

Unpacking Mentorship in Mathematics Education: A Systematic Review

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Abstract—This systematic literature review explores how mentorship, feedback, and standards-based professional development (PD) support the growth and instructional effectiveness of Highly Proficient Mathematics Teachers in the Philippines. Drawing on six Philippine-based peer-reviewed studies published between 2016 and 2025, the review identifies key practices and persistent gaps in mentoring frameworks aligned with the Philippine Professional Standards for Teachers (PPST) and the Results-Based Performance Management System (RPMS). Thematic synthesis reveals five major themes: mentoring practices and technical assistance, feedback-driven professional development, peer and collaborative learning, standards-based CPD, and the impact of mentorship on teacher competence and student outcomes. The findings highlight the importance of formative, dialogic feedback, structured mentoring protocols, and localized PD programs that reflect actual classroom needs. Despite consistent evidence of positive instructional outcomes, current mentoring systems remain underutilized, inconsistently implemented, and limited to public school contexts. This study emphasizes the need for a scalable, feedback-driven mentorship framework adaptable to both public and private school settings and tailored to the unique demands of mathematics education in the Philippines.

Index Terms—Mentoring, feedbacking, standards-based professional development, highly proficient teachers.

1. Introduction

Mentorship plays a vital role in enhancing instructional quality and promoting professional growth. In mathematics education—where conceptual understanding and problem-solving skills are essential—effective mentorship is especially important. However, teachers often face challenges in keeping pace with curriculum changes and addressing diverse student needs. These realities underscore the need for ongoing, subject-specific, and targeted professional development [12].

In the Philippine context, the Philippine Professional Standards for Teachers (PPST) and the Results-Based Performance Management System (RPMS) designate mentoring and leadership responsibilities to Highly Proficient Teachers. Despite this, these frameworks provide limited guidance specific to the demands of mathematics instruction [4]. While national programs such as Lesson Study promote collaborative learning and reflective practice, they often require

considerable institutional support and resources, which limit their sustainability and scalability in many schools [6].

Moreover, many existing mentoring approaches prioritize summative evaluation over formative and developmental feedback. This tendency can hinder trust-building, limit professional dialogue, and reduce opportunities for reflective learning. Research supports the use of feedback that is timely, specific, and rooted in ongoing practice [8], [11]. Yet, the integration of such feedback strategies into structured mentorship remains inconsistent.

There is a noticeable gap in the availability of standardized, mathematics-focused mentorship frameworks that emphasize coaching, continuous formative feedback, and clearly defined monitoring and evaluation mechanisms. Consequently, the mentoring practices of Highly Proficient Mathematics Teachers in the field remain largely undocumented, informally implemented, and underutilized.

Recent empirical studies affirm the positive influence of mentoring on teacher development but also point to persistent limitations. For instance, Kuzle and Biehler (2015) found that while professional development programs led by mathematics mentors can improve teaching, there is often a lack of practical guidance on how to implement subject-specific mentoring. Similarly, Guadalupe (2022) reported that master teachers' mentoring efforts positively affect instructional performance, but called for a deeper analysis of the actual strategies used, especially within the context of mathematics education.

This literature review explores these issues by examining research related to mentoring practices, feedback mechanisms, and professional development frameworks. It focuses on how these elements are applied in mathematics education and identifies evidence-based practices that may inform the development of a feedback-driven mentorship model tailored to the Philippine school system.

2. Methodology

A. Research Method and Design

This study employed a systematic literature review to identify, evaluate, and synthesize existing research on mentorship, feedback, and professional development for highly

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proficient mathematics teachers. Following the eight-step procedure of Okoli and Schabram (2010), the review involved the following phases: identifying the purpose, drafting a protocol, applying screening criteria, conducting a literature search, extracting and organizing relevant data, evaluating study quality, synthesizing key findings, and writing the review. The step-by-step selection process is shown in Figure 1.

