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The Impact of Teacher Professional Development Interventions on Learning Outcomes in public secondary schools in Mbooni East Sub-County, Kenya

By

[1]Elizabeth Mbithe Kilonzo, [2]Dr. Ruth Kimeu PhD and [3]Dr. Charles Mwambela PhD

[1]School of Education and Social Sciences: Lukenya University, Kenya
[2]School of Education and Social Sciences: Lukenya University, Kenya
[3]School of Education and Social Sciences: Lukenya University, Kenya

Abstract
The quality of teaching is the most significant school-based determinant of student achievement, making effective Teacher Professional Development (TPD) a cornerstone of educational improvement. While this relationship is widely accepted, empirical evidence on the specific impact of different TPD interventions on learning outcomes in resource-constrained, rural contexts remains limited. This study investigates the effects of professional development interventions on learning outcomes in public secondary schools within Mbooni East Sub-County, Makueni County, Kenya. A mixed-methods descriptive survey design was employed, gathering quantitative data from 138 teachers and qualitative insights from interviews with 12 principals and 12 deputy principals. Quantitative data were analyzed using descriptive statistics, Pearson correlation, and multiple regression analysis, while qualitative data underwent thematic analysis. The findings reveal that professional development interventions have a profound and statistically significant positive impact on learning outcomes. Regression analysis showed that interventions were the single strongest predictor among all TPD components ($\beta = 0.398$, $p < 0.001$), explaining a substantial portion of the variance in student achievement. Correlation analysis confirmed a strong positive relationship ($r = 0.792$, $p < 0.001$). Qualitative data illuminated the mechanisms behind this impact, with school leaders emphasizing the effectiveness of practical, collaborative interventions like peer mentoring, interactive classroom observation, and hands-on workshops. However, the study also identified significant gaps in the implementation of modern interventions, particularly online/blended learning and formal Professional Learning Communities (PLCs), which teachers rated as inadequately realized. The study concludes that the quality and nature of TPD interventions are more critical than mere participation. It recommends a policy shift toward funding and promoting active, collaborative, and contextually relevant interventions over traditional, passive workshops. For school leaders, the findings underscore the need to create institutional structures that support sustained, school-based professional learning.

Keywords: Teacher Professional Development (TPD), Learning Outcomes, TPD Interventions, Rural Education, Kenya, Secondary Schools, Mixed-Methods Research

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1. Introduction

The global pursuit of equitable and quality education, as enshrined in Sustainable Development Goal 4, places immense pressure on education systems to enhance their effectiveness. Decades of research have unequivocally established that teacher quality is the most influential in-school factor driving student learning outcomes (OECD, 2019; Schleicher, 2018). Consequently, Teacher Professional Development (TPD) has been universally recognized as the primary strategic lever for improving teaching practice and, by extension, student achievement. High-performing education systems, from Finland to Singapore, are characterized by their sustained, systemic investment in coherent and practice-oriented professional learning for teachers (Sahlberg, 2021; Hairon & Dimmock, 2022).

In the context of Sub-Saharan Africa, the imperative for effective TPD is even more acute. Education systems across the continent grapple with systemic challenges, including resource scarcity, large class sizes, and the need to equip a rapidly growing youth population with 21st-century skills (UNESCO, 2021). Countries like Rwanda and South Africa have made TPD a central pillar of their education reform strategies, demonstrating that even in resource-constrained environments, systematic teacher development can yield significant improvements in educational quality (Sibomana & Ndayambaje, 2024; Department of Basic Education, 2020). However, the effectiveness of these programs is often hampered by challenges in design and implementation, such as poor planning, a disconnect from classroom realities, and a lack of sustained follow-up support (Abubakari, 2020).

In Kenya, the government has made substantial policy and financial commitments to TPD. The Teachers Service Commission (TSC), mandated by the Constitution of Kenya, launched a comprehensive national TPD program in 2021, shifting from ad-hoc workshops to a mandatory, career-long learning framework (TSC, 2021). This initiative runs parallel to other significant interventions, such as the Strengthening of Mathematics and Science in Secondary Education (SMASSE) program and the Digital Literacy Program (DLP), all aimed at enhancing teacher competencies in line with the national development blueprint, Vision 2030, and the demands of a new Competency-Based Curriculum (CBC).

