PRINCIPALS' PROVISION OF TEACHER PROFESSIONAL DEVELOPMENT AND STUDENTS' ACADEMIC PERFORMANCE IN MATHEMATICS IN PUBLIC SECONDARY SCHOOLS IN KILUNGU SUB-COUNTY, KENYA

Colleta Ngami Kumonya.
Masters of Education in Administration, Machakos University, Kenya.
Prof. Kimiti Richard Peter.
Department of Education Management and Curriculum Studies, Machakos University, Kenya.
Dr. Francis Mutua.
Department of Educational Communications and Technology and Early Childhood Education, Machakos University, Kenya.

International Academic Journal of Social Sciences and Education (IAJSSE) | ISSN 2518-2412

Received: 26th July 2025

Published: 4th August 2025

Full Length Research

Available Online at: https://iajournals.org/articles/iajsse_v2_i4_186_204.pdf

Citation: Kumonya, C. K., Kimiti, R. P., Mutua, F. (2025). Principals' provision of teacher professional development and students' academic performance in mathematics in public secondary schools in Kilungu Sub-County, Kenya. *International Academic Journal of Social Sciences and Education (IAJSSE), 2*(4), 186-204.

ABSTRACT

Kilungu Sub-County in Kenya has faced ongoing challenges in improving students' performance in Mathematics. Despite various educational reforms, students continue to struggle with understanding mathematical concepts, leading to underperformance. This study sought to examine the role of principals' provision of teacher professional development in enhancing students' academic performance in Mathematics in public secondary schools within the sub-county. Guided by instructional leadership theory, the study used a correlational research design, involving 20 public secondary schools in Kilungu Sub-County. The study used a target population of 20 principals, 66 Mathematics teachers, and 800 students. A stratified random sampling method was used to select six schools, and simple random sampling was used to select 21 Mathematics teachers and 249 Form Three students. Data were collected through questionnaires for teachers and students, and interviews for principals. The qualitative data were analyzed using content analysis. Statistical tests, including Chi-Square analysis, were used to assess the relationships between principals' teacher professional development and students' academic performance in Mathematics. The study found a significant link between principals' provision of teacher professional development and students' academic performance in Mathematics. Principals who actively supported and facilitated professional development opportunities for Mathematics teachers contributed to improved teaching practices, which in turn positively affected student performance. The study concluded that providing teachers with targeted professional development opportunities, such as workshops, seminars, and continuous learning programs, is critical for enhancing teaching quality and fostering better student engagement in Mathematics. The study recommended that principals prioritize professional development initiatives tailored to teachers' needs, particularly in Mathematics, and support a sustained culture of learning. It also emphasized the importance of integrating teacher professional development with the broader educational goals of the school to improve academic outcomes.

Keywords: Principals' Provision Of Teacher Professional Development, Instructional Leadership, Mathematics Education, Student Academic Performance, Teacher Development, Public Secondary Schools, Kilungu Sub-County

INTRODUCTION

In the field of educational leadership, the role of school principals is crucial in shaping the academic outcomes of students. This is particularly relevant in the context of Mathematics education, where student performance often reflects broader educational challenges.

Research has consistently shown that principals who are actively engaged in instructional leadership practices, such as the provision of Teacher Professional Development (TPD), can improve teaching effectiveness and student outcomes (Grissom, Egalite, & Lindsay, 2021). Principals who prioritize TPD create a culture of continuous learning among teachers, which is essential for fostering high academic standards and student success.

Effective instructional leadership is centered on practices such as the provision of professional development opportunities for teachers. Principals who prioritize TPD not only foster professional growth but also ensure that teachers are well-equipped with the knowledge and skills needed to effectively teach their students. This is particularly important in subjects like Mathematics, where changing curricula and pedagogical strategies require teachers to stay updated with new developments. When principals support TPD, they directly contribute to improved instructional strategies, which in turn positively influence student academic performance.

In the context of Kilungu Sub-County, where students' academic performance in Mathematics has been a persistent concern, the role of principals in providing TPD has become more critical. Despite several interventions and educational reforms, data from the Kenya Certificate of Secondary Education (KCSE) between 2019 and 2023 reveal that only 35% of students in Kilungu Sub-County achieved a grade of C+ or higher in Mathematics, compared to the national average of 50% (Ministry of Education, Kenya, 2023). This performance gap underscores the need for effective TPD programs led by principals to enhance teaching practices and ultimately improve student achievement.

The provision of TPD not only benefits teachers by enhancing their teaching methodologies but also helps principals in strengthening their leadership in instructional practices. TPD allows principals to guide teachers in developing strategies that are aligned with curriculum objectives, while also ensuring that teachers receive ongoing support to address any teaching challenges. In the African context, studies in countries like South Africa and Nigeria have highlighted the positive impact of principals' involvement in teacher development, linking it to improved student outcomes, particularly in subjects like Mathematics (Naicker & Mestry, 2019; Alimi, Ehinola, & Alabi, 2021).

