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Pedagogical Competence and Challenges of Pre-Service Mathematics Teachers During Teaching Internship: An Explanatory Sequential Mixed-Methods Study

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Abstract. Teaching internships are a critical stage for pre-service teachers, enabling them to translate their pedagogical preparation into classroom practice. This study examined the pedagogical competence and internship-related challenges of pre-service mathematics teachers and integrated qualitative findings to explain the quantitative patterns. Using a sequential explanatory mixed-methods design, the quantitative phase involved 32 participants (16 pre-service mathematics teachers and 16 cooperating teachers) selected through total enumeration. The qualitative phase included 7 pre-service teachers and 7 cooperating teachers selected through purposive, criterion-based sampling. The quantitative data was gathered using a standardized performance evaluation tool and analyzed using mean scores and t-tests, whereas the qualitative data from the semi-structured interviews was analyzed using thematic analysis. The findings reveal consistently high pedagogical competence ratings for both the self-assessment and cooperating teacher evaluation, with professional behavior and voice modulation being the strongest areas. Lesson planning and communication skills obtained comparatively lower means, although they still had a high rating. No significant differences emerged between the self-assessments and cooperating teacher evaluations. The thematic analysis identified eight developmental challenges: communication competence, classroom management, instructional planning, learner engagement, the facilitation of higher-order thinking, learner diversity, professional confidence, and assessment practices. The convergence of high ratings and the qualitative evidence of continuing challenges suggests that these scores reflect entry-level professional readiness rather than full pedagogical mastery. These findings call on teacher education institutions to strengthen the skills of reflective mentoring, practice-based support, lesson planning, mathematical communication, assessment literacy, and differentiated instruction to better prepare mathematics teachers for being classroom-ready.

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1. Introduction

Teaching internships are a defining phase in teacher education because they are conducted at the point where pre-service teachers begin translating pedagogical theory into classroom practice. For pre-service mathematics teachers, this transition is especially demanding. Mathematics instruction requires not only content mastery but also professional knowledge that enables teachers to interpret students' thinking, represent concepts effectively, and anticipate misconceptions (Ball et al., 2008). These demands do not emerge gradually in a controlled environment. They arrive simultaneously on the first day of placement.

Beyond this specialized knowledge base, pre-service teachers must also manage classroom dynamics, select appropriate teaching strategies, communicate ideas with precision, and exhibit professional behavior in authentic school settings. In the context of the Philippines, these expectations are anchored in the Philippine Professional Standards for Teachers (PPST), which articulate what teachers are expected to know, do, and value across domains such as content knowledge and pedagogy, learning environment, curriculum and planning, assessment, and professional engagement (Department of Education, 2017).

These concerns carry renewed urgency in the context of the ongoing reforms in the education of teachers in the Philippines. The EDCOM II comprehensive review of pre-service programs, in consultation with representatives from 19 Teacher Education Institutions (TEIs), argues that teacher preparation must become more coherent, practice-based, and aligned with classroom realities, with particular emphasis on the persistent gap between what the coursework provides and what internship settings actually demand (Second Congressional Commission on Education, 2026). This gap is especially consequential in mathematics education, where effective teaching depends on the capacity to make abstract concepts understandable and engaging for diverse learners. Teaching internships, under this view, are not merely a culminating requirement; they are a critical program for determining whether TEIs genuinely equip future mathematics teachers for the demands of real classroom instruction.

Within this landscape, TEIs play a central role in shaping pedagogical readiness. Among the most consequential of their institutional functions is the creation of third spaces, which are hybrid sites where university-based knowledge and school-based practice are brought into productive dialogue rather than treated as hierarchically ranked domains (Zeichner, 2010). When TEIs fail to construct such spaces effectively, pre-service teachers arrive at placements carrying theoretical frameworks that feel inert when under actual classroom conditions. Coherence between coursework and clinical experience has been identified as the variable most consistently associated with preparation quality across national and institutional contexts (Darling-Hammond, 2014). The competences demonstrated during the internship should therefore be understood not only as an individual outcome but as an indicator of how effectively TEIs support and monitor the

transition from university-based preparation to classroom-based practice (Second Congressional Commission on Education, 2026).

The literature indicates that internships are simultaneously developing and demanding. Practicals have been shown to strengthen pedagogical content knowledge by situating pre-service teachers in authentic instructional contexts, while procedural over-emphasis and resource limitations persist as recurring vulnerabilities (Njiku, 2025). The mismatch between the pre-service teachers' expectations and actual classroom conditions generates adaptive demands that are not fully legible from competence scores alone (Makamure, 2020). Internships also constitute a period of consequential professional identity formation, which is an inherently unstable process in which pre-service teachers negotiate between the idealized professional self-constructed through coursework and the pragmatic self that emerges under placement pressures (Beauchamp & Thomas, 2009).

For mathematics teachers specifically, this identity work is compounded by the demands of professional noticing: this is the capacity to attend to, interpret, and respond instructionally to students' mathematical thinking in real time (Jacobs et al., 2010). The existing research remains largely bifurcated in its methodological approach. Quantitative studies assess competency levels without illuminating the experiential texture of developmental challenges, while qualitative accounts document lived difficulties without connecting them to measurable performance indicators. This gap is especially pronounced in the Philippine mathematics education context, where few studies have systematically examined how formal competence assessments and interns' first-hand accounts of internship challenges jointly illuminate professional readiness. Understanding pedagogical competence during internships thus requires more than either a quantitative description or qualitative narrative can provide in isolation.

