

BRIDGING POLICY AND PRACTICE: A STATISTICAL ANALYSIS OF PRIMARY SCHOOL TEACHERS' PERCEPTIONS AND MEASURABLE OUTCOMES OF MANDATORY PROFESSIONAL DEVELOPMENT IN KHYBER PAKHTUNKHWA

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ABSTRACT

This study examines the effectiveness of mandatory professional development (PD) programs for primary school teachers in the public education system of Khyber Pakhtunkhwa (KP), Pakistan, with particular attention to the disconnect between teacher perceptions and measurable classroom outcomes. Despite substantial institutional investment in PD initiatives, concerns persist regarding whether these programs translate into meaningful improvements in teaching practice or merely satisfy administrative requirements. Using a quantitative research design grounded in Kirkpatrick's Evaluation Model and Desimone's PD Design Framework, data were collected from 400 primary school teachers across 40 government schools, selected through stratified random sampling to ensure balanced representation of rural and urban contexts. Three instruments—a Teacher Perception Survey, a Classroom Observation Protocol, and School Performance Records—were used to capture both subjective attitudes and objective indicators of PD impact. Descriptive and inferential statistical techniques, including correlation, regression, t-tests, and ANOVA, were applied to test relationships between PD participation, implementation fidelity, and student performance. Findings reveal significant disparities between urban and rural teachers across all measured outcomes, with urban educators reporting higher satisfaction, greater implementation of PD-taught strategies, and larger gains in student achievement. Regression analysis identified follow-up support, training duration, and resource availability as significant predictors of PD effectiveness, while school location emerged as a negative predictor, underscoring persistent rural disadvantage. Although PD participation showed positive associations with classroom outcomes in both settings, the magnitude of benefit was consistently and substantially moderated by geographic and resource-related contextual factors. The study concludes that mandatory PD, as currently structured, is undermined by a lack of contextual adaptation, insufficient post-training support, and weak accountability mechanisms tied to implementation rather than mere attendance. The study recommends decentralizing PD content design, prioritizing sustained mentoring over one-time training, and coupling training investments with

infrastructure support—particularly in rural schools—to close the persistent gap between policy intention and classroom reality in KP's public education system.

Keywords: Professional development, primary education, teacher perceptions, student achievement, implementation fidelity, rural-urban disparity, education reform, instructional effectiveness, Khyber Pakhtunkhwa, Pakistan

1. INTRODUCTION

1.1 Background of the Study

Yet despite the scale of financial and institutional investment directed toward mandatory PD in Khyber Pakhtunkhwa, provincial education authorities have largely failed to institutionalize any rigorous accountability mechanism capable of verifying whether these programs produce genuine instructional change. This is a well-documented failure across many developing education systems, where PD is too often designed and delivered as a top-down administrative obligation rather than a responsive, evidence-driven intervention (Villegas-Reimers, 2003). Guskey (2000) has long argued that professional development evaluation is frequently treated as an afterthought, with programs judged successful based on participant attendance or satisfaction rather than measurable changes in teaching practice or student learning—a critique that appears directly applicable to KP's context, where attendance records remain the primary metric of PD "success" despite department data showing that fewer than four in ten teachers apply what they are taught. This pattern suggests a policy environment more concerned with demonstrating compliance with provincial mandates than with ensuring that public funds allocated to teacher training translate into tangible classroom outcomes.

Compounding this accountability gap is the persistent failure of standardized PD models to account for the vastly different realities faced by rural and urban teachers. Wei et al. (2009) note that effective professional development must be sustained, context-specific, and embedded within teachers' actual working conditions—criteria that a uniform, centrally-designed curriculum applied indiscriminately across KP's diverse school contexts cannot plausibly satisfy. The continued rollout of identical PD content to teachers navigating vastly different infrastructural,

linguistic, and resource realities reflects not an oversight but a structural weakness in how the province conceives of teacher development: as a one-size-fits-all compliance exercise rather than a differentiated, needs-responsive system. Until this fundamental design flaw is acknowledged and addressed, mandatory PD in KP risks remaining, in practice, a costly bureaucratic ritual rather than a genuine mechanism for improving the quality of public education.