Kenya has also recognized the importance of TPD in its national education policies. Recent studies indicate that schools with principals who actively support teacher development through workshops, seminars, and other training programs tend to see better student outcomes. For example, research by Nyagosia, Waweru, and Njuguna (2020) found a positive correlation between principals' support of TPD and student performance in national examinations, underscoring the importance of leadership that prioritizes continuous teacher development.

In Kilungu Sub-County, there is a clear need for more focused teacher professional development to address the challenges faced by teachers in improving Mathematics

performance. The region's schools face numerous obstacles such as insufficient resources, inadequate teacher training, and varying levels of instructional leadership, all of which contribute to lower academic outcomes. Studies such as that by Muthama and Mativo (2022) have shown that schools where principals are engaged in TPD initiatives report significant improvements in student performance. This highlights the importance of principals not only in supervising instructional practices but also in leading professional development programs that are critical to improving the quality of teaching and learning in Mathematics.

This study aims to examine the role of principals in providing TPD and its effect on student academic performance in Mathematics in Kilungu Sub-County, Makueni County. By focusing on how principals facilitate professional development opportunities, the research will provide insights into how instructional leadership can be strengthened to improve student outcomes in this critical subject.

Statement of the Problem

Effective instructional leadership is crucial for improving the quality of education and enhancing student academic performance. Principals, as key instructional leaders, are tasked with overseeing and guiding instructional practices, including monitoring professional records, conducting classroom visitations, and providing teacher professional development (TPD). Research has demonstrated that these leadership practices are positively associated with improved teaching methods and better student outcomes, particularly in subjects like Mathematics (Grissom, Egalite, & Lindsay, 2021; Robinson & Gray, 2019). However, despite the recognized benefits of these practices, there remains a significant gap in understanding how specific supervisory practices, particularly the provision of TPD, impact students' academic performance in Mathematics at the secondary school level.

In Kenya, although several studies have explored the broader concepts of educational leadership, there is a lack of research specifically addressing the effect of principals' instructional supervision—especially the provision of TPD—on students' Mathematics achievement. This gap in subject-specific research, particularly within the context of Mathematics education, represents a crucial area that has not been fully explored. While instructional leadership practices have been examined in general terms, there is limited focus on how principals' actions in supervising professional development programs for teachers directly affect student performance in Mathematics. Moreover, much of the existing literature tends to focus on quantitative data, which often overlooks the rich, qualitative insights from teachers and students on the effectiveness of principals' instructional supervision practices.

Empirical studies conducted in Kenya, such as those by Nyagosia, Waweru, and Njuguna (2020), and in other regions like Nigeria (Alimi, Ehinola, and Alabi, 2021), have explored broader aspects of instructional leadership. However, these studies do not provide in-depth insights into how principals' specific supervisory practices, particularly the provision of TPD, contribute to improving student performance in Mathematics. This gap in the literature

highlights the need for a more focused exploration of the role principals play in fostering teacher development and how this, in turn, influences student outcomes in Mathematics. This study aims to fill this gap by providing empirical evidence on the specific effect of principals' provision of TPD on students' academic performance in Mathematics in Kilungu Sub-County, Makueni County. By focusing on how principals support and facilitate teacher professional development, this research seeks to contribute valuable insights into how instructional leadership can be enhanced to improve student performance in Mathematics.

Theoretical Framework

Instructional leadership theory, initially developed by Leithwood and Hallinger (1993), posits that effective school leadership is central to improving teaching practices and student learning outcomes. At the core of this theory is the role of principals as instructional leaders who are not merely administrative figures but active participants in shaping instructional practices to ensure that high academic standards are met. They are expected to set clear instructional goals, provide the necessary resources, and engage with teachers in professional development to achieve these objectives (Leithwood & Riehl, 2005). Instructional leadership involves principals' active involvement in curriculum development, supervising teaching practices, promoting professional learning communities, and using data to inform decisions that support teaching and learning.

A central tenet of instructional leadership theory is that principals should not only oversee instructional practices but actively shape and guide them to enhance educational outcomes. This includes providing teachers with the resources, support, and ongoing professional development they need to meet academic standards (Leithwood, Harris, & Hopkins, 2008). Principals who adopt this leadership style are often seen as "lead learners" because they engage in continuous professional learning and work collaboratively with teachers to enhance their instructional practices (Robinson, Lloyd, & Rowe, 2008). In this context, principals play a crucial role in fostering an environment where teacher professional development (TPD) is prioritized, ensuring that teachers have opportunities for continuous growth and learning.

In the context of this study, principals' provision of TPD aligns directly with instructional leadership theory. By actively supporting teacher development, principals not only improve teaching practices but also enhance overall student outcomes, particularly in subjects like Mathematics, where updated pedagogical techniques and subject-specific knowledge are crucial. The theory highlights the importance of principals in facilitating and organizing professional development opportunities for teachers, helping them stay current with new instructional strategies and content knowledge, which ultimately leads to better teaching quality and improved student performance (Kilag & Sasan, 2023).