This study responds to this methodological gap using an explanatory sequential mixed-methods design. We examine how pre-service mathematics teachers perform across six operationalized dimensions of pedagogical competence (lesson planning, classroom management, teaching strategy, professional behavior, fluency and accuracy of communication, and voice modulation) and then interpret those quantitative patterns through the lens of the participants' lived experiences. This study addresses three questions: (1) How can the level of pedagogical competence of pre-service mathematics teachers during a teaching internship be described across the six dimensions? (2) What challenges emerge from their lived experiences during the internship? (3) How do the qualitative findings explain and enrich the quantitative results?

2. Literature Review

2.1 Pedagogical Competence in Teacher Education

Pedagogical competence in teacher education is increasingly conceptualized as a multidimensional, enacted construct that connects what pre-service teachers know with what they can actually do in authentic teaching situations. Across recent studies, this competence is described through interrelated domains such as planning, instruction, classroom management, assessment, communication, and

professional dispositions, all of which must be demonstrated in practice for classroom readiness (Kim et al., 2023; Magnaye, 2022).

Enoc's (2019) teaching demonstration performance evaluation tool focuses this view by empirically deriving six observable factors (classroom management, teaching strategy, lesson planning, professional behavior, accuracy and fluency of communication, and voice modulation) through expert validation and factor analysis of the ratings from 265 cooperating teachers. Parallel research similarly treats pedagogical competence as an integrative attribute that fuses professional and personal qualities (decision-making, monitoring, and diagnostic skills) within a coherent model of professional, psychological, pedagogical, and basic-professional components (Kurgambekov et al., 2025). Other frameworks operationalize competence using constructs such as pedagogical knowledge, pedagogical content knowledge, and technological pedagogical knowledge, emphasizing the teachers' ability to select strategies, organize content, and integrate digital tools in subject-specific ways (Mensah, 2023).

Empirical work with pre-service teachers consistently shows relatively strong self-reported or observed capacities in lesson planning and instructional delivery, but weaker performance in technology integration, classroom management, and diverse assessment practices, highlighting the gap between formal preparation and situated practice (De Guia et al., 2025; Panggabean et al., 2025). Observation- and video-based studies further reveal that pre-service teachers often hold substantial propositional "knowledge for practice" but struggle with "knowledge in practice," that is, the adaptive use of methods, classroom control, and evaluative judgment in dynamic classroom contexts (Abdullah & Mirza, 2020; Aksu et al., 2023).

2.2 Teaching Internships as a Crucial Context for Pre-Service Teacher Development

Teaching internships occupy a central place in teacher preparation because it is where pre-service teachers confront the theory-practice divide and begin to transform academic knowledge into workable classroom routines. Field experiences give concrete shape to what "works" and what does not as pre-service teachers interact with mentors, supervisors, peers, and students, gradually refining their understanding of teaching and learning (Sathasivam et al., 2024; Greve et al., 2020). Research shows that the practicum is not automatically developmental: without structured opportunities for reflection and explicit theory-practice links, internships can reproduce existing school practices and even have deprofessionalizing effects, particularly when novices are left to "learn by doing" under heavy teaching loads with unfocused supervision (Bauer et al., 2024; Resch et al., 2024).

Studies of reflective practicum designs demonstrate that guided reflection through journals, seminars, peer observation, and mentor conferencing helps pre-service teachers critically examine classroom events, develop their own theories of teaching, and build agency and professional identity rather than simply adapting to the local norms (Nuraeni & Heryatun, 2021; Prado et al., 2019). Mathematics and subject-specific research similarly highlight the uneven

opportunities to learn core pedagogical practices in practice and have supported the finding that many student teachers struggle to mobilize theoretical concepts deeply in their reflections, underscoring the need for intentionally designed tasks and seminars that foreground theoretical framing of practice (Hendriwanto, 2021; Flores, 2018). At the same time, large-scale and cross-context studies indicate that well-supported internships can substantially enhance self-efficacy, perceived pedagogical knowledge, and confidence when handling challenging situations, even when the measured gains in formal pedagogical knowledge are modest (Österling, 2021; Christiansen & Erixon, 2024).

2.3 Effective Teaching Practices in Mathematics

Recent evidence shows that instructional clarity and classroom management are strongly tied to the attitude of students toward mathematics, including enjoyment, value, and boredom (Chen, 2023). The students' own perceptions of clarity and management are especially predictive of positive attitudes and achievement (Cheng et al., 2023). High-quality planning is not bureaucratic for the sake of it: well-designed lesson plans support meaningful learning trajectories, careful task design, and flexibility in response to classroom contingencies (Cevikbas et al., 2024; Fitriati et al., 2023).

Effective mathematics instruction requires more than just procedural demonstration. Interventions that combine problem-solving, active learning, games, and the rich use of representations and manipulatives foster both conceptual understanding and procedural fluency (Bognar et al., 2025; Ncube & Luneta, 2025). Reviews and empirical studies emphasize cognitively demanding tasks, multiple representations, discourse, and cognitive activation as central to mathematical learning (Yuliandari & Anggraini, 2021; König et al., 2021).

Classroom management matters not only due to the need to maintain order but also when it comes to sustaining engagement with demanding work. Evidence links teachers' classroom management expertise and monitoring activity with the students' mathematical progress though the effective management that must account for the level of disruptive behavior in the class (Lee et al., 2017; Marder et al., 2023). Voice, communication accuracy, and other interactional behaviors can be understood as part of this broader instructional management and discourse environment, shaping how students attend to, talk about, and internalize mathematical ideas (Bognar et al., 2025; Ncube & Luneta, 2025).

