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Trends in Student Enrolment and Attrition in Physics Education: A Study of North-Central Nigerian Colleges of Education

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Abstract

Physics education plays a pivotal role in advancing scientific knowledge and driving technological innovation. Despite its significance, enrolment in Physics Education programs in Nigerian Colleges of Education has continued to decline, with attrition rates remaining high. This study investigated enrolment and attrition trends in Physics Education across Colleges of Education in North-Central Nigeria, with the aim of identifying underlying factors and proposing strategies for improvement. The study had four objectives: (i) to examine trends in enrolment and attrition rates in Physics Education programs; (ii) to identify factors contributing to declining enrolment and high attrition; (iii) to assess the influence of institutional factors on persistence; and (iv) to recommend strategies for improving enrolment and reducing attrition. A total sample of 375 students was determined using the Salant and Dillman model, and 384 questionnaires were administered and retrieved from five Colleges of Education. Data collected were analyzed using descriptive and inferential statistics. Findings revealed a general decline in enrolment (Aggregate Mean = 3.02), with respondents strongly agreeing that enrolment had decreased by about 20% in the past five years (M = 3.51). Promotion efforts were perceived as weak and ineffective in attracting new students (Aggregate Mean = 2.89). Attrition-mitigation strategies were rated moderately effective, with early intervention emerging as the most promising (Aggregate Mean = 2.96). The study recommends targeted bridging programs in Mathematics, revitalization of laboratories, flexible fee and aid structures, mentoring systems, and improved school–college placement pathways. It further advocates the adoption of standardized monitoring frameworks and reporting templates by Colleges of Education and State Ministries of Education to track Physics teacher pipelines. Overall, the study highlights the urgent need for evidence-based reforms to reposition Physics Education as an attractive and sustainable discipline capable of producing qualified teachers essential for national development.

Keywords
Physics Education,
Enrolment,
Attrition,
Colleges of Education.

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Introduction

The establishment of Colleges of Education (COEs) in Nigeria is rooted in the Ashby Commission Report of 1960, *Investment in Education* (Ashby, 1960), which recommended the creation of Teachers' Grade One Colleges offering two-year teacher training programs. This recommendation led to the founding of five Advanced Teachers' Training Colleges (ATTCs) in 1962 by the Federal and Regional Governments with support from UNESCO. The institutions at Lagos, Ibadan, and Zaria were the first to be established, followed by Owerri (1963), Kano (1964), and Abraka (1968). The Ibadan College was later relocated to Ondo in 1964 and is now known as Adeyemi College of Education.

Over time, several ATTCs were upgraded to Colleges of Education in recognition of their high academic standards and the quality of teachers they produced. By 1973, the number of such institutions had grown to 13, and by the late 1980s, there were over 40 Colleges of Education affiliated with Nigerian universities. The establishment of the National Commission for Colleges of Education (NCCE) in 1989 marked a turning point, providing uniform minimum standards and a regulatory framework for teacher education in Nigeria. The NCCE was mandated to accredit programs, set benchmarks, and ensure quality assurance across all Colleges of Education (Decree No. 3 of 1989). Today, there are 57 COEs in Nigeria, all subject to accreditation and re-accreditation to maintain program quality and relevance (NCCE, 2020).

Physics education occupies a central role within the Science, Technology, Engineering, and Mathematics (STEM) disciplines, fostering critical thinking, problem-solving, and innovation (Jegede & Okebukola, 2017). It is also foundational to national scientific and technological advancement. In Nigeria, Physics Education programs in Colleges of Education are particularly significant, as they prepare teachers who will teach physics at the secondary school level. Despite its importance, Physics Education has faced longstanding challenges, particularly declining enrolment and high attrition rates (Yusuf & Afolabi, 2020).

The North Central geopolitical zone—which comprises Kwara, Kogi, Niger, Benue, Plateau, Nasarawa, and the Federal Capital Territory—has historically served as an educational hub in Nigeria. Yet, Colleges of Education in this region continue to grapple with declining student enrolment and persistently high attrition rates in Physics Education programs (Ajayi, 2018). Contributing factors include the perceived difficulty of the subject, inadequate teaching facilities, economic hardship, and negative student attitudes toward Physics (Obafemi & Olarewaju, 2021).

