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Research Article

Assessment of the Implementation of Physics Curriculum in Public Secondary Schools in Calabar Metropolis, Cross River State, Nigeria

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Abstract

This study examined the curriculum implementation gap in the teaching of Physics in public secondary schools in Calabar Metropolis, Cross River State, Nigeria, and investigated the influence of teacher-related factors on curriculum implementation. The study was guided by two hypotheses. A descriptive survey research design was adopted, and a census of 55 Physics teachers from 26 public secondary schools was used. Data were collected using a 30-item structured curriculum implementation checklist. The checklist adopted a four-point Likert scale of Strongly Agree, Agree, Disagree and Strongly Disagree. The instrument was validated by specialists in science education and curriculum study. The internal consistency of the instrument was assessed using Cronbach Alpha reliability which produced a reliability coefficient of 0.72. Multiple linear regression analysis was employed to test the hypotheses at a 0.05 level of significance. Findings revealed significant curriculum implementation gap in Physics teaching. Result also revealed that teacher-related factors significantly influenced physics curriculum implementation in physics teaching. The study concluded that Physics curriculum implementation is significantly constrained by both curriculum implementation gaps and teacher-related factors. It was recommended that sustained professional development, improved laboratory facilities, and enhanced curriculum orientation programs be implemented to strengthen effective curriculum delivery in public secondary schools in Calabar Metropolis.

Keywords

Curriculum Gap, Curriculum Implementation, Secondary Schools, Teacher Factors, Physics Education

1. Introduction

Physics is a fundamental science that underpins technological advancement and national development. At the secondary school level, it is expected to equip learners with problem-solving skills, scientific reasoning, and practical competencies necessary for participation in a modern, technology-driven society. The Nigerian secondary school physics curriculum is therefore structured to promote conceptual understanding, inquiry-based learning, and the application of knowledge to real-life situations. However, the extent to which these objectives are achieved in actual classroom practice remains a matter of concern, particularly in public secondary schools.

Curriculum implementation represents the translation of

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planned educational objectives into meaningful learning experiences through classroom instruction. In the Nigerian context, recent studies indicate that while the physics curriculum is well-designed, its implementation is often inconsistent and ineffective. [2] reported significant misalignment between prescribed curriculum standards and actual classroom practices, suggesting that what is intended in policy documents is not fully realized in teaching and learning processes. This disparity between the intended curriculum and what is achieved in practice reflects a persistent curriculum implementation gap, which continues to undermine the effectiveness of physics education.

In addition to structural gaps, teacher-related factors have emerged as critical determinants of successful curriculum implementation. Teachers serve as the primary agents through which curriculum objectives are enacted, and their effectiveness depends largely on their qualifications, pedagogical skills, and familiarity with curriculum content. Empirical evidence indicates that many secondary schools face shortages of qualified physics teachers, with some teachers lacking the required subject specialization [1]. Research further shows that teachers' beliefs and orientations toward inquiry-based instruction significantly influence how effectively science curricula are implemented in classroom practice [11]. In addition, insufficient knowledge of curriculum objectives contributes to poor alignment between teaching practices and expected learning outcomes [4].

Recent studies also highlight the importance of instructional innovation and continuous professional development in enhancing curriculum implementation, [8] emphasize that the adoption of learner-centered and interactive pedagogical approaches improves the delivery of physics concepts. Likewise, [7] demonstrate that integrating multimedia and other modern instructional strategies can significantly enhance students' understanding and engagement. However, limited access to professional development opportunities continues to constrain teachers' ability to adopt such practices, thereby reinforcing existing implementation challenges.

Despite increasing research attention to physics education, many studies adopt a generalized national perspective, with limited focus on specific states such as Cross River State. Yet, contextual factors such as resource availability, teacher distribution, and school infrastructure vary across regions and can significantly influence curriculum implementation. This highlights the need for localized empirical investigations that examine how curriculum–implementation gaps and teacher-related constraints operate within specific educational contexts.

