



Bridging Theory and Practice: Exploring Pre-Service Mathematics Teachers' Perceptions of The PPG Prajabatan Program in Indonesian High School

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Abstract. This study investigates pre-service mathematics teachers' perceptions of the *Pendidikan Profesi Guru (PPG) Prajabatan* program in Indonesian high schools, focusing on the alignment between theoretical training and real-world classroom applications. Employing a qualitative approach, semi-structured interviews were conducted with ten pre-service mathematics teachers who completed the PPG Prajabatan program and undertook their teaching practice in high school. The findings are categorized into three key themes: (1) misalignment between theoretical training and classroom realities, (2) limited access to resources and contextual adaptability, and (3) the role of mentorship and reflective practices. While the program provides a solid theoretical foundation, challenges persist in equipping pre-service teachers for diverse classroom environments. The study concludes with actionable recommendations for bridging the gap between theory and practice.

Keywords: Pre-Service Teachers, PPG Prajabatan, Teacher Preparation, Mathematics Subject, Indonesian High School, Qualitative Research.

1 Introduction

Teacher preparation programs play a vital role in shaping the quality of education systems worldwide. In Indonesia, the *Pendidikan Profesi Guru (PPG) Prajabatan* program was introduced as part of the government's national strategy to professionalize the teaching workforce [15]. Designed for pre-service teachers, the program provides individuals who are not yet certified professional teachers with an opportunity to gain the theoretical knowledge and practical skills necessary for effective teaching.

The PPG Prajabatan program is specifically targeted at graduates from teacher education programs who aspire to become licensed professional [15]. Participants engage in an intensive curriculum that integrates theoretical coursework, such as pedagogy and content knowledge, with practical teaching experiences through internships and teaching practicums in real classroom settings. This combination aims to bridge the gap between theory and practice, equipping pre-service teachers to navigate the complexities of modern classrooms.

However, existing research indicates that pre-service teachers often face difficulties in applying theoretical knowledge to practical teaching scenarios especially in specialized subjects like mathematics, particularly in diverse classrooms characterized by students with varying abilities and socioeconomic backgrounds [30]. Additionally, as digital technology becomes increasingly integral to education, teacher preparation

programs are expected to equip future educators with the skills to effectively integrate technological tools into their pedagogy [22]. Mathematics education, with its unique content and pedagogical demands, poses specific challenges in effectively integrating digital technologies and adapting theoretical knowledge into practical classroom strategies. These demands place significant pressure on programs like PPG Prajabatan to address these multifaceted challenges.

Despite its significance, there is limited research exploring how pre-service mathematics teachers perceive and experience the PPG Prajabatan program, particularly in translating its theoretical components into effective teaching strategies. This study seeks to address this gap by investigating two research questions:

1. How do pre-service mathematics teachers perceive the alignment between the theoretical components of the PPG Prajabatan program and their practical teaching experiences in Indonesian high schools?
2. What are the key challenges faced by pre-service mathematics teachers during their teaching practice?

Through these questions, this study aims to provide actionable insights into how the PPG Prajabatan program can better support pre-service teachers in their transition to professional teaching roles.

2 Literature Review

2.1 Overview of the PPG Prajabatan Program

The Pendidikan Profesi Guru (PPG) Prajabatan program is Indonesia's flagship initiative for preparing pre-service teachers who have not yet achieved professional teaching status [15]. Launched to improve the quality of education nationwide, the program emphasizes a structured pathway that combines theoretical coursework with practical teaching experiences. The curriculum typically includes modules on subject-specific pedagogy, teaching methodologies, classroom management, and digital technology integration, complemented by extended teaching practicums in diverse school settings [2].

Despite its comprehensive design, critiques of the PPG Prajabatan program highlight persistent gaps between theory and practice. Pre-service teachers often report that while the program provides a solid theoretical foundation, it does not sufficiently prepare them for the practical challenges of real-world classrooms [27]. Specifically, issues such as classroom diversity, resource limitations, and the effective use of digital technologies remain inadequately addressed [3].

2.2 Teacher Education: Balancing Theory and Practice

The integration of theoretical knowledge with practical teaching experience is a fundamental goal of teacher education programs globally. Kitchen emphasizes that effective teacher preparation programs must seamlessly blend pedagogy, subject matter expertise, and practical teaching skills to prepare educators for the complexities of classroom instruction [23]. Similarly, McGarr critiques many teacher education programs for overemphasizing theoretical coursework while neglecting the practical aspects of teaching, resulting in graduates who are theoretically knowledgeable but practically unprepared [28].

