

Collaborative Approaches to Mitigating Teacher Shortages: Evidence from a Systematic Literature Review

Amelia Febriana*, Sugiarto, Siti Zulaikha, Kamaludin

Educational Management, Faculty of Education, Universitas Negeri Jakarta, Indonesia.

*Corresponding Author. Email: amelia.febriana@mhs.unj.ac.id

Abstract: This study aims to examine policy frameworks and collaborative strategies implemented across different countries to address teacher shortages through pre-service teacher education. A systematic literature review method was conducted following the PRISMA 2020 guidelines, analyzing 32 open-access journal articles published between 2020 and 2025 and indexed in the Scopus and Google Scholar databases. The review identified three dominant policy approaches: (1) intensive pre-service programs that actively involve prospective teacher candidates; (2) transitional substitution strategies implemented through short-term policies, such as the utilization of retired teachers and regional incentive schemes; and (3) tripartite structural integration among universities, schools, and government institutions. Data were analyzed using bibliometric techniques to map research trends and thematic structures, followed by qualitative thematic synthesis to examine policy models and collaborative mechanisms. The findings indicate that cross-institutional collaboration plays a crucial role in establishing a sustainable and coherent teacher policy ecosystem. The study concludes that teacher shortages should be addressed through long-term, institutionally grounded policies that strengthen pre-service teacher education pathways. These results provide a conceptual foundation for enhancing Indonesia's Pre-Service Teacher Internship Program (Program Magang Mahasiswa Calon Guru / PMMCG) as an evidence-based strategy for teacher recruitment, preparation, and professionalization.

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Introduction

Teachers play a strategic role in ensuring the sustainability, quality, and equity of education systems. Beyond delivering instructional content, teachers contribute to students' character formation, social development, and the cultivation of competencies required to navigate global change (Eacott, 2024; Dari & Marwiah, 2025; Wrona et al., 2025). As key actors within the educational ecosystem, teachers are central to the achievement of Sustainable Development Goal 4 (SDG 4), which emphasizes inclusive and equitable quality education for all. However, this strategic role cannot be fulfilled effectively when education systems face persistent shortages of qualified teachers.

Teacher shortages have emerged as a global challenge that critically threatens both educational quality and equity. UNESCO (2024) estimates that approximately 44 million additional teachers will be needed worldwide by 2030 to meet global education targets. This shortage affects not only developing countries but also high-income nations, driven by factors such as population growth, increased student enrollment, the COVID-19 pandemic, and mass retirement among senior teachers (Garcia & Clifton, 2023; Oyen & Schweinle, 2020; Cooper et al., 2022; Koch, 2024). These pressures are compounded by declining interest in the

teaching profession among younger generations and persistent disparities in teacher distribution, particularly between urban centers and remote or disadvantaged regions (Lowrance et al., 2023; Little et al., 2024; Gilbert & Corbett, 2022).

Evidence from several countries illustrates that teacher shortages are not merely quantitative but also structural and institutional. In England, for example, high attrition rates among early- and mid-career teachers have intensified shortages, largely due to limited professional recognition and inadequate institutional support (Gorard et al., 2025). Data from the Teaching and Learning International Survey (TALIS) reveal that teachers in countries such as England, France, and Japan often perceive their profession as undervalued by governments, media, and society, contributing to early career exits (Gorard et al., 2025). These findings suggest that teacher shortages are multidimensional problems requiring systemic and long-term policy responses rather than isolated recruitment measures.

In Indonesia, teacher shortages remain a pressing and systemic concern. Data from the Ministry of Education, Culture, Research, and Technology indicate a national shortfall of approximately 1.3 million teachers, while recruitment through the Government Employee with Work Agreement (ASN PPPK) scheme has only fulfilled about half of this demand (Kemendikbudristek, 2022). In addition, nearly one-third of the current teaching workforce is approaching retirement age, further exacerbating future supply risks. These conditions have resulted in increased workloads for remaining teachers, declining instructional quality, and widening regional disparities in access to qualified educators (Rahyasilah et al., 2025; Thorn, 2023).

