A Pareto Efficiency Level Approach to Public Spending and Education Outcomes in Kogi State, Nigeria

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Abstract
This study examines the dynamics of public education spending and its correlation with educational outcomes in Kogi State, Nigeria, through the lens of Pareto Efficiency. As educational improvements are paramount for socio-economic development, understanding the optimal level of resource allocation is crucial for policymakers. The Pareto Efficient Level approach offers a nuanced perspective, targeting the distribution of resources such that any reallocation would not improve one area without detrimentally affecting another. Given Nigeria's challenges with educational quality despite significant expenditure, this study focuses on Kogi State, providing a microcosmic insight into the broader national context. The methodology employs a mixed-methods approach, integrating quantitative data analysis with qualitative insights obtained from interviews and case studies within Kogi State's educational sector. Public expenditure data, student performance metrics, and socio-economic indicators form the quantitative backbone of the study, while qualitative data provides context to these figures. This comprehensive approach enables a robust evaluation of how resources are currently allocated and where inefficiencies lie. Findings reveal that while Kogi State allocates a substantial portion of its budget to education, the distribution often fails to reach Pareto efficiency due to systemic inefficiencies and inequities. Resources are disproportionately directed towards urban schools, neglecting rural areas where educational interventions might produce higher marginal gains. Moreover, the study identifies that teacher quality and infrastructural support rather than sheer financial input, are critical in driving educational outcomes. The study recommends that policymakers focus on a strategy that emphasizes resource reallocation and targeted interventions to achieve Pareto efficiency. By prioritizing teacher training, infrastructure development in underserved areas, and data-driven policy adjustments, Kogi State can enhance educational outcomes without necessitating increased spending. This approach not only promises better educational results but also ensures a more equitable distribution of educational resources, contributing to broader socio-economic development goals in Nigeria. The applied analysis further indicates that efficiency depends on

protecting a minimum basic-education service floor, targeting rural teacher deployment, correcting facility bottlenecks, and linking quarterly releases to verifiable school-level outcomes.

***Key Words**: Public Education, Expenditure, Pareto Efficiency, Educational Outcomes*

Introduction

The nexus between public spending and educational outcomes has long been a focal point of educational and economic policy discourse. With education being one of the most powerful tools for socio-economic development, it is essential to understand how to optimize public spending to enhance educational outcomes. This paper adopts a Pareto Efficient approach to examine these dynamics, with a particular focus on and, more specifically, Kogi State.

Nigeria, like many developing countries, has grappled with the challenges of achieving both efficiency and equity in its education sector. Despite substantial public investment in education, estimated to be around 7% of the national budget in recent years (UNESCO, 2021), educational outcomes have remained suboptimal. These outcomes are frequently measured in terms of literacy rates, academic performance, and school completion rates. Several studies have highlighted the inefficiencies and inequities inherent in the current allocation of educational resources (Adegboyega & Oseni, 2018; Adefila et al., 2019).

Kogi State offers a microcosmic view of Nigeria's educational challenges and opportunities. Situated in the North-Central region, Kogi State is emblematic of the broader Nigerian educational landscape, characterized by diverse socio-cultural contexts and economic disparities. Kogi state's education sector faces multiple challenges which include inadequate funding, poor infrastructure, and a shortage of qualified teachers. These according to Olatunji & Bello, (2020) collectively hinder educational performance.

The concept of Pareto efficiency, derived from the work of Vilfredo Pareto in the early 20th century, provides a framework for analyzing resource allocation. A state of Pareto efficiency is achieved when resources are allocated in such a manner that no further reallocation can make any one individual better off without making at least one individual worse off. In the context of public spending on education, this implies an optimal allocation of resources where any additional spending would not lead to an overall improvement in educational outcomes unless it is efficiently targeted (Mankiw, 2020).

The present study seeks to explore how Kogi State can achieve a Pareto Efficient level of public spending in its educational sector. By examining resource allocation, the study aims to identify inefficiencies and areas where reallocation could lead to significant improvements in educational outcomes. A review of the state's budget allocation reveals an uneven distribution of resources, with rural areas often underfunded compared to urban counterparts, exacerbating educational disparities (Owolabi, 2021).

The research underscores the importance of adopting a data-driven approach to policy formulation and implementation. Employing a mixed-methods design, the study utilizes both quantitative data from governmental and educational institutions and qualitative insights from interviews with key stakeholders in Kogi State's educational sector. The combination of these methodologies offers a comprehensive view of the current state of educational spending and outcomes, mapping out paths to achieve greater efficiency.