Research has consistently documented global declines in Physics enrolment (Hodson, 2014; Mulholland & Wallace, 2015), and Nigeria reflects this trend (Adeyemi, 2018). Attrition rates are equally troubling: studies suggest that up to 50% of students who initially enrol in Physics-related programs fail to complete their studies (Okebukola, 2018). While prior studies have examined science education challenges broadly, there remains limited empirical research focusing specifically on Physics Education enrolment and attrition trends in North Central Nigeria.

The implications of these challenges are profound. Persistent enrolment declines and attrition threaten the supply of qualified physics teachers, which in turn undermines the quality of science education in secondary schools (Adeyemo & Olayemi, 2019). Without targeted intervention, Nigeria risks a widening gap in teacher supply, limiting its capacity to meet national development goals and the United Nations' Sustainable Development Goal 4 on quality education (UNESCO, 2021).

This study therefore seeks to investigate enrolment and attrition trends in Physics Education programs in Colleges of Education in North Central Nigeria. Specifically, it aims to: (i) examine trends in enrolment and attrition rates; (ii) identify factors contributing to declining enrolment and high attrition; (iii) assess the impact of institutional factors such as infrastructure, instructional materials, and teacher quality; and (iv) propose strategies for improving enrolment and reducing attrition.

The findings will contribute to knowledge in several ways: by informing policy interventions, guiding institutional planning, enhancing human capital development, and addressing critical gaps in the literature on Physics teacher education in Nigeria.

Statement of the Problem

The persistent decline in enrolment and the high attrition rates in Physics Education programs across Nigerian Colleges of Education present a critical challenge to the nation's educational system. Over the past decade, these trends have significantly weakened the supply of qualified physics teachers for secondary schools, a shortage already evident in many parts of the country (Adeyemo & Olayemi, 2019). The North Central region—historically a stronghold for teacher training—has not been spared, with its Colleges of Education struggling to attract and retain students in Physics Education programs despite its reputation as an educational hub.

Several factors are believed to contribute to this trend, including the perception of Physics as a difficult and abstract subject, inadequate infrastructure and laboratory facilities, limited institutional support, and broader socioeconomic pressures that compel students to withdraw prematurely (Ajayi, 2018; Obafemi & Olarewaju, 2021). However, the specific dynamics and interplay of these factors within the North Central zone remain poorly understood. Are enrolment challenges primarily driven by student-related factors such as low interest and weak academic preparation, or by institutional constraints such as poor facilities and ineffective promotional strategies? To what extent do existing policies and interventions address attrition, and why have these strategies failed to reverse the trend?

While prior studies have examined science education more broadly, there is a dearth of empirical research focusing specifically on Physics Education enrolment and attrition trends in Colleges of Education in this region. Without reliable data and contextual insights, policymakers, teacher educators, and institutional leaders lack the evidence required to design effective interventions. Left unaddressed, these challenges threaten Nigeria's capacity to meet its science and technology workforce needs and undermine progress toward achieving the Sustainable Development Goal on quality education (UNESCO, 2021).

Objectives of the Study

The overarching aim of this study is to investigate enrolment and attrition trends in Physics Education programs in Colleges of Education in North Central Nigeria. Specifically, the study seeks to:

1. Examine the trends in enrolment and attrition rates in Physics Education programs across Colleges of Education in North Central Nigeria.
2. Identify the major factors contributing to declining enrolment and high attrition in these programs.
3. Assess the impact of institutional factors—such as infrastructure, instructional materials, and teacher quality—on enrolment and attrition trends.
4. Propose evidence-based strategies for improving enrolment and reducing attrition rates in Physics Education programs.

Research Questions

To achieve the stated objectives, the study addresses the following research questions:

1. What have been the enrolment trends in Physics Education programs in North Central Colleges of Education over the last five years?
2. What are the most common reasons for student attrition in Physics Education programs?
3. What strategies can be used to effectively promote Physics Education to prospective students?
4. What measures have Colleges of Education adopted to reduce attrition rates in Physics Education, and how effective have these been?

Research Questions

This study was guided by the following research questions:

1. What have been the enrolment trends in Physics Education programs across North Central Colleges of Education over the last five years?
2. What are the common reasons for student attrition in Physics Education programs in these institutions?
3. What strategies can be employed to effectively promote Physics Education to prospective students?
4. What measures have Colleges of Education adopted to reduce attrition rates in Physics Education, and how effective are these strategies?

Null Hypotheses

The following null hypotheses were formulated and tested at the 0.05 level of significance:

- H01 (Enrolment trends): There is no significant difference in mean ratings on enrolment trends across lecturers, students, and administrators.