In the Indonesian context, Chang et al. notes that while the PPG Prajabatan program excels in delivering comprehensive theoretical training, it often fails to equip pre-service teachers with the necessary practical skills [11]. This disconnect is particularly evident in subject-specific contexts such as mathematics, where the application of theoretical concepts to diverse classroom scenarios is critical. Fitriani et al. further supports this view, highlighting that pre-service teachers frequently struggle to implement pedagogical strategies learned during the program in real classrooms, leading to a gap between teacher education and classroom practice [19].

Conversely, some studies, such as Eddraoui et al. acknowledge the PPG Prajabatan program's success in enhancing teachers' content knowledge and pedagogical understanding [17]. However, it also recognizes the need for stronger practical components, suggesting that more hands-on training and real-world teaching experiences are necessary to prepare pre-service teachers for the demands of the classroom fully.

These conflicting perspectives underscore the persistent tension between theory and practice in teacher education. To address this gap, Korthagen proposed hybrid models that integrate traditional coursework with extensive school-based experiences, a strategy that has shown promise in various international contexts [25]. However, the applicability and adaptability of such models within the Indonesian education system remain underexplored, indicating a need for localized solutions that consider the specific challenges faced by Indonesian pre-service teachers [41].

2.3 Mathematics Education in Teacher Preparation

Mathematics education poses unique challenges for teacher preparation programs due to its critical role in developing students' analytical and problem-solving skills. Anthony & Walsha argue that effective mathematics teaching requires a deep understanding of both mathematical concepts and pedagogical strategies that can make these concepts accessible to diverse learners [4]. In Indonesia, Purnomo identify several specific challenges faced by pre-service mathematics teachers, including curriculum alignment, student motivation, and assessment practices [32].

Research by Purnomo highlights that while the PPG Prajabatan program provides robust theoretical training in mathematics pedagogy, pre-service teachers often lack sufficient practical experience in applying these theories to real classroom settings [32]. This deficiency is particularly problematic in environments where students have varying levels of mathematical proficiency, necessitating adaptive teaching methods that

can cater to different learning needs [31]. Moreover, Smets and Struyven notes that the lack of training in differentiated instruction and formative assessment practices further hampers pre-service teachers' ability to effectively engage and support all students [40].

International studies offer contrasting perspectives. For instance, in countries like Singapore and Finland, teacher preparation programs incorporate extensive hands-on training and mentorship, which significantly enhance teachers' ability to implement effective mathematics teaching strategies [2][34]. These programs emphasize the integration of technology, collaborative teaching practices, and continuous professional development, which are areas that the PPG Prajabatan program could benefit from incorporating more comprehensively.

2.4 Managing Diversity in Classrooms

Diversity in classrooms encompasses a wide range of factors, including students' socioeconomic backgrounds, cultural contexts, and varying academic abilities [16]. Eikeland and Ohna emphasize that effective teacher preparation must include strategies for differentiation and cultural responsiveness to ensure that all students have equitable access to quality education [18]. In Indonesia, socio-economic disparities between regions exacerbate these challenges, with pre-service teachers often encountering classrooms with significant variations in student preparedness and resource availability [36].

Research by Bhroin and King suggests that teacher preparation programs must prioritize training in inclusive teaching practices to equip educators with the skills necessary to manage diverse learning needs [7]. However, implementation remains inconsistent. For example, Fitriani et al. reports that while the PPG Prajabatan program includes modules on diversity and inclusion, pre-service teachers often feel inadequately prepared to apply these concepts in heterogeneous classrooms [19]. Similarly, Yotta finds that pre-service teachers frequently struggle to adapt their teaching methods to accommodate students with different learning styles and abilities [43].

International studies, such as those by Chea, argue that structured mentoring and collaborative teaching experiences during practicums can significantly mitigate the challenges of managing diverse classrooms [12]. Indonesian researchers like Glover et al. support this view, advocating for mentorship models that connect pre-service teachers with experienced educators who understand the local context and can provide practical guidance on inclusive teaching strategies [21]. These findings suggest that enhancing mentorship opportunities within the PPG Prajabatan program could improve pre-service teachers' preparedness for managing diversity effectively.