Despite its scale, the ASN PPPK policy has shown limited effectiveness in addressing teacher shortages in a sustainable manner. Recent studies on education policy in Indonesia indicate that teacher recruitment and workforce policies are often implemented through top-down administrative mechanisms, with limited integration of long-term workforce planning and insufficient coordination with teacher education institutions (Widiastuti, 2025; Rahyasilah et al., 2025). Such approaches tend to prioritize the procedural fulfillment of vacancies rather than the development of a sustainable teacher pipeline aligned with regional needs. As a result, the involvement of teacher education institutions (LPTKs/universities) in shaping future teacher supply remains weak, constraining the policy's capacity to address the structural and distributional dimensions of teacher shortages.

At the subnational level, local governments have implemented various policy responses to mitigate teacher shortages, yet these efforts often yield limited results. Studies in Ambon City show that despite regulatory interventions targeting honorary teachers, mismatches persist between subject demand and teacher availability due to structural constraints and limited institutional coordination (Rahabav et al., 2024). Similarly, research in Pidie District indicates that short-term solutions such as accelerated recruitment, contractual teachers, and temporary incentives may alleviate immediate shortages but fail to address long-term sustainability and workforce planning challenges (Handayani et al., 2024). These cases highlight that teacher shortage policies in Indonesia tend to be fragmented, reactive, and insufficiently integrated across governance levels.

Globally, governments have adopted a range of short-term strategies to address immediate teacher shortages, including fast-track certification, career-change programs, and the temporary employment of unqualified or retired teachers. Countries such as Australia, the United Kingdom, and the United States have implemented alternative pathways to attract professionals from other sectors into teaching, particularly in high-demand subjects (White et al., 2025; Fielder et al., 2024; Morris, 2023). In Austria and Switzerland, policies allowing

retired or provisionally certified teachers to return to classrooms have served as emergency measures to stabilize teacher supply (Resch, 2025; Keller & Boye, 2025). While these approaches offer short-term relief, they often lack sustainability and do not address underlying weaknesses in teacher preparation and workforce development systems.

In response to these limitations, increasing attention has been directed toward strengthening pre-service teacher education as a long-term and sustainable strategy. Programs such as teacher residency and Grow Your Own (GYO) emphasize early recruitment, extended field-based training, and closer alignment between teacher education institutions and schools (Lowrance et al., 2023; Potts, 2022; Jiang & Yip, 2024). Despite their potential, such programs are frequently implemented in a fragmented manner, often without a coherent policy framework or strong involvement from regional governments. As a result, initiatives like GYO tend to function as isolated projects rather than integrated components of national or regional teacher workforce planning.

Moreover, many existing policies remain predominantly top-down, with limited systemic engagement of universities or teacher education institutions (LPTKs) in policy formulation and implementation. While partnerships between universities and schools are commonly discussed in the context of teaching practicums, the role of governments as coordinating and enabling actors is often underexplored. This lack of integrative governance weakens the effectiveness of pre-service teacher programs as strategic tools for addressing teacher shortages.

Although a growing body of research examines teacher shortage policies, most studies focus on alternative recruitment mechanisms, post-retirement teaching, or financial incentives, with limited attention to pre-service teacher internships as a deliberate government policy instrument. Furthermore, empirical and review-based studies on tripartite collaboration among universities, schools, and governments remain scarce, particularly in the Indonesian context. Given Indonesia's complex teacher shortage challenges and regional disparities, there is a clear need for a more coherent, evidence-based, and institutionally integrated policy approach.

Accordingly, this study aims to systematically review international policies and practices that utilize pre-service teacher education programs as strategic responses to teacher shortages. By synthesizing global evidence, the study seeks to identify how collaboration among universities, schools, and governments can be structured to support sustainable teacher workforce development and inform the strengthening of pre-service teacher internship policies in Indonesia.

Research Method

This study used a qualitative approach with a systematic literature review method, guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 framework (Page et al., 2021). This approach was selected to obtain a comprehensive and evidence-based understanding of policies and practices related to pre-service teacher programs implemented in various countries as strategies to address teacher shortages.

Data sources consisted of peer-reviewed journal articles retrieved from major academic databases, namely Scopus and Google Scholar, using the Publish or Perish software to facilitate the search process. The article selection process was conducted through the application of inclusion and exclusion criteria to ensure that all reviewed studies aligned with

the research focus. Table 1 presents the detailed inclusion and exclusion criteria used in the article screening process.