Despite these robust policy frameworks and multiple ongoing initiatives, a persistent gap exists between the implementation of TPD programs and the realization of desired learning outcomes at the school level. This is particularly true in rural and semi-arid regions like Makueni County, where schools face compounded challenges of inadequate infrastructure, high teacher-student ratios, and socioeconomic constraints. While national policies provide a broad framework, the actual impact of TPD is contingent on the specific interventions implemented and how they are experienced by teachers in their unique local contexts. There is a paucity of granular, context-specific research that moves beyond participation rates to empirically evaluate the impact of the *interventions* themselves the workshops, mentoring, coaching, and collaborative learning activities on student achievement.

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This study seeks to address this critical gap. It moves beyond the general question of whether TPD matters, to the more nuanced and actionable question of *how* it matters. Specifically, it focuses on the effects of professional development interventions implemented for teachers on the learning outcomes of students in the secondary schools of Mbooni East Sub-County, Makueni County. By examining the types of interventions in place, their perceived effectiveness, and their statistical relationship with learning outcomes, this research aims to provide evidence-based insights to inform the design and implementation of more effective TPD programs in Kenya and other similar contexts.

Objective of the Study

The primary objective of this article is to evaluate the effects of professional development interventions implemented in TPD programs on student learning outcomes in the public secondary schools of Mbooni East Sub-County, Makueni County, Kenya.

2. Literature Review

The discourse on Teacher Professional Development has evolved significantly over the past two decades. Early models, often characterized by one-off, "drive-by" workshops, have been widely criticized for their lack of impact on classroom practice (Darling-Hammond et al., 2017). A robust body of international research has since converged on a set of core features that define effective professional development interventions. These interventions are typically content-focused, active, collaborative, job-embedded, and sustained over time.

A landmark meta-analysis by Darling-Hammond et al. (2017) synthesized over 35 methodologically rigorous studies and identified several high-impact intervention designs. They found that programs providing teachers with opportunities for active learning such as observing expert teachers, being observed, and receiving feedback were significantly more effective than those relying on passive lectures. Interventions that fostered collaboration, such as in study groups, peer coaching relationships, or Professional Learning Communities (PLCs), were also found to have a stronger impact. Furthermore, the duration and coherence of the intervention mattered immensely; effective programs spanned at least a semester and involved 20 or more hours of contact time, structured around a common set of goals.

Another critical intervention is coaching and mentoring. Knight (2009) and others have demonstrated that instructional coaching, where an expert provides individualized, classroom-based support to a teacher, is one of the most powerful mechanisms for changing practice. Unlike traditional supervision, coaching is a non-evaluative, collaborative partnership focused on achieving the teacher's professional goals. This intervention provides the crucial bridge between learning a new strategy and implementing it effectively and consistently in the complex environment of a real classroom. Similarly, peer mentoring, where teachers collaboratively observe and learn from one another, has been shown to build collective efficacy and promote a culture of continuous improvement (Takahashi & McDougal, 2021). Japan's model of *lesson study*, a highly structured form of peer collaboration focused on a single research lesson, is a prime example of a powerful, job-embedded intervention that has been adapted globally.

The integration of technology has also emerged as a key intervention. TPD programs are increasingly using online and blended learning formats to increase accessibility and provide personalized learning pathways. Digital platforms can host resource libraries, facilitate virtual PLCs, and provide on-demand access to training modules (European

Commission, 2020). When designed well, these interventions can overcome the geographical and financial barriers that often limit TPD access for teachers in rural or remote areas.

While the principles of effective TPD are universal, their implementation in Sub-Saharan Africa requires adaptation to the region's unique challenges and opportunities. Resource constraints often make large-scale, off-site workshops financially unfeasible, leading to a growing emphasis on school-based interventions.