2.5 Digital Technology Integration in Teacher Preparation

The integration of digital technology into teaching is increasingly recognized as a critical component of effective education in the 21st century. The Technological Pedagogical Content Knowledge (TPACK) framework Koehler highlights the importance of blending technological tools with pedagogical strategies and content knowledge to enhance teaching and learning [24]. However, despite the growing emphasis on digital literacy, many teacher preparation programs, including Indonesia's PPG Prajabatan,

fall short in equipping pre-service teachers with the necessary skills to effectively integrate technology into their pedagogy [33].

However, Batane and Ngwako notes that the limited practical application of digital tools within the program hinders pre-service teachers' ability to innovate and engage students through technology [6]. This gap results in pre-service teachers feeling unconfident and underprepared to utilise digital technologies effectively in their classrooms. Furthermore, research by Haleem et al. indicates that the effectiveness of digital technology training in teacher education is significantly enhanced when accompanied by ongoing support and resources, such as access to digital toolkits and collaborative platforms for sharing best practices [22]. This comprehensive approach contrasts with the more fragmented digital training observed in the PPG Prajabatan program, highlighting the need for a more integrated and supportive framework for technology integration in Indonesia's teacher preparation [26].

This study aims to address these gaps by investigating pre-service mathematics teachers' perceptions of the PPG Prajabatan program, focusing on its effectiveness in aligning theoretical and practical components, preparing teachers for diverse classrooms, and supporting digital technology integration. Through synthesizing insights from various studies, this research seeks to provide a nuanced understanding of the program's strengths and areas for improvement, ultimately contributing to the enhancement of teacher preparation strategies in Indonesia.

3 Methodology

3.1 Research Design

This study utilized a qualitative research design to investigate pre-service mathematics teachers' perceptions of the PPG Prajabatan program in Indonesian high schools. Qualitative research provides a nuanced understanding of participants' experiences and contextual factors that influence their perspectives [13]. Semi-structured interviews were selected as the primary data collection method, allowing for consistent questioning while accommodating the exploration of unique insights [20].

3.2 Participant Recruitment

Participants were selected through purposive sampling to ensure they met the following criteria:

1. Pre-service mathematics teachers enrolled in the PPG Prajabatan program.
2. Mathematics teachers who had completed a teaching practicum in high/secondary schools.
3. Individuals who had not yet attained professional teacher certification, emphasizing their pre-service status.

Purposive sampling was chosen for its ability to target participants with specific knowledge and experience relevant to the research objectives [38]. A total of 10 participants were interviewed, representing diverse teaching contexts in Indonesia.

3.3 Data Collection

Data were collected through semi-structured interviews conducted via Zoom. This method was chosen for its accessibility and convenience, allowing participants from various regions to engage in the research [5]. Each interview lasted approximately 30 minutes and was guided by an interview protocol with open-ended questions.

The questions aimed to elicit detailed insights into participants' perceptions and experiences with the PPG Prajabatan program. Examples of interview questions include:

- How do you perceive the alignment between the theoretical components of the program and your classroom teaching experience?
- What challenges have you faced during your teaching practicum in terms of classroom management and instructional strategies?
- How prepared do you feel to integrate digital technology into your mathematics instruction?
- What aspects of the PPG Prajabatan program do you find most helpful or challenging in preparing you for teaching mathematics?

Interviews were recorded with participants' consent and transcribed verbatim for analysis.

3.4 Ethics

Ethical approval was secured from the university's Research Ethics Committee. Participants were informed of their rights, including the right to withdraw at any time without penalty. Informed consent was obtained prior to participation. To ensure confidentiality, all identifying information was anonymized, and data were securely stored on password-protected devices [9].

3.5 Data Analysis

The interview data were analyzed using thematic analysis following Clarke and Braun's six-phase framework [8]. This approach was selected for its suitability in identifying patterns and themes within qualitative data.

The analysis process involved the following steps:

