



Unlocking Potentials: Professional Development of Secondary Mathematics Teachers in the 21st-Century Classrooms

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International Journal of Interdisciplinary Viewpoints
Vol. 2, No. 4, pp. 1-9, 2026

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Abstract

This study examined the professional development (PD) experiences of secondary mathematics teachers in the San Luis District, Division of Agusan del Sur, Philippines, during the 2025–2026 school year using a mixed-method explanatory sequential design (QUAN-qual). Quantitative data were collected from 62 secondary mathematics teachers through a validated researcher-made questionnaire, while qualitative data were gathered from 15 key informants through focus group discussions analyzed using Braun and Clarke's thematic analysis framework. Findings revealed that existing PD programs only partially met teachers' expectations, particularly in terms of frequency and accessibility. PD initiatives demonstrated a moderate influence on teaching practices, with stronger effects observed in content mastery and teacher confidence. Teachers generally perceived PD programs as effective, especially in promoting collaboration and achieving intended objectives. Significant differences in PD experiences were identified according to sex, teaching position, educational attainment, length of service, and grade level taught. Correlation analysis further showed that alignment of PD activities with teachers' professional needs significantly predicted the achievement of program objectives, while teacher satisfaction was positively associated with both achievement and applicability of PD programs. Qualitative findings identified four major challenges affecting PD participation and effectiveness: workload and time constraints, limited administrative support, misalignment between training content and classroom realities, and logistical and financial barriers. Based on the findings, the study developed an eight-objective Teachers' Development Plan anchored on the Philippine Professional Standards for Teachers (PPST). The study recommends the implementation of context-responsive, subject-specific, flexible, and gender-responsive PD programs to strengthen mathematics instruction and support continuous teacher growth.

Keywords

professional development; mathematics teachers; teaching practices; 21st-century classrooms; teacher effectiveness

Citation

Escarda, M. L. (2026). Unlocking Potentials: Professional Development of Secondary Mathematics Teachers in the 21st-Century Classrooms. *International Journal of Interdisciplinary Viewpoints*, 2(4), 1–9.

<https://doi.org/10.64612/ijiv.v2i4.111>

Received: 15 February 2026

Accepted: 24 April 2026

Published: 30 April 2026

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Peer Review Statement

This article underwent a double-anonymous peer review process in accordance with the editorial policies of the *International Journal of Interdisciplinary Viewpoints*. Both author and reviewers remained anonymous throughout the review process.

Open Access Statement

The *International Journal of Interdisciplinary Viewpoints* is a fully open-access, peer-reviewed journal. All articles are freely available online immediately upon publication without subscription or access fees.

Funding Statement

The author received no financial support for the research, authorship, and/or publication of this article.

Conflict of Interest

The author declared no conflicts of interest.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Author Contributions

The author contributed to conceptualization, methodology, investigation, writing—original draft preparation, writing—review and editing, and supervision. The author approved the final manuscript.

Ethics Statement

This study was conducted in accordance with ethical standards.

INTRODUCTION

Across the world, education continues to evolve in response to the shifting demands of the 21st century—demands that call not only for knowledge acquisition but for deeper human capacities such as critical thinking, collaboration, communication, creativity, adaptability, and meaningful engagement with technology (Partnership for 21st Century Skills, 2002; Carter et al., 2021; Khotimah & Utama, 2025). Within this changing landscape, mathematics education holds a quiet yet powerful responsibility: to shape how learners make sense of patterns, solve real-world problems, and navigate

complexity. Yet behind every meaningful learning experience stands a teacher whose growth is equally essential. The professional development of educators, particularly in mathematics, has become a shared global concern, as studies emphasize the need for continuous refinement of pedagogical practices, integration of innovative approaches, and alignment with modern competencies (Garcia & Cruz, 2021; Smith et al., 2019; Bustamante, 2024; Jones & Lee, 2020; Nkundabakura et al., 2024; Alsina & Vasquez, 2024; Thompson & Miller, 2023; Adams, 2023). Recent studies likewise highlight how classroom conditions, instructional resilience, mindfulness, and learner engagement continue to shape educational experiences across different learning environments (Rosario, 2026; Caballero & Morre, 2026).