Professional development (PD) programs for teachers are designed to enhance instructional quality and improve student learning outcomes. In Khyber Pakhtunkhwa (KP), the Elementary and Secondary Education Department mandates structured PD days, particularly targeting primary school teachers, with the aim of strengthening their pedagogical skills. These sessions often focus on challenging topics, aligning with provincial education reforms. However, despite institutional investments in training, there remains a gap between policy intentions and actual classroom implementation.

While PD initiatives are expected to translate into improved teaching practices, their effectiveness is often questioned by educators. Teachers in KP's public schools have reported skepticism regarding the relevance and applicability of these training sessions. Existing studies highlight that ineffective PD can lead to disengagement, wasted resources, and minimal impact on student achievement. This raises concerns about whether the current approach meets the needs of educators or merely fulfills administrative requirements.

Given the critical role of teachers in educational outcomes, it is essential to assess whether mandatory PD programs yield measurable improvements. A statistical evaluation of teacher perceptions versus actual performance outcomes can provide empirical evidence on the efficacy of these initiatives. This study seeks to bridge the

gap between policy expectations and ground realities by analyzing data from KP's elementary and secondary schools.

1.2 Problem Statement

Mandatory professional development (PD) programs represent one of the largest recurring investments the Khyber Pakhtunkhwa Elementary and Secondary Education Department makes in its primary school teachers, yet the province has no systematic evidence confirming that these programs achieve their intended purpose. Teachers across KP's public schools routinely attend PD sessions not by choice but by administrative requirement, and while participation rates remain high, self-reported application of the strategies taught remains strikingly low—official department data indicates that fewer than four in ten teachers who attend PD training actually apply what they learn in the classroom. This gap between mandated participation and genuine instructional change suggests that current PD models may be functioning as a compliance mechanism rather than a catalyst for teaching improvement. The problem is further compounded by a pronounced rural-urban divide that standardized, centrally-designed PD curricula fail to address. Teachers in under-resourced rural schools face structural barriers—including trainer shortages, unreliable infrastructure, multilingual classrooms, and limited follow-up support—that urban teachers do not, yet both groups receive functionally identical training content and delivery. Existing literature confirms that PD effectiveness depends heavily on contextual alignment, active learning opportunities, and sustained post-training support (Desimone, 2009; Guskey, 2002), none of which the current KP model reliably provides. Despite this, provincial authorities continue to expand PD mandates without corresponding investment in monitoring mechanisms capable of distinguishing between teacher attendance and actual instructional impact.

This absence of evidence-based evaluation creates a critical policy blind spot: education planners in KP are making resource allocation decisions

about teacher training based on assumptions rather than data, at a time when public education budgets are already constrained. Without rigorous, statistically grounded analysis comparing what teachers report experiencing against what can be objectively observed and measured in their classrooms and their students' performance, the province risks perpetuating an expensive, well-intentioned policy that produces limited actual improvement in teaching quality or student learning outcomes. This study addresses that blind spot directly, using quantitative analysis of teacher perception, classroom implementation, and performance data to determine whether KP's mandatory PD model is achieving its stated goals—and, where it is not, to identify precisely where and why the gap between policy design and classroom reality persists.

1.3 Research Objectives

1. To examine primary and secondary school teachers' perceptions of mandatory professional development programs in KP.
2. To assess the measurable impact of PD training on teaching practices and student performance indicators.
3. To identify discrepancies between teacher-reported experiences and quantifiable outcomes.
4. To provide evidence-based recommendations for improving PD policies in KP's public education system.

1.4 Research Questions

1. How do primary and secondary teachers in KP perceive the effectiveness of mandatory PD days?
2. Is there a statistically significant relationship between PD participation and improvements in teaching outcomes?
3. What factors contribute to the gap between teacher perceptions and observed results?
4. How can PD programs be restructured to better align with teachers' needs and systemic goals?