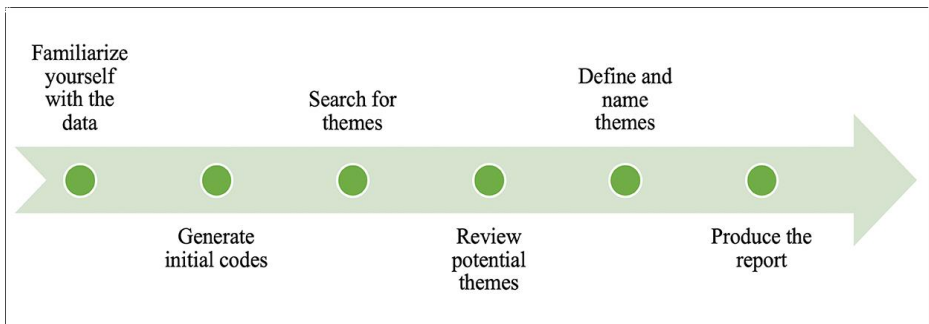


Fig. 1. Thematic analysis stages

1. Familiarization: Transcriptions were reviewed multiple times to gain a comprehensive understanding of the data.
2. Initial Coding: Data were systematically coded to identify key ideas and patterns.
3. Theme Development: Codes were grouped into preliminary themes that reflected the research objectives.
4. Theme Review: Themes were refined to ensure alignment with the data and relevance to the research questions.
5. Theme Definition: Each theme was clearly defined to encapsulate its central meaning.
6. Reporting: Themes were documented and supported with illustrative quotes to provide depth and context.

The results of this analysis will be presented in the subsequent chapter, focusing on key themes derived from participants' responses.

4 Results

This chapter presents the findings from the interviews conducted with pre-service mathematics teachers participating in the PPG Prajabatan Program. The findings are structured to address the two research questions, focusing on the perceptions of the alignment between theoretical and practical components and the challenges faced during their teaching practice.

Sociodemographic data of the participants and the themes that emerged from the data analysis are also provided.

Table 1. Sociodemographic Profiles of Interview Participants

Participant	Age	Gender	Undergraduate Degree	Teaching Placement
1	27	Female	Mathematics Education	Medan
2	29	Male	Mathematics Education	Semarang

3	26	Female	Mathematics Education	Medan
4	26	Female	Mathematics	Toba
5	27	Female	Mathematics	Makassar
6	25	Male	Mathematics Education	Pontianak
7	28	Female	Mathematics Education	P. Siantar
8	28	Male	Mathematics Education	Manokwari
9	30	Female	Mathematics Education	Bali
10	25	Female	Mathematics Education	Medan

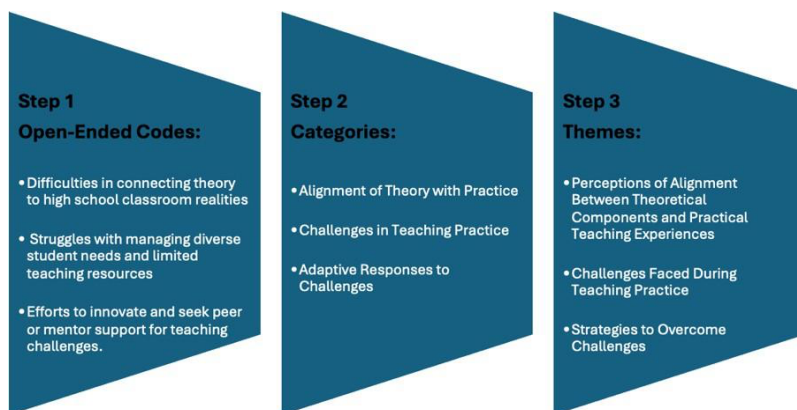


Fig. 2. Process of themes extraction from semi-structured Interviews.

Table 1 summarizes the sociodemographic profiles of the ten participants. The age range of the interviewees was between 25 and 30 years old. Seven participants were female, and three were male. All participants were enrolled in the PPG Prajabatan Program, specialising in mathematics education, and all had completed their undergraduate degrees in either mathematics education or mathematics. Their teaching practice took place in a range of Indonesian high schools, from diverse areas located in the islands of Sumatera, Java, Kalimantan, Sulawesi, Bali, and Papua, providing diverse insights into the program's effectiveness. The participants' varied teaching placements enriched the data, offering perspectives on how the theoretical training from the PPG Prajabatan Program was applied in different school contexts in Indonesia.

Theme One: Perceptions of Alignment Between Theoretical Components and Practical Teaching Experiences.

The majority of participants expressed varying perceptions regarding the alignment between the theoretical components of the PPG Prajabatan program and their practical teaching experiences. A key observation was that the theoretical knowledge provided during the program was seen as valuable for foundational understanding.

Seven participants highlighted that the pedagogical frameworks and strategies introduced in the program were applicable and supported their classroom practices. Participant 3 shared:

"The theories we learned in the PPG program helped me design lesson plans that cater to different student needs, especially in mathematics. It gave me confidence."

However, three participants noted that some theoretical concepts were challenging to implement in specific classroom conditions due to contextual differences, such as large class sizes or resource limitations. Participant 6 explained:

"The strategies, like inquiry-based learning, sound ideal, but in my class with 35 students, it's very difficult to apply. The theory doesn't always fit reality."