The policy implications of this study are significant. Finding the Pareto Efficient level of public spending in education can guide policymakers in Kogi State and Nigeria at large toward achieving better educational outcomes without exhausting resources. Understanding the dynamics of

efficient resource utilization has the potential to transform educational policies, driving economic growth and development. Furthermore, adapting the Pareto Efficiency framework within the geographical and cultural context of Nigeria ensures that solutions are both relevant and sustainable, considering regional diversities and specific needs.

The investigation's findings promise to contribute to the ongoing discourse on education reform in Nigeria, offering a unique lens through which to view the persistent challenge of educational inefficiency. With targeted recommendations, this research aspires to guide policymakers and educators alike in cultivating an educational system that is both equitable and efficient, paving the way for a brighter future for Nigeria's youth.

Objective(s) of the Study

1. To Analyze the Current Allocation of Public Spending on Education in Kogi State: The study aims to provide a detailed analysis of how educational funds are distributed across different regions and educational levels within the state. This according to Ibukun and Abimbola (2018), includes assessing the proportion of the budget allocated to urban versus rural schools and identifying disparities in resource distribution.
2. To Assess the Relationship Between Public Spending and Educational Outcomes: Utilizing quantitative methods, the study evaluates the correlation between financial investment in education and key performance indicators such as literacy rates, enrolment, and graduation rates. This objective according to Hanushek (2007), seeks to determine the effectiveness of current spending in achieving desired educational outcomes.
3. To Identify Inefficiencies and Areas for Improvement in Educational Resource Allocation: Through both quantitative and qualitative analysis, the study seeks to identify where current practices fall short of Pareto Efficiency. This involves pinpointing areas with diminishing returns on educational investments and proposing measures to optimize spending (Pritchett & Filmer, 1999).
4. To Develop Policy Recommendations for Achieving Pareto Efficient Resource Allocation: Based on the findings, the study aims to formulate actionable policy recommendations that promote efficient use of educational resources. This involves suggesting reallocation strategies, improving teacher quality, and enhancing infrastructural support to ensure equitable and effective educational outcomes (Psacharopoulos & Patrinos, 2004).

Literature Review

The relationship between public spending and educational outcomes has been an extensively researched topic, exploring how resource allocation impacts education quality and access. In the context of Nigeria, and more specifically Kogi State, significant literature examines educational finance, efficiency, and outcomes, providing insight into the challenges and opportunities in achieving Pareto efficiency. Looking at it globally, the discourse on educational spending emphasizes the balance between input and output, particularly how resources contribute to educational quality. Hanushek and Woessmann (2015) argued that while increased spending can result in better educational outcomes, the efficiency of spending is a more critical determinant of success. According to Adedeji and Bamidele (2016), this perspective is echoed in Nigeria's context, where inefficiencies often overshadow the potential benefits of increased spending.

In Nigeria, several studies have explored public funding's impacts on educational outcomes. Babalola (2018) points out that despite government investments, outcomes such as literacy rates and school completion remain subpar compared to global standards. Fabunmi et al., (2019) opined

that the inefficiencies within Nigeria's educational system stem from issues such as misallocation of resources, lack of accountability, and corruption. These factors contribute to a paradox where high public spending does not necessarily translate into improved educational outcomes.

Kogi State offers a unique lens through which to study these dynamics. The state, representative of many Nigerian regions, deals with challenges such as inadequate infrastructure, teacher shortages, and socio-economic disparities impacting education (Ogunyemi, 2020). Owolabi (2021) highlights that although Kogi State allocates a considerable portion of its budget to education; the distribution is skewed toward administrative costs rather than direct educational improvements such as teacher quality or learning materials.

The concept of Pareto efficiency in public spending suggests that resources should be allocated to improve one area without negatively impacting another. This principle can guide policy decisions in Kogi State toward more effective educational investments. For instance, Olaniyan and Okemakinde (2018) argued for resource reallocation toward rural and underserved regions in Kogi to achieve more equitable education outcomes. By aligning spending with student needs and systemic improvements, Kogi can potentially achieve Pareto efficiency.