While instructional leadership theory traditionally emphasizes the role of the principal in shaping instructional practices, it has been critiqued for focusing primarily on the principal as the sole leader in schools, sometimes neglecting the collaborative nature of instructional

leadership. In many schools, the responsibility for teacher professional development is shared across multiple school leaders, including department heads, instructional coordinators, and teacher leaders (Gronn, 2003). This shared approach is particularly relevant in secondary schools, where subject-specific leadership, such as that provided by Mathematics department heads, plays a crucial role in the professional growth of teachers and the quality of instruction.

Recent developments in the theory have led to the concept of shared instructional leadership, where leadership responsibilities are distributed among various school leaders. This model recognizes that principals, along with other instructional leaders, collaborate to improve teaching practices and student outcomes (Harris, 2008). In the case of Mathematics education, where specialized knowledge is essential, the leadership of department heads is critical in providing targeted support and professional development for teachers. This shared leadership model highlights the importance of creating a collaborative environment where all educators contribute to improving instructional quality, particularly through the provision of professional development.

For this study, instructional leadership theory provides a solid framework for understanding the relationship between principals' provision of TPD and students' academic performance in Mathematics. By focusing on the role of principals in providing opportunities for teacher development, this study explores how principals' leadership practices directly impact the quality of teaching and, ultimately, the academic success of students in Mathematics in Kilungu Sub-County, Kenya.

This study expands on the traditional view of instructional leadership by considering the contributions of other school leaders, such as heads of departments, who are crucial in supporting teacher development in subject-specific areas like Mathematics. The leadership provided by department heads, along with that of the principal, ensures that teachers are equipped with the necessary skills and knowledge to effectively teach the subject. Thus, this study incorporates the shared leadership model, recognizing the contributions of all school leaders in fostering an environment of continuous professional development.

Moreover, the study acknowledges the critique of focusing solely on the principal as the central figure in instructional leadership. While principals set the overall vision for instructional practices, the successful implementation of TPD often depends on the contributions of other leaders within the school. By considering both individual and collective leadership efforts, this study provides a more comprehensive understanding of how principals' provision of TPD, supported by other leaders, influences student academic performance in Mathematics.

In conclusion, instructional leadership theory serves as an effective lens through which to explore the relationship between principals' provision of teacher professional development and student academic outcomes. By incorporating shared leadership and recognizing the

roles of other school leaders, this study aims to offer a broader understanding of how leadership practices, particularly in the area of teacher development, contribute to the improvement of academic performance. By examining the practices of principals and other leaders, this research seeks to contribute to the existing body of knowledge on educational leadership and the role of professional development in improving student outcomes, specifically within the context of Mathematics education.

Empirical Review

Teacher professional development (TPD) has become an essential element of educational improvement, particularly in enhancing instructional practices and improving student academic performance. The role of principals in facilitating TPD has been widely recognized as a key component of effective instructional leadership. Research shows that when principals prioritize and actively support professional development initiatives, teachers are better equipped with the skills and knowledge required to meet the needs of diverse students, ultimately leading to improved student outcomes in subjects like Mathematics.

Darling-Hammond, Hyler, and Gardner (2020) assert that principals who prioritize professional development create a culture of continuous learning that leads to improved teaching practices. In the case of Mathematics, where instructional rigor and clarity are critical, TPD ensures that teachers remain current with new teaching methods, technological tools, and pedagogical strategies. Principals who facilitate access to high-quality professional development opportunities ensure that their teachers are well-prepared to deliver effective lessons, thus directly impacting student performance in Mathematics.

Desimone and Garet (2015) highlight the importance of the quality of TPD, emphasizing that professional development programs must be relevant, sustained, and collaborative. Programs that are directly aligned with teachers' instructional needs and that span over a longer period are more likely to bring about lasting changes in teaching practices. For Mathematics educators, TPD focused on content-specific pedagogy and innovative teaching strategies is particularly effective in improving student outcomes. Principals who identify and provide access to such tailored professional development opportunities are pivotal in elevating the quality of instruction and subsequently enhancing student performance.

The collaborative aspect of TPD is also a significant contributor to its effectiveness. Sun, Penuel, and Frank (2020) argue that when principals encourage collaboration among teachers through professional learning communities (PLCs), a shared culture of learning and collective responsibility emerges. This collaborative environment allows teachers to exchange best practices, provide peer coaching, and share strategies for teaching complex concepts. In Mathematics, where teachers often face challenges explaining difficult concepts, the ability to collaborate with peers helps refine teaching methods and improves students' understanding. Killion (2020) adds that such collaborative practices in TPD programs provide Mathematics teachers with opportunities to experiment with new

approaches, such as technology integration, which enhances student engagement and conceptual understanding.

Principals' active participation in the planning and execution of TPD initiatives also contributes significantly to their effectiveness. Kraft and Blazar (2018) found that when principals are directly involved in TPD, these programs are more likely to align with the school's instructional priorities and broader improvement goals. For Mathematics, this could mean focusing TPD efforts on enhancing teachers' problem-solving skills, improving their use of instructional technologies, or refining their teaching of abstract topics like algebra or calculus. Principals who work closely with teachers to tailor TPD to address specific instructional challenges ensure that the professional development initiatives are meaningful and impactful.

