

A COMPARATIVE ANALYSIS OF QUALITY EDUCATION ALIGNMENT WITH SUSTAINABLE DEVELOPMENT GOAL 4 (SDG-4) IN GOVERNMENT AND PUNJAB EDUCATION FOUNDATION SCHOOLS AT THE PRIMARY LEVEL

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Abstract

Quality education is education that provides all learners with the knowledge, skills, and values necessary to succeed in life and contribute to society, ensuring equal access and opportunities for everyone. This comparative study assessed the alignment of primary education quality with Sustainable Development Goal 4 (SDG-4) across centralized Government schools and decentralized Punjab Education Foundation (PEF) schools in District Bahawalpur. Employing a rigorous inferential statistical analysis of performance metrics, including Literacy and Numeracy Drive (LND) scores, the research confirmed the PEF model's effectiveness in fulfilling access mandates. Critically, PEF schools demonstrated statistically comparable learning outcomes to resource-intensive Government schools, as confirmed by inferential statistical tests. However, the analysis identified a critical systemic gap in quality inputs, specifically the lower training levels of PEF teachers. The findings imply that achieving comprehensive SDG-4 compliance requires harmonizing quality inputs across the dual system, necessitating policy intervention to mandate cross-sectoral teacher capacity development.

1. INTRODUCTION

The pursuit of quality education for all, codified as Sustainable Development Goal 4 (SDG-4), represented a global commitment requiring transformative policy action within signatory nations. Pakistan, having formally adopted the SDGs as its National Development Goals in 2016 (Sörensson & Ghannad, 2025), faced significant structural complexities in achieving this target, particularly within the province of Punjab. The educational landscape was characterized by a fundamental dualism: a vast system of centralized Government schools operating alongside a growing network of

decentralized schools managed through public-private partnerships (PPPs) via the Punjab Education Foundation (PEF) (PEF, 2004). This report specifically focused on District Bahawalpur, situated in Southern Punjab, as a critical microcosm for examining the differential performance and resource efficiency of these two models at the primary level. This research was anchored by Human Capital Theory and New Public Management (NPM) principles, investigating the core challenge of mitigating the high rate of out-of-school children (OOSC) and pervasive overage enrollment, while

simultaneously ensuring high-quality teaching and foundational learning proficiency as mandated by Target 4.1 (PIE, 2025). The operational effectiveness of the PEF's results-based financing model, which delivered comparable outcomes at lower per-student costs (Arshad, 2024), necessitated a rigorous comparative investigation to inform future resource allocation and policy harmonization for SDG-4 acceleration.

Statement of the Problem

The Government of Pakistan, committed to achieving SDG-4 targets by 2030, relied on a dual primary education delivery system in Punjab, including District Bahawalpur: centralized Government schools and decentralized PEF PPP schools. While the PEF model dramatically improved access in underserved areas, an efficiency paradox existed: PEF schools, operating on significantly lower per-student funding, achieved statistically comparable student learning outcomes to public schools. This situation posed a critical problem regarding the quality and equity of resource utilization specifically within the district. Specifically, the observed disparity in teacher training quality, which consistently favored Government schools, raised questions about the sustainability and integrity of quality inputs across the entire educational system, hindering comprehensive SDG-4 achievement, particularly Target 4.c. Furthermore, systemic issues such as high overage enrollment and the critical exclusion of children with disabilities persisted, underscoring the failure to meet Target 4.5.

Objectives of the Study

The study was designed to achieve the following objectives:

1. To comparatively assess the effectiveness of Government and PEF primary schools in District Bahawalpur in expanding access and addressing the out-of-school children (OOSC) challenge.
2. To analyze the comparative efficiency and accountability of the two systems by benchmarking

student learning outcomes using inferential statistics against resource allocation.

3. To identify and analyze critical disparities in key quality inputs, specifically teacher capacity, professional development, and infrastructure alignment with SDG Target 4.a, within the District Bahawalpur context.
4. To propose evidence-based strategic policy recommendations for harmonizing educational quality and accelerating overall SDG-4 progress in Punjab, based on findings from the district-level analysis.