Professional development is deeply grounded in theories of adult learning and social cognition, which recognize teachers as active learners who construct knowledge through reflection, collaboration, and experience (Knowles, 1980; Bandura, 1986). Effective professional learning opportunities are those that are sustained, collaborative, context-sensitive, and directly connected to classroom realities (Bobis et al., 2020; Goldsmith et al., 2020; Ponce & Miranda, 2019). Reflective practice further enables teachers to critically examine instructional approaches and improve learner engagement over time (Martin & Roberts, 2019; Williams et al., 2023). Collaborative learning communities and peer-supported environments also contribute significantly to teachers' professional growth, instructional confidence, and observational learning through shared practice (Nguyen & Tran, 2019; Wang et al., 2020; Clark, 2021; Nguyen & Harris, 2020). Moreover, adult learning principles suggest that professional development becomes more meaningful when teachers perceive immediate relevance and applicability to their teaching contexts (Brown & Green, 2019; Davis, 2022). Personalized and differentiated professional development pathways are likewise recommended to address the diverse instructional needs and experiences of mathematics teachers (Lee, 2024). Studies also reveal that work engagement, leadership trust, institutional transparency, and community involvement strongly influence teachers' professional growth and instructional effectiveness (Nini & Guhao, 2026; Baog & Cueme, 2026; Catid et al., 2026).

Within the Philippine educational landscape, this global narrative finds its own lived expression—shaped by contextual realities, institutional structures, and the everyday experiences of teachers in diverse communities. The implementation of the K to 12 curriculum under Republic Act No. 10533 and the recent MATATAG Curriculum reforms underscore the increasing demand for responsive and standards-aligned teacher professional development (Republic Act No. 10533, 2013; Delos Santos & Aquino, 2020). While initiatives from the Department of Education continue to promote instructional improvement, the journey of professional growth is not always equally accessible. In regions such as the Division of Agusan del Sur, particularly in the San Luis District, teachers navigate a complex interplay of aspirations and constraints. Accessibility to sustained and meaningful professional development remains uneven, often influenced by workload pressures, institutional limitations, resource allocation, and logistical barriers (Reyes & Santiago, 2022; Soriano, 2023; Garcia & Martinez, 2022; AbdulMajid & Noor, 2021). Studies likewise note that excessive working hours and overlapping responsibilities may reduce teachers' capacity to actively engage in professional learning opportunities (Kreuzfeld et al., 2022). School leadership and institutional support also significantly influence teachers' professional development engagement and expertise development (Li et al., 2023). Furthermore, recent local studies involving public school teachers and pre-service educators reveal how institutional conditions, teaching challenges, grit, and school-based programs shape both instructional commitment and educational outcomes in Philippine settings (Cariaga et al., 2025; Caballero & Morre, 2026).

As education increasingly integrates digital technologies, professional development has likewise expanded to include technology-enhanced instruction and digital pedagogies. The Technological Pedagogical Content Knowledge (TPACK) framework highlights the importance of equipping teachers with the integrated knowledge needed to effectively combine pedagogy, content, and technology in instruction (Mishra & Koehler, 2006). Similarly, technology-oriented professional development programs have been recognized as essential in supporting mathematics teachers in adapting to modern instructional environments (Johnson & Blake, 2018; Villanueva, 2023; Wajid et al., 2025). Teacher readiness in utilizing digital resources has also emerged as a critical factor influencing the effectiveness of mathematics training programs and technology-enhanced instruction (Alonzo & Perez, 2025). Teachers' technological pedagogical content knowledge has likewise been associated with improved instructional effectiveness and learner achievement in mathematics education (Patalinghug & Arnado, 2022). Recent studies further emphasize that well-designed online professional development programs can strengthen instructional technology integration and support continuous teacher learning regardless of geographical limitations (Cewart & Jin, 2024). Although collaborative platforms such as learning action cells foster shared learning and collegial support (Guzman et al., 2023; Cruz & Santos, 2022), many educators still encounter challenges in translating training into practice, especially within under-resourced school settings (Alcantara & De Guzman, 2021).

