Teacher Professional Learning Conditions and Student Achievement in Kentucky High Schools

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Abstract

Teacher professional learning (PD) is a critical educational investment, yet its link to improved student achievement remains inconsistent. This quantitative study analyzes statewide data from 227 Kentucky high schools, utilizing teacher perceptions from the *Impact Kentucky Working Conditions Survey* and Kentucky Summative Assessments (KSA) data, to explore the relationship between professional learning conditions and student outcomes in reading and mathematics. Descriptive analysis reveals that while nearly half of high school students achieve proficiency in reading, mathematics outcomes lag, suggesting a key instructional challenge. Correlation analysis showed weak, nonsignificant associations between professional learning conditions and student achievement across the statewide sample. These findings align with the literature suggesting that the *availability* of professional learning is insufficient. We conclude that future investments must prioritize structures that support teacher enactment, collaboration, and reflection to realize meaningful gains in student outcomes.

Keywords: teacher professional learning, student achievement, working conditions, professional development

Introduction

Teacher professional learning has long been regarded as a cornerstone of educational improvement. Across the United States, policymakers, districts, and schools invest billions of dollars each year in professional development (PD; teacher professional learning, often referred to as professional development, is used synonymously throughout this study) intended to enhance teacher practice and, ultimately, student achievement (Desimone, 2009). Recent estimates suggest that districts routinely spend between 2% and 5% of their operating budgets—amounting to thousands of dollars per teacher annually—on professional learning opportunities (Darling-Hammond et al., 2017). Despite these substantial investments, questions persist about whether and how PD translates into improved student outcomes.

The stakes of this debate are particularly high given the current educational climate. Nationally, schools are grappling with teacher shortages, declining retention, and increasing demands for instructional innovation. Early-career teachers often report feeling underprepared for the complexities of contemporary classrooms (Stewart & Jansky, 2022), while veteran teachers must adapt to new standards, accountability systems, and technologies. Within this context, professional learning is expected to serve both as a mechanism for teacher support and as a lever for systemic improvement. Yet, the evidence base remains mixed: while case studies and qualitative reports highlight examples of transformative teacher growth, large-scale quantitative studies often reveal weak or inconsistent relationships between PD and student achievement (Hill et al., 2013; Yoon et al., 2007; Kennedy, 2016; Ventista, 2023; Sims et al., 2025; Lynch et al., 2025).

Federal Policy and the Expansion of Professional Development

The modern landscape of professional development in the United States has been shaped significantly by federal policy, particularly the No Child Left Behind Act (NCLB) (NCLB, 2002). NCLB required that every classroom be staffed by a "highly qualified teacher" and positioned professional development as the primary mechanism to achieve this goal. Through Title II, Part A, states and districts were allocated substantial funds that had to be directed toward "high-quality" PD. The law defined "high-quality" as sustained, intensive, classroom-focused, and content-specific learning, rather than the short-term workshops that had previously dominated professional development. Moreover, NCLB linked teacher PD directly to student achievement in tested subjects, which fueled both an expansion and a narrowing of professional learning. Districts were expected to demonstrate that PD supported gains in reading and mathematics, which encouraged alignment with state standards and assessments. At the same time, this narrowed focus often left out broader aspects of teaching, such as relationship building, social-emotional learning, or culturally responsive pedagogy.

NCLB also spurred significant research into PD effectiveness, as policymakers sought evidence that investments translated into higher student performance. Reviews such as Yoon et al. (2007) emerged directly from this accountability climate, with more recent meta-analyses (Lynch et al., 2025; Sims et al., 2025) asking whether professional development could be causally linked to student learning. Although many initiatives under NCLB fell short of their intended impact—often defaulting to compliance-driven or fragmented PD—the law nonetheless established enduring

expectations that teacher professional learning should be sustained, evidence-based, and explicitly connected to student outcomes. These expectations continue to shape how states, districts, and researchers conceptualize and evaluate professional learning today (e.g., Darling-Hammond et al., 2017; Sims et al., 2025).