Table 1. Inclusion and Exclusion Criteria

| Criteria | Inclusion | Exclusion |
|---------------------|--|--|
| Publication Year | Documents published between 2020-2025 | Documents published before 2020 |
| Type of Publication | Journal Articles | Books, proceedings, or book chapters |
| Language | English and Indonesian | Other languages |
| Journal Access | Open-access articles | Closed-access articles |
| Type of Educator | Teacher in regular school | Special education teachers |
| Scope of Discussion | Government strategies, policies, or programs to address teacher shortage | Articles discussing only about causes or impacts of teacher shortages without policy solutions |

The search strategy was developed systematically using Boolean operators and combinations of keywords relevant to the research topic. The search string was formulated as follows: “teacher shortage” AND (“pre-service teacher” OR “teacher education”) AND (“government policy” OR “local government”). The search was limited to journal articles published between 2020 and 2025 and written in either English or Indonesian. All search results were exported to Mendeley and Microsoft Excel for screening and data management purposes. Articles were retrieved from two major academic databases Scopus and Google Scholar resulting in an initial total of 577 records.

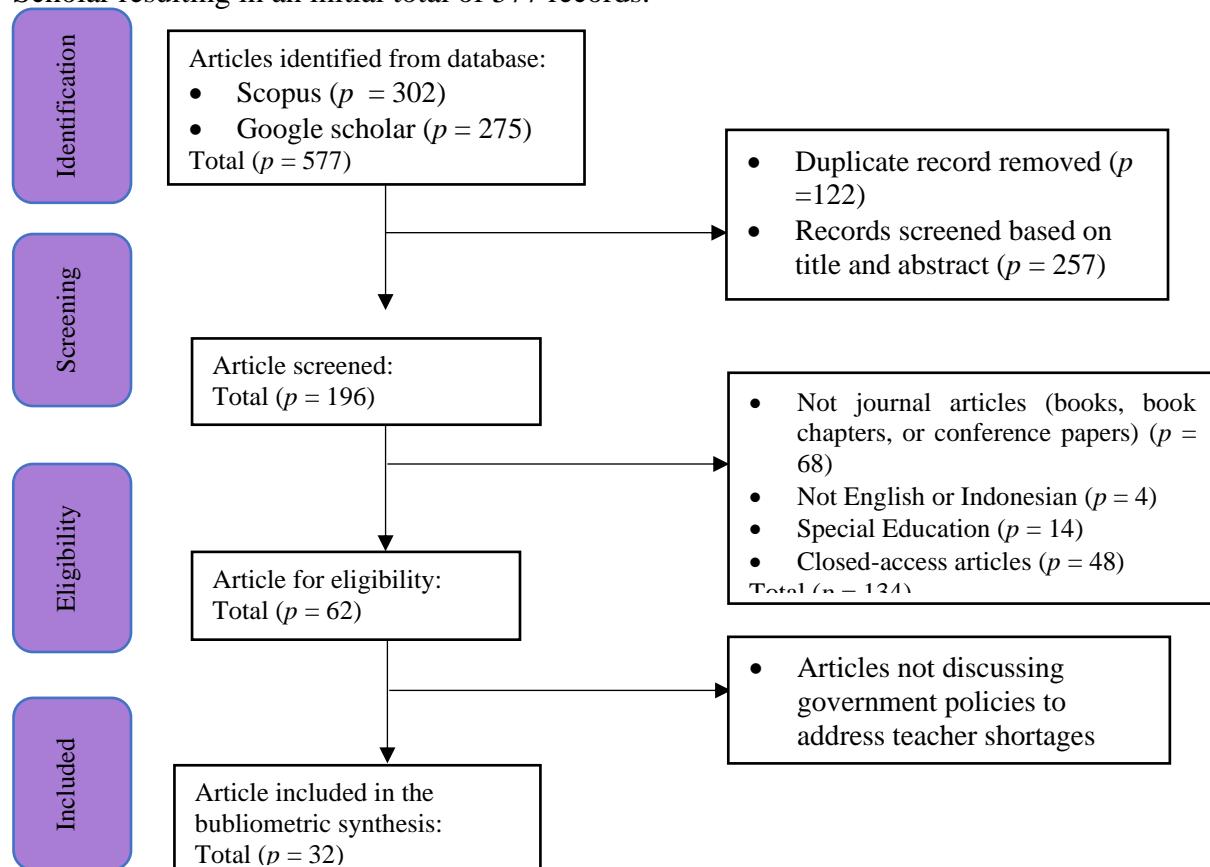


Figure 1. PRISMA Flowchart

The article selection process followed four main stages in accordance with the PRISMA 2020, namely: identification, screening, eligibility assessment, and final inclusion. To ensure the quality and relevance of the included studies, several selection criteria were applied, as outlined in Table 1. The systematic literature search result in 32 journal articles that met all inclusion criteria. The complete article selection process is illustrated in Figure 1 (PRISMA Flowchart). The PRISMA flowchart illustrates the systematic process used to identify, screen, assess eligibility, and include studies for the final synthesis.