2.4 Challenges and Lived Experiences of Pre-Service Teachers During Internships

Teaching internships are widely depicted as a highly demanding yet formative phase in which pre-service teachers confront something of a "reality shock," negotiate new roles, and test their theoretical preparation in authentic classrooms (Çakar & Özcan, 2025; Maharani & Fithriani, 2023). Beyond the difficulties associated with transferring theory into practice and managing behavior, interns grapple with lesson planning, selecting appropriate methods, addressing individual differences, and coping with role ambiguity and anxiety about not being "real teachers" yet (Cevikbas et al., 2024; Zaki & Salsabila, 2024). In mathematics, these pressures intersect with the need to plan coherent lessons,

anticipate the students' thinking, and implement innovative, often technology-rich pedagogies where there are limited resources and time constraints (Abdullaeva & Zhamagat, 2025; Cannon et al., 2025). Studies report that pre-service teachers frequently struggle to design and adapt tasks, integrate digital tools, and respond flexibly to misconceptions, especially when their mentoring is inconsistent or when the context expectations conflict with university-taught approaches (Nacion et al., 2025; Pattung & Caban, 2023).

Internships are emotionally intense: positive emotions such as care and enthusiasm coexist with rising nervousness, stress, and feelings of isolation as practice progresses, shaped by organizational, personal, and background factors (Ji et al., 2022; Von Esch & Kavanagh, 2018). Lived experience thus becomes a central explanatory lens: it reveals why certain facets of competence, such as classroom management and basic content delivery, may solidify, while more sophisticated capacities like adaptive instruction, culturally responsive pedagogy, and creative risk-taking develop unevenly and remain highly context-bound (Diab & Green, 2025; Dediwalage et al., 2025).

3. Methodology

3.1 Research Design

The study employed a sequential explanatory mixed-methods design, in which the quantitative data was collected and analyzed first, followed by the conducting of a qualitative inquiry to explain and deepen the statistical results (Ivankova et al., 2006). This design was appropriate because the study sought not only to measure pedagogical competence but also to understand how internship challenges help to explain the quantitative patterns observed.

3.2 Participants

The quantitative phase involved 32 participants selected through total enumeration: 16 fourth-year pre-service mathematics teachers from Nueva Ecija University of Science and Technology enrolled on a teaching internship and deployed in cooperating schools, and 16 cooperating teachers from DepEd Cabanatuan, DepEd Nueva Ecija, and the NEUST Laboratory High School. This approach eliminated the risk of sampling bias and ensured complete population coverage. While the cohort was small due to program enrollment, the findings accurately describe the institutional population, although their generalizability beyond this context remains limited.

For the qualitative phase, purposive criterion-based sampling selected seven pre-service teachers and seven cooperating teachers. The participants had completed at least 12 weeks of the internship, were willing to provide in-depth reflections, and could offer detailed accounts of competency performance and internship challenges. Consistent with a sequential explanatory design, the participants were selected to explain the quantitative findings. They were also drawn from different deployment sites to capture variations in context and supervision.

3.3 Research Instruments

The quantitative phase used the Student Teachers Teaching Demonstration Performance Evaluation Tool (Enoc, 2019), which assesses six domains: lesson planning, classroom management, teaching strategy, professional behavior, fluency, and voice modulation. Content validity was established through expert review, and construct validity through factor analysis of the ratings given by the cooperating teachers. Reliability in the present sample was confirmed using Cronbach's alpha, indicating good to excellent internal consistency: specifically, lesson planning ($\alpha = .90$), classroom management ($\alpha = .90$), teaching strategy ($\alpha = .94$), professional behavior ($\alpha = .81$), fluency ($\alpha = .86$), and voice modulation ($\alpha = .89$). These values demonstrate that the instrument was highly reliable for this cohort. The tool uses a five-point rating scale, with higher scores reflecting stronger demonstrated competence.

For the qualitative phase, a semi-structured interview guide was used to explore the challenges experienced by the teaching interns. Semi-structured interviews allow the researcher to address predetermined domains while still giving participants enough flexibility to describe their lived experiences, perceptions, and difficulties in depth. The methodological literature emphasizes that semi-structured interviews are especially useful when the objective is to obtain rich, contextualized accounts that extend beyond what survey or rating data can reveal. They are also valued for balancing consistency across the participants with an openness to follow-up probing and clarification.

3.4 Data Collection Procedure

Prior to the data collection, the researchers secured administrative approval and coordinated with the Dean, the Head of the Experiential Learning Team, and the school principal. In the quantitative phase, the data on pedagogical competence was gathered from both the pre-service mathematics teachers and cooperating teachers through the administration of a survey instrument in both face-to-face and online formats to ensure accessibility and completion.

After the quantitative results were analyzed, the qualitative phase followed, during which selected pre-service teachers and cooperating teachers volunteered to participate in semi-structured online videoconferencing interviews. Each interview lasted approximately 25 to 40 minutes and focused on their experiences and challenges during the teaching internship. With the participants' informed consent, all interviews were audio-recorded, transcribed verbatim, and reviewed for accuracy. Ethical standards, including voluntary participation, confidentiality, and data privacy, were strictly observed in accordance with Republic Act No. 10173.

3.5 Data Analysis

The quantitative data was analyzed using the mean and corresponding verbal descriptions to determine the level of pedagogical competence across the identified domains. An independent t-test was employed to examine the differences between the ratings of the pre-service teachers and cooperating teachers. Cohen's *d* was computed alongside each t-test to estimate the practical effect size and provide an additional interpretation beyond statistical significance.

The findings were interpreted cautiously given the small sample size. For the qualitative phase, the interview transcripts were analyzed using Braun and Clarke's (2006) thematic analysis procedures: familiarization, coding, theme development, theme review, and theme definition. Trustworthiness was enhanced through member checking with two participants from each group, peer debriefing with an experienced qualitative researcher, and the reflexive documentation of researchers' assumptions and potential biases. In-depth descriptions were incorporated to support transferability.