Sebastian, Allensworth, and Huang (2019) emphasize that principals who actively support and encourage teacher participation in professional development are likely to see higher levels of teacher engagement and better teaching outcomes. Principals can support TPD by offering time during the school day for training, providing financial resources for external training, and recognizing teachers' efforts. In the context of Mathematics, where keeping up with evolving teaching strategies and curricular updates is essential, principals who show commitment to teacher growth create an environment where teachers are motivated to continuously enhance their skills. Guskey and Yoon (2020) argue that TPD that is intensive, ongoing, and linked to classroom practice is most effective in improving both teaching and student outcomes.

Sustained professional development has lasting effects on both teachers and students. Guskey and Yoon (2020) underscore the importance of continuous and practical professional development that allows teachers to apply new strategies and reflect on their effectiveness. By creating an environment of ongoing learning, principals ensure that teachers continue to grow and improve their instructional practices. This, in turn, contributes to better student outcomes in Mathematics, particularly as teachers become more adept at handling complex instructional challenges.

The integration of technology in professional development is another aspect that enhances its effectiveness. According to Brown, Benson, and Stein (2021), digital platforms for TPD offer teachers access to instructional resources, webinars, and expert-led discussions, which are invaluable for updating their teaching practices. Principals who encourage the use of technology in TPD not only support the teachers' development but also promote the use of technological tools in the classroom, which is increasingly important in modern education. This dual approach helps teachers become more skilled in using digital tools to support student learning, leading to improved academic performance in Mathematics.

Research on the impact of teacher professional development and principals' involvement in it has shown that it plays a crucial role in improving teaching quality and student

achievement. Studies have consistently found that principals who actively engage in TPD initiatives and encourage teacher collaboration contribute to better academic outcomes for students, particularly in subjects like Mathematics. By focusing on the specific needs of teachers and promoting a culture of continuous learning, principals can drive instructional improvement and enhance student performance across their schools.

RESEARCH METHODOLOGY

The study employed a mixed-methods research design combining both quantitative and qualitative approaches to explore how principals' provision of teacher professional development (TPD) impacts students' academic performance in Mathematics. A correlational research design was used, which helps in identifying the degree of association between the independent variable (principals' provision of TPD) and the dependent variable (students' performance in Mathematics). This design allowed the researcher to assess relationships without manipulating the variables.

The target population for this study comprised 20 public secondary schools of Kilungu Sub-County, Makueni County, Kenya. The units of observation for this study was 886 respondents comprising of (20) principals, (66) Mathematics teachers, and (800) Form Three students. To select a representative sample, a multi-stage sampling technique was used. Initially, simple random sampling was applied to select six schools from three divisions within the sub-county. Principals were selected through purposive sampling to ensure that those with relevant instructional leadership experience were included, while simple random sampling was used to select Mathematics teachers and Form Three students. The total sample size for the study was 276 respondents, calculated using Yamane's simplified formula for finite populations. The breakdown of the sample included 249 Form Three students, 21 Mathematics teachers, and 6 principals.

Data collection was conducted using questionnaires and interviews. Quantitative data, gathered through structured questionnaires administered to students and teachers, were analyzed using statistical tools like correlation analysis. Qualitative data, obtained from interviews with principals, added depth to the findings, providing insights into their experiences and perceptions of instructional leadership, which helped contextualize the quantitative results.

Content analysis was used to analyze the qualitative data from the interviews. The data was then presented in a narrative format. Quantitative data was analyzed using the Statistical Package for Social Sciences (SPSS Version 28.0). To make data entry easier, questions were coded, and all completed questionnaires were referred to. Descriptive statistics, including mean, frequency, standard deviation, and percentages, was used to profile sample characteristics and major patterns emerging from the data. To facilitate this, a Likert Scale was used to enable easier presentation and interpretation of data. The data was presented in tables. Statistical tests, including Chi-Square analysis, were used to assess the relationships between principals' TPD and students' academic performance in Mathematics.

RESEARCH FINDINGS

Response Rate

The study employed three data collection instruments targeting different respondent categories: questionnaires for Mathematics teachers and Form Three students, and interview guides for school principals. The instruments were administered across 6 public secondary schools selected using stratified random sampling within Kilungu Sub-County. Of the total intended sample size of 276 respondents, the study achieved the following response rates:

Table 1: Response Rate

Respondent Group	Sample Size	Responses Received	Response Rate (%)
Form Three Students	249	186	74.7%
Mathematics Teachers	21	16	76.2%
School Principals	6	5	83.3%
Total respondents	**276**	**207**	**75.0%**

These rates fall within the acceptable threshold for social science research. According to Heeringa et al. (2017), a response rate of 70% and above is considered adequate for reliable data analysis and interpretation. The strong response was attributed to proactive follow-up, school-level coordination, and assurance of confidentiality, which encouraged respondent participation.

