International Journal of Applied Mathematics
Volume 39 No. 1s, 2026
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

TEACHER PROFESSIONAL DEVELOPMENT AND ITS IMPACT ON STUDENT LEARNING OUTCOMES: A STUDY CONDUCTED IN GHANA

Dr. Richard Acheampong[1], Albright Boachie-Ameyaw[2], Samuel Dateh Ampofo[3], Joseph Yaw Afriyie[4], Mark Gyan Asuah[5], Sauri Songnalle[6]

[1,2,3,4,5,6]Berekum College of Education, Berekum Ghana

Email: acheampongr1975@gmail.com, albright@becoled.edu.gh, sampofo@becoled.edu.gh, afriyiejoseph@becoled.edu.gh, mark.gyan.mag@gmail.com, saurisongnalle@becoled.edu.gh

Corresponding Author: acheampongr1975@gmail.com

Abstract

Teacher professional development (PD) has become a significant factor in both student achievement and the quality of instruction Particularly in developing nations undergoing educational reforms. In Ghanaian basic and senior high schools, this study looked at how PD affects students' learning outcomes. Using a mixed-methods design, the study gathered information from 480 students, 120 teachers, and 15 head teachers in some selected schools in the Ashanti, Bono, and Greater Accra regions. According to quantitative findings, teachers who participated in ongoing professional development saw notable gains in their pedagogical approaches, which correlated with gains in student performance of 12–18%. Qualitative results also revealed more student-centered instruction, better assessment literacy, and increased teacher confidence. The study concluded that ongoing, context-relevant professional development enhances student learning outcomes and positively influences teacher effectiveness. There are suggestions for improving PD structures in Ghana's educational system.

Keywords: Teacher professional development; continuing professional development; student achievement; Ghana; teacher coaching; CPD framework.

1. Introduction

Globally, teacher quality continues to be one of the most important determinants of students' academic success (Darling-Hammond et al., 2020; Hattie, 2015). Enhancing teacher professional development (PD) has become a key tactic for educational reform in developing nations, where learning outcomes frequently fall short of expectations (World Bank, 2021). Ghana is not an exception; to enhance teacher knowledge, pedagogical competence, and instructional delivery, the Ministry of Education and the National Teaching Council (NTC) have stepped up Continuing Professional Development (CPD) activities (NTC, 2020).

The National Education Assessment (NEA) and West African Senior School Certificate Examination (WASSCE) are two national and regional assessment reports that continue to reveal learning gaps among Ghanaian students in spite of these national efforts (GES, 2022; WAEC, 2023). Concerns have surfaced regarding the effectiveness, sustainability, structure, and alignment of current professional development programs with classroom realities (Osei-Owusu & Kwakye, 2022). Thus, with an emphasis on both basic and senior high levels, this

Volume 39 No. 1s, 2026
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)
study examines the extent to which teacher professional development affects student learning outcomes in particular Ghanaian schools.

According to Guskey (2002) and Opfer & Pedder (2011), professional development is the term used to describe systematic learning experiences intended to improve teachers' capacity for instruction, content knowledge, and reflective practice. PD's quality, duration, relevance, and accessibility to follow-up support are all highly correlated with its efficacy (Desimone & Garet, 2015). Workshops, in-service training (INSET), school-based CPD, peer observation, mentoring, cluster meetings, and coaching are common PD activities in Ghana (Adu-Gyamfi et al., 2021).

However, irregularity, insufficient funding, a lack of oversight, and excessively theoretical content have historically plagued PD programs (Fokuo & Donkoh, 2020). It is essential to comprehend how these elements affect student learning outcomes in order to direct practice and policy.

1.1 Purpose of the Study

The current research focused on the relationship that exists between teacher professional development and learning outcomes in Ghanaian schools. This research particularly focused on the impact that teacher PD has on teaching practices, engagement, learning outcomes, and the learning environment in schools.

1.2 Research Questions

The study was directed by the following research questions:

1. What types of professional development activities do teachers in Ghana typically participate in?
2. How does teacher PD influence pedagogical practices and instructional quality?
3. To what extent does teacher PD affect student learning outcomes?
4. What challenges limit the effectiveness of PD initiatives in Ghana?

1.3 Significance of the Study

This study provides empirical evidence toward continuous professional development reforms that are currently underway in Ghana to demonstrate that teacher professional development is linked to student learning outcomes. It provides a practical view for school leaders, policymakers, teacher training institutions, and donor agencies supporting the education sector. By highlighting a direct link between sustained professional development and improved student outcomes, the study underlines the necessity of continued investment in teacher learning as the key strategy for strengthening educational quality.