Kentucky Context

Education conversations in Kentucky illustrate the tensions that have been described. The state has prioritized educator development and accountability through initiatives such as the Impact Kentucky Working Conditions Survey, which gathers teacher perceptions of professional learning opportunities, leadership, and school climate. At the same time, the Kentucky Summative Assessments (KSA) provide detailed data on student performance across reading and mathematics. These paired datasets offer a unique opportunity to examine whether the working conditions that support teacher professional learning are associated with measurable differences in student achievement outcomes. Such analysis is particularly timely as Kentucky, like many states, faces challenges of recruiting and retaining qualified teachers, especially in high-poverty and rural schools. Few studies have analyzed paired statewide teacher working condition data and student outcome data at this scale.

Understanding the relationship between teacher professional learning conditions and student outcomes is thus both a state and national priority. If professional development is to fulfill its promise as a mechanism for educational improvement, policymakers and practitioners need evidence not only about whether PD "works," but also about the conditions under which it supports student learning. Research shows that professional learning that is sustained, job-embedded, and aligned with teacher and student needs holds the greatest promise (Darling-Hammond et al., 2017; Desimone, 2009). Yet, much of what is offered to teachers remains fragmented, short-term, and disconnected from classroom practice (Yoon et al., 2007).

This study analyzes statewide data from 227 Kentucky high schools to explore the relationship between four teacher professional learning working-condition variables— (1) the perceived value of opportunities, (2) opportunities to explore new ideas, (3) learning new teaching strategies, and (4) overall professional learning—and student achievement outcomes in reading and mathematics. By situating Kentucky findings within the broader national and international literature, this study seeks to illuminate both the potential and the limitations of quantitative measures (Ventista, 2023; Sims et al., 2025) of professional learning, and to raise critical questions about how teacher development can best be structured to support student achievement in an era of heightened accountability and persistent workforce challenges.

Literature Review

The assumption that stronger professional development (PD) should translate into higher student achievement seems straightforward. Yet reviews consistently reveal a more complicated reality (Ventista, 2023; Filderman et al., 2025; Lynch et al., 2025). For example, Yoon and colleagues (2007) examined more than 1,300 studies across reading, mathematics, and science according to the What Works Clearinghouse standards. What Works Clearinghouse is an initiative by the U.S. Department of Education's Institute of Education Sciences to evaluate the reliability of educational research. This standard requires studies to have a strong research design, comparable groups, valid

outcomes, low attrition, and a clear description of the PD studied. This is no small threshold to meet these requirements, and Yoon and colleagues (2007) only found nine that met this strict standard. In those nine studies, intensive PD averaging 49 hours produced substantial gains that showed students performed about 21 percentile points higher than control groups. PD experiences of fewer than 14 hours showed no significant effect. This points to the potential for improved student learning outcomes from sustained, content-focused professional learning, but there is little evidence of this occurring in the literature.

Even when PD improves teacher knowledge, the link to student learning outcomes often remains far off. Hill et al. (2013) noted that despite decades of policy investment, much PD research yields weak or null effects, a pattern confirmed in (Ventista, 2023; Rice et al., 2024), because of short study windows, inadequate fidelity of implementation, and limited measures of teacher practice. Garet et al. (2016) offered a striking illustration: their large-scale randomized trial of a content-intensive mathematics PD program improved teachers' knowledge and even certain instructional practices, yet it failed to generate measurable gains in student achievement. Kennedy (2016) complicates this picture by showing that design features like duration or coaching, while often emphasized, are not reliable predictors of effectiveness. Instead, the critical factor is how PD helps teachers enact new ideas within the complex "noise" of classroom practice. Teachers may learn new approaches in workshops, but entrenched routines, competing demands, and the problem of enactment often blunt their translation into classroom change.

Characteristics of Effective Professional Development

Although impact studies like the ones discussed previously are inconsistent as to the effectiveness of teacher PD on student learning outcomes, there is a broad consensus among researchers regarding the features that make PD effective. Desimone (2009) articulated a framework for effective PD as including the following components: content-focused, including active learning, coherence, collective participation, and duration, principles that continue to receive empirical support in recent meta-analyses (Filderman et al., 2025; Rice et al., 2024; Lynch et al., 2025). Darling-Hammond et al. (2017) examined 35 studies of teacher PD that showed a positive outcome across PD, classroom practices, and student outcomes, and subsequent meta-analytic work reinforcing these findings (Sims et al., 2025; Ventista, 2023). From these studies, they identified seven elements that were consistently associated with positive teacher and student outcomes: content focus, active learning, collaboration, modeling of practice, coaching and expert support, feedback and reflection, and sustained duration. Other large-scale survey evidence supports these principles. Garet et al. (2001) found that PD emphasizing content knowledge, active learning, and coherence with broader instructional goals was most strongly linked to positive teacher outcomes. Cordingley et al. (2015) concluded that sustained, collaborative, and subject-specific PD is most effective.