While existing literature affirms the value of professional development in enhancing teaching effectiveness and student outcomes, important gaps persist in both focus and implementation. Many programs emphasize content knowledge while giving less attention to pedagogical depth, reflective practice, and contextual adaptability (Tan & Villanueva, 2022; Jensen, 2022). Although technology integration and innovative methodologies are widely promoted (Davis & Carter, 2020; Liang & Zhang, 2022; Haines et al., 2021), their practical application remains inconsistent, particularly in rural contexts where access and support systems are limited (Reyes & Santiago, 2022; Soriano, 2023). Furthermore, while collaborative and sustained professional development models have shown promise (Darling-Hammond et al., 2020; Desimone, 2019; Borko et al., 2021; Vangrieken et al., 2020; Ronfeldt et al., 2019), there is still limited understanding of how these approaches align with the specific needs, realities, and lived experiences of secondary mathematics teachers in localized settings such as the San Luis District. Teaching competencies and coping mechanisms are also shaped by workload demands and institutional conditions experienced by public school teachers (Saro et al., 2022). Existing local studies have explored learner motivation, work engagement, educational leadership, grit, mindfulness, and classroom challenges (Rosario, 2026; Nini & Guhao, 2026; Baog

& Cueme, 2026; Caballero & Morre, 2026; Cariaga et al., 2025), yet limited attention has been given to the professional development experiences of secondary mathematics teachers within localized and resource-constrained educational contexts. This gap highlights the need for a more grounded and context-sensitive exploration of teachers' professional development.

This study seeks to illuminate the professional development experiences of secondary mathematics teachers in the San Luis District by grounding inquiry in both their challenges and aspirations. By identifying gaps, challenges, and opportunities, it aims to propose a structured and context-responsive development plan that enhances instructional practices, strengthens pedagogical skills, and supports meaningful integration of innovative methodologies. More importantly, the study recognizes teachers not merely as recipients of training, but as active agents of change whose growth directly shapes student learning experiences. In doing so, it contributes to a more human-centered understanding of professional development—one that bridges policy and practice, responds to local realities, and ultimately supports the continuous transformation of mathematics education in alignment with the goals of 21st-century learning (Saavedra & Opfer, 2022; DepEd Memorandum No. 054, s. 2023). Encouraging teachers to engage in research-oriented professional development may further strengthen reflective practice, innovation, and evidence-based instructional improvement (Saro & Taray, 2024).

METHODOLOGY

Design

This study adopted a mixed-method approach, utilizing an Explanatory Sequential Design (quan-QUAL), which combined quantitative and qualitative phases to achieve a comprehensive understanding of the research questions (Creswell & Creswell, 2018). The quantitative phase served as the foundation, providing initial data and insights, while the qualitative phase substantiated and expanded on these results, offering deeper contextual understanding and rich narrative detail. Employing this design allowed for effective triangulation, strengthening the validity and reliability of the research findings. For the quantitative phase, a descriptive-correlational approach was utilized to analyze relationships between several factors. Quantitative data was collected through a researcher-made survey questionnaire distributed to secondary mathematics teachers in the San Luis District. For the qualitative phase, data was collected through focus group discussions (FGDs), with qualitative data analyzed using thematic analysis as guided by Braun and Clarke's (2006) thematic guidelines.

Locale

The study was conducted in the district of San Luis within the Schools Division of Agusan del Sur, focusing on secondary schools: Anislagan NHS, Cecilia NHS, San Luis NHS, Coalicion IS, San Pedro IS, Laminga NHS, San Luis NHS – Balit Annex, and Ulangan NHS. The selection of the San Luis District was strategically based on its significant number of mathematics teachers and their active participation in various professional development and instructional activities within the division.