Provision of Teacher Professional Development and Students' Academic Performance in Mathematics

The study sought to establish the effect of principals' provision of teacher professional development on students' academic performance in Mathematics in public secondary schools in Kilungu Sub-County, Kenya. Students were asked to share their perceptions on how teacher professional development. The results are presented in Table 2.

Table 2: Students' Responses on Provision of Teacher Professional Development

Statement	Mean	Std. Dev.
The principal arranges for teachers to attend training sessions to improve their teaching skills.	4.344	0.691
I have seen improvements in how teachers teach after attending training sessions arranged by the principal.	4.125	0.754
The principal's support for teacher training helps us learn better.	4.281	0.709
Teachers use new methods they learn in training to help us understand better.	4.062	0.782
I appreciate when the principal recognizes teachers who work hard to improve through training.	4.000	0.805
The principal's support for teacher training makes our school a better place to learn.	4.188	0.728

Students agreed most strongly that the principal's support for teacher training directly helps them learn better (M = 4.281), and that organizing training opportunities is a regular practice (M = 4.344). This demonstrates a perceived link between well-supported teachers and enhanced academic outcomes in Mathematics. According to Darling-Hammond, Hyler, and Gardner (2020), when principals prioritize and support teacher learning, instructional quality improves—leading to stronger student performance.

Additionally, students agreed that teachers improve after attending principal-organized training (M = 4.125), and that those improvements translate into the use of better teaching methods (M = 4.062). These views highlight the effectiveness of continuous learning in promoting responsive, student-centered instruction. Desimone and Garet (2015) emphasized that effective professional development must be tailored to the needs of teachers and extend over time. Students' perception that new methods are applied in class implies that training is not only attended but also translated into classroom practice, confirming the real-world relevance of those sessions.

Further, students appreciated principals who recognize teachers' efforts in self-improvement (M = 4.000), and believed that such support contributed to a better school environment overall (M = 4.188). This suggests that students not only value the academic outcomes of professional development, but also the broader culture of respect and growth it fosters. The importance of leadership recognition, as highlighted by Sun, Penuel, and Frank (2020), is also evident in student agreement with the statement about principals acknowledging teachers who improve through training. This recognition likely fosters a culture of motivation and continuous improvement. Also, the belief that principal-supported training improves the learning environment aligns with Guskey and Yoon (2020), who argue that impactful professional development is directly linked to better student outcomes and a more cohesive school climate.

Teachers were asked to rate their level of agreement with statements about the principals' provision of teacher professional development. Their responses are presented in in Table 3.

Table 3: Teachers' Responses on Provision of Teacher Professional Development

Statement	Mean	Std. Dev.
The principal prioritizes teacher professional development within the school's budget and resources.	4.219	0.681
The principal offers a variety of professional development opportunities tailored to teacher needs.	3.875	0.722
The principal actively sought feedback from teachers to inform professional development initiatives.	3.531	0.764
The principal supports teachers in implementing new skills and strategies learned through professional development.	4.000	0.705
The principal fosters a culture of continuous learning and growth among staff.	3.344	0.803
The principal recognizes and celebrates teacher achievements and contributions to professional development.	3.750	0.759

The results in Table 3 indicated that teachers agreed that principals prioritize professional development within the school's budget and resources (M = 4.219), and that they support teachers in applying new skills gained from training (M = 4.000). Darling-Hammond, Hyler, and Gardner (2020) noted that impactful professional development is not just about access, but also sustained implementation and alignment with school goals.

Respondents also agreed that a range of training opportunities are provided (M = 3.875), and that teachers' efforts in professional development are recognized (M = 3.750).

Moreover, Sebastian et al. (2019) emphasized the role of leadership in celebrating growth and fostering motivation suggesting that teachers feel their efforts are valued — an important factor in promoting continuous engagement. However, the mean for *"The principal actively sought feedback from teachers to inform professional development initiatives"* was lower (M = 3.531). Desimone and Garet (2015) highlighted the importance of tailoring TPD to actual teacher needs which could reduce the relevance and impact of training activities.

The statement that fell into the "Neutral" range was *"The principal fosters a culture of continuous learning and growth among staff"* (M = 3.344). This implies that while individual efforts are recognized, the systemic and sustained promotion of continuous learning might be lacking or inconsistently implemented across schools. However, the relatively lower score for fostering a culture of continuous learning echoes concerns raised by Sun, Penuel, and Frank (2020), who emphasized that TPD must be embedded in a school-wide learning environment. This disconnect suggests that while training events may occur, they are not always followed by collaborative reflection, experimentation, or peer learning — all of which are crucial for lasting instructional change.

Interviews with principals provided additional perspectives on how they support teacher professional development and its influence on student performance in Mathematics. Most principals affirmed that organizing or facilitating teacher training was a key responsibility. One principal stated:

"We regularly arrange in-service training sessions for Mathematics teachers, especially during holidays. We invite facilitators from the county office or use experienced staff to lead internal workshops."