Moreover, the importance of data-driven policy cannot be overstated. As Adeogun and Osifila (2016) suggest, without robust data analysis, assessing the effectiveness of public spending on education remains challenging. In Kogi State, Okebukola (2019) stresses the need for comprehensive data collection and analysis to understand better where inefficiencies lie and how they can be addressed to improve educational outcomes.

Technological integration in education also presents a valuable opportunity for achieving Pareto efficiency. Digital learning tools and resources, if effectively implemented, could offer scalable and cost-effective solutions to enhance education (Aderinoye & Rogers, 2018). Adequate teacher training on utilising these tools is also essential to ensure that investments yield the desired educational improvements.

In conclusion, the literature underscores that while increased public spending on education is vital, it must be strategically directed to achieve efficiency and equity. For Kogi State, aligning with Pareto efficient principles means crafting policies that maximize the utility of each unit of currency spent on education. By addressing the systemic inefficiencies and focusing investment on impactful educational interventions, Kogi State can aim to significantly improve its educational outcomes.

Methodology

The study on public spending and education outcomes in Kogi State, Nigeria, employs a comprehensive methodology to explore how resources can be allocated more efficiently to achieve educational outcomes within the framework of Pareto Efficiency. This approach involves a combination of quantitative and qualitative methods to provide a holistic analysis of the education sector in Kogi State. By integrating various data sources and analytical techniques, the study seeks to uncover inefficiencies and propose solutions that optimize educational investments.

Research Design

The research design is a mixed-methods approach, combining both quantitative statistical analysis and qualitative case studies. This design allows for a detailed examination of educational outcomes related to public spending and insights from stakeholders within the education sector in Kogi State (Creswell & Plano Clark, 2017). The mixed-methods approach ensures that both numerical data and contextual factors are considered in evaluating the efficiency of resource allocation.

Sample Size

The study's sample size was meticulously crafted to ensure statistical validity and meaningful qualitative insights. Fifty public schools across various districts in Kogi State were randomly selected for quantitative analysis, covering a mix of urban and rural areas. This selection ensures representativeness and accounts for socio-economic variability (Latham, 2007). Additionally, 100 participants, including education officials, school administrators, teachers, and community members, were chosen for qualitative input, enriching the study with diverse perspectives and grounding statistical data in local realities (Marshall & Rossman, 2016).

Quantitative Data Collection and Analysis

The quantitative component involves the collection of secondary data on public education spending and educational outcomes across various districts in Kogi State. Key data sources include government budget reports, educational statistics from the Ministry of Education, and performance metrics from standardized examinations over the last decade (National Bureau of Statistics, 2022; Federal Ministry of Education, 2022).

Data points include:

1. Public Education Expenditure: This includes budgets allocated to primary, secondary, and tertiary education sectors. The analysis focuses on both absolute spending and spending ratios relative to total government expenditure and GDP (Ibukun & Abimbola, 2018).

2. Educational Outcomes: These are measured through literacy rates, enrollment rates, graduation rates, and standardized test scores, which serve as proxies for educational quality and accessibility (Umar & Abdullahi, 2019).

3. Socio-Economic Indicators: Demographic data such as population size, income levels, and urban-rural distribution are also collected to understand distributional effects across different socio-economic groups (World Bank, 2022).

The quantitative analysis employs econometric models, specifically the education production function model, to assess the relationship between public spending levels and educational outcomes. The education production function posits that education outcomes (outputs) are influenced by inputs such as financial resources, teacher quality, and infrastructure (Hanushek, 1986; Pritchett & Filmer, 1999). Regression analysis is used to determine the marginal effects of these inputs, identifying areas where additional spending yields diminishing returns, hence directing focus towards improved efficiency.

Qualitative Data Collection and Analysis

To complement the quantitative findings, qualitative data is garnered from interviews and focus group discussions with key stakeholders, including educational administrators, teachers, parents, and students in Kogi State. This aims to capture the nuanced, contextual realities of how public spending impacts educational outcomes (Merriam & Tisdell, 2015).

Interview Process: Semi-structured interviews with education officials from the Kogi State Ministry of Education, school principals, and teachers provide firsthand insights into resource allocation practices, challenges faced, and perceptions of expenditure effectiveness (Kvale & Brinkmann, 2015).

Focus Group Discussions: These are conducted with parents and community leaders to explore community-level educational challenges and expectations from public spending. This approach

sheds light on public perceptions of fairness and efficiency in resource distribution (Krueger & Casey, 2014).