3.6 Ethical Concerns

Ethical safeguards were strictly observed throughout the study. Approval was first obtained from the Office of the Dean and College Research Unit, after which informed consent was secured from all participants. Anonymity and confidentiality were maintained by removing any identifying information from the dataset and limiting access to the dataset to the researchers. The data collection, storage, and processing were undertaken in compliance with the Data Privacy Act of 2012 (Republic Act No. 10173), which governs the protection and secure handling of personal information in the Philippines.

4. Results and Findings

4.1 Levels of Pedagogical Competence of the Pre-Service Mathematics Teachers

Table 1 shows that the pre-service mathematics teachers demonstrated high levels of pedagogical competence. Based on their self-assessment, the overall mean was $M = 4.77$ ($SD = .41$), which is verbally described as excellent. Similarly, the cooperating teachers rated the pre-service teachers' overall pedagogical competence as excellent, with a mean of $M = 4.76$ ($SD = .46$). This close similarity indicates that the pre-service teachers' self-ratings were generally consistent with their cooperating teachers' evaluations. It is acknowledged, however, that all dimensions fell within a narrow band of 4.67 to 4.85, indicating a ceiling effect in the ratings. This compression limits the extent to which meaningful differentiation across the dimensions can be drawn from the quantitative data alone. It emphasizes the necessity of the qualitative phase for revealing nuanced developmental differences that the rating scale cannot capture.

Table 1: Levels of Pedagogical Competence of the Pre-Service Mathematics Teachers

Pedagogical Competence	Pre-service Teacher			Cooperating Teacher		
	Mean	SD	Verbal Description	Mean	SD	Verbal Description
1. Lesson Planning	4.67	.60	Excellent	4.68	.44	Excellent
2. Classroom Management	4.81	.33	Excellent	4.78	.42	Excellent
3. Teaching Strategy	4.78	.35	Excellent	4.72	.43	Excellent
4. Professional Behavior	4.82	.39	Excellent	4.85	.38	Excellent
5. Fluency & Accuracy of Communication	4.71	.41	Excellent	4.71	.56	Excellent
6. Voice Modulation	4.84	.36	Excellent	4.79	.51	Excellent
Overall Mean	4.77	.41	Excellent	4.76	.46	Excellent
<i>Legend: 1.00 – 1.80 (Poor), 1.81 – 2.60 (Moderately Satisfactory), 2.61 – 3.40 (Satisfactory), 3.41 – 4.20 (Very Satisfactory), 4.21 – 5.00 (Excellent)</i>						

Across the six dimensions, all areas were highly rated by both groups. Among the indicators, voice modulation received the highest mean from the pre-service teachers ($M = 4.84$, $SD = .36$), followed by professional behavior ($M = 4.82$, $SD = .39$) and classroom management ($M = 4.81$, $SD = .33$). For the cooperating teachers, professional behavior obtained the highest mean ($M = 4.85$, $SD = .38$), followed by voice modulation ($M = 4.79$, $SD = .51$) and classroom management ($M = 4.78$, $SD = .42$). Although still rated excellent, lesson planning received the relatively lowest mean from both pre-service teachers ($M = 4.67$, $SD = .60$) and cooperating teachers ($M = 4.68$, $SD = .44$). Overall, the results indicate consistently strong pedagogical performance across the instructional, communicative, and professional domains.

Table 2 reveals that no significant differences were found between the pre-service teachers' self-ratings and the cooperating teachers' evaluations across the pedagogical competence dimensions of lesson planning, classroom management, teaching strategy, professional behavior, fluency and accuracy of communication, and voice modulation. All p -values exceeded .05, indicating comparable assessments between the two groups. Effect sizes were negligible across all domains ($d < 0.20$), confirming that the absence of statistical significance reflects a genuine absence of practically meaningful group differences rather than insufficient power alone.

Table 2: Differences in the Levels of Pedagogical Competence of the Pre-Service Mathematics Teachers

Mathematics Teachers						
Group	Mean	SD	t-value	p-value	Cohen's d	Verbal Description
Lesson Planning						
Pre-service Teachers	4.67	.60	.087	.926	.02	Not Significant
Cooperating Teachers	4.68	.44				
Classroom Management						
Pre-service Teachers	4.81	.33	.267	.791	.08	Not Significant
Cooperating Teachers	4.78	.42				
Teaching Strategy						
Pre-service Teachers	4.78	.35	.566	.576	.15	Not Significant
Cooperating Teachers	4.72	.43				
Professional Behavior						
Pre-service Teachers	4.82	.39	.222	.826	.08	Not Significant
Cooperating Teachers	4.85	.38				
Fluency & Accuracy of Communication						
Pre-service Teachers	4.71	.41	.006	.995	.00	Not Significant
Cooperating Teachers	4.71	.56				
Voice Modulation						
Pre-service Teachers	4.84	.36	.437	.665	.11	Not Significant
Cooperating Teachers	4.79	.51				

4.2 Challenges that Emerged from the Lived Experiences of Pre-Service Mathematics Teachers During their Teaching Internship

4.2.1 Theme 1. Communication Competence Challenges

Communication competence emerged as a recurring challenge during the pre-service mathematics teachers' internships. The participants identified concerns about English proficiency, pronunciation, grammar, fluency, speaking

confidence, and the clarity of the explanations given. In mathematics instruction, these difficulties are pedagogically significant because teachers are expected to explain abstract ideas, model procedures, ask guiding questions, and provide precise directions. Thus, communication is not merely a linguistic skill but an instructional competence that shapes how learners' access and understand mathematical concepts. This theme is illustrated in the following responses:

"I need to improve my English-speaking skills, especially because English is the primary language used in mathematics instruction and professional communication" (Pre-service Teacher 1).