Against this backdrop, this study assesses the implementation of the physics curriculum in public secondary schools in Cross River State, Nigeria, with particular emphasis on the curriculum–implementation gap and teacher-related constraints. Specifically, the study seeks to determine the extent to which the physics curriculum is implemented, examine the gap between intended and achieved curriculum, investigate teacher-related factors such as qualification, pedagogical skills, and familiarity with curriculum objectives, and determine how these factors influence the effectiveness of curriculum implementation.

In line with these objectives, the study is guided by the following research questions: To what extent is the physics curriculum implemented in public secondary schools in Calabar Metropolis, Cross River State? What gap exists between the intended and achieved physics curriculum? What teacher-related constraints affect the implementation of the physics curriculum? How do teacher qualification, pedagogical skills, and curriculum familiarity influence the effectiveness of curriculum implementation?

Research Hypotheses

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

H_{01}: There is no significant curriculum implementation gap in the teaching of physics in public secondary schools in Calabar Metropolis, Cross River State, Nigeria, in terms of content coverage, practical activities, and instructional methods.

H_{02}: Teacher-related factors (qualification, pedagogical skills, and curriculum familiarity) do not significantly influence the implementation of the physics curriculum in public secondary schools in Calabar Metropolis, Cross River State, Nigeria.

2. Literature Review

2.1. Curriculum Implementation Gap

The concept of curriculum implementation gap refers to the discrepancy between the intended curriculum, what policy documents prescribe and the achieved curriculum, which reflects actual classroom practice. This gap has been widely documented in physics education, particularly in developing contexts where systemic and institutional constraints affect instructional delivery [3], conceptualized this gap as the difference between curriculum expectations and what is practically realized in teaching and learning processes, emphasizing that effective curriculum implementation requires alignment between content, pedagogy, and assessment.

Recent empirical studies continue to affirm the persistence of this gap in science education, [6] identified a substantial mismatch between curriculum requirements and classroom practices across Sub-Saharan Africa; particularly in the teaching of practical physics, where resource limitations and systemic inefficiencies hinder effective implementation. This finding is consistent with [10], who highlighted that contextual and institutional factors contribute to disparities between intended instructional approaches and actual teaching practices.

Furthermore, evidence suggests that the curriculum–implementation gap is not merely a structural issue but also reflects deeper systemic challenges, including inadequate monitoring, limited instructional time, and poor alignment between curriculum objectives and assessment practices. Studies indicate that while curricula emphasize inquiry-based and learner-centered approaches, classroom practices remain largely teacher-centered, thereby limiting the realization of intended learning outcomes [2]. This persistent disconnect underscores the need to examine not only the existence of the gap but also the factors that sustain it within specific educational contexts.

2.2. Teacher-Related Constraints

Teacher-related factors are widely recognized as central to the effectiveness of curriculum implementation, particularly in science subjects such as physics, where both content knowledge and pedagogical competence are critical. Empirical evidence consistently shows that teacher qualification, pedagogical skills, and familiarity with curriculum objectives significantly influence the quality of instructional delivery.

One major challenge is the shortage of qualified physics teachers and the presence of non-specialist instructors in many secondary schools, [5] found that inadequate teacher qualification remains a significant barrier to effective curriculum implementation, as teachers without strong subject backgrounds are less able to interpret and deliver curriculum content accurately. However, qualification alone does not guarantee effectiveness. Research by [9] demonstrates that teachers' pedagogical knowledge—particularly their ability to integrate subject content with appropriate instructional strategies—is a stronger predictor of teaching effectiveness.

Pedagogical practices also play a crucial role in shaping curriculum outcomes. Studies indicate that many physics teachers rely heavily on traditional lecture methods, despite curriculum recommendations for inquiry-based and student-centered approaches. [11] showed that teachers' beliefs about teaching and learning significantly influence their adoption of inquiry-based methods, with those holding more traditional views, less likely to implement innovative pedagogies. This reliance on teacher-centered approaches has been linked to reduced student engagement and limited development of higher-order thinking skills.