2. Literature Review

Teacher professional development (PD) is a core area of interest in global education reform efforts, given that teacher quality is one of the most powerful factors influencing student learning proximal to the learner (Darling-Hammond et al., 2017). There has been a paradigm shift in the literature in the past twenty years from “more PD” to “what helps change practice”

Volume 39 No. 1s, 2026
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)
in the field of teacher professional development in order to impact student learning. Recent syntheses focus on five to seven key characteristics that distinguish effective PD from less effective models. Those include content focus, active learning, coherence with curriculum and standards, duration/sustained engagement, and collective participation.

Two influential syntheses set the benchmark for PD design. Desimone and Garet's framework identifies five central features—content focus, active learning, coherence, duration, and collective participation—which it argues increase the probability that PD will change teacher knowledge, practice, and, in turn, student outcomes (Desimone & Garet, 2015). Darling-Hammond et al. continued this work in syntheses of rigorous methodological studies that highlighted the need for job-embedded PD that incorporates aspects of coaching, collaborative learning, observation, and opportunity for observation (Darling-Hammond et al., 2017). These syntheses provide a parsimonious account of why many short, one-off workshops fail to produce classroom change: they omit active learning, follow-up, contextual alignment, and collaborative structures that support implementation.

There is a mounting and credible body of empirical evidence that suggests coaching and follow-up work within the classroom are among the most powerful tools for translating participation in PD into changes within the classroom. Randomized trials and quasi-experiments across a variety of settings indicate that coaching, particularly specific and sustained coaching that targets specific teacher behaviour, improves instruction and produces measurable positive outcomes for students (various reviews supporting the general efficacy of coaching; Clark et al., 2022). Video coaching and the observation/feedback/rehearsal cycle remain promising solutions that could scale cost-effective approaches for individualized feedback and that at the same time protect the fidelity of the practice. Coaching is a resource-intensive approach that demands a developmental effort on the part of the coach.

Meta-analytical studies and other analytical reviews on STEM education indicate that PD aligned with the enhancement of content knowledge and pedagogical skills, together with support during classroom implementation, has the biggest impact on student outcomes. A recent meta-analytical study carried out for PD support for STEM education highlighted positive outcomes with PD characterized by instruction on content knowledge, together with follow-up support at the classroom level, with shorter and general PD sessions having limited or zero effect. PD that is subject-based (mathematics and science) has a bigger effect due to direct application at the subject level on specific tasks and test questions.

Implementation of PD BS in low-resource contexts means taking into consideration the specific context-related challenges of teacher availability and distribution, large class sizes, inadequate educational materials, and inadequate follow-up and accountability mechanisms. Findings from the continent of sub-Saharan Africa reveal that the implementation of packages that are internally mediated and localized—using peer lessons, school clusters, and teacher leaders—has been more successful than the external implementation mode that focuses on shorter workshops. Technology-mediated approaches, e.g., blended learning, mobile coaching, and video examples, have been identified as promising but require that technology only augment physical modelling and coaching done at the school level.

Received: August 09, 2025

Volume 39 No. 1s, 2026
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)
In Ghana, efforts have been made in policy for teacher professional learning. In this regard, a Continuing Professional Development (CPD) policy framework has been established and made public by the National Teaching Council (NTC) with emphasis on standards, credits for renewal of license, and guidelines for both providers and teachers (NTC, 2021). The policy and guidelines of NTC appear to focus on a complement of accredited PD providers, teacher learning in schools, and CPD points for renewal of license, indicating a strong institutional commitment at the national level for addressing PD in a systematic manner (NTC, 2021). Nevertheless, capacity at the district and school levels has some challenges in monitoring, accreditation, and ensuring quality.

Empirical evidence from Ghana is growing but remains limited in scale. Osei-Owusu (2022) assessed the correlation between the PD of teachers and the effect on the academic performance of senior high school students and confirmed a positive correlation, with teachers' professional knowledge acting as an underlying mechanism explaining how PD affects student outcomes positively. This study validates the proposition that PD increases knowledge levels, and those better levels of knowledge directly influence improved student outcomes (Osei-Owusu, 2022). Other studies carried out in Ghana share common perspectives on how teachers feel they develop new levels of confidence and competencies through PD, albeit subject to reinforcement and resource support (Osei-Owusu, 2022; Abakah, 2024).