The data analysis in this study was conducted using a qualitative analysis involved several stages, including the selection, coding, and thematic synthesis of articles that met the inclusion criteria (Soundy, 2025). At the same time, a bibliometric analysis was performed using VOSviewer software to visualize publication trends, keyword relationships, authorship patterns, and research collaboration networks related to *teacher shortages*, *pre-service teacher programs*, and *government policies*. These visualizations helped identify the main research themes and highlight how different topics are connected across the literature. In addition, a content analysis of the selected studies was conducted to explore government strategies and policy models designed to address teacher shortages through pre-service teacher education. This process was carried out manually through systematic coding, categorization, and thematic interpretation, allowing the researchers to draw comprehensive and evidence-based conclusions (Soundy, 2025).

Results and Discussion

Synthesis of Research Trends and Bibliometric Visualization

The bibliometric analysis of 32 articles that met the inclusion criteria revealed a significant increase in publications focusing on *teacher shortages* and *pre-service teacher education* over the past five years. As shown in Figure 2, the number of related publications rose sharply starting in 2022 and peaked in 2024. This surge reflects growing attention from both researchers and policymakers toward the global teacher shortage crisis, which was further exacerbated by the COVID-19 pandemic.

This period marked a critical transition in academic discourse from merely identifying the causes of teacher shortages to actively exploring sustainable policy solutions through pre-service teacher education and reform of recruitment systems (Blanco et al., 2023; Ellul-Thorn, 2023; Dadvand & Lampert, 2024).

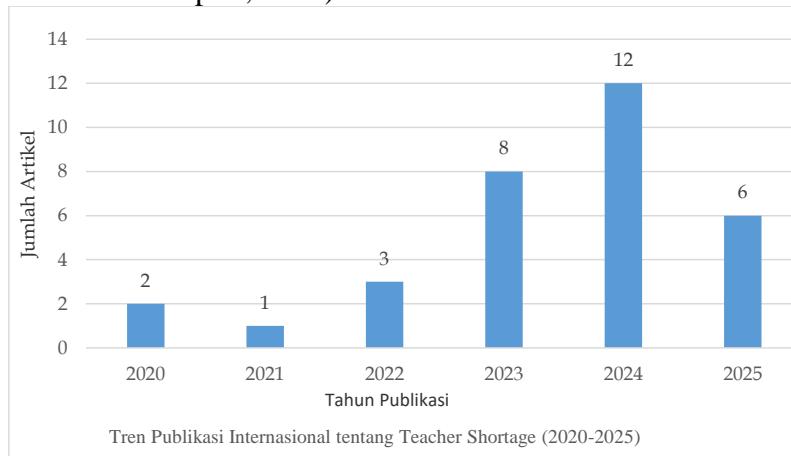


Figure 2. Representation of the Intensity and Evolution of Scholarly Attention

This trend also reflects the growing maturity of the research topic. While publications in the early period (2020–2021) were predominantly descriptive, since 2023, an increasing number of articles have become more policy-oriented and focused on innovative program designs such as teacher residency, Grow Your Own, and cross-institutional partnerships. This pattern underscores that the issue of teacher shortage has evolved into a strategic global research agenda and continues to serve as a sustained area of scholarly inquiry.