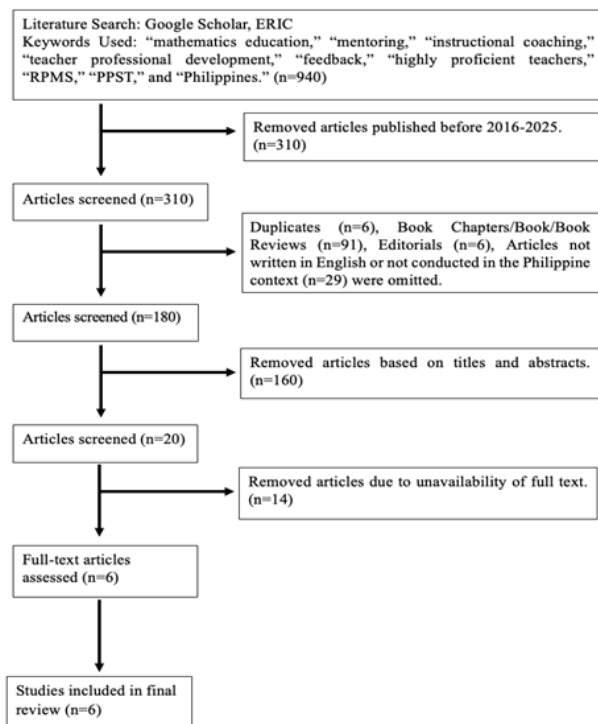


Fig. 1. Flow Diagram of the article selection process used in the systematic review

B. Inclusion and Exclusion Criteria

The inclusion criteria of this systematic review were developed to ensure that the study remained focused on the core areas of interest—mentorship, feedback, and teacher professional development in the context of mathematics education. To be included, articles had to be peer-reviewed journal articles, meta-analyses, or systematic and/or critical reviews that featured either qualitative, quantitative, or mixed-methods designs. These articles needed to contribute directly to the understanding of how mentoring practices and feedback mechanisms support mathematics teachers, particularly within or relevant to the Philippine education system.

A time-based criterion was applied, limiting the search to studies published between 2016 and 2025, ensuring that the review reflected recent research developments unless older foundational works were required to support theoretical grounding. To maintain accessibility and clarity, only articles written in English and available in full text were considered. In terms of geographic scope, studies conducted in the Philippines were prioritized. However, relevant international studies with strong implications for the local context were also considered.

On the other hand, exclusion criteria were established to

maintain a tight scope and avoid irrelevant content. Articles were excluded if they did not directly examine mentorship, feedback, or professional development in the context of mathematics education. Studies that addressed these topics only in general education settings without reference to mathematics or teacher mentoring were not considered. Likewise, non-peer-reviewed publications such as opinion pieces, editorials, book reviews, and conference abstracts were excluded. Articles published before 2016 were also disregarded unless they provided seminal insights critical to the framework. Additionally, articles not written in English or not accessible in full-text format were omitted.

These inclusion and exclusion parameters helped maintain a clear and consistent focus throughout the review, ensuring that only credible, relevant, and methodologically sound studies informed the analysis and proposed framework.

C. Literature Search

The primary sources of literature for this study were the Google Scholar and ERIC databases, which were used in accordance with the defined inclusion and exclusion criteria. A general search was initially conducted using the following keywords and combinations: “mathematics education,” “mentoring,” “instructional coaching,” “teacher professional development,” “feedback,” “highly proficient teachers,” “RPMS,” “PPST,” and “Philippines.” This broad search yielded a total of 940 related articles.

To ensure relevance and timeliness, a time-based filter was applied to limit publications to those released between 2016 and 2025. This reduced the pool to 310 articles. A preliminary review was then conducted, during which irrelevant records were removed, including duplicates (n=6), book chapters or reviews (n=91), editorials (n=6), and studies not written in English or not conducted in the Philippine context (n=29). After this screening process, 180 articles remained.

The titles and abstracts of these 180 articles were then examined. Based on relevance to mentorship, feedback, and teacher development specifically in the context of mathematics education, 160 articles were excluded. This resulted in a shortlist of 20 articles for full-text assessment.

From these 20 articles, 14 were excluded due to the unavailability of full text. The remaining six articles were reviewed in full, and all were retained after evaluation. Each of these studies was found to be directly relevant to the objectives of this review and methodologically appropriate.