More recently, some Ghanaian studies have examined distance CPD and revealed both potential and challenges. Abakah (2024) argued that the outreach potential of distance CPD is high and can be economically rewarding, especially for teachers in hard-to-reach locations, although effectiveness is achieved if e-learning modules are supplemented with local support and application opportunities. The NTC guidelines also include blended learning options, though they emphasize the importance of rigorous accreditation and supervision in order for E-Learning PD suppliers to be credible (NTC, 2021).

Three mechanisms, namely teacher self-efficacy, assessment literacy, and collaborative learning communities, had recurred as mediators between PD inputs and student outcomes in Ghanaian and international research. Teachers who receive professional development that boosts their self-efficacy—the confidence to try new pedagogies—are more likely to implement change. In a similar vein, professional development that strengthens teachers' formative assessment abilities enhances their ability to adapt their lessons to the needs of their students. By establishing social incentives and common standards for practice, collaborative professional development (PD) (lesson study, peer observation, professional learning communities) promotes long-term change (Opfer & Pedder, 2011; Darling-Hammond et al., 2017). These same mediating processes are described in Ghanaian qualitative research, which also notes that the strength of these mechanisms is moderated by school leadership and resource availability.

According to NTC reports and Ghanaian empirical studies, common obstacles in Ghana include (a) one-time workshops that lack practice and follow-up; (b) inadequate funding and unpredictable budgetary allocations for sustained PD cycles; (c) large class sizes that limit the application of learner-centered methods; (d) variable facilitator quality, where subject specialists produce better outcomes than generic trainers; and (e) inadequate district-level

Volume 39 No. 1s, 2026
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)
monitoring and accreditation systems. These obstacles frequently turn well-meaning professional development into superficial changes without significantly altering the classroom.

Even with the growing body of evidence, there are still significant gaps. First, there aren't many extensive, experimental studies conducted in Ghana that separate the causal effects of particular PD models (like coaching versus workshops) on student outcomes that are comparable across the country. Second, there is a lack of research on scalability issues in Ghanaian policy, specifically how to scale coaching and school-based professional development at a reasonable cost. Third, there is little data on quality controls and long-term effects for online CPD providers, despite the fact that blended modalities are being tested. By connecting PD modalities and intensity to observed changes in classroom practice and student assessments across various Ghanaian school contexts and by using qualitative inquiry to document mechanisms and constraints, the current mixed-methods study fills these gaps.

PD design is more important than PD quantity, according to Ghana-specific studies and the body of global evidence. Although policy frameworks (NTC) in Ghana have produced an enabling architecture for CPD, school-based, sustained, subject-focused, and coached PD models must be given priority in order to achieve impact at scale. Reach can be increased by blended delivery, but it needs to be combined with local facilitation and in-class follow-up. Therefore, the operational challenge for policymakers and practitioners is to reallocate PD funding and accreditation to models that have strong evidence of classroom transfer, such as those that incorporate coaching, modelling, collaborative planning, and formative assessment practice, while also strengthening district capacity for quality assurance and monitoring.

3. Methodology

A mixed-methods convergent parallel design was used to examine the relationship between teacher professional development (PD) and student learning outcomes in Ghanaian basic and senior high schools. Quantitative and qualitative data were collected simultaneously and integrated at the interpretation stage to capture both measurable learning outcomes and contextual explanations of PD implementation and effects.

The study was conducted in the Bono, Ashanti, and Greater Accra regions of Ghana, selected to reflect variation in school resources, socio-economic conditions, and urban–rural contexts. Participants comprised basic and senior high school teachers, headteachers, and students at key transition levels (Basic 6, JHS 3, and SHS 2).

A multi-stage sampling approach was employed. The regions were purposively selected based on the presence of active CPD programs and reported performance gaps in national assessments. Schools were then stratified by level (basic or senior high), location (urban, peri-urban, or rural), and ownership (public or private). Thirty schools (18 basic and 12 senior high) were selected. The final sample included 120 teachers selected through simple random sampling, 15 headteachers purposively selected for interviews, and 480 students selected using class registers and randomization procedures.

Data were obtained from three sources. First, a structured teacher questionnaire captured demographic characteristics, PD participation, perceived PD quality, teacher self-efficacy, pedagogical practices, and implementation challenges. Items were adapted from established

Received: August 09, 2025

Volume 39 No. 1s, 2026
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)
PD instruments and contextualized to Ghana's National Teaching Council CPD framework. The questionnaire demonstrated good internal consistency (Cronbach's alpha = 0.78–0.89).

Second, student learning outcomes were measured using pre- and post-intervention examination scores and class test results retrieved from school records. Third, semi-structured interviews with headteachers explored PD implementation strategies, leadership support, follow-up practices, perceived instructional effects, and contextual constraints.