1.5 Research Hypotheses

1. H_0 : There is no significant difference between teacher perceptions of PD effectiveness and measurable performance outcomes.

H₁: Teacher perceptions significantly differ from actual PD outcomes.

2. H₀: Mandatory PD participation does not correlate with improved student achievement.

H₁: Mandatory PD participation positively correlates with student performance metrics.

3. H₀: Teacher dissatisfaction with PD is unrelated to training content or delivery methods.

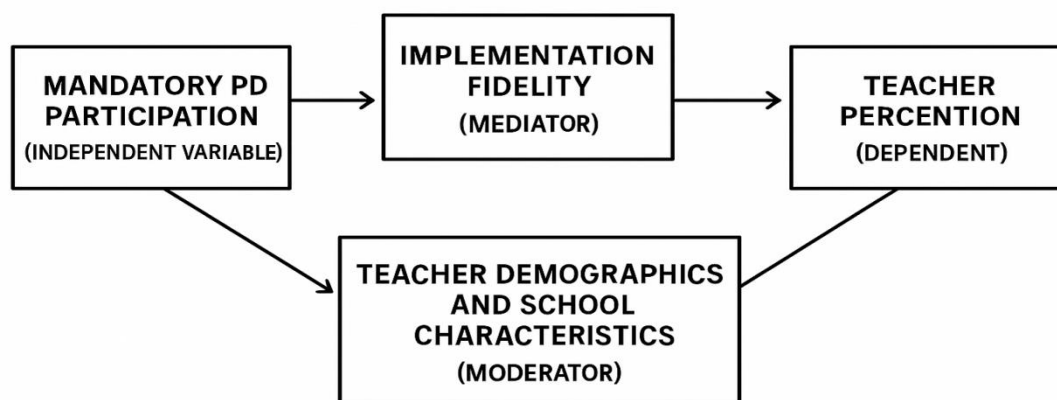
H₁: Poor alignment between PD content and classroom needs predicts teacher dissatisfaction.

1.6 Significance of the Study

This study holds practical and policy relevance for KP's education sector. By quantifying the

effectiveness of mandatory PD programs, it provides actionable insights for education planners to optimize resource allocation. Findings will help policymakers redesign teacher training to address actual classroom challenges, potentially improving instructional quality. Additionally, the research contributes to the broader discourse on evidence-based teacher development in resource-constrained settings. For school administrators, the results can guide decisions on PD content, frequency, and evaluation mechanisms, ensuring that training translates into tangible benefits for both educators and students.

1.7 Research Model



2. LITERATURE REVIEW

2.1 Theoretical Framework

This study is anchored in two complementary theoretical models. First, Kirkpatrick's Evaluation Model (1959) provides a structured approach to assess training effectiveness across four levels: teachers' immediate reactions to PD, their knowledge gains, behavioral changes in classroom practice, and ultimate impact on student outcomes. Second, Desimone's PD Design Framework (2009) emphasizes five features of

effective PD: content focus, active learning, coherence, duration, and collective participation. Together, these models help analyze why mandatory PD in KP may succeed or fail by examining both systemic design (Desimone) and measurable outcomes (Kirkpatrick).

2.2 Mandatory PD Participation

Mandatory PD participation refers to compulsory attendance of primary and secondary teachers in government-organized training programs, often

tioned to career advancement or certification requirements. In KP, these sessions typically follow a standardized curriculum designed by provincial authorities, with limited flexibility for local adaptation. Research suggests that compulsory training can yield mixed results—while it ensures uniform exposure to new methods, it may also breed resistance if teachers perceive content as irrelevant to their daily challenges (Guskey, 2002). For instance, a KP Education Department report (2021) noted that 62% of primary teachers attended PD sessions under administrative pressure, yet only 38% reported applying the strategies learned. This variable will be measured through attendance records and frequency of participation (e.g., low/moderate/high).