In conclusion, after careful and systematic screening aligned with the inclusion and exclusion criteria, a total of six full-text articles published between 2016 and 2025 were selected and included in this review.

D. Data Analysis

The analysis focused on identifying recurring themes and patterns across the selected studies related to mentorship, feedback practices, and professional development in mathematics education. A cross-study comparison method was used to examine methodological approaches, key findings, and contextual factors across the six included studies. The collected

data were organized into thematic categories to highlight how mentorship practices were designed, how feedback was integrated into professional development, and how these elements influenced teacher growth and instructional effectiveness. This thematic clustering allowed for a coherent synthesis that reflects the strengths, challenges, and gaps in current mentoring frameworks, particularly those relevant to Highly Proficient Mathematics Teachers in the Philippine context.

3. Results and Discussion

The study reviewed six (6) research articles on mentorship, feedback, and professional development in mathematics education. These articles were selected based on the established inclusion and exclusion criteria. A systematic review process was applied to critically examine the content, methodology, and relevance of each study to the research objectives.

A. Overview of the Articles

The researchers examined six Philippine-based studies related to mentorship, feedback, and professional development in mathematics education. These studies employed a variety of research designs including descriptive-evaluative, mixed-method, quasi-experimental, and correlational approaches. The articles responded to an evident lack of structured and subject-specific mentorship programs that are aligned with national teacher standards and performance frameworks.

Collectively, the articles aimed to address challenges in the implementation of effective mentoring strategies within public school systems. Key issues identified include the limited use of formative, collaborative feedback mechanisms, the underutilization of highly proficient teachers as peer mentors, and the insufficient availability of continuous professional development programs that are tailored to mathematics instruction. The findings also emphasized that while many teachers engage in professional development activities, not all of these are aligned with competencies specific to mathematics or reflective of actual classroom needs.

Some of the articles focused on technical assistance and mentoring practices among master teachers, revealing that the effectiveness of mentorship is influenced by institutional support, access to resources, and clarity of mentoring roles.

Others highlighted the importance of localized and transformative PD programs that promote active learning, teacher reflection, and instructional innovation. One study explored the value of peer mentoring in enhancing problem-solving skills, underscoring the potential of collaborative models that encourage shared learning between mentors and mentees.

Despite differences in methodology, location, and participants, all studies confirmed that effective mentorship and feedback contribute to improved teaching strategies, teacher motivation, and learner performance. However, the reviewed literature also revealed a need for a well-defined mentorship framework that supports ongoing coaching, aligns with national standards, and includes systematic feedback processes. Notably, all of the reviewed studies were conducted in public school settings, highlighting a contextual gap in understanding how mentorship operates across different institutional types. This underscores the importance of designing a feedback-driven mentorship model that is adaptable to both public and private school contexts—especially in supporting Highly Proficient Mathematics Teachers within the broader Philippine education landscape.

B. Thematic Synthesis

1) Mentoring Practices and Technical Assistance

The studies emphasized that mentoring is a core function of Highly Proficient and Master Teachers, particularly in delivering technical assistance aligned with the Results-Based Performance Management System (RPMS). Guadalupe (2022) found that mentoring positively influenced teachers' instructional competence and student engagement when implemented through structured coaching and modeling strategies. Her study underscored that mentoring goes beyond supervision and becomes transformative when it is task-focused, feedback-oriented, and aligned with classroom realities. Similarly, Agan (2024), using a mixed-method design, identified strong correlations between mentoring dimensions—such as professional dialogue, goal setting, and instructional modeling—and the perceived effectiveness of technical assistance performance among 91 Master Teachers. The study also revealed persistent structural challenges such as time constraints, workload issues, and lack of administrative support

Table 1
Overview of objectives, methodologies, and respondents of the articles reviewed