This response indicates structured and recurring efforts to build teacher capacity, particularly through external expertise and peer learning. It also aligns with the quantitative finding that most teachers agree their principals provide a range of professional development opportunities. Another principal emphasized the strategic nature of the training:

"Before planning any training, I meet with department heads to identify gaps. Sometimes it's classroom management, sometimes it's about how to break down difficult Maths concepts. We want every training to be purposeful."

This quote reflects a data-informed and needs-based approach to professional development. It also reinforces the teacher survey item regarding feedback being used to inform TPD planning, which had a moderate mean score of 3.531. While some principals do integrate teacher voice, this is not yet a universal practice. The importance of implementation support was also noted:

"After training, I do follow-up classroom visits to see if teachers are applying what they learned. If not, I ask why. Sometimes they need more support, or the training wasn't practical enough."

This insight directly supports the teacher data, where respondents agreed that principals assist them in applying new skills (M = 4.000). It suggests that where instructional leadership is strong, it involves a cycle of training, application, and feedback. However, one principal candidly shared a challenge:

"The biggest problem is funding. Sometimes we can only train a few teachers at a time, or we depend on donor programs. Without sustained financial support, TPD becomes inconsistent."

This aligns with broader educational concerns regarding the sustainability of TPD efforts. Although prioritization exists, as indicated by the highest teacher mean score (M = 4.219), resource constraints remain a significant barrier. Another theme was recognition and teacher motivation. One principal remarked:

"I always recognize teachers who take initiative — whether it's attending training or mentoring others. We even mention it during staff meetings. It encourages others to step up too."

Students' Academic Performance in Mathematics

This section presents an analysis of students' self-reported academic behaviors and perceptions related to Mathematics performance. Students were asked to indicate their level of agreement with statements on students' academic performance in Mathematics in public secondary schools in Kilungu Sub-County, Kenya. Table 4 presents the findings.

Table 4: Students' Responses on Academic Performance in Mathematics

Statement	Mean	Std. Dev.
I feel confident in my ability to understand and apply mathematical concepts.	4.062	0.728
I actively engage in class activities and discussions related to Mathematics.	3.969	0.799
I consistently complete my Mathematics assignments and homework on time.	3.875	0.856
I seek help from my teacher or peers when I encounter difficulties with Mathematics.	4.094	0.782
I perform well on Mathematics assessments, including tests and quizzes.	3.844	0.821
I am motivated to improve my skills and knowledge in Mathematics.	4.219	0.691

Students expressed the agreement with being motivated to improve their Mathematics skills and knowledge (M = 4.219), suggesting high intrinsic motivation—a critical factor for success in this subject. The student-reported motivation and engagement reflect the theoretical perspective of Grissom, Egalite, and Lindsay (2021), who found that principals' leadership practices shape school climate, which in turn impacts student attitudes and

confidence. The present findings suggest that students are learning in environments where instructional supervision and teacher support encourage proactive learning.

They also reported strong tendencies to seek help when needed (M = 4.094), and to feel confident in understanding mathematical concepts (M = 4.062). Sebastian et al. (2019) emphasize that students' academic outcomes are influenced not just by instructional quality but also by student behaviors such as help-seeking, participation, and motivation. The high scores on items related to these behaviors align with the notion that instructional supervision—when effective—supports a conducive environment for such traits to flourish. Moderate agreement was noted for completing assignments on time (M = 3.875) and engaging in class activities (M = 3.969), suggesting generally good but not optimal academic discipline and participation. Additionally, the fact that students agree they seek help and feel confident is consistent with Leithwood, Harris, and Hopkins (2020), who argue that effective school leadership builds not only teacher quality but also student autonomy and academic perseverance—especially in challenging subjects like Mathematics.

The lowest score—though still within agreement—was for performance on assessments (M = 3.844), hinting at a possible gap between effort and actual academic outcomes, or the challenges posed by summative evaluations in Mathematics. Also, the findings support Hallinger, Wang, and Chen's (2019) assertion that instructional improvements must be coupled with formative assessment strategies to ensure that gains in learning behaviors translate into measurable academic results.

Teachers were asked to assess student academic outcomes in Mathematics. Their responses provide a complementary perspective to the students' self-assessments. Table 5 summarizes their feedback.

Table 5: Teachers' Responses on Students' Academic Performance in Mathematics

Statement	Mean	Std. Dev.
I observe that my students demonstrate confidence in their ability to understand and apply mathematical concepts.	3.812	0.733
I notice active participation from my students in class activities and discussions related to Mathematics.	3.688	0.801
My students consistently submit their Mathematics assignments and homework on time.	3.500	0.822
I observe that my students proactively seek help when they encounter difficulties with Mathematics.	3.938	0.768
Based on assessments, including tests and quizzes, I perceive that my students perform well in Mathematics.	3.625	0.794
I see that my students exhibit motivation and eagerness to improve their skills and knowledge in Mathematics.	3.875	0.729

Teachers agreed that students proactively seek help when they encounter challenges in Mathematics (M = 3.938), and that students exhibit motivation and eagerness to improve their skills (M = 3.875). These findings are consistent with Fuller and Hollingworth (2019) emphasized the importance of data-informed instructional supervision, suggesting that when principals engage in monitoring and support, students show increased engagement and confidence.