Participants

The study concentrated on all secondary mathematics teachers in the San Luis District 1 and District 2. A complete enumeration sampling method was employed, including all sixty-two (62) mathematics teachers as respondents. For the qualitative phase, fifteen (15) key informants participated in focus group discussions, with each secondary school providing two (2) participants, except Ulangan National High School, which had one representative.

Table 1
 Distribution of Mathematics Teachers as Respondents and Participants of the Study

School	Teacher-Respondents	Teacher-Participants
Anislagan National High School	7	2
Cecilia National High School	9	2
San Luis National High School	17	2
Coalicion Integrated School	4	2
San Pedro Integrated School	5	2
Laminga National High School	10	2
San Luis NHS – Balit Annex	3	2
Ulangan National High School	7	1
Total	62	15

Note. Teacher-respondents refer to survey participants, while teacher-participants refer to those involved in qualitative data collection.

Instrument

The study utilized a researcher-made survey questionnaire structured into distinct sections aligned with the research questions. The first section collected profile data. The second section, employing a 5-point Likert scale, explored the current status, impact on teaching practices, and perceptions of the effectiveness of professional development programs. The questionnaire's reliability was confirmed through a pilot test in the neighboring Prosperidad District, yielding a Cronbach's alpha coefficient of 0.824, indicating high internal consistency. For the qualitative aspect, semi-structured, open-ended questions were developed to explore the challenges faced by mathematics teachers in relation to professional development programs. Prior to data collection, the instruments were validated by five experts, including a National Research Consultant, the Division Research Coordinator of Agusan del Sur, a District Head in Mathematics and Sciences, a Master Teacher in Mathematics, and an Educational Program Supervisor in Mathematics.

Statistical Treatment and Data Analysis

The data were tabulated, treated, and analyzed using the following statistical tools: (1) Frequency and Percentage for the demographic profile; (2) Weighted Mean Analysis using a 5-point Likert scale for the current status, impact, and perceptions of PD programs; (3) One-way ANOVA to assess significant differences among teacher profiles and PD-related variables; (4) Pearson Correlation Analysis to assess the strength and direction of relationships between PD status, impact on teaching practices, and perceived effectiveness; and (5) Thematic Analysis following Braun and Clarke's (2006) guidelines, using hand-coding to identify recurring themes and patterns within participants' narratives.

Ethical Considerations

The study prioritized ethical standards throughout the research process. Formal letters of request were submitted to the Schools Division Superintendent of the Division of Agusan del Sur, district supervisors, and school heads before data collection. Informed consent was obtained from all respondents and participants. All personal and professional information shared by participants was kept strictly confidential and used solely for research purposes. Data privacy was upheld in compliance with the Data Privacy Act.

RESULTS AND DISCUSSION

Table 2 presents the demographic profile of the sixty-two (62) secondary mathematics teacher-respondents. The teaching force was predominantly composed of early- to mid-career educators aged 31–40 (40%), followed by those aged 21–30 (32%), indicating a relatively young and developing workforce. Female teachers comprised the majority at 60%, reflecting broader patterns in the Philippine teaching profession. Most respondents taught Grades 7 (23%) and 8 (27%), which are critical formative years for students' mathematical foundations. In terms of teaching positions, Teacher I (47%) and Teacher III (37%) comprised the largest segments. A considerable proportion held Master's Degree–CAR status (40%) or master's degree units (24%), indicating academic aspirations alongside practical constraints. Over half of the respondents had 6–10 years of teaching experience (52%), and nearly half had attended only 0–2 trainings or seminars (45%).