Article	Author	Study Objective	Methodology	Respondents
Art-1	Guadalupe (2022)	Assessed the effect of mentoring practices on instructional competence and student outcomes.	Descriptive-evaluative; surveys and correlation analysis	Master Teachers, regular teachers, and students (Philippines)
Art-2	Bonghanoy et al. (2019)	Explored a transformative professional development model responsive to classroom realities.	Qualitative; focus group discussions and key informant interviews	Public secondary mathematics teachers
Art-3	Mercado & Cabuquin (2023)	Examined the relationship between participation in PD and teaching effectiveness in math.	Correlational; teacher and student surveys	30 public secondary mathematics teachers and 314 students
Art-4	Bercasio & Cabrillas (2017)	Determined the effectiveness of peer mentoring in enhancing mathematical problem-solving skills.	Quasi-experimental; pre-test/post-test, focus group discussions	Peer mentors and mentees (college mathematics students)
Art-5	Mantos et al. (2025)	Evaluated the alignment of continuing PD activities with the PPST indicators.	Qualitative; survey aligned with PPST domains	Basic education teachers across grade levels
Art-6	Agan (2024)	Investigated how mentoring dimensions correlate with Master Teachers' technical assistance performance.	Mixed-method; questionnaires, interviews, FGDs	91 Master Teachers from 12 districts

Table 2
Thematic summary of the findings

Theme	Description	Supporting Studies	Key Insights
Mentoring Practices and Technical Assistance	Focuses on the structure, delivery, and challenges of mentoring by Highly Proficient and Master Teachers, especially in relation to providing technical assistance in accordance with RPMS expectations.	Guadalupe (2022); Agan (2024)	Structured mentoring linked to technical assistance enhances effectiveness when roles are clearly defined and supported institutionally. Master Teachers who receive guidance and administrative backing are better positioned to fulfill their coaching responsibilities under RPMS.
Feedback-Driven Professional Development	Highlights the importance of formative and developmental feedback in promoting reflective practice, teacher confidence, and instructional quality during mentoring and PD activities.	Bonghanoy et al. (2019); Mantos et al. (2025)	Ongoing, formative feedback fosters teacher reflection, confidence, and improvement in classroom instruction. Feedback integrated into PD systems promotes a culture of continuous learning and instructional refinement.
Peer and Collaborative Learning	Emphasizes the role of peer mentoring and collaborative learning communities in enhancing instructional practices and fostering professional growth through shared problem-solving and reflective dialogue.	Bercasio & Cabrillas (2017)	Peer mentoring builds subject mastery and leadership while fostering a culture of shared learning and collaboration. It also empowers both mentors and mentees to take ownership of their learning, leading to improved engagement and accountability.
Role of Standards-Based CPD	Discusses how aligning continuing professional development with the Philippine Professional Standards for Teachers (PPST) ensures coherence, relevance, and teacher motivation in achieving targeted competencies.	Mantos et al. (2025); Mercado & Cabuquin (2023)	Standards-based PD increases teacher engagement and ensures alignment with national teacher competency expectations. When CPD is mapped to PPST indicators, it helps teachers self-assess and align their growth plans with institutional goals.
Impact on Instructional Competence and Student Outcomes	Examines how effective mentorship and standards-based PD improve teaching practices, learner engagement, and academic performance, supported by monitoring and evaluation mechanisms.	Guadalupe (2022); Mercado & Cabuquin (2023)	Effective mentorship and PD show measurable gains in teaching quality and student outcomes, particularly when supported by evaluation tools. Linking these outcomes to monitoring systems allows for data-driven adjustments and sustainability of programs.

that hinder effective mentoring implementation.

Both studies concluded that while the potential of mentoring is recognized, the lack of operational guidelines, monitoring tools, and protected mentoring time limits its full realization. There is also limited training on mentoring strategies that are content-specific to mathematics instruction. To address these challenges, a more systematized mentoring protocol is needed—one that includes explicit mentoring objectives, task alignment with RPMS indicators, and progress tracking mechanisms. Additionally, mentorship should be institutionally supported through leadership engagement, scheduled release time, and a community of practice that enables ongoing dialogue and reflection among mentors

2) *Feedback-Driven Professional Development*

Formative and reflective feedback emerged as a critical enabler of effective teacher development. Bonghanoy et al. (2019) explored a transformative model of professional development that integrates classroom-based inquiry and reflective feedback. Their qualitative findings showed that teachers benefited most from PD activities that incorporated coaching cycles and collaborative reflections rather than one-time training sessions. Similarly, Mantos et al. (2025) assessed how continuing professional development (CPD) initiatives aligned with the Philippine Professional Standards for Teachers (PPST) influence growth. The study found that when feedback is embedded as a developmental mechanism—particularly in post-lesson reflections and peer review—it supports professional growth and instructional improvement.