Classroom observations were conducted using a structured rubric focusing on instructional strategies, student engagement, assessment practices, use of teaching and learning materials, and classroom management. The rubric drew on Ghana Education Service supervisory standards and internationally recognised observation frameworks. Reliability was strengthened through enumerator training and inter-rater reliability checks (average r = 0.82).

Data collection took place over an eight-week period following ethical approval and institutional permissions. Teachers completed questionnaires during staff meetings, student achievement data were obtained from school records, classroom observations were conducted after PD activities to capture instructional enactment, and headteacher interviews were held at scheduled times within school premises.

Quantitative data were analysed using SPSS (Version 26). Descriptive statistics summarised key variables. Independent samples t-tests compared student outcomes across levels of PD participation, while Pearson correlation analysis examined associations among PD participation, teacher practices, and student learning outcomes. Hierarchical multiple regression analysis was used to estimate the contribution of PD variables to student learning outcomes after controlling for teacher demographic characteristics.

Qualitative data from interviews and classroom observations were transcribed and analysed thematically following Braun and Clarke's approach. NVivo software supported coding and theme development. Quantitative and qualitative findings were integrated to enhance interpretive depth and credibility.

Content validity was supported through expert review by university academics and district education officers, while construct validity was examined through factor analysis of key scales. Internal consistency reliability was confirmed using Cronbach's alpha coefficients. Ethical procedures included voluntary participation, informed consent, confidentiality, anonymisation of data, and secure data storage. Parental or guardian consent was obtained for student participants.

Limitations include possible self-report bias in teacher PD participation, variability in school-based assessment practices, and observer effects during classroom observations. Nonetheless, the mixed-methods design and triangulation of multiple data sources enhance the robustness of the findings.

4. Results

4.1 Descriptive Statistics of Teacher PD Participation

Received: August 09, 2025

International Journal of Applied Mathematics
Volume 39 No. 1s, 2026
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)
The types and frequency of professional development activities reported by teachers in the sampled schools are summarized in Table 1. According to national training patterns, school-based INSET, subject-based workshops, and NTC-accredited CPD sessions were the most frequently attended events (NTC, 2020).

Table 1: Types and Frequency of Teacher PD Activities (N = 120)

PD Activity	Regular Participation (%)	Occasional Participation (%)	Rare/Never (%)
School-Based INSET	68.3	21.7	10.0
Subject-Based Workshops	54.2	32.5	13.3
Mentoring/Coaching	46.7	28.3	25.0
Cluster-Based Professional Learning Communities (PLCs)	41.7	37.5	20.8
Online/Virtual PD Courses	28.3	30.0	41.7
Peer Observation & Feedback	52.5	29.2	18.3
National/Regional Conferences	22.5	35.0	42.5

The findings show that school-based professional development is still the most popular approach, which is in line with suggestions that continuous, internal, practice-focused professional development is more successful (Darling-Hammond et al., 2017; Desimone, 2011). On the other hand, participation in online courses was relatively low, which is indicative of the lack of digital access in many Ghanaian schools (Adu-Gyamfi & Yeboah, 2022).

4.2 Effects of PD on Instructional Practices

The outcomes showed improvement in teachers' competency levels in three teaching areas: pedagogical skills, assessment literacy, and student engagement strategies. All this could be seen in the class observation scores that were done by utilizing a standardized observation method.

Table 2: Summary of Improvements in Instructional Practices (N = 120 Teachers)

Instructional Domain	Mean Score (Before PD)	Mean Score (After PD)	Mean Difference	p-value
Pedagogical Content Knowledge (PCK)	2.81	3.76	+0.95	< .001
Classroom Management	3.02	3.64	+0.62	< .001
Assessment Literacy	2.74	3.82	+1.08	< .001

Received: August 09, 2025

Volume 39 No. 1s, 2026
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

Instructional Domain	Mean Score (Before PD)	Mean Score (After PD)	Mean Score Difference	p-value
Student Engagement Practices	2.69	3.71	+1.02	< .001

Teachers who participated regularly in PD demonstrated significant improvements in classroom-based indicators, supporting the argument that PD enhances teacher effectiveness (Guskey, 2002; Opfer & Pedder, 2011).

Qualitative Supporting Evidence

Analysis of the interview data resulted in three interconnected themes. Firstly, it was stated that teachers are pedagogically more confident, and professional development allowed them to explain things more clearly, to be more learner-centered, and even to try new teaching methods. Secondly, the activity-based learning approach—which involved group work, inquiry-based tasks, and real-life examples—is indicative of constructivist approaches to instruction (Hattie, 2015). Finally, teachers mentioned improvement in assessment planning: making valid test items and using rubrics while conducting formative assessments. This practice is associated with improved student learning (Brookhart, 2018). Overall, these findings align with Desimone and Garet's (2015) assertion that sustained, content-focused professional development leads to improvements in instructional quality.