These demographic findings carry significant implications for professional development design. The predominance of early- to mid-career teachers suggests a cohort still actively shaping their professional identity and open to innovation, positioning them as prime candidates for transformative PD initiatives (Bustamante, 2025). The high percentage of female teachers implies that PD design must be gender-responsive, accounting for work-life balance and scheduling flexibility. The concentration of teachers in lower secondary grades underscores the strategic importance of developing pedagogical content knowledge at these foundational levels (Lee, 2022). Furthermore, the fact that nearly half of the respondents had attended only 0–2 trainings signals a significant gap in continuous PD exposure, highlighting the urgent need for accessible, sustained, and context-relevant professional development programs to truly unlock teachers' potentials for 21st-century education (Ziębakowska-Cecot, 2025).

Table 2
Demographic Profile of the Respondents

Variable	Category	n	%
Age	21–30	20	32
	31–40	25	40
	41–50	11	18
	51 & above	6	10
Sex	Male	25	40
	Female	37	60
Grade Level Taught	Grade 7	14	23
	Grade 8	17	27
	Grade 9	10	16
	Grade 10	10	16
	Grade 11–12	11	18
Teaching Position	Teacher I	29	47
	Teacher II	7	11
	Teacher III	23	37
	Master Teacher I–II	3	5
Highest Educational Attainment	Bachelor's Degree	14	23
	Master's Degree Units	15	24
	Master's Degree–CAR	25	40
	Master's Degree Graduate	8	13
Length of Teaching Service	5 years & below	10	16
	6–10 years	32	52
	11–15 years	7	11
	16–25 years	9	15
	26 years & above	4	6
No. of Trainings Attended	0–2	28	45
	3–5	16	26
	6–8	8	13

Variable	Category	n	%
	9-11	7	11
	12-15	3	5

Note. n = frequency; % = percentage

Table 3 presents the current status of professional development programs for secondary mathematics teachers based on four key indicators. The overall mean of 3.098, interpreted as "partially meets expectations," indicates that while certain aspects of PD are considered adequate, there remain significant areas requiring improvement.

Table 3
Current Status of Professional Development Programs for Mathematics Teachers

Parameter	M	Description
Relevance of Training to the Mathematics Curriculum	3.27	Partially Meets Expectation
Frequency and Accessibility of PD Sessions	2.56	Rarely Meets Expectation
Alignment of Training with Current Teaching Standards	3.39	Partially Meets Expectation
Teacher Satisfaction with the PD Programs	3.17	Partially Meets Expectation
Overall Mean	3.10	Partially Meets Expectation

Note. M = mean.

The highest-rated indicator was "Alignment of Training with Current Teaching Standards and Competencies" (M = 3.394), suggesting that PD programs are fairly well-aligned with the expectations of modern mathematics instruction, which is critical for ensuring that teachers are equipped with relevant knowledge directly applicable to curriculum delivery (Elliott, 2025). Conversely, the lowest mean was recorded in "Frequency and Accessibility of Professional Development Sessions" (M = 2.555), described as rarely meeting expectations. This finding indicates that teachers experience significant challenges in consistently accessing PD sessions, which reduces the overall impact of teacher learning and limits improvements in instructional quality (Johnson, 2023). These results are consistent with Reyes and Santiago (2022), who found that many secondary mathematics teachers in rural districts face logistical constraints in accessing training.

Table 4 shows that professional development programs had a moderate impact on the teaching practices of secondary mathematics teachers (overall M = 3.136). Mastery of Content Knowledge and Curriculum Standards obtained the highest mean score of 3.268, followed closely by Confidence in Delivering Complex Mathematical Concepts (M = 3.261), both interpreted as moderately impactful. The lowest mean was recorded for Improvement of Students' Engagement and Learning Outcomes (M = 2.932). In the context of the MATATAG Curriculum, deeper content mastery enhances teachers' ability to design meaningful, concept-driven lessons. However, the lower mean for student engagement improvement (M = 2.932) highlights a persistent challenge: bridging the gap between teacher professional learning and student-level impact. This finding is consistent with evidence showing that even well-crafted PD fails to consistently translate into sustained student engagement gains when it lacks practical application or contextual responsiveness (Bustamante, 2025). Effective PD initiatives must be sustained, embedded in real teaching contexts, and responsive to teachers' evolving classroom challenges (Saro et al., 2023).