One of the clearest ideas presented in the literature is the inadequacy of short-term or one-off workshops. Yoon et al. (2007) noted that studies providing fewer than 14 hours of PD produced no significant effects. Darling-Hammond et al. (2017) similarly critiqued the prevalence of "drive-by" workshops in U.S. schools and highlighted

job-embedded, collaborative PD as more effective alternatives.

Professional Development as a Cognitive and Contextual Process

While much of the literature previously discussed emphasizes structural features of effective professional development, Kennedy (2016) offers a critical reappraisal of these assumptions. In her review of 28 experimental and quasi-experimental PD studies, Kennedy concluded that these commonly cited design elements did not reliably predict whether PD improved student learning outcomes. PD initiatives that adhered closely to these frameworks were just as likely to show null effects as positive ones. Kennedy argued that the critical factor in whether PD is effective or not is how it supports teachers in enacting new ideas within the constraints and complexities of classroom life (Lynch et al, 2025). Recent work (Sims et al., 2025) similarly emphasizes that the quality of enactment mediates PD effects more than duration or format. Prescriptive PD models, which present teachers with discrete strategies to adopt, often falter because they fail to address the persistent dilemmas teachers face—managing competing instructional goals, balancing classroom management with engagement, or adapting strategies for diverse learners. PD that encouraged teachers to reason about problems of practice, make principled instructional decisions, and integrate new ideas into their existing systems of practice showed stronger promise for improving student outcomes.

Opfer and Pedder (2011) conceptualize teacher learning as a systemic process influenced by individual beliefs, school culture, and policy environments. From this perspective, professional development cannot be divorced from the conditions under which teachers work. Timperley et al. (2007) emphasize that when PD is organized around collective inquiry into student learning, supported by leadership and aligned with school priorities, it can foster cultural change that extends beyond individual teachers. Case studies such as Polly and Hannafin's (2011) also demonstrated how learner-centered PD can shift teacher beliefs and classroom practices, even when standardized test outcomes remain unchanged, consistent with recent meta-analytic findings showing stronger effects on teacher outcomes than student test scores (Rice et al., 2024). Cordingley et al. (2015) likewise document how collaborative, practice-based PD improves not only teaching but also coherence across grade levels and schools. Yet, scaling such approaches remains challenging, particularly in resource-constrained systems.

Taken together, these studies reveal why measuring the impact of PD on student achievement is elusive. Teacher learning needs, cognition, the school context, and systemic supports determine whether professional learning translates into classroom practice. Because of this, teachers may report opportunities to explore ideas or learn new strategies, but the impact on student achievement depends on whether these opportunities align with their needs, beliefs, and instructional practices. Therefore, buying into or actively developing new ways of thinking about teaching acquired through PD experiences is one of the few ways teachers can exercise agency in contemporary contexts, and as such, there is a mixed bag of results that show PD may or may not lead towards improvements in student learning. Recent large-scale meta-analyses continue to document these mixed effects while providing greater precision about conditions under which PD succeeds (Lynch et al., 2025; Sims et al., 2025).

Research Questions

The guiding question for this research was "Which types of professional learning for teachers influence student achievement?" The following specific research questions sought to identify the linear relationship between four different working conditions predictor variables and four student achievement outcomes:

1. How do Kentucky high schools compare statewide in reading and mathematics proficiency based on a comparative analysis of descriptive statistics?
2. How do Kentucky high school statewide data describe professional learning conditions related to the value of opportunities, exploration of new ideas, and development of new teaching strategies through comparative descriptive analysis?
3. To what extent are teacher working conditions, such as value of opportunities, opportunities to explore new ideas, and learning new teaching strategies, associated with student achievement in reading and mathematics across Kentucky high schools, according to statewide correlations?

Answering these questions will provide useful information for current and aspiring teachers, school and district leaders, local boards of education, teacher preparation colleges and universities, state legislatures and other education advocacy or authorizing bodies, in Kentucky, from where the data were collected, and across the nation, where documented concerns about teacher shortages, professional learning, and community support threaten the availability and preparation of school teachers. Though there is an impressive collection of research on professional learning opportunities for teachers, there is little recent quantitative research on the relationship between working conditions predictor variables and student achievement, in the Commonwealth of Kentucky or elsewhere.