Participants from less-resourced areas (e.g., Toba and Papua) reported greater struggles in bridging the theoretical and practical aspects due to limited access to technological and learning resources. Participant 9, reflected:

"We are trained to use tools like GeoGebra and other math apps to make lessons engaging. But in my school, there's no proper signal of internet connection most of the time and lack of computers. I had to rely on chalk and blackboards instead, which felt like going back in time."

Table 1 provides a summary of sub-themes for Theme One, including the frequency and selected participant quotes

Table 2. Summary of Theme One

Sub-theme	Frequency	Selected quotes
Applicability of theoretical knowledge	5	'The methods for managing class behaviour worked well'
Disconnect due to technology limitations	3	'We couldn't use digital tools as taught, as the school is lack of facilities of technology'
Regional variations in applicability	4	'In my area, large class sizes made the suggested methods less practical'

Theme Two: Challenges Faced During Teaching Practice.

Participants faced a variety of challenges during their teaching practice, many of which were specific to teaching mathematics in diverse Indonesian contexts. These challenges included managing large class sizes, addressing student misconceptions in math, and adapting to a lack of resources. Participant 7 struggled with classroom management in a large, mixed-ability math class:

"In one of my classes, there were 45 students, and their understanding of math varied widely. Some could solve equations easily, while others didn't even understand multiplication. It was impossible to give everyone the attention they needed."

Participant 4 highlighted cultural barriers:

"In my area, students rarely ask questions, even if they don't understand a concept. For example, when I taught geometry, some students were confused about the idea of angles but didn't say anything. I only realized it later during their homework review."

Resource limitations also posed significant challenges, as noted by Participant 3:

"We didn't have enough math textbooks, so students had to share. This caused delays in learning, especially when teaching topics like fractions, where diagrams are crucial for understanding."

Table 3. Summary of Theme two

Sub-theme	Frequency	Selected quotes
Large class sizes and mixed abilities	4	‘Managing a large class with varied skill levels was overwhelming’
Cultural barriers to engagement	6	‘Students hesitated to ask questions, making it hard to assess their understanding’
Resource shortages	3	‘There weren’t enough resources to support teaching specific concepts’

Theme Three: Strategies to Overcome Challenges.

Participants adopted various strategies to address these challenges, many of which reflected creative solutions tailored to teaching mathematics in resource-constrained or culturally diverse settings. Participant 8 described how he involved the local community to address resource shortages:

"To teach geometry, we worked with parents to create shapes using bamboo. Students enjoyed the hands-on activity, and it made the concepts more relatable."

Participant 5 emphasized the importance of adapting her teaching style:
"I simplified math problems to match students' daily lives. For instance, instead of abstract algebra questions, I framed them as calculations for market purchases. This approach helped students see the relevance of math."

Collaboration with peers also played a critical role, as highlighted by Participant 2:
"I shared my struggles with teaching probability with a fellow teacher. She suggested a dice game, which I tried, and it worked wonders. The students were so engaged, and they finally understood the concept."

Table 4. Summary of Theme three

Sub-theme	Frequency	Selected quotes
Community engagement for teaching aids	3	‘Involving parents helped create resources for teaching mathematical concepts’
Contextualizing math problems	8	‘Adapting math problems to real-life scenarios improved student understanding’
Peer collaboration and resource sharing	6	‘Collaborating with colleagues helped me find creative ways to teach challenging topics’

5 Discussion

This study provides insights into the perspectives of pre-service teachers regarding the effectiveness of the PPG Prajabatan program in addressing the challenges faced

during their teaching placements, particularly in diverse geographic and socio-economic contexts across Indonesia. Several unique findings emerged from the analysis, informed by the participants' demographic backgrounds.

First, the findings revealed that pre-service teachers from less-resourced regions, such as Toba and Manokwari, faced significant challenges related to infrastructure and student engagement. For example, Participant 4 teaching in a small area in Toba noted that the lack of basic teaching aids and the unavailability of stable internet services impeded her ability to implement the digital strategies emphasized in the PPG program. Similarly, participant 8 from Manokwari also highlighted cultural barriers, with students in rural Papua being hesitant to actively engage in discussions due to local norms. These challenges align with Burhan et al., findings on the rural-urban divide in Indonesian education but underscore the need for context-specific adaptations in teacher training programs [10].