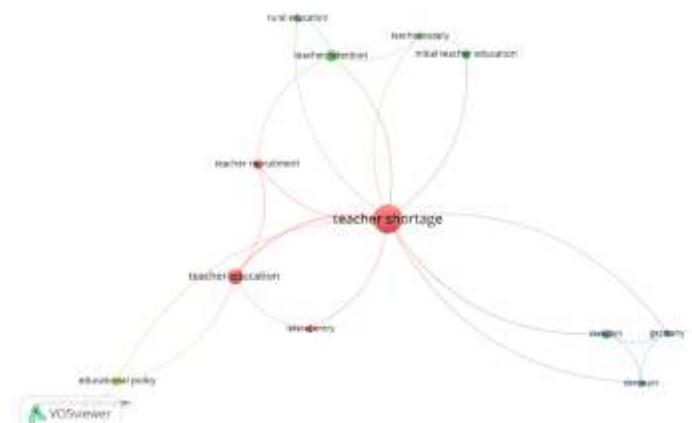


Figure 3a. Network Visualization Map

The keyword co-occurrence map generated by VOSviewer Figure 3a confirms this shift in research focus. The term *teacher shortage* occupies a central position in the network and is closely linked to *teacher education*, *teacher recruitment*, *retention*, and *educational policy*. From these relationships, three main clusters emerge: the cluster of educational policy and economics, the cluster of teacher recruitment and pre-service teacher education, and the cluster of teacher distribution in rural areas. These findings indicate that the issue of teacher shortage is now understood as a multidimensional phenomenon that integrates policy, socio-economic, and teacher professional development aspects.

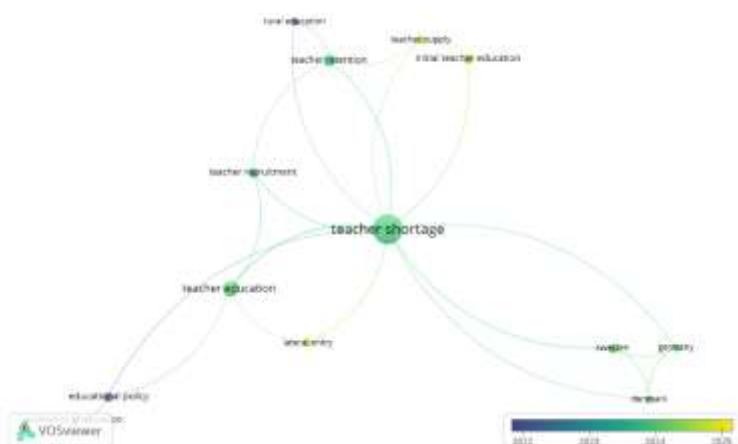


Figure 3b. Overlay Visualization

Thus, global research trends reveal two important developments. First, there has been a broadening of the issue from merely a labor shortage crisis to the strengthening of teacher education policy systems. Second, there is a growing convergence between the fields of educational policy research and teacher education research, giving rise to a new subfield known as *teacher education policy studies*. This shift demonstrates that teacher-related issues

are no longer viewed solely as matters confined to schools but rather as complex and multidimensional public policy concerns.

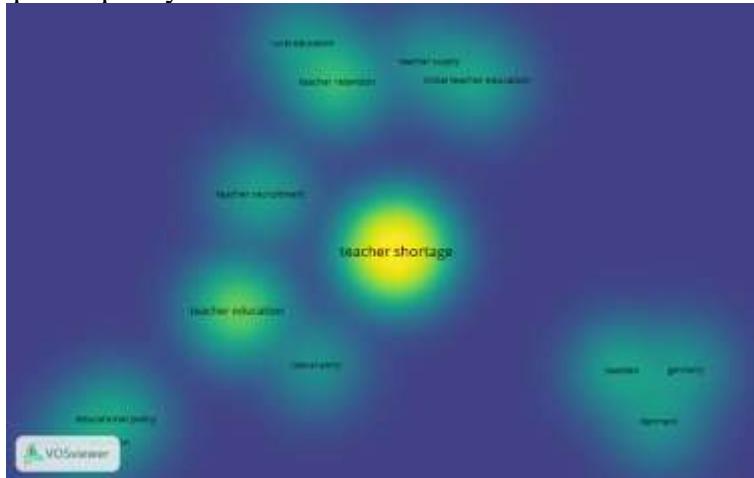


Figure 3c. Density Visualization

The density visualization presented in Figure 3c illustrates the intensity of research focus based on the frequency of keyword occurrences within the analyzed literature. The yellow areas represent topics with the highest frequency, while the green and blue areas indicate regions of lower density. The mapping results show that the term "*teacher shortage*" has the highest density and serves as the central node within the global research network. Other highly dense keywords include "*teacher education*," "*teacher recruitment*," "*teacher retention*," and "*initial teacher education*." Meanwhile, terms such as "*rural education*," "*educational policy*," and "*lateral entry*" exhibit relatively lower density levels, suggesting that these issues remain in developmental stages within the scholarly discourse. These findings corroborate the earlier *overlay visualization* results, confirming that the global research focus has shifted from reactive strategies toward efforts to strengthen pre-service teacher education systems. Thus, the *density visualization* further emphasizes that studies on teacher shortages have evolved into a strategic research agenda that integrates the dimensions of education, policy, and teacher distribution equity.