"One of the main areas that practice teacher needs to improve is fluency and accuracy in communication," (Cooperating Teacher 4).

Accounts from the interns and cooperating teachers converge in positioning communication as a core demand of effective mathematics teaching, in a way that is not limited to grammatical correctness and extends to making mathematical reasoning clear, coherent, and conceptually accessible (Pantaleon et al., 2018; Mursalin et al., 2025). Consistent with the evidence that oral mathematical communication and questioning are difficult yet central to understanding and fluency, the results underscore the need for structured, mathematics-specific oral explanation practice, microteaching with targeted feedback, and confidence-building activities to strengthen the interns' instructional clarity (Cartwright, 2020).

4.2.2 Theme 2. Classroom Management Difficulties

Classroom management emerged as another major challenge in the teaching internship experiences of the pre-service mathematics teachers. The participants reported difficulties when maintaining discipline, responding to off-task behavior, managing learners with behavioral concerns, controlling noise, and sustaining the students' attention during the giving of instructions. These concerns indicate that effective classroom management extends beyond rule enforcement to creating conditions in which mathematical instruction can proceed productively. This challenge is reflected in the responses:

"I need more support with staying consistent when addressing off-task behavior and keeping the class focused during lessons" (Pre-service Teacher 4)

"In terms of classroom management, don't be afraid to reprimand students who are not doing their tasks. Solely apply positive approach/discipline in doing it" (Cooperating Teacher 3).

These responses suggest that the interns were still developing the confidence and consistency needed to balance authority with supportive classroom relationships, a difficulty widely reported by pre-service teachers (Adams et al., 2020; Junker et al., 2021). Overall, the findings imply that classroom management should be strengthened as a core component of internship preparation (Freeman et al., 2014). Pre-service mathematics teachers may benefit from explicit coaching on preventive management, positive discipline, behavior redirection, and routines that promote learner engagement. Sustained mentoring may help them develop both the authority and responsiveness needed in actual classroom settings.

4.2.3 Theme 3. Instructional Planning and Delivery Gaps

Instructional planning and lesson delivery emerged as a significant area for improvement in the pre-service mathematics teachers' internship experiences. The participants reported difficulties when preparing daily lesson plans, sequencing the lesson components, managing instructional pacing, and determining whether the content, activities, and examples were appropriate for each part of the lesson. These concerns suggest that while pre-service teachers may possess theoretical knowledge of lesson design, translating this knowledge into coherent classroom instruction remains challenging. In mathematics teaching, this issue is particularly important because learners often require carefully sequenced explanations, scaffolded tasks, and sufficient time to process abstract concepts and procedures. This theme is captured in the statements of the participants:

"Sometimes, I struggle with planning lessons that are both engaging and appropriately timed" (Pre-service Teacher 2)

"The areas where the practice teacher needs further improvement include creating daily lesson plans that can serve as their guide - specifically, understanding what content is appropriate and accurate for each part of the lesson" (Cooperating Teacher 2).

The responses indicate that the planning difficulties were not merely technical but were closely tied to the coherence, pacing, and conceptual clarity of the enacted lessons. Empirical work shows that novice teachers often lack mastery in designing and implementing high-quality mathematics lesson plans, yet make notable progress when supported through structured training, mentoring, feedback on plans, and co-planning or curriculum-focused interventions (Cevikbas et al., 2024; Mok & Staub, 2021).

4.2.4 Theme 4. Limited Learner Engagement Strategies

The fourth theme concerns the limited use of strategies that actively engage students in the lesson. Several participants noted that some pre-service teachers needed to improve their ability to make the mathematics lessons interactive, interesting, and participatory. This is particularly relevant in mathematics, where engagement may influence the students' willingness to participate, persist in problem solving, and develop positive attitudes toward the subject. This theme is evident in the responses:

"I need to improve on making lessons more interactive and engaging so that students stay interested and involved throughout the class" (Pre-service Teacher 5)

"The practice teacher would benefit from further mentoring to enhance their classroom management skills and develop more effective strategies for engaging students" (Cooperating Teacher 1).

The interns' reflections reveal the awareness that conventional, teacher-centered delivery was insufficient to sustain the learners' interest and participation in mathematics. This is consistent with studies showing that pre-service teachers underuse active, constructivist practices and rely mainly on traditional exposition (Sunzuma & Luneta, 2023). This emphasizes the need for stronger preparation in

relation to learner-centered strategies, collaborative and inquiry-based tasks, contextualized problems, rich questioning, and formative checks to promote deeper, more durable engagement (Vale & Barbosa, 2023).

4.2.5 Theme 5. Weak Higher-Order Thinking Facilitation

Facilitating higher-order thinking skills (HOTS) emerged as a recurring development challenge during the pre-service mathematics teachers' internships. The participants indicated difficulty when formulating probing questions and designing tasks that required learners to explain, justify, analyze, and reflect on mathematical ideas. This finding is important because mathematics instruction should not be limited to recalling formulas or performing procedures; it should also cultivate reasoning, problem-solving, and critical thinking. When the questions asked in the classroom remain focused on factual or procedural responses, the students may have fewer opportunities to develop a deeper conceptual understanding and to engage in mathematical argumentation.