Methodology

The *Impact Kentucky Working Conditions Survey* asked educators to reflect on the PD opportunities available to them and the extent to which these experiences influenced their teaching. Specifically, teachers were asked to evaluate the value of PD, the opportunity to explore new ideas, and the usefulness of learning new strategies. These prompts align with a growing body of research emphasizing that PD's effectiveness depends not only on its availability but on how teachers process and enact new learning within their specific instructional contexts.

This quantitative research study analyzes multiple working conditions variables of teacher professional learning to determine the extent to which they correlate with student achievement in the areas of high school reading and mathematics as measured by the Kentucky Summative Assessments (KSA). The quantitative research uses the Pearson correlation coefficients to measure the linear relationship, including both direction and degree, between four different working conditions predictor variables and four student achievement outcomes.

For each of the predictor variables and student achievement outcomes, data from 227 Kentucky public high schools were used. The data were extant in nature and collected from multiple "open house" websites hosted by the Kentucky Department of Education (KDE). Unless indicated otherwise, the data comes from the 2023-2024 school year. The researchers assumed the data were reported in

accordance with KDE guidelines and were thus accurate.

Findings and Analysis

The following sections present a comprehensive analysis of student achievement outcomes and professional learning working conditions across Kentucky high schools during the 2023–2024 academic year. First, descriptive statistics are used to summarize statewide student performance in reading and mathematics (See Table 2), including variability in novice and proficient/distinguished achievement levels. The performance levels used in Kentucky's state assessment system are novice, apprentice, proficient, and distinguished. This is in order of increasing performance level. Next, teacher perceptions of professional learning conditions are examined using statewide survey data (See Table 3). Finally, correlations are reported between professional learning conditions and student outcomes at the statewide level (See Table 4) to explore potential correlations between teachers' professional learning environments and student academic performance. Collectively, these analyses provide a multidimensional perspective on the relationships among working conditions, professional learning, and student achievement in Kentucky high schools.

Student Contextual Data Comparisons

Incorporating data from the Kentucky School Report Card Dashboard for the 2023-2024 school year (Kentucky Department of Education, 2025), Table 1 provides context for several student data categories. Data are shown for all high schools in the state of Kentucky (N=227).

Table 1

Kentucky High Schools (N = 227) Statewide Student Contextual Data (2023-2024)

Student Data Category	KY
Enrollment	206,096
% White	70.7
% Black	10.9
% Hispanic	10.8
% Annual Average Daily Attendance	92.3
% Economically Disadvantaged	57.1
% English Language Learner (ELL)	7.8
% Individual Education Plans (IEP)	18.2
% 4-Year Graduation Rate	92.3

During the reporting year, Kentucky public high schools enrolled a total of 206,096 students. The racial and ethnic composition of the student population was predominantly White (70.7%), with smaller proportions of Black (10.9%) and Hispanic (10.8%) students. The state's Annual Average Daily Attendance rate was 92.3%, indicating consistent student participation across schools. More than half of Kentucky's students (57.1%) were identified as economically disadvantaged, reflecting substantial socioeconomic diversity within the student body. Additionally, 7.8% of students were classified as English

Language Learners (ELL), and 18.2% received services through Individualized Education Plans (IEPs), highlighting the presence of varied instructional and support needs. Kentucky's 4-year high school graduation rate stood at 92.3%, demonstrating relatively strong completion outcomes in comparison to national averages (Kentucky Department of Education, 2025). Collectively, these data provide an overview of the demographic composition, economic context, and educational performance indicators of the state's K–12 student population.

Student Achievement Data

Like many states, Kentucky uses numerous methods to measure student achievement. To meet federal and state testing requirements, students take the Kentucky Summative Assessments (KSA). Classroom teachers in Kentucky develop these assessments, which align with the Kentucky Academic Standards. The KSA is an annual summative assessment and measures proficiency on content standards. The content standards in Kentucky create goals identifying what all students should know and be able to do. The KSA is an online assessment that includes extended response and technology-enhanced items for students to demonstrate critical thinking and problem-solving skills. Guidance from the KDE Associate Commissioner in the Office of Assessment and Accountability (OAA) indicated that the best data to use for this research was the percentage of students scoring proficient or distinguished, and the percentage of students scoring novice, in the areas of reading and math (R. Sims, personal communication, April 26, 2023).