- H02 (Attrition reasons): There is no significant difference in mean ratings on reasons for attrition across lecturers, students, and administrators.
- H03 (Promotion strategies): There is no significant difference in mean ratings on the effectiveness of promotion strategies across lecturers, students, and administrators.
- H04 (Attrition-reduction strategies): There is no significant difference in mean ratings on strategies to reduce attrition across lecturers, students, and administrators.

Methodology

Study Area

The study was conducted in North Central Nigeria, also referred to as the Middle Belt. This geopolitical zone lies between Nigeria's northern and southern regions and comprises Benue, Kogi, Kwara, Nasarawa, Niger, and Plateau States, along with the Federal Capital Territory (FCT). Geographically, the region extends from the border with Cameroon in the east to the Republic of Benin in the west, and is situated around latitude 10°19'60" N and longitude 7°45'0" E. The zone is of strategic importance due to its central location and historical role in teacher education.

Research Design

The study adopted a mixed-methods research design, integrating both quantitative and qualitative approaches to provide a comprehensive understanding of enrolment and attrition trends in Physics Education. This design was chosen to enable triangulation of findings and ensure robustness in addressing the research objectives.

Population and Sampling

The population of the study comprised students, lecturers, and administrators in Physics Education departments across selected Colleges of Education in North Central Nigeria. A multi-stage sampling technique was employed to ensure representativeness. Five Colleges of Education were purposively selected from the zone. From each institution, 60 students and 15 lecturers/administrators were randomly selected, giving a total sample of 375 respondents. The sample size was determined using the Salant and Dillman (1994) model for sample size determination.

Data Collection

Data were collected using structured questionnaires, which captured quantitative

responses from the sampled students, lecturers, and administrators. In addition, semi-structured interviews were conducted with dropout students (where accessible), heads of departments, and administrative staff to obtain qualitative insights into factors influencing enrolment and attrition.

Data Analysis

Quantitative data were analyzed using descriptive statistics (mean, frequency, and percentage) to summarize trends, and inferential statistics (ANOVA and t-tests) to test the stated hypotheses at the 0.05 significance level. Qualitative data from interviews were analyzed thematically to complement and contextualize the quantitative findings.

DATA AND DISCUSSION OF RESULTS

Table 1: Trends in Physics Education Enrolment

S/No	Items	No	Mean	Standard Deviation	Remark
1	We've seen a steady decline in enrolment numbers, with a 20% drop over the last 5 years.	74	3.51	0.83	Agreed
2	Enrolment has remained relatively stable, with a slight increase in the past 5 years."	74	3.01	0.87	Agreed
3	There has been a noticeable shift towards more female students enrolling in physics education programmes.	74	2.73	1.09	Agreed
4	We've observed an increase in enrolment, particularly among students from rural areas.	74	2.76	1.03	Agreed
5	The number of students enrolling in physics education has fluctuated, but overall, it's moderately consistent with the previous 5-year period.	74	3.11	0.96	Agreed
6	There has been a significant increase in students opting for combined physics and mathematics or physics and computer science programmes	74	2.74	1.10	Agreed
			Aggregate Mean		2.97

Sources: Field Study, 2025.

The results from Table One show that respondents agreed on varying trends in physics education enrolment, with an aggregate mean of 2.97. The most prominent trend observed was a steady decline in enrolment over the past five years, with a 20% drop (Mean = 3.51). Enrolment stability with slight increases (Mean = 3.01) and moderate consistency despite fluctuations (Mean = 3.11) were also acknowledged. Meanwhile, shifts toward more female participation, rural student enrolment, and combined physics programmes were rated lower, indicating that such changes are less significant. Overall, the findings suggest that enrolment in physics education is on a declining path, with only marginal stability and limited growth in specific areas.

Table 2: Reasons for Students' Attrition

S/No	Items	No	Mean	Standard Deviation	Remark
1	Insufficient prior knowledge or preparation in physics/mathematics discouraged me from studying physics Education.	74	3.61	0.77	Agreed
2	Difficulty with coursework or academic rigor depressed me from studying physics Education.	74	3.11	0.80	Agreed
3	Lack of engaging or relevant teaching methods discouraged me from studying physics Education.	74	2.85	0.84	Agreed
4	Limited career opportunities or unclear job prospects.	74	2.73	1.13	Agreed
5	Inadequate resources or facilities for physics education discouraged me from studying physics Education.	74	2.92	0.95	Agreed
6	Personal or financial issues unrelated to academics discouraged me from studying physics Education.	74	3.16	0.88	Agreed
				Aggregate Mean	3.06

Sources: Field Study, 2025.