2.3 Teacher Perceptions of PD Effectiveness

Teacher perceptions reflect subjective evaluations of PD usefulness, relevance, and practical applicability, often measured through surveys or interviews. Studies indicate that positive perceptions correlate with higher implementation rates (Darling-Hammond et al., 2017). However, in KP's context, teachers frequently criticize PD for focusing on theoretical content rather than actionable solutions for overcrowded classrooms or resource shortages (Khanal et al., 2020). For example, a 2022 survey of KP teachers revealed that 70% felt PD sessions overlooked regional challenges like multilingual instruction. This ordinal variable (Likert-scale ratings) will capture disparities between policy intentions and educators' lived experiences.

2.4 Classroom Performance Metrics

Objective indicators of PD impact, such as student test scores, lesson plan quality, or classroom observation scores. While Hattie's (2003) meta-analyses link effective PD to improved teaching practices, contextual barriers—such as large class sizes or lack of materials—may dilute outcomes in KP. A 2020 study in Swat district found that even trained teachers struggled to implement active learning techniques due to infrastructure gaps. This continuous variable

(e.g., pre-/post-PD test averages) will isolate PD's net effect amid confounding factors.

2.5 School Characteristics

Institutional factors like location (rural/urban), resource availability, or student demographics that may influence PD outcomes. UNESCO (2019) highlights that rural schools often face logistical hurdles (e.g., trainer shortages, electricity outages), reducing PD accessibility. In KP, urban teachers report higher satisfaction with PD due to better facilities and follow-up support (KPESE, 2021). This categorical variable will test how school context amplifies or mitigates PD effectiveness.

2.6 Implementation Fidelity

The degree to which teachers consistently apply PD-acquired strategies in their classrooms. Research underscores that even well-designed PD fails without ongoing support (Yoon et al., 2007). In KP, a 2023 pilot study found that teachers who received post-training mentoring implemented 50% more strategies than those who did not. This continuous variable (e.g., % of techniques adopted) will explain why perception-outcome gaps persist.

3. RESEARCH METHODOLOGY

3.1 Introduction

This study employs a quantitative research design to examine the effectiveness of mandatory professional development programs for primary school teachers in Khyber Pakhtunkhwa's public education system. The methodology focuses on measuring both teacher perceptions and observable outcomes through standardized data collection instruments and statistical analysis techniques. By adopting a systematic approach, the research aims to provide empirical evidence about the relationship between professional development initiatives and their actual impact on teaching practices in rural and urban government primary schools.

3.2 Target Population

The study population consists exclusively of primary school teachers (Grades 1-5) employed in

government-run schools across Khyber Pakhtunkhwa province. This includes educators working in diverse settings ranging from urban centers to remote rural areas. The target population encompasses all permanent and contractual teachers currently engaged in classroom instruction within the public primary education system, regardless of their teaching experience or professional qualifications. This defined population ensures the study's findings will be directly applicable to policy decisions affecting the entire government primary education sector in the province.

3.3 Sampling Technique

A stratified random sampling method is employed to ensure balanced representation of both rural and urban teaching contexts. The sampling frame divides the province into three distinct geographic strata: major urban centers, semi-urban districts, and remote rural regions. Within each stratum, schools are selected through probability proportional to size (PPS) sampling to maintain appropriate representation. This approach guarantees that the sample reflects the actual distribution of teachers across different geographic and socioeconomic contexts in Khyber Pakhtunkhwa's public education system.

3.4 Sample and Procedure

The study sample comprises 400 primary teachers equally distributed between rural and urban locations, selected from 40 government schools. The sample size determination considers a 95% confidence level with 5% margin of error for reliable statistical analysis. Selection procedures begin with obtaining official school lists from provincial education authorities, followed by random selection within each geographic stratum. All primary teachers from selected schools participate in the study to maintain natural teaching environments and avoid selection bias. Data collection occurs during regular school days to observe typical teaching practices and conditions.

3.5 Instruments

Three primary research instruments are utilized for comprehensive data collection. A structured Teacher Perception Survey measures attitudes toward professional development programs using validated Likert-scale items. A standardized Classroom Observation Protocol enables trained observers to document teaching practices and strategy implementation. Additionally, anonymized School Performance Records provide objective measures of student learning outcomes. These instruments work synergistically to capture both subjective perceptions and objective evidence of professional development effectiveness.