For KSA, students receive a performance level (distinguished, proficient, apprentice, or novice). Performance levels are descriptive, differ by content area, and indicate performance on groups of items that measure similar skills (Kentucky Department of Education, 2025). The performance levels for reading (assessed in grade 10) are as follows:

- Distinguished: A student performing at the Distinguished performance level for grade 10 Reading can read closely to provide an in-depth analysis of the author's choices. The student consistently cites relevant and thorough evidence to support analysis of how themes, central ideas, and elements are developed over the course of texts. The student can develop sophisticated analyses of how authors create and use effects, such as word choice, structure, point of view, and perspective and rhetoric, within texts in order to impact the reader and/or audience. The student will also critically analyze a subject across diverse media and how the author draws on and transforms source material in their work.
- Proficient: A student performing at the Proficient performance level for grade 10 Reading can read closely to analyze the author's choices. The student can cite relevant and thorough evidence to support analysis of how themes, central ideas, and elements are developed over the course of texts. The student can develop basic analyses of how authors create and use effects, such as word choice, structure, point of view, and perspective and rhetoric, within texts in order to impact the reader and/or audience. The student will also demonstrate the ability to analyze a subject across diverse media and how the author draws on and transforms source material in their work.

- Novice: A student performing at the Novice performance level for grade 10 Reading demonstrates minimal ability to read and analyze the author's choices. The student inconsistently cites relevant evidence to support analysis of how themes, central ideas, and elements are developed over the course of texts. The student displays minimal understanding of how authors create and use effects, such as word choice, structure, point of view, and perspective and rhetoric, within texts, and is unable to analyze how they impact the reader and/or audience. The student is rarely able to identify a subject across two diverse media and how the author draws on and transforms source material in their work.

The performance levels for mathematics (assessed in grade 10) are as follows:

- Distinguished: A student performing at the Distinguished performance level for grade 10 Mathematics consistently makes sense of quantities and their relationships in problem situations. The student routinely demonstrates the ability to flexibly choose among methods and strategies to solve contextual and mathematical problems, understand and explain their approaches, and produce accurate answers efficiently. The student effectively interprets mathematical relationships. The student is adept at identifying key features and applying correspondences between multiple representations, such as equations, verbal descriptions, tables, and graphs.
- Proficient: A student performing at the Proficient performance level for grade 10 Mathematics often makes sense of quantities and their relationships in problem situations. The student usually demonstrates the ability to flexibly choose among methods and strategies to solve contextual and mathematical problems, understand and explain their approaches, and produce accurate answers efficiently. The student generally interprets mathematical relationships. The student reasonably identifies key features and applies correspondences between multiple representations, such as equations, verbal descriptions, tables, and graphs.
- Novice: A student performing at the Novice performance level for grade 10 Mathematics displays little understanding of how to make sense of quantities and their relationships in problem situations. The student rarely demonstrates the ability to flexibly choose among methods and strategies to solve contextual and mathematical problems, understand and explain their approaches, and produce accurate answers efficiently. The student interprets mathematical relationships ineffectively or inaccurately. The student minimally or inappropriately attempts to identify key features and apply correspondences between multiple representations, such as equations, verbal descriptions, tables, and graphs.

All Kentucky High School Data

The following table provides context for several student achievement indicators using data from the Kentucky School Report Card Dashboard for the 2023-2024 school year (Kentucky Department of Education, 2024). Data are shown for all high schools in the state of Kentucky (See Table 2).

Table 2

Kentucky High Schools (N = 227) Student Achievement Variables Descriptive Statistics (2023-2024)

Student Achievement Indicator	M	SD	Min	Max	CV
Reading Novice %	26.52	10.18	5	66	38.39
Reading Proficient & Distinguished %	47.03	12.30	5	73	26.15
Mathematics Novice %	33.34	10.51	5	73	31.52
Mathematics Proficient & Distinguished %	36.38	12.84	5	81	35.29

For all Kentucky high schools, the mean for Reading Novice percentage is 26.52, with a standard deviation of 10.18. The minimum Reading Novice percentage is 5.0, and the maximum Reading Novice percentage is 66.0. The coefficient of variance is 38.39. The mean Reading Proficient and Distinguished percentage is 47.03, with a standard deviation of 12.30. The minimum Reading Proficient and Distinguished percentage is 5.0, and the maximum Reading Proficient and Distinguished percentage is 73.0. The coefficient of variance is 26.15.