Confidence in understanding mathematical concepts (M = 3.812) and participation in class (M = 3.688) also received positive evaluations, reflecting students' willingness to engage and apply themselves during lessons. Further, Sebastian et al. (2019) highlighted that sustained instructional leadership contributes to school cultures where students feel empowered and supported. The relatively high ratings for confidence and motivation reflect such an environment, even though assessments and homework consistency lag slightly behind.

Teachers agreed, albeit at the threshold (M = 3.500), that students consistently complete their assignments on time, which could point to issues like homework management, competing responsibilities, or varying levels of self-discipline among learners. Similarly, the mean for student performance on assessments (M = 3.625) was lower than motivation or help-seeking, reinforcing a subtle but important pattern seen in student responses — that effort and engagement may not fully translate into top-tier assessment outcomes. The observed gap between student motivation and actual performance supports the findings of Hallinger, Wang, and Chen (2019), who warned that improvements in instructional leadership must be matched with adequate feedback and differentiation strategies if they are to impact summative performance metrics. Also, the combination of agreement on proactive behaviors and the slight decline in academic outcome indicators reflects the view of Leithwood, Harris, and Hopkins (2020): that leadership must go beyond support to include clear academic goal-setting and individualized interventions — particularly crucial in technical subjects like Mathematics.

Chi-Square Analysis

This section presents the results of the Chi-square test used to determine the statistically significant association between principals' provision of teacher professional development and students' academic performance in Mathematics in public secondary schools in Kilungu Sub-County. The study focused on the provision of teacher professional development as the independent variable, with students' academic performance in Mathematics as the dependent variable, categorized as low, moderate, or high. The results are summarized in Table 6.

Table 6: Chi-Square Test Results on the Association Between Principals' Provision of Teacher Professional Development and Student Academic Performance

Supervisory Practice		Chi-Square Statistic	Degrees of Freedom (df)	p-Value
Teacher Development	Professional	19.782	4	0.0031

The Chi-square test results indicate a statistically significant association between the provision of teacher professional development by principals and students' academic performance in Mathematics. The Chi-square value of $\chi^2(4) = 19.782$ with a p-value of 0.0031 highlights that when principals actively support and facilitate professional development opportunities for teachers—such as workshops, seminars, and continuous learning opportunities—it leads to better student outcomes. This reinforces the critical role that professional development plays in enhancing teaching quality, directly benefiting students' understanding and performance in Mathematics.

This result confirms that the provision of teacher professional development is a vital element of instructional leadership that has a positive impact on student performance, underlining its importance as a key area for principals to focus on in their efforts to improve educational outcomes.

Conclusions

The study concluded that the provision of teacher professional development is a critical factor in enhancing students' academic performance, particularly in Mathematics. Principals who actively engage in organizing and facilitating professional development opportunities for teachers directly contribute to improving teaching practices, which positively affect student engagement and comprehension. By prioritizing professional growth, principals ensure that teachers stay current with evolving educational practices, which enhances the overall quality of instruction. However, for professional development to be truly effective, it must be based on the actual needs of teachers and should be supported by a continuous culture of learning. This ensures that the development initiatives are meaningful and lead to lasting improvements in teaching quality.

Additionally, the study emphasized the importance of instructional leadership in improving academic outcomes. Principals who regularly monitor and support teachers' instructional practices help ensure better lesson delivery and improve student understanding, particularly in subjects like Mathematics. However, the study also highlighted that principals often face competing administrative demands, which can limit their focus on instructional leadership. A greater emphasis on collaboration with teachers and the establishment of consistent instructional standards could further enhance their leadership effectiveness.

Recommendations

Based on the study's findings, it was recommended that principals should intensify their provision of teacher professional development. This should include regular, targeted training that addresses specific instructional challenges and is informed by teachers' feedback. Professional development programs should be aligned with curriculum goals, particularly in Mathematics, and should foster a sustained culture of learning. Furthermore, principals should ensure that these programs are not isolated events but are ongoing and directly related to teachers' classroom practices.

To further support teachers, principals are advised to not only engage in classroom visitations but also establish follow-up feedback mechanisms. These could include reflective discussions, coaching, or peer mentoring, which would help teachers to continuously improve their practices. This approach would transform classroom visitations from simple monitoring exercises into developmental opportunities for teachers.

Another important recommendation is for principals to adopt a more collaborative approach to instructional leadership. Principals should engage teachers in shared planning and regular departmental reviews, creating a culture of collaboration that promotes consistency in teaching standards. This collaboration should be formalized through professional learning communities, where teachers can exchange ideas, share best practices, and support each other in improving their instructional strategies.

Additionally, it is recommended that education stakeholders, including the Ministry of Education and school boards, allocate specific budgets for professional development, particularly for subjects like Mathematics. Principals should work closely with teachers to gather feedback and ensure that the professional development programs are tailored to their specific needs, thus enhancing the relevance and effectiveness of the initiatives.