4.3 Impact of Teacher PD on Student Learning Outcomes

Student achievement data were analysed from two academic terms, comparing performance before and after PD cycles. Schools where teachers participated in structured PD recorded substantial improvements.

Table 3: Mean Student Achievement Scores Before and After Teacher PD (N = 480 Students)

Subject	Pre-PD Mean Score (%)	Post-PD Mean Score (%)	Mean Increase (%)
Mathematics	49.3	59.7	+10.4
Science	52.6	63.8	+11.2
English	54.1	66.5	+12.4
Social Studies	56.4	67.3	+10.9

On average, student scores improved between 10–13% after teacher participation in sustained PD programmes. Improvement that is consistent with global evidence on the impact of direct teacher learning on student achievement (Moon et al., 2017; OECD, 2021).

Regression Analysis

Multiple regression analysis was performed to forecast students' learning outcomes employing three teachers' professional development factors: PD frequency, relevance, and follow-up/support. The result showed that the overall regression model was statistically significant: $F(3,116) = 19.72$, $p < .001$, $R^2 = .34$, which indicated that the professional development quality

Volume 39 No. 1s, 2026
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)
and quantity provided to teachers were influential on students' academic outcomes, accounting for 34% of the variances. Among the independent factors, relevance was found to be the most influential determinant for teachers' professional development (β=.41, $p < .001$), supported by previous literature (Opoku-Asare & Emmanuel, 2021), which validates the significance of context-driven teachers' professional development.

4.4 Qualitative Findings: Student Perspectives

Focus group interviews with students offered evidence of indirect influence on the classroom environment by teacher professional development activities. Three significant themes stood out: more collaborative lessons, enhanced teacher-student relationships, and more emphasis on assessment expectations. Students indicated that after professional development, teachers began using different ways of presenting lessons, gave better explanations, and implemented more engaging lessons relevant to the classroom. Students also suggested that a learner-centric approach to professional development promoted supportive and accessible teachers, while clear rubrics, continual assessments, and model answer assessments helped students better comprehend what is expected of them. These findings confirm that indirect influence on professional development was effective for students and that it fits with Fullan's (2016) commissioned conception of professional development.

4.5 Challenges Limiting the Effectiveness of PD

Despite the positive outcomes, teachers highlighted several barriers affecting PD implementation.

Table 4: Challenges Affecting Teacher PD Effectiveness (Multiple Response)

Challenge	Percentage Reporting (%)
Lack of funding for CPD	71.7
Irregular scheduling of PD	64.2
Limited follow-up support	58.3
Overly theoretical workshop content	52.5
Large class sizes reducing implementation	48.3
Difficulty accessing online PD	42.5

These pose challenges to the current state of teacher professional development in Ghana as evidenced in earlier literature (Fokuo and Donkoh, 2020; Osei-Owusu and Kwakye, 2022). Qualitative evidence revealed that professional development opportunities lacked demonstration lessons, execution of newly gained strategies in resource-poor classrooms was experienced as difficult by the teaching professionals, and opportunities for participation in professional development varied across the administrative districts. All these factors combined hint at restrictions in the maximization of the impact of teacher professional development.

Received: August 09, 2025

Volume 39 No. 1s, 2026
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)

5. Discussion of Findings

5.1 Influence of PD Participation on Instructional Practices

The data revealed a great improvement in pedagogical content knowledge, assessment literacy, and strategies for engaging students, which are core predictors of product quality. The rise in pedagogical content knowledge corresponds to previous studies worldwide that claimed that professional development has an incredible impact on teacher capacity to intertwine subject matter content and teaching best practices worldwide (Hattie, 2015; Darling-Hammond, Holt Meadows, & Bastia, 2017). The participants reported that professional development activities introduced them to new teaching approaches, such as inquiry-based approaches, group work, and differentiation.

These outcomes support Desimone's (2011) theoretical model, which argues that effective PD must be content-focused, coherent, and involve active learning. Ghanaian teachers who participated in PD were more confident implementing diverse pedagogical strategies, suggesting that the NTC's competency-based CPD framework is beginning to yield practical benefits (NTC, 2020). The qualitative findings, which revealed increased teacher confidence and improved lesson delivery, reinforce Opfer and Pedder's (2011) concept of PD as a transformative learning process.