For all Kentucky high schools, the mean for the Mathematics Novice percentage is 33.34, with a standard deviation of 10.51. The minimum Mathematics Novice percentage is 5.0, and the maximum Mathematics Novice percentage is 73.0. The coefficient of variance is 31.52. The mean Mathematics Proficient and Distinguished percentage is 36.38, with a standard deviation of 12.84. The minimum Mathematics Proficient and Distinguished percentage is 5.0, and the maximum Mathematics Proficient and Distinguished percentage is 81.0. The coefficient of variance is 35.29.

Analysis

The results indicate that while nearly half of Kentucky high school students met proficiency or distinguished benchmarks in reading, mathematics outcomes lagged, with approximately one-third of students performing at the novice level and only slightly more than one-third achieving proficiency or higher. The disparity between reading and mathematics suggests that mathematics achievement may present greater instructional challenges at the high school level, consistent with broader national trends in secondary education performance.

Limitations

Several limitations should be acknowledged. First, the data represent a single academic year and therefore cannot capture trends over time. Second, results are descriptive and do not establish causal relationships between school-level factors and student outcomes. Finally, factors such as student demographics, teacher quality, and socioeconomic conditions were not

included in this analysis but may substantially influence achievement results.

Implications for Practice

These findings suggest several implications for educational practice. First, the higher percentage of novice students in mathematics indicates a pressing need for targeted interventions in this subject area, such as enhanced instructional supports, tutoring, and teacher professional development in math pedagogy. Second, schools demonstrating stronger outcomes may serve as exemplars, providing insight into effective practices that could be adapted in lower-performing schools. Finally, school and district leaders should closely monitor student achievement patterns at both the aggregate and school levels to identify achievement gaps and allocate resources strategically.

Working Conditions Descriptive Statistics

Table 3 provides context for three working conditions indicators (and the Professional Learning Topic Total) using data from the Impact Kentucky Working Conditions Survey (Panorama, 2024) for the 2023-2024 school year. Data are shown for all high schools in the state of Kentucky.

Table 3

Kentucky High Schools (N = 227) Working Conditions Descriptive Statistics – Professional Learning (2023-2024) (Percent Favorable Responses)

Working Conditions Indicator	M	SD	Min	Max	CV
Value of Opportunities	56.93	17.09	11	97	30.02
Opportunities to Explore New Ideas	47.01	16.48	13	100	35.06
Learning New Teaching Strategies	62.34	14.22	25	94	22.01
Professional Learning (Topic Total)	54.88	14.16	21	97	25.01

For all Kentucky high schools, the mean for Value of Opportunities favorable response percentage is 56.93, with a standard deviation of 17.09. The minimum Value of Opportunities favorable response percentage is 11.0, and the maximum Value of Opportunities favorable response percentage is 97.0. The coefficient of variance is 30.02. For all Kentucky high schools, the mean for Opportunities to Explore New Ideas' favorable response percentage is 47.01, with a standard deviation of 16.48. The minimum Opportunities to Explore New Ideas favorable response percentage is 13.0, and the maximum Opportunities to Explore New Ideas favorable response percentage is 100.0. The coefficient of variance is 35.06.

For all Kentucky high schools, the mean for Learning New Teaching Strategies' favorable response percentage is 62.34, with a standard deviation of 14.22. The minimum Learning New Teaching Strategies favorable response percentage is 25.0, and the maximum Learning New Teaching Strategies favorable response percentage is 94.0. The coefficient of variance is 22.01. For all Kentucky high schools, the mean for Professional Learning (topic total) favorable response percentage is 54.88, with a standard deviation of 14.16. The minimum Professional Learning (topic total) favorable response percentage is 21.0, and the maximum Professional Learning (topic total) favorable response percentage is 97.0. The coefficient of variance is 25.01.

Analysis

The results indicate that while professional learning opportunities are moderately favorable across Kentucky high schools, important disparities exist both statewide and at the school level. The relatively higher endorsement of learning new teaching strategies suggests that professional development activities are perceived as practical and applicable. However, the lower scores for opportunities to explore new ideas highlight a potential gap in fostering innovation and teacher agency in shaping their professional growth.