However, both studies noted that the current structure of PD in many schools remains episodic, disconnected from classroom implementation, and heavily focused on compliance. Feedback, when present, is often summative and evaluative rather than formative and dialogic. To improve outcomes, PD programs must embed feedback throughout the learning process—from planning to application—and use tools such as

observation checklists, peer coaching protocols, and reflective journals. This type of feedback fosters teacher agency, confidence, and motivation to innovate within their classrooms.

3) *Peer and Collaborative Learning*

Collaborative learning, particularly through peer mentoring, was found to be an effective but underutilized strategy in teacher development. Bercasio and Cabrillas (2017), through a quasi-experimental design, demonstrated the impact of peer mentoring on enhancing mathematical problem-solving skills among college students. While the study focused on learners, the mentoring framework employed—peer observation, feedback, and reflection—mirrored the structure of teacher collaborative learning. The findings showed that mentors and mentees both experienced growth in mathematical reasoning and confidence, suggesting that peer learning environments create reciprocal benefits.

Though widely advocated in policy, peer mentoring among teachers is not consistently practiced in Philippine schools due to lack of time, training, and structural support. Nonetheless, it holds great promise, particularly in mathematics education where teachers benefit from co-constructing strategies to tackle content-specific challenges. Integrating peer mentoring within Learning Action Cell (LAC) sessions, paired coaching, or subject-based communities of practice could provide a sustainable, cost-effective platform for ongoing teacher growth. Importantly, the collaborative element fosters trust and reduces the hierarchical tension

4) *Role of Standards-Based CPD*

The alignment of professional development activities with the Philippine Professional Standards for Teachers (PPST) was a recurring theme across studies. Mantos et al. (2025) found that when teachers' CPD engagement is structured around PPST domains—such as content knowledge, learning environment, and professional growth—there is stronger relevance, clearer goal-setting, and more intentional learning. This structured

alignment was seen to improve teachers' motivation and ability to track their development through self-assessment and reflection.

Similarly, Mercado and Cabuquin (2023) identified a significant relationship between mathematics teachers' participation in CPD and their perceived teaching effectiveness. Their quantitative findings showed that CPD aligned with classroom practice—especially when rooted in PPST strands such as differentiated instruction and learner-centered strategies—was more impactful than generic or compliance-driven training. However, both studies also noted that access to high-quality, content-focused CPD remains limited, especially in rural areas.

For CPD to drive real impact, schools must institutionalize the use of PPST-aligned self-assessment tools, ensure equitable access to subject-specific PD, and build a database of effective CPD practices. Integration of mentoring with PPST-focused coaching can also create a more coherent development pathway for teachers aiming for higher proficiency levels.

5) *Impact on Instructional Competence and Student Outcomes*

Improved instructional quality and learner performance were consistently cited as the ultimate goals of mentoring and professional development. Guadalupe (2022) reported measurable improvements in both teacher competence and student outcomes following structured mentoring programs implemented by Master Teachers. Teachers who received mentoring displayed greater clarity in instructional delivery, confidence in handling diverse learners, and adaptability in implementing lesson innovations.

Supporting this, Mercado and Cabuquin (2023) found that professional development significantly correlated with improved student academic performance and engagement. Teachers who were regularly engaged in PD reported higher confidence in lesson planning, use of varied instructional strategies, and student-centered learning practices. However, the studies emphasized that such improvements require continuous support, reflection, and feedback—elements that are often missing in short-term PD initiatives.

To maximize impact, mentoring and PD programs must include built-in evaluation tools that track changes in both teaching practices and student learning. Action research, peer observation reports, and learner performance data can serve as meaningful indicators of impact. Additionally, mentoring programs should provide structured reflection time where teachers can assess how professional learning translates to student achievement, and adjust accordingly.