Research Questions

1. What was the comparative impact of the PEF PPP model versus the traditional Government model on primary school access and equity metrics in District Bahawalpur?
2. Was there a statistically significant difference in student learning proficiency (Literacy and Numeracy Drive scores) between Government and PEF primary school students in District Bahawalpur, as determined by inferential statistics?
3. To what extent did teacher quality and infrastructure inputs differ between the two systems in District Bahawalpur, and how did these disparities affect SDG-4 compliance, particularly Target 4.c?
4. What strategic policy interventions are necessary to bridge the identified quality gaps and ensure a unified, high-quality primary education system in Punjab?

Conceptual Framework

The conceptual framework for this study was designed as an Input-Process-Output (IPO) model, specifically focusing on the comparative effectiveness of two distinct primary education delivery models against SDG-4 quality benchmarks within District Bahawalpur.

Component	Variables/Concepts	Relationship to SDG-4
Independent Variables (Models)	1. Government School Model (High Input Funding, Centralized Management) 2. PEF PPP Model (Low Input Funding, Results-Based Financing)	Determines resource allocation and accountability structure.

Component	Variables/Concepts	Relationship to SDG-4
Mediating Variables (Quality Inputs)	1. Teacher Capacity and Training (Target 4.c) 2. Infrastructure and Safety (Target 4.a)	Intermediate factors directly influencing the learning environment and instructional quality.
Dependent Variable (Outcomes)	1. Student Learning Proficiency (LND Mean Scores) 2. Access and Equity Metrics (Enrollment Rates, OOSC)	Measure of success against SDG-4 Target 4.1 (Learning Outcomes) and Target 4.5 (Equity).

The framework posits that while the PEF model's unique Process (Results-Based Financing) effectively compensates for lower Inputs (Funding) to achieve comparable Outputs (Learning Scores), the systemic disparity in the Mediating Variable (Teacher Training) remains a critical threat to long-term quality and full SDG-4 compliance.

Theoretical Framework

This research is primarily anchored in two complementary theories: Human Capital Theory and New Public Management (NPM).

1. **Human Capital Theory:** This theory asserts that investments in education, particularly in teacher training and instructional resources, lead directly to increased productivity and improved learning outcomes (Afzal et al., 2025). The study uses this theory as a baseline to evaluate the efficiency paradox: traditional Government schools represent a high human capital investment model, while the persistent achievement of comparable outcomes by the PEF model—despite lower documented investment in teacher training (Ahmad et al., 2023)—challenges the expected direct correlation between input spending and output quality.

2. **New Public Management (NPM) / Agency Theory:** The PEF PPP model is a classic implementation of NPM principles, utilizing contracting and Results-Based Financing

3. (RBF) (UNESCO, n.d.a). This approach delegates service delivery to private operators (agents) who are held accountable through performance contracts (QAT). This theoretical lens explains how the PEF structure achieves efficiency and comparable outcomes: the strong

accountability mechanisms of the RBF model incentivize performance, thereby compensating for the lower financial resources and potentially overcoming the deficits predicted by Human Capital Theory.

4. Literature Review

5. The literature concerning SDG-4 alignment in Pakistan revealed a consensus on the urgency of addressing access and quality deficits (PIE, 2025; Shahzadi et al., 2023; Sindhu et al., 2023; Ahmad et al., 2023; Hussain & Khoso, 2021; Laghari et al., 2024; Sabir et al., 2024; Hussain, 2024; Hussain, 2023). The global framework of SDG-4 mandates equitable access (Target 4.5) and the provision of effective learning environments (Target 4.a), demanding high standards for teacher qualification (Target 4.c) and curriculum relevance (United Nations, 2015).

6. **The Efficiency Paradox of Dual Delivery:** The rise of PPPs, particularly the PEF's Public School Support Programme (PSSP), represented a strategic response to the access gap. Arshad (2024) demonstrated that contracting out poorly performing public schools to private operators resulted in a dramatic enrollment increase, exceeding 60%, largely fulfilling the access element of Target 4.1. This model was highly cost-effective, receiving less than half the spending of traditional government schools (Arshad, 2024). Despite this substantial resource disparity, LND assessment data analyzed through inferential statistics indicated no statistically significant difference in student learning outcomes between the two sectors (Raza et al., 2022). This outcome highlighted an "efficiency paradox" in public sector spending and accountability (Enang, 2023).

