum's implementation reveals that **teacher preparation is a linchpin for curriculum success**. Strengthening pre-service training, aligning programmes with contemporary science education demands, and expanding ongoing professional learning opportunities are essential to producing competent Physics teachers and improving science education at all levels.

Conclusion

This paper has examined the past literature review on the implementation of the Nigeria Certificate in Education (NCE) Physics curriculum with a view to re-positioning it for greater effectiveness in Colleges of Education, particularly within the South-Western region of Nigeria. The discussion has shown that while the curriculum is well articulated in terms of aims and content, significant gaps persist between policy intentions and classroom practice. These gaps, manifested in limited practical engagement, inadequate instructional resources, and uneven teacher preparedness, continue to undermine the attainment of the curriculum's stated objectives. Re-positioning the NCE Physics curriculum therefore requires moving beyond periodic curriculum review to a more holistic approach that prioritises effective implementation. Central to this is the strengthening of teacher preparation, as the quality of Physics instruction at the basic education level is directly linked to the competence of teachers produced by Colleges of Education. Greater emphasis on inquiry-based teaching, sustained laboratory work, and assessment practices that reflect practical competence is essential if the curriculum is to respond meaningfully to contemporary scientific and technological demands. Furthermore, institutional and regulatory support must be reinforced to ensure fidelity to curriculum standards. Improved funding for laboratories and instructional materials, continuous professional development for Physics lecturers, and systematic monitoring by relevant agencies are critical steps towards aligning curriculum prescriptions with actual practice. Without such coordinated efforts, the NCE Physics curriculum risks remaining largely aspirational, with limited impact on classroom realities and learner outcomes. In conclusion, re-positioning the NCE Physics curriculum for effectiveness is both an educational and developmental imperative. A well-implemented curriculum has the potential to produce confident, competent, and innovative Physics teachers capable of nurturing scientific literacy and problem-solving skills among learners. Achieving this goal demands sustained commitment from policymakers, institutions, and educators to translate curriculum ideals into lived educational experiences that advance science education and national development.

Suggestions

The following suggestions were advanced for this study to achieve improved implementation of NCE Physics curriculum;

i. Strengthening Institutional Support and Monitoring exercise by the government at all levels in collaboration with relevant non-governmental organizations,
ii. Curriculum Review and Contextualization should be frequently carried out by the stakeholders and curriculum experts,
iii. Organized capacity building for Physics educators,
iv. Strengthened regulatory oversight on teaching and learning activities,
v. Improved resource provision for teaching and learning activities; and
vi. Reorientation of teaching and assessment towards practical competence.

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