Table 4
Impact of Professional Development to Teaching Practices

Parameter	M	Description
Implementation of Innovative Teaching Strategies	3.08	Moderately Impactful
Mastery of Content Knowledge and Curriculum Standards	3.27	Moderately Impactful
Confidence in Delivering Complex Mathematical Concepts	3.26	Moderately Impactful
Improvement of Students' Engagement and Learning Outcomes	2.93	Moderately Impactful
Overall Mean	3.14	Moderately Impactful

Table 5 presents the perceptions of secondary mathematics teachers regarding the effectiveness of professional development programs. The overall mean of 3.973, interpreted as "Effective," indicates that teachers generally believe PD programs successfully met their objectives, provided applicable knowledge, offered meaningful collaboration, and contributed to professional growth.

Table 5
Teachers' Perceptions of Professional Development Effectiveness

Parameter	M	Description
Achievement of Program Objectives	4.25	Highly Effective
Applicability of Acquired Knowledge to Classroom Teaching	3.03	Moderately Effective
Opportunities for Collaboration and Networking	4.37	Highly Effective
Contribution to Professional Growth and Career Advancement	4.24	Highly Effective
Overall Mean	3.97	Effective

Note. M = mean.

The highest-rated parameter was "Opportunities for Collaboration and Networking" (M = 4.368), reflecting that PD programs strongly fostered teamwork and peer support. "Achievement of Program Objectives" (M = 4.252) also rated highly, indicating that teachers believed PD sessions were well-designed and responsive to evolving mathematics instruction

demands, aligning with Bustamante (2025). In contrast, "Applicability of Acquired Knowledge to Classroom Teaching" received the lowest mean ($M = 3.032$), suggesting that while teachers recognized the value of PD sessions, some concepts and strategies were not easily transferable to actual classroom situations. This gap aligns with Saro et al. (2025), who note that applicability gaps arise when training content does not fully reflect teachers' real-world instructional contexts. These findings imply a need to strengthen instructional follow-through, coaching, and contextualized training activities to reinforce the practical use of newly acquired strategies (Turner, 2022).

Table 6
Significant Differences Between Mathematics Teachers' Profiles and the Current Status of Professional

PD Status Indicator	Source of Variation	F	p	Decision	Conclusion
Relevance of Training	Sex	14.18	.000	Reject H_0	Significant
Relevance of Training	Teaching Position	5.59	.006	Reject H_0	Significant
Frequency & Accessibility	Sex	8.29	.006	Reject H_0	Significant
Frequency & Accessibility	Teaching Position	10.56	.000	Reject H_0	Significant
Frequency & Accessibility	Educational Attainment	5.43	.002	Reject H_0	Significant
Alignment of Training	Grade Level	3.88	.008	Reject H_0	Significant
Teacher Satisfaction	Sex	19.03	.000	Reject H_0	Significant
Teacher Satisfaction	Grade Level	3.30	.018	Reject H_0	Significant

Note. F = F-value; p = p-value; H_0 = null hypothesis.

Regarding the current status of PD programs (Table 6), significant differences were observed for Sex and Teaching Position in the Relevance of Training indicator ($F = 14.180$, $p = 0.000$ and $F = 5.590$, $p = 0.006$, respectively), indicating that male and female teachers, as well as teachers holding different positions, perceive the relevance of PD differently. For Frequency and Accessibility, significant differences emerged for Sex ($F = 8.290$, $p = 0.006$), Teaching Position ($F = 10.560$, $p = 0.000$), Educational Attainment ($F = 5.430$, $p = 0.002$), and Length of Service ($F = 4.050$, $p = 0.003$), implying that PD opportunities may not be equally distributed or perceived across all teacher subgroups and highlighting the need for equitable access. Teacher Satisfaction showed the most significant variation by Sex ($F = 19.030$, $p = 0.000$), underscoring the importance of designing gender-responsive PD programs.