7. **Quality Inputs and the Teacher Gap:** Conversely, a distinct gap in the quality of core inputs

was consistently documented. Research focused on Southern Punjab revealed that teachers employed in public schools were generally better trained than their counterparts in PEF-funded institutions, leading to a documented gap in teaching effectiveness (Ahmad et al., 2023; Afzal et al., 2025; Hussain & Khoso, 2022; Hussain & Abbas, 2023); Perveen & Hussain, 2023; Hussain et al., 2024). This disparity directly impacted compliance with Target 4.c (qualified teachers) and raised concerns about the ability of PEF schools to deliver complex curriculum components, such as

global citizenship education and gender inclusivity (Ahmad et al., 2023; Afzal et al., 2025). Policy initiatives, such as the World Bank's GRADES project, focused on bridging these gaps through capacity building and investment in climate-smart infrastructure (World Bank, 2024), yet systemic policy awareness gaps and insufficient development among existing staff persisted as implementation challenges (Khan & Azhar, 2024).

Methodology of the Research

Component	Description
Research Philosophy	Post-Positivism (Adopting a critical realist stance, using inferential statistics to test hypotheses about measurable educational outcomes).
Research Design	Descriptive, Ex Post Facto Research Design (Analysis of existing data/literature)
Data Sources	Mean scores from Literacy and Numeracy Drive (LND) assessments; Enrollment data (PSSP); Policy reports; Academic studies (Ahmad et al., 2023; Raza et al., 2022)
Quantitative Analysis	Inferential Statistics: Independent Samples Z-test was employed to determine if the difference in mean LND scores between Government schools (M=53.02) and PEF schools (M=50.178) was statistically significant (Raza et al., 2022). The quantitative results were analyzed through inferential statistics to test the null hypothesis of no significant difference between the two groups.
Qualitative Analysis	Policy and input analysis involving review and synthesis of official government documents and academic literature regarding infrastructure, teacher training (Target 4.c), and curriculum alignment (PIE, 2025; World Bank, 2024).

Population and Sample

Category	Description
Target Population	All primary school students and teachers in primary (Grade 1-5) Government and Punjab Education Foundation (PEF)-affiliated schools in District Bahawalpur, Punjab, Pakistan.
Total Sample Size (N)	60 Students
Sample Determination	The sample size was strategically selected as \$N=60\$, a cohort size often employed in focused comparative educational studies, and is highly manageable for a specific district analysis. This size is deemed sufficient for statistical inferences concerning the two sectors (Krejcie & Morgan, 1970).
Sample Distribution (Sector)	Government Schools (N=30); PEF-Affiliated Schools (N=30)
Sample Distribution (Gender)	Government: 15 Male, 15 Female; PEF-Affiliated: 15 Male, 15 Female
Sampling Technique	Stratified Random Sampling (stratified by sector and gender)

III. Comparative Outcomes: Access, Equity, and Learning Proficiency

A. Expanding Access and Addressing the OOSC Challenge (Target 4.1, 4.5)

The effectiveness of the PEF model in expanding access was evident through the outcomes of large-scale conversion programs, such as the initiative where 4,276 poorly performing public primary schools were contracted out to private operators under the Punjab Public School Support Programme (PSSP) (Arshad, 2024). Utilizing a difference-in-difference framework, Arshad (2024) estimated the effect was a dramatic increase in enrollment of over 60 percent in converted schools.

Despite these efforts, significant equity gaps persisted. The goal of inclusive education for persons with disabilities (PwD) remained largely unmet, with data indicating that only 0.44% of persons with disabilities were reported in the education system, highlighting a critical failure to meet the requirements of Target 4.5 (PIE, 2025).

B. Learning Outcomes and Foundational Skills (Target 4.1)

Comparative performance data, derived from the Literacy and Numeracy Drive (LND), offered a crucial measure of Target 4.1 achievement.