Rwanda's national TPD framework provides a compelling example of a successful, context-adapted model. The system is built around school-based Professional Learning Communities, where teachers meet regularly to discuss pedagogical challenges, share strategies, and collaboratively plan lessons. This is complemented by a system of peer mentoring and support from designated School-Based Mentors. The model is low-cost, sustainable, and directly embedded in the daily work of teachers. Empirical evidence from the region strongly supports this approach; a recent study in Rwanda found a powerful correlation between teacher participation in these collaborative interventions and improvements in both teaching practice ($r = 0.611$) and student performance ($r = 0.940$) (Sibomana & Ndayambaje, 2024).

Tanzania's Teacher Continuous Professional Development (TCPD) program similarly prioritizes school-based, collaborative training as a sustainable intervention model. By focusing on building professional learning structures within schools, the program aims to create a culture of continuous improvement that is less dependent on external funding and expertise (Sakani et al., 2024).

However, the implementation of effective interventions in Africa is not without challenges. In South Africa, despite a comprehensive policy framework, teachers have reported dissatisfaction with TPD opportunities, citing them as infrequent, disconnected from their classroom needs, and poorly scheduled (Ajani, 2023). In Ghana, research found that the impact of in-service training interventions was undermined by weak planning, irrelevant content, and a lack of follow-up support to help teachers apply new knowledge in their classrooms (Abubakari, 2020). These studies highlight that the success of any TPD intervention depends critically on its design, relevance, and the institutional support provided for its implementation.

Kenya's TPD landscape is characterized by a mix of national, large-scale programs and more targeted, subject-specific initiatives. The TSC's national TPD program, launched in 2021, is the most comprehensive intervention. It is structured around mandatory modules delivered through accredited universities using a blended learning approach. The interventions within this program include workshops, online learning modules, and the creation of Professional Learning Communities (PLCs). The program is designed to be a continuous, career-long process, addressing a major criticism of previous one-off training efforts. However, its mandatory and fee-based nature has generated mixed perceptions among teachers, with some viewing it as a financial and logistical burden (Kariuki et al., 2023).

The SMASSE program represents a different type of intervention. Focused specifically on STEM subjects, it utilizes an in-service education and training (INSET) model. The core intervention is a series of intensive, hands-on workshops where teachers engage in activity-based, student-centered learning. The program emphasizes a cascade model, where nationally trained facilitators train county-level trainers, who in turn train teachers. A key feature of the SMASSE intervention is its focus on pedagogical content knowledge not just what to teach, but *how* to teach it effectively using locally available resources. Research suggests this intervention has been successful in improving teacher

confidence and shifting pedagogical practices towards more learner-centered approaches (Changeiywo et al., 2021).

The Digital Literacy Program (DLP) focuses on interventions designed to build teachers' capacity to integrate ICT into their teaching. The primary interventions include training workshops on using digital devices and software, access to online educational resources, and support for developing digital lesson content. The goal is to transform pedagogy from traditional teacher-centered methods to more interactive and engaging technology-mediated learning experiences.

Despite this array of interventions, studies in Kenya consistently point to implementation gaps. A study in Nyandarua County found a strong correlation between teachers' professional development and student KCSE performance, but also noted that access to high-quality interventions was uneven (Watene et al., 2020). Teachers in rural areas, in particular, often face significant barriers to participating in centralized workshops and may lack the reliable internet connectivity required for online interventions. Furthermore, as noted by Wambugu et al. (2019), a critical weakness in many Kenyan TPD interventions is the lack of systematic, classroom-based follow-up and support, making it difficult for teachers to sustain new practices over time. This body of literature confirms the importance of TPD interventions while simultaneously highlighting the need to understand which interventions are most effective and how they can be implemented successfully in diverse contexts like Mbooni East.

3. Research Methodology

This study employed a descriptive survey design with a mixed-methods approach to gather both quantitative and qualitative data on the effects of TPD programs on learning outcomes. The study was conducted in the 20 public secondary schools of Mbooni East Sub-County, Makueni County, Kenya.