In addition, teachers' familiarity with curriculum objectives is essential for ensuring alignment between intended and achieved learning outcomes. [4] found that gaps in teachers' understanding of curriculum goals often result in incomplete syllabus coverage and misalignment between instruction and assessment. Similarly, [13] reported that insufficient professional development opportunities limit teachers' capacity to update their knowledge and adapt to curriculum changes, thereby constraining effective implementation. Overall, these findings suggest that teacher-related constraints operate at multiple levels qualification, pedagogy, and curriculum knowledge and collectively contribute to the persistence of the curriculum implementation gap.

2.3. Theoretical Framework

`This study is anchored on [14] objective model of curriculum, which emphasizes the alignment between educational objectives, instructional processes, and learning outcomes as the basis for effective curriculum implementation. [14] posits that curriculum effectiveness is achieved when what is planned is systematically translated into classroom instruction and reflected in measurable learning outcomes. The study is further informed by the intended implemented achieved curriculum framework advanced by [12], which distinguishes between the intended curriculum (what is prescribed in curriculum documents), the implemented curriculum (what teachers actually deliver in the classroom), and the achieved curriculum (what learners ultimately acquire). This framework highlights the possibility of discrepancies between these levels, commonly referred to as the curriculum–implementation gap.

In the context of this study, the intended curriculum represents the prescribed physics curriculum, while the implemented/achieved curriculum reflects actual classroom practices in public secondary schools. The framework also recognizes teacher-related factors such as qualification, pedagogical skills, and familiarity with curriculum objectives as critical mediating variables that influence the extent to which the intended curriculum is effectively implemented. Thus, the combined perspective of [14] and [12] provides a robust basis for examining both the existence of the curriculum–implementation gap and the role of teacher-related constraints in shaping physics curriculum implementation outcomes.

3. Methodology

This study adopted a descriptive survey research design to assess the implementation of the physics curriculum in public secondary schools in Calabar Metropolis, Cross River State, Nigeria. The area of study comprises Calabar Municipality and Calabar South Local Government Areas. Calabar Municipality has 18 public secondary schools with 42 physics teachers, while Calabar South has 8 public secondary schools with 13 physics teachers, giving a total population of 26 schools and 55 physics teachers. Given the manageable size of the population, a census (total enumeration) sampling technique was adopted. This implies that all 55 physics teachers in public secondary schools in Calabar Metropolis were included in the study, thereby eliminating sampling error and ensuring complete coverage of the target population.

Data were collected using a 30-item structured curriculum implementation checklist developed by the researcher. The checklist adopted a four-point Likert scale of Strongly Agree, Agree, Disagree and Strongly Disagree, weighted 4, 3, 2, and 1, for positive items while 1, 2, 3, and 4 respectively for all negative items. The instrument measured the curriculum implementation gap across three dimensions: content coverage, practical activities, and instructional methods, as well as teacher-related factors including qualification, pedagogical skills, and familiarity with curriculum objectives using checklist. The instrument was validated by specialists in science education and curriculum study. The internal consistency of the instrument was assessed using Cronbach Alpha reliability which produced a coefficient of 0.72. Data collected were analyzed using multiple linear regression analysis to determine the influence of teacher-related factors on physics curriculum implementation in public secondary schools in Calabar Metropolis at a 0.05 level of significance.

4. Results and Interpretation

The analyzed data from the study are presented in the tables below:

Hypothesis One**:** There is no significant curriculum implementation gap in the teaching of physics in public secondary schools in Calabar Metropolis, Cross River State, Nigeria, in terms of content coverage, practical activities, and instructional methods.

Table 1. *Regression of Physics Curriculum Implementation on Curriculum-Implementation Gap Dimensions (Content Coverage, Practical Activities, Instructional Methods).*

R-Value	**R-Square**		**Adj. R-square**	**Std. Error**	
.720	.520		.500	2.104	
Source of Variation	Sum of Squares	DF	Mean Square	F-value	P-value
Regression	4215.368	3	1405.123	18.460*	.000
Residual	3890.214	51	76.279		
Total	8105.582	54			
Predictor Variable	B	Std. Error	Beta	t-value	p-value
Constant	1.210	.340	----	3.560*	.001
Content Coverage	.410	.090	.480	4.560	.000
Practical Activities	.520	.100	.550	5.200	.000
Instructional Methods	.360	.080	.440	4.250	.001

Significant at .05 level

Interpretation: to test this hypothesis, multiple linear regression analysis was applied, with content coverage, practical activities and instructional methods as independent variables and physics curriculum implementation as the dependent variable. Curriculum implementation gap was measured using the independent variables. The F-ratio was used to determine the significance of the overall influence model, while the t-test was used to examine the significance of the relative contributions of the regression constant and coefficients in the model. Table 1 presents a summary of the results obtained.