Pre-Service Teacher Programs as a Government Policy Strategy

International literature shows that pre-service and teacher internship programs have become key policy strategies for addressing teacher shortages. These programs aim not only to expand the supply of new teachers but also to strengthen professional competence and teaching readiness through hands-on school experience. Implementation varies across countries according to social context, institutional structures, and funding systems.

In the United States, models such as Grow Your Own (GYO) and Teacher Residency place prospective teachers in schools with shortages while providing financial support. Studies indicate these programs enhance professional readiness and improve early-career teacher retention, especially in high-turnover areas (Dillard, 2023; García & Weiss, 2020; Lowrance et al., 2023; Laurx et al., 2024). Partnerships with schools also benefit experienced teachers and faculty through curriculum updates and professional networking (Hash, 2021; Desmeules et al., 2023). Similar recommendations emerge from Estonia, highlighting the need for collaboration among governments, universities, and schools to strengthen pre-service teacher programs (Leijen et al., 2025).

In Europe, transitional approaches are adopted in Austria and Poland. Austria's Retired Teachers Return to School program and Poland's regional scholarships temporarily

address shortages but lack systemic reform (Resch, 2025; Ellul-Thorn, 2023). Japan exemplifies a regulatory approach, integrating pre-service teacher education into national legal frameworks to ensure alignment among standards, curricula, and school practices (Sakuma & Shimazaki, 2024). Overall, three policy approaches are evident: (1) Integrated professionalization combining academic support, funding, and mentoring (U.S., Canada); (2) Transitional substitution for short-term solutions (Austria, Poland); (3) Regulatory integration within national frameworks (Japan). Effectiveness depends on inter-agency coordination, sustainable funding, and strong educational partnerships. Pre-service programs thus serve as strategic policy instruments, bridging teacher demand gaps while reinforcing long-term teacher professionalism.

Partnership as an Effective Implementation Mechanism

The success of pre-service teacher programs depends largely on partnerships among universities, schools, and governments. Such collaboration ensures programs are academically sound and responsive to real-world needs. In Canada, joint efforts between school boards and universities led to more contextual and professionally relevant field-practice curricula (Desmeules et al., 2023). Similarly, in Colorado, partnerships among universities, state governments, and school districts effectively addressed rural workforce needs through targeted regulations and incentives (Laurx et al., 2024).

In Europe, cross-institutional partnerships show similar benefits. In Austria, coordination among the Ministry of Education, teacher education universities, and teacher associations allowed the integrated use of retired and pre-service teachers to fill shortages (Resch, 2025). In Germany, university–school training systems reduced teacher vacancy rates by up to 15% in two years (García & Weiss, 2020).

These cases reveal a consistent pattern of tripartite partnerships, where governments provide policy and funding, universities develop academic and pedagogical capacity, and schools serve as practical training sites. This non-hierarchical, collaborative governance model emphasizes horizontal coordination, forming a strong foundation for effective pre-service teacher program implementation.

These findings reinforce those of Cooper et al. (2022), who emphasized the importance of collaboration between universities and schools, while expanding the framework by recognizing the crucial role of local governments as key actors in teacher policy governance.

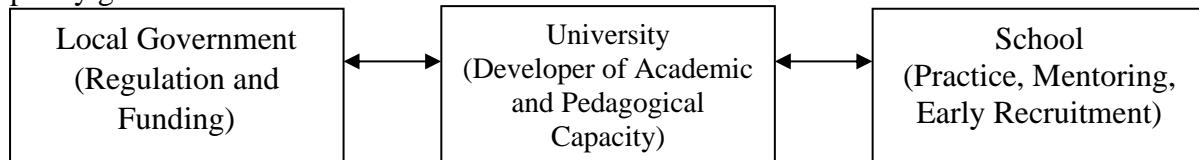


Figure 4. Tripartite Partnership (Government-University-School)

Figure 4 conceptualizes the tripartite partnership among government, universities, and schools as a reciprocal and resource-exchanging system, rather than a unidirectional or administrative arrangement. Each actor contributes distinct resources and responsibilities while simultaneously receiving strategic benefits that sustain long-term collaboration.