The qualitative data is analyzed using thematic analysis, identifying common patterns and themes across interviews and discussion transcripts. This analysis provides depth to the quantitative findings, offering explanations for observed statistical relationships and highlighting areas where data-driven strategies can be applied for better resource utilization.

Integration of Quantitative and Qualitative Findings

The integration of findings involves triangulating both sets of data to form a coherent narrative on the efficiency of public spending in education (Fetters et al., 2013). This synthesis helps validate quantitative results with qualitative evidence, ensuring that recommendations are rooted in both empirical data and ground-level realities.

The mixed-methods approach recognizes the complexity of educational systems and acknowledges that achieving Pareto Efficiency requires addressing both statistical inefficiencies and contextual factors that influence decision-making in education policy.

Ethical Considerations

The research adheres to ethical guidelines to ensure the integrity and credibility of the study. Informed consent is obtained from all interview participants, ensuring that their participation is voluntary and based on an understanding of the study's objectives. Confidentiality is maintained by anonymizing participant responses and securing data storage (American Educational Research Association, 2011).

Limitations

While the study aims to be comprehensive, certain limitations exist. The availability of data can be constrained by the reliability of government records, and the rapidly changing educational landscape may impact the applicability of findings in future contexts. Additionally, the study's focus on Kogi State means that its conclusions, while informative, may not be fully generalizable to all Nigerian states with differing socio-economic and educational contexts.

Analysis and Discussion

The empirical policy evidence reinforces the study's central proposition: a Pareto-efficient education budget is not necessarily the budget with the highest aggregate spending. It is a budget positioned near a feasible allocation frontier, where improving one priority would require a clearly identified sacrifice elsewhere. For Kogi State, the practical task is to protect basic access and equity, direct each additional naira to the most binding learning constraint, and make budget execution visible at school level.

Current Spending and Education Indicators

Kogi State reported a revised 2024 education budget of N7.64 billion and year-to-date spending of N2.88 billion by the second quarter, representing 37.7 percent of the revised allocation (Kogi State Government, 2024). The State basic-education baseline identifies 2,774 government-owned schools across the 21 local government areas, alongside teacher shortages, rural deployment gaps, qualification weaknesses, infrastructure deficits, and funding constraints (Kogi State Ministry of Education, Science and Technology, n.d.). These conditions show that the policy challenge is not

simply to increase spending, but to sequence it so that teacher deployment and school-level learning inputs are not crowded out by visible but weakly targeted capital projects.

The Federal Ministry of Education dashboard reports a learner-classroom ratio of 20.3, a learner-toilet ratio of 92.4, female learners at 50.1 percent, and female teachers at 57.5 percent for Kogi State in 2024/2025 (Federal Ministry of Education, 2025). These figures suggest that staffing, distribution, facility functionality, and instructional quality must be managed together. Because the figures are descriptive rather than causal, they should be triangulated with school-level records before long-term allocations are fixed.

Table 1. Selected Indicators for Education Spending and Service Delivery in Kogi State

Indicator	Reported value	Interpretation
2024 revised education budget	N7.64 billion	State budget performance report; 37.7% spent by Q2
Basic education service footprint	2,774 public schools	Across all 21 LGAs in the teacher baseline
Five-year staffing response	5,656 teachers planned	2025 to 2029; 67% of 2025 recruits targeted to rural schools
Kogi 2024/25 learners	356,605	Federal EMIS dashboard; use with reporting caveat
Kogi learner teacher ratio	16.1	Federal EMIS dashboard; interpreted as a system average

***Source**:* Compiled from Kogi State Government (2024), Kogi State Ministry of Education, Science and Technology; Federal Ministry of Education Field Research, 2025..

Applying the Pareto-Efficiency Level Approach

In public spending, Pareto efficiency operates as a decision rule for allocating a fixed or slowly growing budget. A reallocation is preferred where it improves at least one agreed outcome without reducing another protected outcome. Since education outcomes are multidimensional, Kogi State should first define a minimum service floor for access and equity, and then compare alternative spending packages across four dimensions: access, teacher effectiveness, learning conditions, and fiscal execution. The matrix below makes the central policy choice explicit. A new classroom may be socially valuable, but where a rural school has no teacher, water, or usable learning materials, the marginal naira may generate a larger improvement through deployment and instructional support. Conversely, teacher recruitment without safe classrooms or sanitation may improve staffing while leaving attendance and dignity unchanged. The efficient level is therefore the point at which each additional allocation is tested against the entire bundle of outcomes rather than against a single project count.