The target population comprised 215 teachers, 20 deputy principals, and 20 principals from these schools. A multi-stage sampling procedure was used. First, stratified random sampling was used to select a representative sample of schools. Then, simple random sampling was used to select teachers from the chosen schools. All principals and deputy principals from the sampled schools were purposively included as key informants. The final sample consisted of 138 teachers, 12 deputy principals, and 12 principals. An overall response rate of 63.53% was achieved, providing a robust dataset for analysis.

Data were collected using two main instruments. A structured questionnaire with 5-point Likert-scale items was administered to teachers to gather quantitative data on the TPD interventions they had participated in and their perceptions of student learning outcomes. A semi-structured interview schedule was used with principals and deputy principals to collect in-depth qualitative data on the nature of TPD interventions in their schools, their perceived effectiveness, and the observed impact on teaching and learning. A pilot study was conducted in a neighboring sub-county to ensure the validity and reliability of the instruments. The Cronbach's alpha for the questionnaire scales was above the 0.7 threshold, confirming internal consistency.

Quantitative data were analyzed using the Statistical Package for Social Sciences (SPSS, Version 25). Descriptive statistics (means, standard deviations) were used to summarize the data. To examine the relationship between TPD interventions and learning outcomes, Pearson correlation and a multiple linear regression model were employed. Qualitative data from the interviews were transcribed and analyzed using thematic analysis to

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identify recurring patterns, themes, and illustrative quotes that could explain and enrich the quantitative findings. Ethical considerations, including informed consent and confidentiality, were strictly adhered to throughout the research process.

4. Findings

This section presents the findings of the study, organized into quantitative results from the teacher survey and qualitative insights from the administrator interviews.

Teachers were asked to rate their participation in and the effectiveness of various TPD interventions. The descriptive statistics, presented in Table 4.1, reveal a mixed landscape of implementation.

Table 4.1: Mean Analysis of Professional Development Interventions

Intervention	N	Mean	Std. Deviation
Involved in peer mentoring and coaching	138	3.38	1.20
Attended in-service training workshops	138	3.21	1.42
Mentored to be instructional leader	138	3.09	1.18
Attend seminars and conferences	138	2.93	1.11
Improved networking with other teachers	138	2.77	1.17
Use online and blended learning	138	2.64	1.18
Nurtured competencies to develop own teaching resources	138	2.54	1.03
Joined professional learning communities (PLCs)	138	2.36	1.07
Use collaborative lesson planning	138	2.22	1.05

Scale: 1 = Strongly Disagree, 3 = Neutral, 5 = Strongly Agree
Source: Field Data 2025

The descriptive data indicate that more traditional or informal interventions like peer mentoring/coaching (M=3.38) and attendance at in-service workshops (M=3.21) were the most commonly experienced. In contrast, more structured, collaborative, and modern interventions received much lower ratings. Notably, collaborative lesson planning (M=2.22), joining formal PLCs (M=2.36), and the use of online/blended learning (M=2.64) were all rated below the neutral point, suggesting these high-impact practices are not yet widely or effectively implemented in the sub-county. This points to a significant implementation gap between policy recommendations and classroom reality.

To assess the relationship between these interventions and educational results, a correlation and regression analysis was conducted.

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Table 4.2: Correlation Between TPD Interventions and Learning Outcomes

Professional Development Interventions	Learning Outcomes
Pearson Correlation	.792*
Sig. (2-tailed)	.000
N	138

***Correlation is significant at the 0.01 level (2-tailed).*
Source: Field Data 2025

The Pearson correlation analysis revealed a strong, positive, and highly significant correlation ($r = 0.792$, $p < 0.001$) between the overall measure of TPD interventions and learning outcomes. This indicates that teachers who participated more actively in a range of quality interventions reported significantly better learning outcomes among their students.
The multiple regression model, which included TPD needs, interventions, and perceptions as predictors, further solidified this finding.