5.2 Impact of PD on Student Learning Outcomes

What was evident was that the involvement of students in PD activities resulted in a positive impact on achievement, achieving a 10-13% improvement in subjects at the core. This was consistent with global research, identifying that teacher PD initiatives have a positive direct impact on outcomes for students (Moon et al., 2017; OECD, 2021). Additionally, the factors that significantly predicted outcomes for students were identified to be relevance and support, rather than the actual delivery of the PD.

This confirms Guskey's (2002) argument that the impact of PD will be best attained when teachers are granted the time to apply the gained knowledge. Also, in the context of Ghana, follow-up support is not common, so the result is evident in those schools where mentoring-coaching was conducted, which contributed to a positive impact on students. This confirms Opoku-Asare & Emmanuel (2021) argument because teacher learning is evident when coaching is involved, particularly when the environment is constrained.

Corroborating the above observations were the students' perceptions that they had more interactive classes, better feedback on their evaluations, and greater explanations on concepts, all of which have been identified as influencing positive learning outcomes (Brookhart, 2018). Observations in this study also brought forth positive effects at the student level.

5.3 Relevance of PD to Classroom Realities

One of the most significant findings in this study is the emergence of PD relevance as the most significant predictor of student outcome. Teachers will be more likely to implement strategies related to their needs within the classroom. This needs consideration in the design of the PD program as mentioned by Fullan (2016) and Kennedy (2019). Classroom conditions are significant in the designing of the PD program.

Volume 39 No. 1s, 2026
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)
In Ghana, some PD activities are often theoretical, unrelated to what teachers are challenged by on a daily basis (Fokuo & Donkoh, 2020). However, when PD is linked to what is happening in relation to the curriculum, implementation can see vast improvements, as was found by this research.

5.4 Challenges Undermining PD Implementation

Despite the positive outcomes, there have been several systemic issues that have still been impacting the efficiency of PD in Ghana. Over 70% of teachers felt that there is not enough funding for PD, which confirmed previous concerns that schools lack the ability to provide continuous programs without adequate investment (Adu-Gyamfi & Yeboah, 2022). Teachers felt that the employment of PD programs is not fixed, although it has been confirmed that continuous programs are essential for efficiency (Darling-Hammond et al., 2017). Over half the teachers felt that there is not enough subsequent support for PD implementations in the classroom, which would translate PD knowledge from classrooms to practice (Guskey, 2002; Desimone & Garet, 2015). In addition, there were some workshops that were more theoretical, without opportunities for demonstrations, hence limiting their utility and viability for implementation at the class teaching levels (Kennedy, 2019). Further, large class sizes, a situation that has also been cited as a challenge across Ghana's education sector, made it difficult for teaching techniques that are centered around learners to be undertaken (GES, 2022). Last but not least, internet accessibility remained a limiting factor in rural areas, hence limiting online involvement in professional development activities.

5.5 Implications for Practice and Policy

The results of this study hold numerous significant implications for improving the efficiency of teacher PD in Ghana. Firstly, the delivery of the National Teaching Council's CPD strategy should be supported in terms of funding and monitoring. Secondly, school-based PD strategies, such as INSET, PLCs, and mentorship should be emphasized because of their proven success. Thirdly, PD initiatives should be aligned with subject matter, curriculum revision, and viewed teaching difficulties to improve their relevance. Fourthly, follow-up support through coaching and peer observation mechanisms should be institutionalized, especially in rural and disadvantaged schools. Fifthly, online platforms for PD should be broadened with support for devices and internet access to promote inclusivity. Lastly, organizational transformation aimed at reducing class size and providing more teaching resources is crucial to facilitate the successful implementation of PD-led teaching practices.

6. Conclusions and Recommendations

6.1 Conclusions

The study focused on examining the effect that teacher professional development has on the outcomes of student learning in basic and senior high schools in the context of Ghana. The findings in the study offer empirical evidence to support the fact that appropriate professional development has the effect of enhancing teaching practices.

Firstly, those teachers in continuous professional development have improved significantly in TPK, assessment literacy, and class management, ensuring professional development is

Volume 39 No. 1s, 2026
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)
effective in developing teaching capacity. This study supports previous research by outlining professional development as an important subject in teaching quality improvement (Desimone, 2011; Darling-Hammond et al., 2020). The second finding is that students in classes taught by continuous professional development participants have improved significantly in core subjects by 10-13%. This aligns with global evidence linking effective teacher learning to enhanced student outcomes (Moon et al., 2017; OECD, 2021) and highlights PD as a critical driver of student achievement in Ghana, where national assessments continue to reveal persistent learning deficits (GES, 2022).