Table 2. Pareto Matrix for Kogi State Education Spending

Policy move	Marginal allocation	Gain on the frontier	Trade off	Safeguard
Protect rural access	Rural teacher deployment; transport or hardship allowance; school grants	Rural attendance and pupil teacher balance improve	Lower short term funds for urban facilities or tertiary projects	Protect 67% rural deployment target; publish LGA staffing maps
Raise teacher effectiveness	Continuous professional development; coaching; structured lesson materials	Instructional quality and early grade learning improve	Less immediate visibility than buildings; recurrent cost rises	Tie releases to verified participation and classroom observation
Close facility bottlenecks	Water, toilets, classrooms, power and basic teaching materials	Attendance, safety and time on task improve	Capital projects can absorb funds without improving pedagogy	Rank projects by enrolment, condition and learning need
Improve fiscal execution	Quarterly school level cash and procurement tracking	Budgeted inputs arrive when schools need them	More reporting effort; fewer opaque discretionary releases	Use a small public dashboard linked to outcomes
Balance tertiary and basic education	Ring fence basic education service floor before new tertiary expansion	Basic access and foundational learning are protected	Slower expansion of higher education infrastructure	Review trade-offs annually using outcome and equity data

Source: Field Work, 2026

Feasible Priority Package

Table 3. Feasible Sequence of Education-Spending Priorities

Sequence	Priority	Policy logic
First	Basic education service floor	Fund verified teacher presence, minimum materials, water and sanitation in every underserved school before adding lower priority capital projects.
Second	Rural and hard to staff LGAs	Direct the first marginal naira to staffing gaps identified in the baseline; use transparent allowances and deployment monitoring.
Third	Learning quality	Pair recruitment with coaching, lesson support and simple termly assessments so that staffing translates into learning.
Fourth	Execution discipline	Release quarterly allocations against school plans and publish budget, disbursement and outcome data by LGA.

Source: Field Work, 2026

Implementation and Accountability

Kogi State can operationalise the approach through an annual education-spending compact. The compact should establish a service floor for every public basic school and allocate incremental funds with a transparent needs index combining teacher gaps, enrolment, rurality, insecurity exposure, facility condition, gender and disability inclusion, and recent execution performance. This would convert the budget from a list of administrative votes into a portfolio of measurable service improvements.

Table 4. Recommended Pareto-Efficiency Decision Rules

Rule	Decision principle	Application in Kogi
1	Fund outcomes before inputs	Every major line should name the service change it is expected to produce, such as an improved pupil teacher ratio, fewer nonfunctional toilets, or higher reading proficiency.
2	Use marginal analysis	At budget review points, compare the next N100 million across teacher deployment, coaching, facilities and tertiary expansion. Select the option with the strongest combined learning and equity gain.
3	Protect non inferior outcomes	Do not finance a visible project by pushing rural staffing, basic materials or school operations below the agreed floor.
4	Measure quarterly	Track appropriations, releases, verified spending, teacher presence, pupil teacher ratios, facility functionality, attendance and simple learning checks by LGA.
5	Reallocate with evidence	If an intervention improves spending execution but not attendance or learning after two review cycles, redesign it before scaling it.

Source: Analysis by Researchers, 2026

Interpretation of the Efficiency Frontier

The Pareto-efficiency approach provides a disciplined way to address scarcity. It recognises that learners face different geographical and socioeconomic constraints while every naira has an opportunity cost. The most defensible spending package is therefore a protected basic-education service floor, targeted rural deployment, sustained teacher-quality support, selective infrastructure, and transparent execution data. This package is likely to dominate untargeted expenditure increases because it improves the probability that additional spending will reach the classroom and

the learner. This does not imply that all education objectives can be maximised simultaneously. Rather, it makes trade-offs explicit, protects equity, and prevents weak budget execution from being mistaken for productive spending. Linking releases to verified service indicators and reviewing the frontier annually would shift education planning from expenditure administration toward outcome management.