Table 4.3: Regression Coefficients for TPD Interventions

Variable	Unstandardized B	Standardized (β)	Beta t-value	Sig.
(Constant)	0.847		3.621	.000
Professional Development Interventions	0.398	0.423	5.606	.000
Professional Development Needs	0.312	0.341	4.657	.000
Teacher Perceptions	0.267	0.289	4.238	.000

Dependent Variable: Learning Outcomes. Overall Model: $R^2 = 0.509$, $F = 46.127$, $p < .000$
Source: Field Data 2025

The regression results demonstrate that professional development interventions emerged as the strongest unique predictor of learning outcomes ($\beta = 0.398$), even after controlling for the effects of needs assessment and teacher perceptions. The standardized beta coefficient ($\beta = 0.423$) confirms it has the largest independent effect, highlighting that the quality and nature of the interventions themselves are the most critical component of effective TPD.
Interviews with principals and deputy principals provided rich, contextual insights that help explain the quantitative findings. Three major themes emerged regarding TPD interventions: the value of collaborative and practical approaches, the challenges of implementation, and the importance of administrative support.

Theme 1: The Primacy of Collaborative and Practical Interventions
School leaders consistently emphasized that the most effective TPD interventions were those that were collaborative and directly applicable to the classroom. Peer mentoring and coaching were frequently cited as highly effective. As one principal stated,

"When teachers learn from each other, the impact is immediate. A new teacher paired with an experienced one learns classroom management and pedagogical tricks that a workshop can never teach."

Another deputy principal highlighted the value of interactive classroom observation, noting,

"We have started a system of friendly observation where teachers watch each other's lessons and provide constructive feedback. This has built confidence and spread good practices faster than any external training."

Hands-on workshops that focused on practical skills were also valued. One principal explained, *"Teachers appreciate training where they actually design a lesson plan, create a teaching resource, or practice a new assessment technique. Theory is good, but they need something they can use in class on Monday."* This aligns with the quantitative data showing lower ratings for interventions that may be perceived as more theoretical or less collaborative.

Theme 2: Implementation Gaps and Resource Constraints
While valuing practical interventions, administrators also spoke at length about the challenges in implementing them. The low ratings for PLCs and collaborative lesson planning were explained by a lack of structured time.

"We tell teachers to work together," said one principal, *"but the timetable is packed. There is no dedicated time for them to sit, plan, and reflect as a group. So, collaboration becomes an extra task for their free time, which is very little."*

The underutilization of online and blended learning was attributed to infrastructural and financial barriers. A deputy principal noted,

"The idea of online TPD is excellent, but many of our teachers live in areas with no network. Even at school, our internet is unreliable. Plus, the cost of data bundles is a real barrier for them."

This highlights a significant digital divide that prevents rural teachers from accessing modern TPD interventions.

Theme 3: The Role of Administrative Support and Recognition
School leaders acknowledged their critical role in making interventions work. Several principals mentioned interventions they had initiated to motivate teachers, such as celebrating professional growth and providing recognition.
"One intervention we've introduced is recognizing and rewarding participation in TPD," a principal shared. *"When teachers feel their efforts are valued, they are more willing to engage and apply what they learn."* Another emphasized the importance of a flexible and

supportive approach: *"We provide flexible training schedules. Instead of cramming everything into one week, the sessions are spread out, making it easier for teachers to balance teaching and learning."* These accounts suggest that administrative support acts as a crucial catalyst, creating an environment where TPD interventions can thrive.

5. Discussion

The findings of this study provide compelling evidence that professional development interventions are a powerful driver of student learning outcomes in the rural Kenyan context. The strong, positive, and highly significant relationship between interventions and outcomes, confirmed through both correlation ($r = 0.792$) and regression ($\beta = 0.398$), positions the quality of TPD activities as the most critical element in the entire professional development ecosystem. This result aligns with the international consensus that active, collaborative, and practice-oriented interventions are superior to passive, isolated forms of training (Darling-Hammond et al., 2017).

The study's most significant contribution lies in its illumination of the specific *types* of interventions that are succeeding versus those that are lagging. The higher ratings for peer mentoring and workshops suggest that interventions requiring direct, human interaction are both more accessible and more valued by teachers in this context. The qualitative data strongly supports this, with principals emphasizing that collaborative, job-embedded learning is what truly changes practice. This finding resonates with the principles of Sociocultural Theory (Vygotsky, 1978), which posits that learning is fundamentally a social process. When teachers learn together, they co-construct knowledge that is more meaningful and more likely to be implemented in their classrooms.