The findings from Table Two reveal that respondents generally agreed on several reasons contributing to students' attrition in physics education, with an aggregate mean of 3.06. The most significant factor identified was insufficient prior knowledge or preparation in physics/mathematics (Mean = 3.61), followed by personal or financial issues (Mean = 3.16) and difficulty with coursework or academic rigor (Mean = 3.11). Other factors such as inadequate resources, lack of engaging teaching methods, and limited career prospects were moderately acknowledged. Overall, the results suggest that both academic and non-academic challenges contribute to student attrition, with inadequate preparation standing out as the primary barrier.

Table 3: Ways of promoting physics education to prospective students.

S/No	Items	No	Mean	Standard Deviation	Remark
1	The college's website effectively showcases physics programmes and opportunities.	74	2.86	1.00	Agreed
2	Physics Department and staff are accessible and provide helpful guidance.	74	3.00	0.83	Agreed
3	The college offers informative and engaging physics-related events and activities.	74	2.97	0.83	Agreed
4	Admission materials (brochures, catalogues) highlight physics programmes and opportunities.	74	2.95	0.83	Agreed
5	Current students and Alumni share positive experiences about physics education.	74	2.65	0.88	Agreed
				Aggregate Mean	2.89

Sources: Field Study, 2025.

Table Three revealed that respondents generally agreed that the college promotes its physics Education programmes effectively, with an aggregate mean of **2.89**. The Physics Department's accessibility and staff guidance received the highest rating (Mean = 3.00), followed closely by the availability of engaging events and admission materials. However, alumni and current students' positive experiences recorded the lowest mean (2.65), indicating weaker agreement. Overall, while the college demonstrates moderate effectiveness in promoting physics programmes, greater emphasis on alumni involvement and sharing student success stories would further strengthen visibility and appeal.

Table 4: Strategies adopted by the college to reduce attrition rates in physics education

S/No	Items	N	Mean	Standard Deviation	Remark
1	The college offers early intervention programmes for students struggling in physics courses.	74	3.32	0.94	Agreed
2	The college provides additional academic support services (e.g., tutoring, mentoring) for physics students.	74	2.88	1.03	Agreed
3	Physics Department engage in student-cantered teaching approaches.	74	2.89	0.75	Agreed

4	Career counselling and guidance are provided to help students see the relevance of physics education.	74	2.95	0.84	Agreed
5	The college has implemented bridge programmes or summer courses to prepare students for physics coursework.	74	2.78	0.86	Agreed
6	Academic advisors closely monitor students' progress and feedback in physics education	74	2.52	0.85	Agreed
				Aggregate Mean	2.89

Sources: Field Study, 2025.

Table Four indicate that the college provides moderate support systems for physics students, with an aggregate mean of **2.89.** Respondents strongly agreed that early intervention programmes are available for struggling students (Mean = 3.32) and that career counselling helps connect physics education to future opportunities (Mean = 2.95). Additional support services, student-cantered teaching, and bridge programmes were also acknowledged, though at a moderate level. The lowest rating was for academic advising and close monitoring of student progress (Mean = 2.52), highlighting the need for stronger follow-up and sustained guidance to enhance student success.

SUMMARY OF THE MAJOR FINDINGS

i. Enrolment in physics education is generally perceived as declined (Aggregate Mean 3.02)
ii. Respondents agree most strongly that there has been a 20% decline in enrolment over the last 5 years (M = 3.51).
iii. Promotion efforts are weak and not effectively attracting new students (Aggregate Mean 2.89).
iv. Strategies to reduce attrition are moderately agreed, with early intervention being the most promising (Aggregate Mean = 2.96).

Table 5: HO1: There is no significant difference in mean ratings on enrolment trends across Lecturers, Students, and Administrators

Variable	X^2 (H)	df	p-value	Decision on H0
Enrollment trends	6.12	2	.047	Reject H0

Sources: Field Study, 2025.

Significant differences exist in perceptions of a steady decline in enrolment and the overall enrolment trend across Lecturers, Students, and Administrators. For other items, perceptions were not statistically different. H01 is therefore reject. The stakeholder groups differ significantly in their perception of enrolment trends.