Within this model, governments provide regulatory frameworks, funding mechanisms, and workforce planning instruments that legitimize and scale pre-service teacher programs. In return, governments benefit from evidence-based inputs generated by universities, including labor market analyses, graduate tracking data, policy evaluations, and research-based recommendations that inform teacher demand forecasting and recruitment strategies (García & Weiss, 2020; McPherson et al., 2024). This reciprocal exchange allows

governments to shift from reactive recruitment toward more anticipatory and data-driven teacher workforce policies.

Universities function as intermediaries that translate policy mandates into academic curricula and structured internship designs. Their primary contributions include pedagogical innovation, competency-based curriculum development, and the professional preparation of pre-service teachers. However, universities also receive critical inputs from schools, such as curriculum feedback, classroom-based insights, mentoring evaluations, and contextual knowledge regarding student diversity and local educational challenges (Desmeules et al., 2023). These inputs enable universities to continuously refine teacher education programs and ensure alignment between theoretical preparation and practical teaching demands.

Schools, as the primary sites of implementation, contribute professional practice environments, mentoring resources, and real-time assessments of pre-service teacher readiness. Through sustained engagement, schools also play a strategic role in early identification and recruitment of potential teachers who are already familiar with school culture and community contexts. In return, schools benefit from access to a continuous supply of well-prepared teacher candidates, reduced induction and recruitment costs, and strengthened staffing stability particularly in hard-to-staff or underserved areas (Laurx et al., 2024; Lowrance et al., 2023).

The sustainability of this partnership is driven by mutual benefits rather than administrative compliance. For governments, the partnership enhances policy effectiveness and fiscal efficiency; for universities, it strengthens institutional relevance, graduate employability, and research impact; and for schools, it supports workforce continuity and instructional quality. Scholars argue that such mutually reinforcing arrangements reflect the principles of collaborative governance, where shared responsibility, horizontal coordination, and institutional trust replace hierarchical control as the primary drivers of policy success (Cooper et al., 2022; Eacott, 2024).

In this sense, the tripartite partnership model transforms pre-service teacher education into a strategic policy ecosystem that integrates training, recruitment, and retention within a single coherent framework. The model demonstrates that addressing teacher shortages requires not only programmatic interventions but also sustained reciprocal collaboration across institutions. Within the Indonesian context, this framework provides a robust analytical basis for strengthening the Pre-Service Teacher Internship Program (PMMCG) as an evidence-based and mutually beneficial mechanism for developing a sustainable national teacher workforce.

Conclusion

This study concludes that addressing the teacher shortage requires building a sustainable teacher pipeline that begins at the pre-service education stage. Cross-country evidence shows that the effectiveness of such policies is shaped by three core elements: policy coherence, sustainable funding, and strong inter-institutional collaboration. From the synthesis, the Tripartite-Based Pre-Service Teacher Policy Model is proposed, positioning collaboration among universities, schools, and government as the cornerstone of sustainable teacher education reform. The model extends the teacher policy continuum by demonstrating that policy success is determined not only by program design, but also by the quality of coordination and institutional trust across actors. Theoretically, this study contributes to teacher education policy scholarship by integrating academic, professional, and governance

dimensions. Practically, it provides implications for strengthening the PMMCG as a strategic national mechanism for teacher recruitment, professionalization, and equitable distribution.

Recommendation

To ensure long-term policy effectiveness, this study recommends that the government develop a national, data-driven teacher demand information system to strengthen forecasting and targeted recruitment. Incentive schemes for pre-service teachers, particularly those assigned to disadvantaged (3T) regions, should be enhanced to improve retention and promote equitable teacher distribution. Furthermore, partnerships among universities, schools, and local education authorities need to be expanded and institutionalized so that pre-service teacher programs remain practice-oriented, contextually responsive, and aligned with workforce needs. Future research is also encouraged to employ mixed-methods and longitudinal approaches to generate empirical evidence on the effectiveness and long-term impacts of pre-service teacher programs on teacher performance and retention.

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