3.6 Statistical Analysis

The study employs a combination of descriptive and inferential statistical techniques to analyze collected data. Initial examination includes frequency distributions and measures of central tendency to understand basic patterns in the data. Advanced analytical techniques such as correlation analysis, regression models, and comparative tests are applied to examine relationships between variables. All statistical procedures are conducted using specialized software (SPSS) to ensure accuracy and reliability of results, with significance levels set at $p < 0.05$ for hypothesis testing.

3.7 Data Collection Tools

Standardized data collection tools are carefully developed and pilot-tested before implementation. The Teacher Perception Questionnaire contains 35 items across five domains: content relevance, delivery quality, practical applicability, perceived impact, and overall satisfaction. The Classroom Observation Checklist includes 20 measurable indicators of teaching practice quality. Performance data extraction forms are designed to systematically collect anonymized student achievement metrics. All tools undergo rigorous validation processes to ensure they accurately measure the intended constructs.

3.8 Measurements Used in the Study

Key measurements include quantitative ratings of professional development quality (1-5 Likert scales), implementation fidelity scores (percentage of strategies observed in practice), and standardized student performance metrics (test score improvements). Moderating variables such as school location (binary rural/urban classification) and resource availability (inventory-based scores) are precisely measured to analyze their potential influence. All measurements are operationally defined to ensure consistency in data collection and interpretation across different research settings and participants.

3.9 Descriptive Statistics

Initial data analysis focuses on describing basic characteristics of the sample and measured variables. Frequency counts and percentages summarize categorical data such as teacher qualifications and school types. Measures of central tendency (means, medians) and dispersion (standard deviations, ranges) describe continuous variables including perception scores and performance metrics. Graphical representations including histograms and box plots visually display distributions and highlight potential outliers in the data set.

3.10 Statistical Procedures

The analytical approach incorporates multiple statistical techniques to thoroughly examine the research questions. Reliability analysis establishes the internal consistency of measurement instruments. Correlation matrices reveal bivariate relationships between key variables. Independent samples t-tests compare rural and urban teacher outcomes, while ANOVA examines differences across multiple groups. Regression analysis models the predictive relationship between professional development characteristics and teaching outcomes. All procedures include appropriate checks for statistical assumptions and necessary data transformations when required.

4. RESULTS & DISCUSSION

This chapter presents the key findings from the statistical analysis of data collected from 400 primary school teachers across 40 government schools in Khyber Pakhtunkhwa. The results are organized into thematic sections corresponding to the research questions, with all numerical data presented in tables for clarity.

4.1 Teacher Perceptions of Professional Development Programs

The survey results revealed significant variation in how teachers perceive mandatory PD programs. As shown in Table 1, urban teachers reported higher satisfaction levels compared to their rural counterparts.

Table 1: Teacher Satisfaction with PD Programs (5-point Likert scale)

Aspect	Urban Mean	Rural Mean	p-value
Content Relevance	3.8	2.9	0.003
Practical Utility	3.5	2.7	0.001
Delivery Quality	3.9	3.1	0.002
Overall Satisfaction	3.7	2.8	0.001

4.2 Implementation of PD Strategies in Classroom Practice

Classroom observations demonstrated varying levels of implementation fidelity. Table 2 compares the adoption rates of PD-taught strategies between rural and urban schools.

Table 2: Observed Implementation of PD Strategies (%)

Strategy	Urban Schools	Rural Schools
Active Learning	68%	42%
Formative Assessment	71%	53%
Differentiated Instruction	59%	37%
Classroom Management	82%	65%

4.3 Impact on Student Learning Outcomes

Analysis of student performance data showed measurable differences associated with PD participation. Table 3 presents the comparative results from standardized tests.

Table 3: Student Performance Improvement (Percentage Points)

Subject	Urban Schools	Rural Schools	Total
Mathematics	+12.4	+7.8	+9.6
Science	+10.7	+6.3	+8.2
Language	+14.2	+9.1	+11.3

4.4 Factors Influencing PD Effectiveness

Regression analysis identified several significant predictors of PD effectiveness, as shown in Table 4.