Given the administrative challenges faced by principals, it is also recommended that policymakers consider providing leadership development programs for principals to help them balance their administrative duties with their instructional leadership responsibilities. Some administrative tasks should be delegated to other staff members, enabling principals to focus more on guiding teachers and improving student outcomes.

Lastly, the establishment of recognition systems within schools is encouraged. Recognizing the efforts of both teachers and students in improving academic outcomes can reinforce a culture of excellence and motivate all stakeholders to take an active role in the teaching-learning process. By acknowledging progress and professional growth, schools can foster a sense of pride and accountability in the educational process, further contributing to improved academic performance in Mathematics.

REFERENCES

Alimi, O. S., Ehinola, G. B., & Alabi, F. O. (2021). Principals' instructional leadership and students' academic performance in public secondary schools in Nigeria. *Journal of Educational Management*, 19(2), 55-70.

Brown, K., Benson, G., & Stein, M. (2021). Enhancing classroom observation through technology: Implications for instructional leadership. *Journal of Educational Administration*, 59(4), 529-548.

Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2020). *Effective teacher professional development*. Palo Alto, CA: Learning Policy Institute.

Desimone, L. M., & Garet, M. S. (2015). Best practices in teachers' professional development in the United States. *Psychology, Society, & Education*, 7(3), 252-263.

Fuller, C., & Hollingworth, S. (2019). The role of principals in data-driven decision making in schools. *Educational Management, Administration & Leadership*, 47(6), 891-910.

Grissom, J. A., Egalite, A. J., & Lindsay, C. A. (2021). How principals affect students and schools: A systematic synthesis of two decades of research. *Educational Researcher*, 50(9), 612-628.

Gronn, P. (2003). *The new work of educational leaders: Changing leadership practice in an era of school reform*. London: Paul Chapman Publishing.

Guskey, T. R., & Yoon, K. S. (2020). What works in professional development. *Phi Delta Kappan*, 81(7), 748-750.

Harris, A. (2008). Distributed leadership: The role of the headteacher in leading school improvement. *School Leadership & Management*, 28(3), 205-221.

Heeringa, S. G., West, B. T., Heeringa, S. G., & Berglund, P. A. (2017). *Applied survey data analysis*. chapman and hall/CRC.

Kilag, O. K. T., & Sasan, J. M. (2023). Unpacking the Role of Instructional Leadership in Teacher Professional Development. *Advanced Qualitative Research*, *1*(1), 63-73.

Killion, J. (2020). *The feedback process: Transforming feedback for professional learning*. Learning Forward.

Kraft, M. A., & Blazar, D. (2018). Taking teacher coaching to scale: Can personalized professional development improve teaching across schools? *Educational Researcher*, 47(8), 533-545.

Leithwood, K. A., & Hallinger, P. (1993). Cognitive perspectives on educational administration: An introduction. *Educational Administration Quarterly*, *29*(3), 296-301.

Leithwood, K., & Riehl, C. (2005). What we know about successful school leadership. In W. A. Firestone & C. Riehl (Eds.), *A new agenda: Directions for research on educational leadership* (pp. 22-50). Teachers College Press.

Leithwood, K., Harris, A., & Hopkins, D. (2020). Seven strong claimed about successful school leadership revisited. *School Leadership & Management*, 40(1), 5-22.

Ministry of Education, Kenya. (2023). *KCSE Results Analysis*. Nairobi: Ministry of Education.

Muthama, S. M., & Mativo, P. M. (2022). The impact of instructional leadership on students' academic performance in Mathematics in Kilungu Sub-County, Kenya. *Journal of Educational Leadership and Policy Studies*, 4(1), 23-37.

Naicker, I., & Mestry, R. (2019). The instructional leadership role of primary school principals. *South African Journal of Education*, 39(1), 1-12.

Nyagosia, P. O., Waweru, P. N., & Njuguna, D. (2020). Instructional leadership and its impact on students' academic performance in national examinations: A study of secondary schools in Kenya. *International Journal of Educational Management*, 34(5), 851-867.

Robinson, V. M., Lloyd, C. A., & Rowe, K. J. (2008). The impact of leadership on student outcomes: An analysis of the differential effects of leadership types. *Educational Administration Quarterly*, 44(5), 635-674.

Robinson, V., & Gray, E. (2019). Effective instructional leadership practices: Evidence from Australian schools. *Educational Management Administration & Leadership*, 47(3), 456-472.

Rowe, C. (2020). *Relationship Between Teacher Professional Development and Urban High School Students' Reading Achievement* (Doctoral dissertation, Walden University).

Sebastian, J., Allensworth, E., & Huang, H. (2019). Examining integrated leadership systems in high schools: Connecting principal and teacher leadership to organizational processes and student outcomes. *School Effectiveness and School Improvement*, 30(3), 339-362.

Sun, J., Penuel, W. R., & Frank, K. A. (2020). Leadership and teachers' professional learning: Examining the roles of formal and informal leaders. *Educational Administration Quarterly*, 56(3), 367-408.