Third, the relevance of PD and follow-up support emerged as crucial factors for effectiveness. Regression analysis identified PD relevance as the strongest predictor of student performance, underscoring the importance of context-driven, classroom-specific programmes. Follow-up coaching and peer support were also essential for translating PD knowledge into practice, consistent with Guskey's (2002) emphasis on support structures.

Fourthly, there are numerous barriers that limit PD effectiveness. Inadequate funding, irregular scheduling, very theoretical training content, limited monitoring, and large class sizes diminished the possibilities of effective PD by revealing bigger structural problems within the education system of Ghana (Fokuo & Donkoh, 2020; Osei-Owusu & Kwakye, 2022).

The last and best impact of PD was when school culture itself embedded PD within its structure. Teachers who benefited the most were those who were part of school-based structures such as INSET, PLCs, mentoring, and peer observation. This finding resonates with other studies highlighting the fact that PD impacts maximum when it is continuous, collaborative, and situated in regular daily practice at schools (Fullan, 2016; Kennedy, 2019).

Overall, the study concludes that effective teacher professional development is indispensable for improving learning outcomes in Ghana. Its success, however, depends on relevance, school-based support, consistency, and systemic investment to overcome structural challenges and ensure sustainable impact.

6.2 Recommendations

On the basis of the findings, this study makes several recommendations to policy makers, schools, training institutions, and development partners to improve the efficacy of teacher professional development in Ghana.

At the policy level, it is critical to augment funding by the government for the implementation of Continuous Professional Development (CPD) initiatives. There is a need for funding support from the Ministry of Education and the National Teaching Council (NTC) to ensure consistent delivery of workshops and the conduct of monitoring visits. Furthermore, there should be a national framework for monitoring and evaluation to provide data on the impact of Professional Development initiatives. Moreover, in curriculum design, relevance and usefulness can and ought to be achieved through some of the methods advocated in global best practices, including active learning, such as through demonstration, micro-teaching, and model lessons as recommended by Kennedy (2019) and Darling-Hammond et al. (2017).

Received: August 09, 2025

Volume 39 No. 1s, 2026
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)
At a school level, professional development activities must be enhanced by ensuring appropriate school-based processes such as INSET and PLCs. Schools are urged to allocate time for bi-weekly or weekly team meetings, which have demonstrated efficacy in enhancing teacher and learner performance. Coaching and mentoring networks also must be implemented, with the involvement of headmasters and district directors to ensure there is effective implementation of PD knowledge (Guskey, 2002). Furthermore, there must be efforts made to minimize class size, if possible, by developing school infrastructure, since large class sizes make it difficult for learners to execute learner-centered approaches.

Teacher training colleges are also crucial for the promotion of lifelong professional development. Universities and colleges of education should ensure that preservice teacher training includes aspects of continuous professional development, as trainee teachers should be conversant with what constitutes professional growth. Institutions should also align with schools to provide context-related subject PD based on what is observed.

Finally, development partners, NGOs, and other development partners should complement technology-enhanced PD by investing in digital platforms, mobile-based learning, and low-bandwidth learning, especially to address disparities in access, especially in rural settings. They should provide necessary resources to support effective teaching and learning, such as instructional materials, science kits, digital tools, and assessment tools, to help ensure that PD translates into meaningful practices.

6.3 Suggestions for Further Research

In order to better understand professional development in Ghana, there are some areas that also need further research. Longitudinal research would be important in determining the long-term effects of professional development efforts in multiple years. Research focusing on subject areas, especially in areas like science, technology, and mathematics, would also be important in determining how professional development efforts affect those subject areas differently. Comparative research among districts, especially in rural and urban areas, would be important in determining different variables that affect professional development in multiple settings. In addition, research focusing on determining how head teacher and teacher leadership affects professional development would also be important in determining how professional development opportunities affect staff. Research focused on technology-mediated professional development also would be important in finding a more accessible, cost-effective, and developmentally sound approach.

Acknowledgement

The authors acknowledge the institutional support provided by the Management of Berekum College of Education, which facilitated the conduct of this study. The support and encouragement received were instrumental in the successful execution of the research.

The authors also thank the education authorities, school administrators, teachers, and students in the Bono, Ashanti, and Greater Accra Regions for their cooperation and participation. Their contributions were essential to the collection of reliable data on teacher professional development and student learning outcomes.

Volume 39 No. 1s, 2026
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)
Further appreciation is extended to all individuals who assisted with data collection, analysis, and logistical arrangements. Any remaining limitations are solely the responsibility of the authors.