The results in Table 1 show that an R-value of .720 was obtained, giving an R-squared value of .520. This implies that about 52.0% of the total variation in physics curriculum implementation was accounted for by the three predictor variables collectively. The P <.000 associated with the computed F-value (18.460) is less than .05. Hence, the null hypothesis was rejected. This means that the curriculum–implementation gap is significant in terms of content coverage, practical activities, and instructional methods. The regression constant (1.210) and coefficients (.410, .520, and .360) for content coverage, practical activities, and instructional methods respectively made significant relative contributions in the model (t = 3.560, 4.560, 5.200, and 4.250; p < .05).

The influence model may be written mathematically as:

$$Y=1.210+0.410X_1+0.520X_2+0.360X_3$$

Where:
X_1= Content coverage
X_2 = Practical activities
X_3= Instructional methods
Y= Physics curriculum implementation

Hypothesis Two: Teacher-related factors (qualification, pedagogical skills, and curriculum familiarity) do not significantly influence the implementation of the physics curriculum in public secondary schools in Calabar Metropolis, Cross River State, Nigeria.

Table 2. *Regression of Physics Curriculum Implementation on Teacher-Related Factors (Qualification, Pedagogical Skills, Curriculum Familiarity).*

R-Value		**R-Square**		**Adj. R-Square**		**Std. Error**
.680		.460		.440		2.187
Source of Variation	Sum of Squares		DF	Mean Square	F-value	P-value
Regression	3980.552		3	1326.865	14.920*	.000
Residual	4685.113		51	91.865		
Total	8665.665		54			
Predictor Variable	B		Std. Error	Beta	t-value	p-value
Constant	0.890		.290	-----	3.070*	.003
Teacher Qualification	.380		.110	.410	3.450	.001
Pedagogical Skill	.450		.100	.520	4.500	.000
Curriculum Familiarity	.330		.090	.390	3.670	.001

Significant at .05 level

Interpretation: to test this hypothesis, multiple linear regression analysis was applied, with teacher qualification, pedagogical skills and curriculum familiarity as independent variables and physics curriculum implementation as the dependent variable. The F-ratio test was used to test the significance of the overall influence model, while the t-test was used to test the significance of the relative contributions of the regression constant and coefficients in the model. Table 2 presents a summary of the results obtained.

The results in Table 2 show that an R-value of .680 was obtained, giving an R-squared value of .460. This means that about 46.0% of the total variation in physics curriculum implementation was accounted for by the three predictor variables collectively. The P <.000 associated with the computed F-value (14.920) is less than .05. Hence, the null hypothesis was rejected. This means that the independent variables have significant collective influence on physics curriculum implementation. The regression constant (0.890) and coefficients (.380, .450, and .330) for teacher qualification, pedagogical skills, and curriculum familiarity respectively made significant relative contributions in the model (t = 3.070, 3.450, 4.500, and 3.670; $p < .05$).

The influence model may be written mathematically as:

$$Y=0.890+0.380X_1+0.450X_2+0.330X_3$$

Where:
X1 = Teacher qualification
X2 = Pedagogical skills
X3 = Curriculum familiarity
Y = Physics curriculum implementation

5. Discussion of Finding

The findings of this study revealed a significant curriculum–implementation gap in the teaching of physics in public secondary schools in Cross River State, particularly in terms of content coverage, practical activities, and instructional methods. The regression results showed that these dimensions jointly explained a substantial proportion of the variance in curriculum implementation with practical activities emerging as the strongest contributor. This suggests that while elements of the curriculum are being addressed, critical components—especially practical and inquiry-based aspects—are not being fully realized in classroom practice. This finding aligns with studies explored in the literature review, which emphasized that effective curriculum implementation depends on coherence between curriculum intent and classroom delivery. It also corroborates empirical evidence by [6], who reported persistent gaps in physics curriculum delivery, particularly in practical instruction due to resource and systemic constraints. Similarly, [10] and [2] noted that despite curriculum emphasis on learner-centered and inquiry-based approaches, classroom practices remain predominantly teacher-centered, thereby limiting the achievement of intended outcomes.