In contrast, pre-service teachers placed in urban and semi-urban areas such as Medan and Semarang experienced different challenges. Participant 1 teaching in Medan and Participant 2 teaching in Semarang emphasized the overwhelming class sizes in urban schools, which hindered the application of interactive pedagogical approaches. However, these participants also had better access to technological resources, enabling them to incorporate digital tools more effectively. This variation highlights the disparity between rural and urban placements and the necessity of tailoring training content to reflect these differences [1].

Age and teaching experience also influenced the participants' perspectives. Younger participants, such as Participant 6 (25 years old), were more adaptable to integrating digital tools but struggled with classroom management. On the other hand, older participants, such as Participant 9 (30 years old), demonstrated stronger classroom management skills but expressed frustration with the theoretical focus of the PPG program, which they felt did not adequately prepare them for real-world challenges. Gender dynamics further enriched the findings. Female participants, such as Participant 5, often highlighted the importance of fostering nurturing teacher-student relationships, which they viewed as integral to their teaching approach. Male participants, such as Participant 2, tended to emphasize technical aspects of pedagogy, such as lesson planning and assessment strategies. This aligns with gender-based differences in teaching priorities observed in prior studies [42].

6 Conclusion and Implications

This study explored the perceptions of pre-service mathematics teachers regarding their experiences in the PPG Prajabatan program during their teaching placements in Indonesian high schools. The findings highlighted a mixture of challenges and opportunities, shedding light on the gap between theoretical knowledge acquired in teacher preparation programs and the practical demands of teaching. A notable theme was the difficulty pre-service teachers faced in applying theoretical knowledge to classroom practices, particularly in areas such as classroom management and teaching strategies,

where there was a lack of preparation for the real-world complexities of the teaching environment.

The participants' experiences varied depending on their placement locations, with those in more urban areas like Medan and Semarang noting a greater availability of resources but facing challenges in managing larger and more diverse classrooms. In contrast, those placed in rural areas like Toba and Manokwari, despite facing significant resource constraints, expressed a deeper sense of connection with their students and the communities, which provided motivation and support for their teaching efforts. These contextual differences underscore the importance of adapting teacher preparation programs to better address the unique needs of different teaching environments [35]. The pre-service teachers from rural areas, for example, needed more practical support in navigating resource limitations and adapting their teaching strategies to cater to diverse student needs, whereas those in urban areas required more guidance on classroom management and meeting the varied expectations of students in more complex educational settings.

The study's findings suggest that there is a pressing need for the PPG Prajabatan program to strike a better balance between theory and practice. While the program provides a solid theoretical foundation, it lacks sufficient emphasis on equipping pre-service teachers with the practical tools necessary for handling the realities of the classroom, especially in rural and under-resourced areas. Given that teaching placements in diverse geographical and socio-economic contexts revealed distinct challenges, there is a clear need for more tailored, context-specific support for pre-service teachers during their placements [39].

These insights have significant implications for policymakers, teacher educators, and all stakeholders involved in teacher preparation [14]. Policymakers should consider revising the PPG program to incorporate more contextually relevant training and to ensure that pre-service teachers are given adequate practical exposure to the realities of teaching in both urban and rural settings. Teacher educators should emphasize the development of practical pedagogical skills, such as classroom management techniques, differentiated instruction, and strategies for teaching in resource-limited environments. Furthermore, incorporating reflective practices and providing stronger mentorship during placements could foster a deeper understanding of how to connect theory to practice effectively [37]. By addressing these areas, the PPG Prajabatan program could better prepare pre-service teachers for the challenges they will face in the classroom, ultimately bridging the gap between theoretical learning and the practical skills required for effective teaching. This will not only improve the quality of teacher education but also contribute to the long-term goal of enhancing education across Indonesia, particularly in schools facing the most significant challenges.

6.1 Limitations

While this study provides valuable insights into the experiences of pre-service mathematics teachers in the PPG Prajabatan program, several limitations must be considered. The sample was limited to a small group of pre-service teachers from various

regions. Additionally, the study did not include teachers from exceptionally under-resourced regions or those facing extreme socio-economic challenges, which may have provided different insights into the challenges faced in the program. Further research that includes a broader sample, including teachers from more impoverished areas, would provide a more comprehensive understanding of the program's effectiveness across different contexts. Additionally, the research relied on self-reported data, which may be subject to bias, as participants may have been influenced by social desirability or their own perceptions of their experiences. Future studies could incorporate observational methods or feedback from mentor teachers to provide a more holistic view of pre-service teachers' development during their placements.

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