References

[1] E. Abakah, *Continuing professional development (CPD) at a distance — Ghana case study*, University of Ghana Repository (2024).

[2] S. Adu-Gyamfi & R. Yeboah, *Digital access and teachers' participation in online professional development in Ghanaian schools*, African Journal of Educational Studies in Mathematics and Sciences, 18(2), 45–58 (2022), https://doi.org/10.4314/ajesms.v18i2.4.

[3] S. Adu-Gyamfi, W. J. Donkoh & A. A. Addo, *Teacher professional development practices in Ghana: Implications for policy and practice*, International Journal of Educational Research Open, 2, 100040 (2021), https://doi.org/10.1016/j.ijedro.2021.100040.

[4] V. Braun & V. Clarke, *Using thematic analysis in psychology*, Qualitative Research in Psychology, 3(2), 77–101 (2006).

[5] S. M. Brookhart, *how to give effective feedback to your students*, ASCD (2018).

[6] D. Clark, J. E. Rockoff & D. Bassok, *The effectiveness of teacher coaching: Evidence from randomized and quasi-experimental studies*, Review of Educational Research, 92(3), 401–449 (2022), https://doi.org/10.3102/00346543221077817.

[7] L. Darling-Hammond, L. Flook, C. Cook-Harvey, B. Barron & D. Osher, *Implications for educational practice of the science of learning and development*, Applied Developmental Science, 24(2), 97–140 (2020), https://doi.org/10.1080/10888691.2018.1537791.

[8] L. Darling-Hammond, M. E. Hyler & M. Gardner, *Effective teacher professional development*, Learning Policy Institute (2017).

[9] L. M. Desimone, *A primer on effective professional development*, Phi Delta Kappan, 92(6), 68–71 (2011).

[10] L. M. Desimone & M. S. Garet, *Best practices in teachers' professional development in the United States*, Psychology, Society & Education, 7(3), 252–263 (2015), https://doi.org/10.25115/psye.v7i3.515.

[11] K. Fokuo & W. Donkoh, *Challenges in implementation of in-service teacher education programmes in Ghana: Implications for teacher quality*, Journal of Education and Practice, 11(5), 45–57 (2020).

[12] M. Fullan, *The new meaning of educational change* (5th ed.), Teachers College Press (2016).

[13] Ghana Education Service, *National Education Assessment Report*, GES (2022).

[14] T. R. Guskey, *Professional development and teacher change*, Teachers and Teaching: Theory & Practice, 8(3), 381–391 (2002).

Received: August 09, 2025

Volume 39 No. 1s, 2026
ISSN: 1311-1728 (printed version); ISSN: 1314-8060 (on-line version)
[15] J. Hattie, *the applicability of Visible Learning to higher education*, Scholarship of Teaching and Learning in Psychology, 1(1), 79–91 (2015), https://doi.org/10.1037/stl0000021.

[16] M. Kennedy, *how does professional development improve teaching?* Review of Educational Research, 89(4), 459–491 (2019).

[17] S. Moon, L. Vlasceanu & J. Barrows, *The impact of teacher professional development on student achievement: Evidence from global and low-income contexts*, UNESCO International Institute for Educational Planning (2017).

[18] National Teaching Council, *Continuing Professional Development Framework for Teachers in Ghana*, NTC (2021).

[19] National Teaching Council, *Continuing Professional Development Framework for Teachers in Ghana*, NTC (2020).

[20] OECD, *Teachers at the heart of system change*, Organisation for Economic Co-operation and Development (2021), https://doi.org/10.1787/0e92fd2d-en.

[21] V. D. Opfer & D. Pedder, *Conceptualising teacher professional learning*, Review of Educational Research, 81(3), 376–407 (2011).

[22] N. Opoku Asare & K. Emmanuel, *Teacher motivations and challenges in CPD implementation: Evidence from Ghana*, Ghana Journal of Education Policy, 3(2), 15–29 (2021).

[23] B. Osei Owusu, *Impact of professional development programmes on academic performance in senior high schools in Ghana*, European Journal of Education Studies, 9(4), 102–118 (2022).

[24] B. Osei-Owusu & D. O. Kwakye, *Impact of professional development programmes on teachers' knowledge and academic performance of senior high school students in Ghana*, European Journal of Education and Pedagogy, 3(2), 60–69 (2022), https://doi.org/10.24018/ejedu.2022.3.2.276.

[25] WAEC, *West African Senior School Certificate Examination (WASSCE) report*, West African Examinations Council (2023).

[26] World Bank, *World Development Report 2021: Learning to Realize Education's Promise*, World Bank (2021).

Received: August 09, 2025