The findings further revealed that teacher-related factors significantly influence physics curriculum implementation with pedagogical skills having the strongest predictive effect, followed by teacher qualification and curriculum familiarity. This indicates that how teachers teach is more critical than merely what they know, reinforcing the central role of pedagogy in translating curriculum into practice. This result is consistent with [9], who found pedagogical competence to be a stronger determinant of instructional effectiveness than subject qualification alone. It also supports the findings of [11], who demonstrated that teachers' instructional beliefs and practices significantly shape their adoption of inquiry-based methods. Furthermore, the significance of curriculum familiarity aligns with [4] and [13], who reported that limited understanding of curriculum objectives and inadequate professional development constrain effective implementation. The implication is that teacher-related constraints operate synergistically to influence curriculum delivery, thereby contributing to the observed implementation gap.

The results suggest that, the transition from the intended curriculum (policy) to the implemented curriculum (classroom practice) is mediated by teacher-related factors, which ultimately shape the achieved curriculum (learning outcomes). In this sense, the significant influence of teacher qualification, pedagogical skills, and curriculum familiarity confirms their role as critical mediating variables within the curriculum process.

6. Conclusion and Recommendations

6.1. Conclusion

This study examined the curriculum implementation gap in the teaching of physics in public secondary schools in Calabar Metropolis, Cross River State, as well as the influence of teacher-related factors on curriculum implementation. The findings revealed a significant curriculum implementation gap in terms of content coverage, practical activities, and instructional methods, indicating that the intended physics curriculum is not fully realized in classroom practice. In addition, the study established that teacher-related factors particularly pedagogical skills, teacher qualification, and curriculum familiarity significantly influence the implementation of the physics curriculum.

Grounded in [14] objective model and the intended–implemented–achieved curriculum framework of [12], the findings demonstrate a breakdown in alignment between curriculum intentions and classroom realities. This misalignment is largely shaped by teacher capacity, especially instructional competence, thereby confirming that effective curriculum implementation depends not only on curriculum design but also on the quality of its enactment by teachers.

6.2. Recommendations

Based on the findings of the study, the following recommendations are made:

1) Strengthening Teacher Professional Development**:** Regular in-service training, workshops, and refresher courses should be organized for physics teachers to improve their pedagogical skills, particularly in inquiry-based and practical-oriented teaching methods.
2) Improving Curriculum Familiarity**:** Education authorities should ensure that teachers are adequately oriented on curriculum objectives and expectations through structured induction programs and continuous curriculum review seminars.
3) Enhancing Practical Physics Instruction**:** Schools should be equipped with adequate laboratory facilities and instructional materials to support effective implementation of practical activities in physics.
4) Teacher Recruitment and Deployment**:** Only qualified physics specialists should be assigned to teach physics, and efforts should be made to reduce the deployment of non-specialist teachers in science subjects.
5) Curriculum Monitoring and Supervision**:** Education supervisors and school administrators should strengthen monitoring mechanisms to ensure proper alignment between intended curriculum and classroom implementation.

Overall, the study demonstrates that the curriculum–implementation gap in physics education is not merely a structural issue but is significantly shaped by teacher capacity and instructional practices. Addressing this gap therefore requires not only curriculum reform but also sustained investment in teacher development, particularly in pedagogical training and curriculum orientation.

Abbreviations

Ho1	Null Hypothesis 1
Ho2	Null Hypothesis 2

Author Contributions

Ayeshung Rose Imoniri: Conceptualization, Resources
Offiong Okoh Efanga: Formal Analysis

Conflicts of Interest

The authors declare no conflicts of interest.

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