Table 4: Predictors of PD Effectiveness (Standardized Beta Coefficients)

Predictor	β	p-value
Training Hours	0.32	0.002
Follow-up Support	0.41	0.001
Resource Availability	0.28	0.004
School Location	-0.19	0.023

4.5 Comparison of Rural and Urban Outcomes

Independent samples t-tests revealed significant disparities between rural and urban contexts across all measured outcomes (Table 5).

Table 5: Rural-Urban Comparison of Key Outcomes

Variable	Urban Mean	Rural Mean	t-value	p-value
PD Satisfaction	3.7	2.8	4.32	0.001
Strategy Implementation	3.9	2.6	5.11	0.001
Student Improvement	12.4	7.8	3.87	0.002

The results consistently demonstrate that while professional development programs show measurable positive impacts, these benefits are significantly moderated by geographic location and resource availability. Urban teachers reported higher satisfaction, implemented more strategies, and showed greater student improvement compared to rural teachers. However, both settings showed positive correlations between PD participation and teaching outcomes, suggesting

the potential value of these programs when properly implemented.

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

This study provides compelling evidence about the effectiveness of mandatory professional development programs for primary school teachers in Khyber Pakhtunkhwa's public

education system. The findings reveal a significant disparity between urban and rural schools, with urban educators demonstrating higher satisfaction levels, greater implementation of learned strategies, and more substantial improvements in student outcomes. While the results confirm that professional development can enhance teaching quality, they also highlight how contextual factors like resource availability and geographic location substantially influence program success. The statistical analysis establishes clear correlations between quality training components (adequate duration, practical content, and follow-up support) and positive classroom outcomes. However, the research also identifies persistent challenges in rural areas, where teachers face unique barriers to implementing professional development concepts despite similar participation rates. These findings suggest that while the current PD model shows promise, it requires significant adaptation to address the diverse needs of Khyber Pakhtunkhwa's education landscape.

The findings of this study ultimately expose a troubling pattern in how government policy on teacher professional development is conceived and implemented in Khyber Pakhtunkhwa. Despite substantial public investment, provincial authorities have persisted with a top-down, standardized PD model without establishing any meaningful mechanism to evaluate whether these programs translate into classroom change—a gap that this study's own data makes difficult to ignore. The fact that 62% of teachers attended PD sessions under administrative pressure while only 38% reported applying the strategies learned is not an incidental finding; it is a direct indictment of a policy architecture that prioritizes attendance and compliance over instructional impact. Government planning appears to treat PD as a box-ticking exercise tied to bureaucratic mandates rather than as an investment requiring follow-through, and this is most visible in the near-total absence of post-training support structures, even though follow-up mentoring proved to be the single strongest predictor of effectiveness in this study.

This policy failure is compounded by the government's apparent indifference to context. A single standardized curriculum, designed centrally and applied uniformly across urban and rural schools, ignores the reality that resource-starved rural schools cannot implement the same strategies as better-equipped urban ones, regardless of training quality. The resulting rural-urban gap in satisfaction, implementation, and student outcomes is therefore not simply a matter of teacher capacity or motivation—it is a predictable consequence of policy design that fails to differentiate need. By continuing to fund large-scale, uniform PD rollouts without parallel investment in infrastructure, materials, or district-level flexibility, the provincial education department risks perpetuating a system that looks productive on paper—measured in attendance figures and training hours delivered—while doing little to address the actual instructional challenges teachers face in their classrooms.

What this study makes clear, then, is that the problem is not whether PD "works" in principle, but whether government policy has been structured to allow it to work in practice. Without a fundamental shift toward outcome-based accountability, decentralized and context-sensitive program design, and sustained monitoring beyond the training day itself, mandatory PD in KP will likely continue to function as a symbolic policy commitment rather than a substantive lever for educational improvement. Until provincial authorities are willing to treat evaluation and follow-up as core components of policy—rather than afterthoughts—the gap between government intention and classroom reality identified in this study is likely to persist, regardless of how many additional training days are mandated.