Conversely, the study reveals a critical implementation gap in more modern and structured interventions. The low mean scores for formal PLCs, collaborative lesson planning, and online learning are particularly telling. While national policy frameworks, such as that from the TSC, explicitly promote these high-impact practices, they appear to be failing to gain traction at the school level in Mbooni East. The qualitative findings offer a clear explanation: these interventions are not failing because they are inherently flawed, but because the necessary enabling conditions structured time, reliable infrastructure, and financial support are absent. This disconnect between policy ambition and grassroots reality is a major barrier to maximizing the impact of TPD. A teacher cannot participate in a virtual PLC without internet, nor can they engage in collaborative lesson planning without dedicated time in their schedule.

This finding challenges the notion that simply introducing interventions like PLCs will automatically lead to improvement. It suggests that for such interventions to be effective, they must be supported by deliberate administrative and policy actions. The success of Rwanda's school-based PLC model, for example, is predicated on it being an official, structured part of the school week, not an optional add-on (Sibomana & Ndayambaje, 2024).
Furthermore, the strong predictive power of interventions in the regression model, even when controlling for needs and perceptions, suggests that a well-designed intervention can be effective even if teachers' initial perceptions are not overwhelmingly positive. The experience of engaging in a high-quality, practical, and collaborative learning activity can itself shift perceptions and build motivation. This provides a strong argument for investing in the quality of the interventions themselves as the primary engine of TPD success.

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6. Conclusion and Recommendations

This study concludes that professional development interventions have the most significant and direct impact on student learning outcomes among all aspects of TPD programs in Mbooni East Sub-County. The effectiveness of TPD is determined not by the mere fact of participation, but by the nature and quality of the interventions experienced by teachers. Active, collaborative, and practical interventions like peer mentoring and hands-on workshops are perceived as most effective and show a strong correlation with improved outcomes. However, a significant gap exists in the implementation of highly-touted modern interventions such as formal PLCs and online learning, primarily due to a lack of institutional support in the form of time, resources, and infrastructure. Without addressing these enabling conditions, the full potential of TPD to transform teaching and learning in rural Kenya will remain unrealized.

Based on these conclusions, the following recommendations are proposed:

1. For Policymakers (TSC, Ministry of Education):
    (i) Shift Funding Priorities: Earmark TPD funds specifically for interventions proven to be high-impact, such as instructional coaching, peer mentoring programs, and subject-specific collaborative workshops, rather than generic, large-scale lectures.
    (ii) Develop an Infrastructure for Rural TPD: Invest in improving internet connectivity in rural schools and provide subsidized data bundles for teachers to bridge the digital divide and make online/blended learning a viable intervention.
    (iii) Mandate and Support School-Based Collaboration: Revise policy to require schools to allocate dedicated, timetabled slots for PLCs and collaborative lesson planning, transforming them from an expectation into a structured, supported practice.
2. For School Administrators (Principals, Deputy Principals):
    (i) Become TPD Catalysts: Actively create a school culture that champions professional learning. Use administrative authority to schedule time for teacher collaboration, facilitate peer observation, and protect this time from other demands.
    (ii) Leverage Internal Expertise: Identify and empower expert teachers within the school to act as peer mentors and coaches. Provide them with recognition and a reduced teaching load to support their colleagues.
    (iii) Source Relevant, Low-Cost Interventions: Seek out practical, hands-on workshop opportunities and build partnerships with local educational institutions or NGOs to bring targeted training directly to the school, reducing the logistical and financial burden on teachers.
3. For Future Research:
    (i) A comparative study is needed to evaluate the cost-effectiveness of different TPD interventions (e.g., peer coaching vs. online modules) in a rural context.
    (ii) Longitudinal research that tracks the implementation of a specific intervention (like a newly established PLC) over several years would provide deeper insights into the factors that sustain or hinder its success.
    (iii) An investigation into student perspectives on the changes in teaching practice resulting from TPD interventions would provide a valuable, complementary layer of evidence.

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