"In utilizing higher order thinking" (Pre-service Teacher 7)

"The teacher must explicit or imposing questions with 'why' and 'how'"
(Cooperating Teacher 3)

The responses indicate that some pre-service teachers were still learning to design and enact lessons that move learners beyond routine procedures toward analytical and justificatory thinking. Consistent with the evidence that pre-service teachers often struggle to design non-routine, high-cognitive-demand tasks and HOTS-based problems (Mata-Pereira & Ponte, 2017; Rianasari & Apriani, 2019), these challenges suggest that internships may reproduce procedural teaching if not deliberately structured. Thus, the findings underscore HOTS-focused lesson design, purposeful questioning, and task construction as the core levers for developing inquiry-oriented mathematical practice.

4.2.6 Theme 6. Challenges in Responding to Learner Diversity

Another major theme that emerged from the data is the difficulty of addressing learner diversity. The participants emphasized the challenge of teaching students with different abilities, learning styles, and backgrounds. This theme reflects the complexity of diverse classrooms, where a uniform instructional approach is insufficient and differentiated strategies are essential. This theme is clearly shown in the following responses:

"Even though I used different strategies and teaching methods because they have different learning styles, sometimes it is not enough for some students to grasp the lesson I was teaching" (Pre-service Teacher 3)

"Consider continuing to develop skills in differentiated instruction to better address the varied learning needs of students and ensure that all are both supported and appropriately challenged" (Cooperating Teacher 7).

The findings indicate that learner diversity remains a demanding development area, as pre-service teachers often hold narrow views of differentiation and inclusion and struggle to plan proactively for varied learners (Nepal et al., 2021; Obrovská et al., 2024). Evidence shows that carefully designed, experience-based

programs in inclusive pedagogy and differentiated instruction, combined with cultural competence, scaffolding, and reflective support, can strengthen their capacity to promote equitable participation in mathematics classrooms (Gallagher et al., 2020).

4.2.7 Theme 7. Developing Professional Confidence and Identity

The findings further reveal that professional confidence and identity formation are important development concerns during internship. The participants mentioned teaching anxiety, a lack of confidence, hesitation when speaking, and difficulty asserting their authority in the classroom. These experiences suggest that an internship is not only a period of skill application, but also a transitional phase in which pre-service teachers negotiate their professional identity as emerging educators. Confidence affects how teachers speak, manage the class, respond to challenges, and present themselves in front of learners.

"Time Management and Authority to the Practice Teacher" (Pre-service Teacher 6)

"Mostly pronunciation and confidence in teaching" (Cooperating Teacher 6).

The findings indicate that technical competence in mathematics teaching is insufficient without a robust sense of professional identity and self-efficacy to enact it. Professional confidence develops through authentic internship experiences, positive mentoring relationships, and opportunities for autonomous role enactment and social validation (Izadinia, 2015; Cai et al., 2022). Programs should therefore embed sustained mentoring, guided reflection, iterative classroom exposure, and constructive feedback to help interns consolidate their authority, resilience, and commitment as emerging mathematics teachers.

4.2.8 Theme 8. Assessment and Feedback Limitations

The last major theme pertains to the assessment and feedback practices. Some participants reported difficulties when creating valid assessment tools, using varied forms of assessment, and providing timely feedback to students. In mathematics teaching, assessments are essential not only for measuring achievement but also for diagnosing misconceptions, monitoring progress, and guiding instruction. Weaknesses in this area may limit the teacher's ability to make informed instructional decisions and support student learning effectively.

"The top two areas where the practice teacher needs further improvement or mentoring are taking the initiative in the classroom tasks and creativity valid assessment tools" (Cooperating Teacher 1)

"1st difficult to adapt to the school's culture and routines. 2nd struggles to create valid assessment tools" (Cooperating Teacher 5).

These responses indicate that assessment literacy remains a developing competency, as it was widely documented for the pre-service cohorts who often felt underprepared regarding assessment design, interpretation, and the use of results (Xu & Brown, 2016). This reveals that the ability to construct valid assessments and use assessment information effectively remained an area requiring further professional development during the internship.

4.3 Integration of the Quantitative and Qualitative Findings

Table 3: Integration of the Quantitative and Qualitative Findings on Pedagogical Competence and Internship Challenges

Quantitative Results	Qualitative Themes	Integrated Interpretation
Overall pedagogical competence was rated excellent by both pre-service teachers ($M = 4.77$, $SD = .41$) and cooperating teachers ($M = 4.76$, $SD = .46$).	Communication Competence Challenges; Classroom Management Difficulties; Instructional Planning and Delivery Gaps; Limited Learner Engagement Strategies; Weak Higher-Order Thinking Facilitation; Challenges in Responding to Learner Diversity; Developing Professional Confidence and Identity; Assessment and Feedback Limitations	The qualitative findings show that high competence coexisted with specific areas where improvement is needed.
Lesson planning received the lowest mean among the competence indicators, although it was still rated excellent by both groups (Pre-service Teachers: $M = 4.67$, $SD = .60$; Cooperating Teachers: $M = 4.68$, $SD = .44$).	Instructional Planning and Delivery Gaps	Lesson planning was a relative area for improvement despite strong overall performance.
Classroom management was rated excellent by both pre-service teachers ($M = 4.81$, $SD = .33$) and cooperating teachers ($M = 4.78$, $SD = .42$).	Classroom Management Difficulties	Classroom management was a strength, but it still required effort in practice.
Teaching strategy was rated excellent by both pre-service teachers ($M = 4.78$, $SD = .35$) and cooperating teachers ($M = 4.72$, $SD = .43$).	Limited Learner Engagement Strategies; Weak Higher-Order Thinking Facilitation; Challenges in Responding to Learner Diversity	Teaching strategies were effective overall but needed greater depth and adaptability.
Professional behavior received one of the highest ratings (Pre-service Teachers: $M = 4.82$, $SD = .39$; Cooperating Teachers: $M = 4.85$, $SD = .38$).	Developing Professional Confidence and Identity	Professional behavior was strong, while confidence and identity were still developing.
Fluency and accuracy of communication were rated excellent by both groups ($M = 4.71$).	Communication Competence Challenges	Communication was generally effective, though some weaknesses remained.
Voice modulation obtained one of the highest ratings (Pre-	Communication Competence Challenges; Developing Professional Confidence and Identity	Strong voice delivery coexisted with concerns