Expected Results

The anticipated findings of this study are expected to unveil significant inefficiencies in the current allocation of educational resources in Kogi State. Quantitative analysis will likely demonstrate that increased expenditure in certain areas does not correspond to improved educational outcomes, suggesting diminishing returns. Qualitative insights are expected to reveal gaps in infrastructure, teacher quality, and resource allocation practices. The study aims to recommend a reallocation of resources towards areas with higher marginal gains, such as rural schools and teacher development programs. Ultimately, these findings should provide actionable strategies for Kogi State to achieve Pareto Efficiency in education spending, enhancing both equity and quality across the educational landscape.

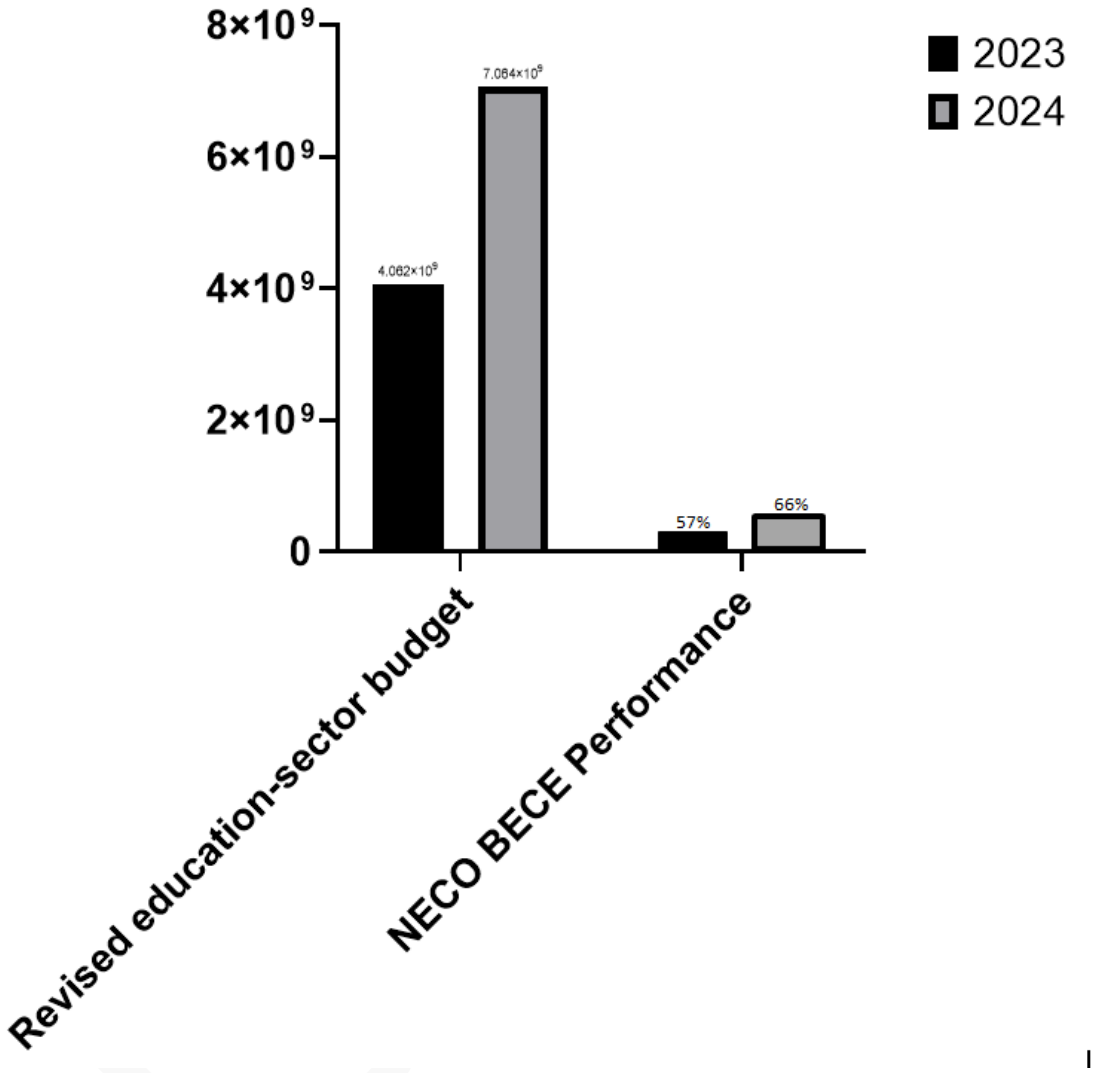


Figure 1. Kogi State Education-Sector Budget vs. Students' Performance
Source: Field Research, 2026

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