Limitations

Several limitations should be considered when interpreting these findings. First, the data rely on self-reported survey responses, which may be influenced by individual perceptions or biases. Second, while the statewide sample provides robust descriptive information, it limits generalizability to other locations. The descriptive nature of the analysis also precludes establishing causal relationships between professional learning conditions and teacher or student outcomes.

Implications for Practice

The findings suggest several implications for practice. District and school leaders should consider prioritizing professional learning structures that encourage teacher innovation and exploration of new ideas, which received the lowest ratings. Efforts to increase teacher voice and choice in professional development planning may enhance engagement and effectiveness. Tailored support for schools with consistently low ratings may also be necessary to reduce disparities and promote equity in teacher development opportunities.

Professional Learning and Student Achievement Correlations

Creswell (2019) defines correlation coefficients between .20 and .35 as “slightly statistically significant” and correlation coefficients between .35 and .65 as “statistically significant.” Additionally, correlation coefficients between 0.0 and .29 are considered “weak”, correlation coefficients between .30 and .49 are considered “moderate”, and correlation coefficients between .50 and .79 are considered "strong." Only two of the 16 correlations were greater than or equal to $r(225) = .20$, $p < .05$. Although slightly statistically significant, these data provide only limited predictive qualities. Table 4 displays the Pearson correlations between four professional learning working condition variables and four student achievement outcomes among Kentucky high schools (N = 227). The correlations ranged from $r(225) = .06$, $p < .05$ to $r(225) = .27$, $p < .05$. Although several positive associations were observed, none of the correlations reached statistical significance at the $p < .05$ level.

Table 4

Kentucky High Schools (N = 227) Pearson's Correlations Between Professional Learning Working Conditions and Student Achievement Variables

Working Conditions Favorable Response	Reading Novice	Reading Prof/Dist	Math Novice	Math Prof/Dist
Value of Opportunities	.21	.14	.06	.08
Opportunities to Explore New Ideas	.27	.19	.06	.06
Learning New Teaching Strategies	.19	.17	.11	.09
Professional Learning (Topic Total)	.22	.15	.07	.08

Note. None were statistically significant at $p < .05$

A Pearson correlation coefficient was computed to assess the linear relationship between the value of opportunities and student achievement. There was a weak, positive correlation between the two variables, ranging from $r(225) = .06$, $p > .05$ to $r(225) = .21$, $p > .05$.

A Pearson correlation coefficient was computed to assess the linear relationship between opportunities to explore new ideas and student achievement. There was a weak, positive correlation between the two variables, ranging from $r(225) = .06$, $p > .05$ to $r(225) = .27$, $p > .05$.

A Pearson correlation coefficient was computed to assess the linear relationship between learning new teaching strategies and student achievement. There was a weak, positive correlation between the two variables, ranging from $r(225) = .09$, $p > .05$ to $r(225) = .19$, $p > .05$.

A Pearson correlation coefficient was computed to assess the linear relationship between professional learning and student achievement. There was a weak, positive correlation between the two variables, ranging from $r(225) = .07$, $p > .05$ to $r(225) = .22$, $p > .05$.

Analysis

The findings indicate that, at the statewide level, professional learning conditions show limited associations with student achievement outcomes. The weak and nonsignificant correlations suggest that teacher perceptions of professional learning may not directly translate into measurable differences in student performance across large populations. This result is consistent with prior research noting that broad survey measures of professional development often fail to capture the nuanced qualities of effective learning opportunities.

Limitations

Several limitations warrant consideration. First, the statewide correlations are based on perceptual survey data, which may not fully reflect the actual quality of professional learning experiences. Second, all analyses were correlational, precluding causal inference. Finally, none of the relationships reached statistical significance, underscoring the need for caution in interpretation.

Implications for Practice

Despite the nonsignificant findings, district leaders and school administrators should consider investing in professional learning opportunities that emphasize

innovation, teacher collaboration, and the acquisition of new instructional strategies. These elements showed the strongest alignment with student performance indicators in the smaller sample. Furthermore, targeted examination of high-performing schools may yield practical insights into how professional learning conditions can be structured to support student success.

Summary of Findings and Analysis

Analysis of 2023-2024 statewide data revealed that Kentucky high school students perform moderately well in reading but continue to struggle in mathematics, with a substantial proportion scoring at the novice level. Considerable variability exists across schools, suggesting that local context plays an important role in shaping student achievement outcomes. Future research should explore longitudinal patterns and investigate the influence of school- and community-level factors on performance to inform evidence-based strategies for improving achievement across Kentucky high schools.