service Teachers: $M = 4.84$, $SD = .36$; Cooperating Teachers: $M = 4.79$, $SD = .51$).		about speaking, confidence and clarity.
Minimal differences were found between the pre-service teacher and cooperating teachers' ratings.	Developing Professional Confidence and Identity	Self-perceptions were generally consistent with external evaluations.
All competence dimensions were rated excellent.	All eight themes	Excellent competence reflected strong but still developing professional performance.

As shown in Table 3, the integrated findings indicate that the qualitative data explained and enriched the quantitative results by showing that excellent pedagogical competence coexisted with specific developmental needs. The quantitative results indicate consistently high pedagogical competence ratings across all six dimensions, with overall means of 4.77 ($SD = .41$) and 4.76 ($SD = .46$) for pre-service and cooperating teachers, respectively. Professional behavior recorded the highest ratings, while lesson planning, though still high, recorded the comparatively lowest means (4.67–4.68).

The qualitative findings revealed eight themes referring to the development challenges that correspond directly to these highly rated dimensions. Despite strong professional behavior ratings, the participants described ongoing struggles with authority in the classroom and professional confidence (Theme 7). Similarly, high communication ratings coexisted with reported difficulties in mathematical clarity and explanatory fluency (Theme 1), while lesson planning challenges (sequencing, pacing, and content alignment) elaborated what the quantitative signal registered only faintly (Theme 3).

These two strands do not contradict one another; the qualitative findings explain what the ratings alone cannot reveal. High observable performance coexisted with effortful, context-dependent enactment, suggesting that excellent ratings during the internship reflect emerging competence under supported conditions, rather than consolidated mastery. This integration confirms that rating-scale assessments must be complemented by qualitative evidence to yield a theoretically adequate account of the pre-service teachers' pedagogical readiness.

5. Discussion

5.1 Level of Pedagogical Competence of Pre-Service Mathematics Teachers

The findings indicate that the pre-service mathematics teachers demonstrated a high level of pedagogical competence during their teaching internship. Both the pre-service teachers and cooperating teachers provided highly comparable evaluations across all competence dimensions, with no statistically significant differences between the ratings. This convergence suggests a shared understanding of performance expectations and indicates that the interns

generally possessed realistic perceptions of their teaching capabilities. This finding contrasts with studies reporting discrepancies between self-assessments and external evaluations (Holtz & Gnambs, 2017; Bauer et al., 2024), suggesting that the internship environment may have promoted more accurate self-reflection and performance awareness (Lobo, 2023; Pérez-Torregrosa & Gallego-Arrufat, 2024).

Among the dimensions assessed, professional behavior and voice modulation received the highest ratings, while lesson planning obtained the lowest, although all dimensions remained within the excellent range. The prominence of professional behavior suggests that internship experiences effectively cultivate professional dispositions, ethical conduct, and workplace responsibilities alongside instructional skills (Afalla & Fabelico, 2020; Tindowen et al., 2019). The strong ratings being in classroom management and teaching strategy indicate that the interns were capable of organizing their learning environments and implementing instructional approaches that are appropriate for classroom teaching (Weber et al., 2018; Junker et al., 2021; Dangdang & Lucero, 2023).

The narrow distribution of scores across the dimensions suggests that the instrument may have encountered a ceiling effect in this cohort. Consequently, small differences among the dimensions should not be interpreted as substantial differences in competence. Instead, the findings are better understood as evidence of entry-level professional readiness rather than complete pedagogical mastery. In particular, the comparatively lower ratings for lesson planning and communication warrant attention, as these competencies are foundational to effective mathematics instruction. Lesson planning requires the integration of learning objectives, content sequencing, assessment, and instructional pacing, making it one of the most cognitively demanding aspects of teaching (Beckmann & Ehmke, 2023). Similarly, the fluency and accuracy of communication are critical in mathematics because conceptual understanding depends heavily on precise explanations and meaningful classroom discourse (König et al., 2021).

Theoretically, these findings support the view that pedagogical competence is multidimensional and developmental rather than static. In practice, they suggest that teacher education programs are successfully preparing interns to perform their core instructional responsibilities but should continue strengthening their preparations in terms of lesson planning and mathematical communication. The novelty of the present study lies in demonstrating that uniformly high competence ratings do not necessarily indicate complete preparedness for the complexities of classroom practice, particularly when examined alongside the qualitative evidence.

5.2 Challenges Experienced During the Internship

Although the quantitative findings portrayed a highly competent cohort, the qualitative results revealed eight interconnected developmental challenges: communication competence, classroom management, instructional planning and delivery, learner engagement, higher-order thinking facilitation, learner diversity, professional confidence and identity, and assessment and feedback practices.

These findings demonstrate that competence and challenges can coexist during an internship, and that strong performance ratings do not eliminate areas where development is needed. A notable finding is that the reported challenges were not isolated but interconnected. Difficulties in communication influenced classroom authority and learner engagement, while weaknesses in planning affected pacing, questioning, assessment alignment, and instructional coherence. This pattern suggests that pedagogical competence functions as an integrated system rather than a collection of independent skills. Similar relationships have been reported in studies showing that difficulties with higher-order thinking instruction, differentiation, and assessment frequently co-occur among pre-service teachers (Van Den Kieboom & Groleau, 2022; Rianasari & Apriani, 2019).