In contrast, it reveals that none of the teacher profile variables produced significant differences across all four dimensions of PD impact on teaching practices (all $p > 0.05$). This uniformity suggests that PD programs are perceived as having similar effects on teaching practices regardless of demographic characteristics, which may reflect consistent program delivery across schools. While this equity is encouraging, it may also signal a need for more targeted, specialized, and differentiated PD interventions that address the unique needs of different teacher groups (Cabrera et al., 2023). Table 8 reveals that for Effectiveness of PD Programs, only Sex significantly influenced the Applicability of Required Knowledge to Classroom Teaching ($F = 4.890$, $p = 0.031$), while only Educational Attainment significantly influenced Opportunities for Collaboration and Networking ($F = 3.750$, $p = 0.022$). Overall, these findings point to the need for more differentiated PD designs that are responsive to gender and educational background (Haug & Mork, 2021; Villanueva & Roldan, 2025).

Significant Relationships Among PD Status, Teaching Practices, and Perceived Effectiveness

The correlation results examining the relationships between PD variables. On the other hand, reveals a mixed pattern of relationships between PD status indicators and perceived effectiveness. Relevance of Training was significantly related to the Applicability of knowledge ($r = 0.289$, $p = 0.023$), suggesting that when teachers perceive training as relevant, they are more likely to apply the acquired knowledge in classroom teaching. Alignment of Training showed a strong and significant relationship with Achievement of Program Objectives ($r = 0.432$, $p = 0.000$), indicating that well-matched training leads to higher perceptions of performance improvement. Teacher Satisfaction demonstrated significant relationships with Achievement ($r = 0.339$, $p = 0.007$) and Applicability ($r = 0.313$, $p = 0.013$), implying that satisfaction acts as a motivational factor influencing how teachers value and utilize training outcomes. Notably, Frequency and Accessibility showed no significant relationships with any measure of perceived effectiveness, revealing that logistical convenience is insufficient without meaningful content and alignment.

The Implementation of Innovative Teaching Strategies shows no significant relationship with any measure of perceived effectiveness, implying that teachers' ability to apply new approaches does not necessarily influence their perceptions of PD effectiveness. Mastery of Content Knowledge showed significant relationships with Achievement ($r = 0.342$, $p = 0.007$) and Opportunities ($r = 0.258$, $p = 0.043$), emphasizing the critical role of subject-matter expertise as a foundation for teacher growth. Confidence in Delivering Complex Mathematical Concepts was significantly related to Achievement ($r = 0.260$, $p = 0.041$), indicating that teacher confidence serves as a key mediator between PD participation and professional perceptions. Improvement of Student Engagement and Learning Outcomes showed no significant relationship with perceived effectiveness, highlighting the need for PD programs to include follow-up support and practical strategies to bridge the gap between professional learning and observable student results. These findings are consistent with AbdulRab (2023) and Alzahrani and Nor (2022), who emphasize that the value of PD is determined by how well programs address specific pedagogical and content-related needs of teachers.

Table 7 presents the thematic summary of challenges encountered by mathematics teachers in participating in professional development programs, derived through systematic pattern identification from focus group discussions with fifteen (15) key informants.

Table 7
Thematic Summary of the Challenges Faced by Mathematics Teachers

Category	Theme	Subtheme
Availability of Time and Resources	Workload Pressures	Heavy workload and paperwork; multiple class preparations; PD scheduled during teaching hours
	Time Constraints	Difficulty balancing PD with teaching duties
	Resource Limitations	Personal expenses; limited resources provided
Support from School Administration and Stakeholders	Encouragement Exists but Limited	Verbal support; minimal concrete assistance
	Stakeholder Support Gaps	Minimal involvement; scheduling conflicts
	Need for Stronger Support	Financial support; PD time accommodation
Relevance of Training Content	General Usefulness	Helpful but not always applicable; technology integration useful
	Relevance Gaps	Too general and theoretical; not math-specific
	Hands-on and Contextual Needs	Real-world approach needed; address learner diversity
Perceived Barriers to Program Accessibility	Workload and Time	Too many responsibilities; fear of lesson disruption
	Cost and Location	Travel expenses; distance; funding limitations
	Technology Issues	Poor internet connection; limited devices
	Flexible Access Needed	Online or school-based PD preferred

Note. PD = Professional Development.