Statistical Metric	Government Schools (M)	PEF-Affiliated Schools (M)	Z-Calculated Value	Z-Critical Significance)	(5% Result of Hypothesis Testing
Mean LND Score	53.02	50.178	1.8	1.96	No Significant Difference

LND analysis showed that Government schools had a mean performance score of 53.02, compared to 50.178 for PEF schools. While government schools demonstrated a slight numerical advantage, the Z-test calculation (Z=1.8) indicated that there was no statistically significant difference (Z < Z-critical of

1.96) in performance between students of public and PEF schools.

IV. Findings and Discussion

The investigation into the dual educational system in District Bahawalpur yielded significant findings regarding efficiency, equity, and quality inputs, directly addressing the research questions.

Research Question	Key Finding (Result)	Discussion & Theoretical Alignment
RQ 1: Comparative Impact on Access & Equity	The PEF PPP model achieved >60% enrollment increase in converted schools. However, PwD inclusion failed (0.44% reported in the system).	Validates NPM efficacy in rapidly boosting access (Target 4.1). Failure in disability inclusion violates Target 4.5, revealing structural equity limitations (Crawford, 2020).
RQ 2: Statistical Difference in Learning Proficiency	Mean LND scores (Govt: 53.02 vs. PEF: 50.178) showed No Significant Difference (Z-calc 1.8 < Z-crit 1.96).	Strong alignment with NPM/Agency Theory: Results-Based Financing (RBF) accountability successfully incentivizes performance, creating an 'efficiency paradox' relative to Human Capital Theory (Raza et al., 2022).

<p>RQ 3: Disparities in Quality Inputs</p>	<p>Teachers in public schools were generally better trained than PEF teachers. Infrastructure adoption (e.g., climate-smart) posed cost challenges for the PEF model.</p>	<p>Confirms a critical SDG 4.c compliance gap, supporting Human Capital Theory regarding input quality. The training deficit threatens the long-term quality sustainability of the cost-efficient PEF model.</p>
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V. Conclusion and Recommendations for Policy

A. Conclusion

Domain	Assessment	Theoretical Implication
<p>Efficiency & Outcomes</p>	<p>PEF model is highly cost-efficient and delivered statistically equivalent learning outcomes (LND scores) to Government schools.</p>	<p>Validates New Public Management (NPM) principles in achieving core educational outputs.</p>
<p>Quality Inputs</p>	<p>A critical quality gap exists, rooted in inferior teacher training and infrastructure adoption in the PEF sector.</p>	<p>Challenges the efficacy of the NPM model to ensure high-quality professional inputs required by Human Capital Theory.</p>
<p>Overarching Conclusion</p>	<p>Success in access and efficiency masks a structural quality deficit. Policy must urgently shift focus to input harmonization across the dual system.</p>	<p>Necessary for achieving holistic and equitable SDG-4 compliance.</p>

B. Recommendations

Based on the findings, the following clear policy recommendations were proposed:

Recommendation Area	Policy Action	SDG-4 Alignment	Target
<p>Human Capital Harmonization</p>	<p>Mandate that PEF-affiliated teachers participate fully and freely in the public sector’s specialized Continuous Professional Development (CPD) and leadership training programs.</p>	<p>Target 4.c</p>	<p>(Qualified Teachers)</p>
<p>Accountability & Equity</p>	<p>Refine the Results-Based Financing (RBF) model to incorporate value-added metrics that measure the learning progression of students who enter with significant foundational deficits (OOSC).</p>	<p>Target 4.1</p>	<p>(Learning Outcomes) & Target 4.5 (Equity)</p>
<p>Digital & Climate Equity</p>	<p>Prioritize scaling smart classroom technology and ICT training, explicitly in PEF-affiliated schools, and mandate climate-resilient infrastructure upgrades through targeted capital support.</p>	<p>Target 4.a</p>	<p>(Inclusive and Safe Schools)</p>

Recommendation Area	Policy Action	SDG-4 Alignment	Target
Governance Oversight	Establish dedicated, fully empowered provincial implementation units focused on institutional coordination, robust data governance, and enhancing parliamentary oversight.	SDG-4 Target 4.c & Global Partnership (SDG 17)	

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