Overall, professional learning conditions in Kentucky high schools during the 2023–2024 academic year were rated as moderately favorable, with particular strengths in learning new teaching strategies and notable weaknesses in fostering opportunities for innovation. Statewide analyses highlight substantial variability across schools, pointing to the importance of local context in shaping teacher experiences. Future research should explore the connections between professional learning conditions, teacher retention, and student outcomes to further understand the impact of professional development environments in K–12 education.

Lastly, the analysis of professional learning conditions across Kentucky high schools revealed weak and nonsignificant associations with student achievement at the statewide level. These findings highlight the complexity of linking teacher professional development experiences to student outcomes, as well as the importance of examining local contexts more closely. Future research should employ larger samples with multilevel or longitudinal designs to better understand how professional learning conditions influence student achievement.

Discussion

Findings from the Kentucky data reflect both the promise and limitations of current PD approaches. Simply providing opportunities is insufficient. Kentucky districts may need to invest in structures—such as collaborative studies or teacher action research—that help teachers discover and enact new ideas. Consistent with national trends, correlations between PD working conditions and student achievement were weak (Ventista, 2023; Sims et al., 2025). However, this does not suggest that professional learning is unimportant. Rather, it underscores the need to attend more closely to PD's design, duration, and contextual fit.

This study highlights the need for mixed-methods research that goes beyond checklist-style evaluations of PD. Future studies should explore how teachers interpret, adapt, and sustain new practices in ways that support student learning. For policymakers, the implication is clear: investments in PD must be accompanied by structures that support enactment—such as collaborative inquiry and time for reflection—if they are to yield meaningful improvements in student outcomes.

This study offers important insights into the relationship between teacher professional learning conditions and student achievement, but several limitations must be acknowledged. First, the use of survey-based measures from the *Impact Kentucky*

Working Conditions Survey captures teacher perceptions of PD opportunities but does not assess the quality, depth, or enactment of those experiences. As Kennedy (2016) argues, the availability of PD is not sufficient; its impact depends on how teachers integrate new learning into their instructional reasoning and practice.

Second, the correlational nature of the analysis limits causal inference. While associations between PD conditions and student achievement were examined, it is not possible to determine whether PD directly influenced student outcomes, or whether other mediating factors—such as school leadership, curriculum alignment, or teacher collaboration—played a role. Additionally, the Kentucky Summative Assessment (KSA) data reflect performance in tested subjects only, which may not capture broader instructional impacts of PD, such as improvements in engagement, equity, or social-emotional learning.

Third, the exploratory dataset used to examine nonlinear or context-specific associations was limited in size and scope. While it provided valuable insights, its findings should be interpreted cautiously and warrant further investigation through larger, more diverse samples.

Finally, the study did not include qualitative data, such as teacher interviews or classroom observations, which could have enriched the understanding of how PD is experienced and enacted in practice.

Conclusion

This study contributes to ongoing conversations about the role of professional development in supporting student achievement by analyzing statewide data from Kentucky high schools. While the correlations between PD working conditions and student outcomes were modest, the findings align with national research suggesting that PD's effectiveness depends not only on its design but also on its enactment within complex instructional contexts (Kennedy, 2016; Lynch et al., 2025; Sims et al., 2025). The literature reviewed underscores that PD must be sustained, job-embedded, and responsive to teacher and student needs to yield meaningful change. Yet, as Kennedy (2016) and others have shown, even well-designed PD may falter if it does not support teachers in reasoning through and adapting new practices to their classrooms. The Kentucky data reflect this tension: teachers report opportunities to learn and explore, but without deeper support for enactment, the impact on student achievement remains limited.

For policymakers, the implication is clear: improving PD is not just about offering more opportunities, but about ensuring teachers have the time, trust, and collaborative structures to enact what they learn. Future efforts must move beyond surface-level evaluations of PD availability and toward deeper inquiry into how professional learning transforms instructional practice. Mixed-methods research, longitudinal studies, and context-sensitive designs are needed to capture the full arc of teacher learning and its impact on students. In an era of heightened accountability and persistent workforce challenges, understanding how to design and support effective PD is not just a research priority—it is a moral and educational imperative.

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