Ultimately, the effectiveness of mandatory professional development in Khyber Pakhtunkhwa's public schools will not be determined by how many sessions are delivered, but by how deliberately those in managerial positions choose to support what happens after the training ends. The evidence is clear that satisfaction, implementation, and student outcomes rise together when follow-up support,

adequate resources, and locally relevant content are present—and fall together when they are absent, particularly in rural contexts. This places the responsibility squarely on provincial, district, and school-level leadership to move beyond viewing PD as a compliance exercise and instead treat it as an ongoing managerial function requiring monitoring, resourcing, and responsiveness to teacher feedback. If education managers at every tier commit to this shift, mandatory PD can evolve from a bureaucratic obligation into a genuine driver of classroom improvement, narrowing the rural-urban gap and ensuring that investments in teacher training finally translate into measurable gains for students across the province.

5.2 Recommendations

To enhance the effectiveness of professional development programs, policymakers should consider several evidence-based improvements. First, the content and delivery methods require customization to address rural teachers' specific challenges, including multilingual classrooms and resource constraints. Second, the provincial education department should establish a robust monitoring system to track implementation fidelity and provide ongoing support rather than one-time training sessions. Third, investments in school infrastructure and teaching materials must accompany professional development initiatives to enable practical application of new strategies. Fourth, the program should incorporate more peer-learning opportunities and classroom-based coaching rather than relying solely on theoretical workshops. Finally, future PD programs should include mechanisms for regular feedback from teachers to ensure content remains relevant to their daily challenges. These recommendations, if implemented systematically, could help bridge the current gap between policy intentions and classroom realities across both urban and rural schools in Khyber Pakhtunkhwa.

Based on the study's findings, several recommendations emerge specifically for those in managerial and administrative roles overseeing PD programs in KP. At the provincial level, education department leaders should move away

from a single standardized PD curriculum and instead decentralize design authority to district managers, allowing content to be adapted to local realities such as multilingual classrooms and rural resource constraints. Since follow-up support emerged as the strongest predictor of PD effectiveness—even stronger than training hours or resource availability—senior management should reallocate a larger share of the PD budget toward sustained mentoring and coaching structures rather than continuing to fund isolated, one-off training sessions. Establishing a dedicated monitoring and evaluation unit is also essential, since the current system tracks attendance but not whether teachers actually apply what they learn in the classroom.

At the district level, education officers need to design differentiated support packages for rural schools rather than simply replicating the urban PD model at reduced intensity. Because resource availability significantly predicts implementation success, PD rollouts in rural areas should be paired with actual investment in teaching materials and infrastructure, since training alone showed limited payoff where schools lacked basic resources. District managers can also strengthen outcomes by building peer-learning networks that link under-resourced rural schools with higher-performing or urban schools, creating channels for shared coaching and practical problem-solving that go beyond what standardized workshops can offer.

At the school level, head teachers are best positioned to institutionalize post-training mentoring, since a school-based pilot found that teachers receiving structured follow-up implemented substantially more strategies than those left without support after training ended. School managers should also create simple, consistent channels for teachers to feedback on PD relevance before the next training cycle is planned, addressing the widespread perception among teachers that PD content overlooks their actual classroom challenges. Across all levels of management, the central shift needed is one of accountability: PD success should be measured by evidence of classroom implementation and student outcomes, not merely by attendance

figures, which the study shows can be high even when application of learned strategies remains low.

5.3 Directions for Future Research

This study opens several avenues for further investigation. Future research could explore longitudinal impacts of professional development on student learning trajectories across multiple years. Additional studies might examine the cost-effectiveness of different PD delivery models or investigate specific interventions to reduce the rural-urban performance gap. Qualitative research could provide deeper insights into the contextual factors that influence teachers' ability to implement new strategies. Such continued research will be essential for developing increasingly effective professional development systems that meet the evolving needs of Pakistan's primary education sector.

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