The qualitative findings reveal four major challenge categories. In terms of Availability of Time and Resources, teachers reported heavy workloads, multiple daily preparations, and PD sessions scheduled during instructional hours as significant barriers, consistent with Lopez and Bernardo (2021) and Martinez (2023). As one key informant stated: "I have four preparations every day, and sometimes this affects my ability to participate in professional development." Resource limitations, including personal financial burdens and insufficient institutional support, further constrained engagement (Rivera & de Guzman, 2024).

Regarding Support from School Administration and Stakeholders, teachers experienced encouragement that was often limited to verbal support without concrete assistance in scheduling, funding, or reduced workload. As noted by one informant: "There is verbal encouragement, but limited concrete assistance." This aligns with He, Guo, and Abazie (2024), who found that insufficient administrative support significantly undermines teachers' PD engagement. Regarding the Relevance of Training Content, teachers identified gaps between general theoretical content and the specific practical demands of mathematics instruction. Informants expressed a desire for "more hands-on activities, classroom-based strategies, and examples that directly address common student difficulties in learning mathematics," consistent with Alzahrani and Nor (2022). Finally, Perceived Barriers to Program Accessibility included cost, distance, poor internet connectivity, and inflexible scheduling. Teachers strongly emphasized the need for online, hybrid, or school-based alternatives, which aligns with recommendations from Eroglu and Donmus (2021), who identified time constraints, limited infrastructure in remote areas, and inadequate institutional support as major PD barriers.

Conclusion and Recommendations

This study concludes that secondary mathematics teachers in the San Luis District represent a diverse and predominantly early- to mid-career group with varied academic backgrounds and teaching assignments, highlighting the need for continuous and differentiated professional development. While professional development (PD) programs are present and actively implemented, they are not fully optimized to meet teachers' expectations or instructional demands. Limitations in accessibility, scheduling, and contextual relevance result in PD experiences that are only moderately impactful. Although teachers reported gains in content mastery and confidence in delivering complex mathematical concepts, these improvements were not consistently translated into enhanced student engagement and learning outcomes. Furthermore, while PD programs were generally perceived as effective in achieving program objectives and fostering collaboration, gaps remain in aligning training content with actual classroom realities. Differences in demographic characteristics such as sex, teaching position, educational attainment, and grade level taught also significantly shaped teachers' PD experiences, emphasizing the need for more inclusive, responsive, and equity-oriented program designs. Structural barriers—including workload pressures, financial constraints, and logistical challenges—continue to limit the full potential of PD initiatives, underscoring the importance of designing flexible, accessible, and context-sensitive frameworks aligned with the Philippine Professional Standards for Teachers (PPST) and the MATATAG Curriculum.

In response, it is recommended that mathematics teachers actively engage in professional development opportunities that strengthen both content knowledge and pedagogical innovation while maximizing collaborative platforms such as learning action cells and peer mentoring. School administrators are encouraged to provide stronger institutional support by ensuring flexible scheduling, adequate resource allocation, and consistent communication that enables teachers to fully participate in and apply PD learnings. At the policy level, the Department of Education is urged to design contextualized, evidence-based training programs that reflect real classroom challenges, ensuring equitable access, sufficient funding, and sustained monitoring and support systems. Long-term PD frameworks that include mentorship and follow-through mechanisms are essential to ensure meaningful application in teaching practice. Future researchers are also encouraged to expand this line of inquiry by exploring additional variables, conducting comparative and qualitative studies, and examining long-term impacts of professional development across different contexts. Such efforts will deepen understanding and contribute to more responsive and transformative approaches to teacher development.

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