4. Summary and Conclusion

Six Philippine-based studies on mentorship, feedback, and professional development in mathematics education were systematically reviewed. Using a thematic synthesis approach, the review identified five major themes: mentoring practices and technical assistance, feedback-driven professional development, peer and collaborative learning, standards-based CPD, and the impact of mentorship and PD on instructional competence and student outcomes.

The findings revealed that structured and well-supported

mentoring programs significantly enhance teachers' professional growth and classroom effectiveness. However, inconsistencies in implementation, lack of standardization, and limited institutional support often hinder the full potential of technical assistance provided by Master and Highly Proficient Teachers. The role of clear guidelines, mentoring protocols, and administrative backing emerged as essential in optimizing the impact of mentorship.

Feedback emerged as a powerful tool for professional learning when embedded in a formative and reflective framework. Yet, the current professional development practices often lack such feedback loops, making teacher learning disconnected from actual classroom application. Integrating coaching, feedback cycles, and peer review mechanisms can strengthen the developmental role of feedback in both mentoring and PD.

Peer and collaborative learning practices were found to be effective in building teacher confidence and content mastery, especially in mathematics instruction. Despite its benefits, peer mentoring remains underutilized, largely due to lack of time, recognition, and formal structures in schools. Institutionalizing peer coaching models and professional learning communities may offer sustainable and cost-effective solutions.

The alignment of CPD programs with the Philippine Professional Standards for Teachers (PPST) ensures coherence, relevance, and goal-driven development. However, access to subject-specific and high-quality CPD remains a challenge, particularly in rural areas. Stronger integration of PPST indicators, self-assessment tools, and classroom-based reflections are necessary to improve teacher engagement and development outcomes.

Mentorship and professional development activities were consistently linked to improvements in instructional competence and learner outcomes. Nonetheless, most studies lacked long-term tracking and robust evaluation tools to measure sustained instructional change and student impact. Embedding monitoring and evaluation systems within mentoring and PD frameworks will help ensure accountability, relevance, and continuous improvement.

In conclusion, effective mentoring and professional development in mathematics education require a structured, feedback-rich, and standards-aligned approach. When institutionalized and supported, these practices not only build teacher expertise but also contribute to improved student learning and professional empowerment. Future research and policy development should focus on expanding access, improving implementation fidelity, and building evaluation mechanisms that ensure sustained and scalable mentorship and PD practices in the Philippine education system.

5. Further Studies

Future research should focus on the design, implementation, and validation of a structured, feedback-driven mentorship framework specifically tailored for Highly Proficient Mathematics Teachers. This framework should integrate clear mentoring roles, formative feedback strategies, and performance-based monitoring tools aligned with the

Philippine Professional Standards for Teachers (PPST) and the Results-Based Performance Management System (RPMS). Emphasis should be placed on developing mentorship models that are subject-specific, contextually relevant, and adaptable to varying school capacities.

It is recommended that the development of this framework follow an iterative process involving the participation of both mentors and mentees. Validation should include consultations with mathematics education experts, feedback from teacher-users, and pilot implementation in diverse school settings. This participatory and evidence-based approach will ensure that the framework is practical, scalable, and responsive to classroom realities.

Future studies may also explore the integration of peer mentoring structures and professional learning communities (PLCs) within the framework to foster collaborative teacher growth. Additionally, research can investigate how digital tools, such as mentoring software or feedback applications, can enhance the delivery, documentation, and effectiveness of mentoring programs, particularly in remote or under-resourced areas.

Longitudinal research is needed to evaluate the sustained impact of mentorship programs on teacher instructional competence, professional advancement, and student learning outcomes. Pre- and post-intervention assessments, as well as reflective narratives and classroom observations, could provide deeper insights into how mentorship transforms teaching practice over time. Furthermore, studies should examine how mentoring can support teacher well-being, motivation, and retention, especially in high-demand subjects like mathematics.

Lastly, future work should address policy and implementation pathways for integrating mentorship into institutional development plans and teacher career progression frameworks. This includes the development of training modules, mentor certification programs, and support systems that ensure consistency, quality, and sustainability of

mentorship practices across the Philippine education system

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