Table 6: HO2: There is no significant difference in mean ratings on reasons for attrition across Lecturers, Students, and Administrators.

Variable	X^2 (H)	df	p-value	Decision on H0
Attrition factors	10.02	2	.007	Reject H0

Sources: Field Study, 2025.

Significant differences were found for insufficient prior knowledge, personal, financial issues, and the overall attrition construct. Other reasons were not significantly different across groups. Therefore, the HO2 is Reject

Table 7: HO3: There is no significant difference in mean ratings on the effectiveness of promotion strategies across Lecturers, Students, and Administrators.

Variable	**X^2 (H)**	**df**	**p-value**	**Decision on H0**
Promotion strategies	4.21	2	.122	Accept H0

Sources: Field Study, 2025.

No statistically significant differences were found across groups in perceptions of promotion strategies, though alumni testimonials approached significance. H03 is hereby accepted.

Table 8: HO4: There is no significant difference in mean ratings on strategies to reduce attrition across Lecturers, Students, and Administrators.

Variable	**X^2 (H)**	**df**	**p-value**	**Decision on H0**
Attrition-reduction strategies	7.35	2	.025	Reject H0

Sources: Field Study 2025

Significant differences were observed for early intervention programmes, academic advisor monitoring, and the overall attrition-reduction construct. Other strategies showed no significant variation across groups. H04 is rejected this indicated that stakeholder groups differ significantly in their perception of strategies adopted to reduce attrition in physics education.

CONCLUSION

This study has demonstrated that Physics Education programs in North Central Nigerian Colleges of Education are confronted with persistent challenges of under-enrolment and high attrition, trends that have been particularly pronounced in the last five academic years. The findings reveal that student attrition is strongly influenced by four critical factors: (i) inadequate mathematics preparation, (ii) poor laboratory conditions and limited access to practical facilities, (iii) financial hardship, and (iv) lack of effective

mentoring and a sense of belonging within the program.

Institutional and policy-level interventions remain fragmented, with existing accreditation and quality assurance frameworks by the National Commission for Colleges of Education (NCCE) not sufficiently addressing these root causes. Embedding tracking indicators for enrolment, retention, and mentoring into NCCE accreditation processes could serve as a significant quality enhancement measure. Similarly, targeted interventions by State Ministries of Education and private proprietors—such as earmarked funding for laboratory revitalization and scholarships specifically designed for Physics Education students—would address structural gaps.

Importantly, the study underscores that low-cost, practical interventions can make a measurable difference even before major capital investments are secured. Examples include TETFund-supported provision of portable laboratory kits, small-scale retention grant schemes, and capacity-building in educational analytics for continuous program monitoring.

Overall, addressing enrolment and attrition challenges requires a multi-pronged approach that combines policy reforms, institutional capacity strengthening, and student-centered support systems to ensure the sustainability of Physics Education programs in the region.

Recommendations

Based on the findings, the following recommendations are advanced to improve enrolment and reduce attrition in Physics Education programs in North Central Nigeria:

1. Student Preparation and Support
    - Establish micro-grant and flexible fee-payment schemes to cushion the impact of registration and tuition shocks.
    - Create emergency retention funds to provide rapid support for at-risk students.
    - Launch gender-sensitive recruitment and mentoring initiatives, leveraging alumni role models to inspire and guide prospective and current students.
2. Teaching and Laboratory Environment
    - Revitalize physics laboratories through shared-use timetables to ensure weekly hands-on sessions for all students.
    - Introduce active learning pedagogies, including problem-based laboratory work, peer-led tutorials, and formative assessments, to enhance engagement and learning outcomes.

- Encourage the use of low-cost laboratory kits as interim measures while awaiting large-scale infrastructural upgrades.

3. School and Institutional Partnerships

- Formalize partnerships with secondary schools to provide timely and structured teaching practice placements for Physics Education students.

- Coordinate with State Universal Basic Education Boards (SUBEB) and Teaching Service Commissions (TESCOM) to create clear recruitment pipelines, supported by regular information sessions for graduating students.

4. Data-Driven Program Management

- Standardize registry dashboards across Colleges of Education to track student enrolment, progression, retention, and completion on a semesterly basis.

- Conduct annual student experience surveys to capture feedback on academic, social, and infrastructural challenges, and incorporate findings into program review and improvement cycles.

- Build analytics capacity within Colleges of Education to monitor and evaluate interventions in real-time.

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