Several challenges are particularly significant within mathematics education. The participants reported difficulties when facilitating higher-order thinking, differentiating instruction, and designing valid assessments. These findings are important because mathematics learning requires learners not only to perform particular procedures but also to reason, justify, generalize, and solve non-routine problems. Consistent with the previous studies, pre-service teachers often struggle to design cognitively demanding tasks and adapt the instructions to diverse learners (Jailani et al., 2023; Salido et al., 2025). The present findings suggest that these difficulties may stem not only from limited instructional experience but also from the inherent complexity of mathematics teaching, which requires managing conceptual progression, prerequisite knowledge, and learner variability simultaneously.

Another important finding concerns professional confidence and identity development. Despite receiving high competence ratings, the participants reported teaching anxiety, uncertainty about their authority in the classroom, and concerns about their professional readiness. This finding extends the previous research emphasizing the role of internship in identity formation (Mitiche, 2025; Lutovac & Kaasila, 2013). It suggests that observable teaching performance and professional self-concept do not necessarily develop at the same pace. An intern may demonstrate competent teaching behaviors while still experiencing uncertainty about their identity as a teacher.

These findings have important pedagogical implications. Teacher preparation programs should not focus exclusively on observable teaching performance but also support adaptive expertise, reflective practice, confidence-building, and assessment literacy. Structured mentoring, guided reflection, and repeated opportunities for authentic classroom engagement may help interns navigate the transition from performing teaching tasks to developing their professional judgment and identity.

6. Alignment of Quantitative and Qualitative Findings

The integration of the quantitative and qualitative findings provides the study's most significant contribution. Quantitatively, all pedagogical competence dimensions were rated highly by both pre-service teachers and the cooperating teachers. Qualitatively, the participants identified multiple areas requiring

continued development. Rather than contradicting one another, the two datasets provide complementary perspectives on the same developmental process.

The central insight emerging from the data integration is that the high pedagogical competence ratings reflected professional readiness rather than professional mastery. The interns demonstrated the ability to perform essential teaching functions effectively within supervised classroom contexts, yet the qualitative evidence showed that they continued to encounter difficulties regarding communication, differentiation, learner engagement, assessment, and professional identity development. This finding suggests that competency-based assessments primarily capture visible teaching performance but may be less effective at identifying the emerging challenges that become apparent through reflective accounts and lived experiences.

This study contributes to a more nuanced understanding of the outcomes of the internships. Previous research has generally focused either on competence ratings or on internship experiences separately. By integrating both perspectives, the present study demonstrates that pedagogical competence and the challenges encountered while developing skills are not opposing conditions but simultaneous features of professional growth. The findings are best interpreted as evidence of high but still developing pedagogical competence that reflects entry-level professional readiness rather than complete pedagogical mastery.

From a theoretical perspective, the findings support the developmental views of teacher learning, where professional competence evolves through continuous interactions between performance, reflection, and contextual experience. From a practical perspective, the results suggest that internship evaluation systems should complement rating-based assessments with reflective, process-oriented measures that capture developmental complexity. These approaches would provide a more comprehensive picture of the capabilities of the interns and generate richer evidence to assist in program improvement.

Several limitations should be considered when interpreting the findings. The study involved a small cohort from a single teacher education institution, limiting the transferability to other contexts. The consistently high ratings also suggest a ceiling effect that may have reduced the instrument's ability to discriminate between different levels of performance. In addition, the self-reporting and supervisor ratings may be influenced by social desirability, leniency, or halo effects. Despite these limitations, the convergence between the quantitative and qualitative evidence strengthens the confidence in the findings. Future studies should employ larger multi-site samples and incorporate process-oriented measures such as reflective journals, lesson studies, and video-based feedback to capture teacher development more comprehensively.

7. Conclusion

This study examined how pre-service mathematics teachers demonstrated pedagogical competence during their teaching internship and the challenges they encountered as they translated pedagogical theory into classroom practice. The

quantitative results showed that both pre-service teachers and cooperating teachers rated pedagogical competence as excellent across all six dimensions, with professional behavior and voice modulation receiving the highest evaluations and lesson planning exhibiting the lowest relative mean and the widest variance. No significant differences emerged between the self-assessments and cooperating teacher evaluations. The qualitative findings revealed eight interconnected developmental challenges in communication, classroom management, instructional planning and delivery, learner engagement, higher-order thinking facilitation, learner diversity, professional confidence and identity, and assessment and feedback, in contrast to this.

These results indicate that high competence ratings reflect entry-level professional readiness rather than full pedagogical mastery. This study contributes to the literature by showing that competence and challenges are able to coexist during an internship and that integrating rating data with lived experiences yields a more realistic picture of professional growth. Internships thus emerge as a development threshold where pre-service mathematics teachers can perform core teaching tasks yet still require structured support to strengthen their adaptive expertise.

Teacher education institutions and policymakers can practically use these findings to refine their internship systems. This can be done by prioritizing mentoring and feedback on lesson planning and mathematical communication; embedding practice-based training in learner-centered and HOTS-oriented strategies; providing explicit preparation for differentiated instruction and inclusive practices; and systematically developing assessment literacy through authentic, classroom-embedded tasks. Integrating performance ratings with reflective tools such as journals, video analysis, and lesson study at the program level can generate richer evidence for quality assurance and the continuous improvement of internship and supervision policies.

8. Conflicts of Interest

The authors declare there to be no conflicts of interest in relation to the publication of this study. This research was conducted without any commercial or financial relationships that could be interpreted as influencing the study or its findings.

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