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Reorienting Teacher Professional Education in Indonesia: An Integrative Review and The PPG-4P Model For Continuous Professional Learning

Yusrizal[1], M. Jainuri[2], Elfa Eriyani[3], Ade Susanti[4], Zamdani[5]
[1,2,3,4,5]Teacher Professional Education Program, Faculty of Teacher Training and Education, Universitas Merangin, Bangko, Indonesia

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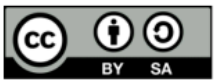
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ABSTRACT

Teacher Professional Education (Pendidikan Profesi Guru, PPG) is a central instrument for teacher professionalisation in Indonesia; however, programme success cannot be adequately judged only by completion and certification. This article critically examines contemporary evidence on the contributions and limitations of PPG, identifies mechanisms that shape the transfer of competence into classroom practice, and develops a framework for reorienting PPG toward continuous professional learning. A critical integrative literature review was combined with policy document analysis. Empirical studies on PPG published primarily between 2020 and 2026 were synthesised alongside seminal scholarship on practice-based teacher education, reflective practice, teacher-preparation evaluation, professional development, and digital pedagogy. Evidence was interpreted according to research design so that perception studies, case studies, comparative studies, and systematic reviews were not treated as equivalent causal evidence. The synthesis indicates that PPG is associated with improvements in competence, self-efficacy, soft skills, and teaching practice, although the evidence base remains heterogeneous and often context-specific. Four design gaps emerge: the theory–practice divide, reflection that is not consistently evidence-informed, technology integration that remains tool-oriented, and weak continuity of mentoring after certification. The article proposes the PPG-4P Model Intensive Practice, Reflective Learning, Digital Pedagogy, and Continuous Mentoring as a cyclical framework linking practice, evidence of learning, reflection, pedagogical judgment, and professional development across career stages. Its contribution lies in integrating these mechanisms into a testable framework for programme design and longitudinal evaluation.

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Corresponding Author:

Yusrizal
Teacher Professional Education Programme, Faculty of Teacher Training and Education, Universitas Merangin
Email: jgholed@gmail.com

1. INTRODUCTION

Teacher professionalism cannot be reduced to possessing declarative knowledge. Teaching requires professional judgment: interpreting classroom situations, weighing evidence of student learning, selecting appropriate pedagogical responses, and revising decisions when strategies do not produce the intended outcomes. Because learning contexts are dynamic, professional competence is better understood as an adaptive capacity developed through the interaction of knowledge, experience, feedback, and reflection. The quality of professional education must therefore be assessed not merely by the amount of course content completed but by participants' ability to translate knowledge into defensible pedagogical action.

This perspective places two demands on professional education. First, programmes must establish minimum competence standards for recognising an individual as a professional teacher. Second, they must cultivate learning dispositions and infrastructure that enable competence to develop after certification. The tension between certification and professional learning is central to understanding PPG. When certification dominates, programme success risks being defined by graduation rates; when professional learning is strengthened, certification becomes one milestone in a longer professional trajectory.

In Indonesia, Teacher Professional Education (Pendidikan Profesi Guru, PPG) occupies a central position in the teacher education system. Ministerial Regulation No. 19 of 2024 stipulates that PPG should develop teachers' pedagogical, personal, social, and professional competencies. Its implementation encompasses participants, educational processes, personnel, quality assurance, monitoring, and evaluation. Subsequent policies have retained pathways for prospective teachers and specified categories of practising teachers, combining certification requirements with the strengthening of teacher professionalism.

These regulations indicate that PPG has an institutional mandate extending beyond coursework. Programme quality depends on coherence among the curriculum, practicum experiences, lecturers and mentor teachers, partner schools, assessment, and quality assurance. Because these elements involve different actors and institutions, PPG effectiveness is fundamentally a systems issue rather than simply a matter of individual participant quality. Variation across providers, subjects, regions, and partner schools must therefore be recognised as contextual factors shaping programme experiences and outcomes.

Contemporary PPG also comprises distinct pathways. In 2026, the prospective-teacher pathway spans two semesters and includes coursework, field experience, leadership projects, and mentoring. By contrast, the pathway for specified practising teachers primarily enables teachers already in service to complete certification through learning activities supported by Ruang GTK and a final PPG competency examination. Differences in purposes, duration, practicum exposure, and participant profiles are analytically important: PPG should not be treated as a homogeneous intervention. Evaluation must distinguish programme pathways and the learning mechanisms participants actually experience [1], [2]. [3].

This raises an important evaluative question. Teaching certificates serve legal and professional functions, yet certification does not itself demonstrate sustained improvement in classroom practice. PPG evaluation should distinguish at least three levels of outcomes: competence demonstrated during the programme, the ability to transfer competence to school settings, and continuing improvement in practice over a teaching career. This distinction underpins the argument that PPG must shift from a logic of programme completion towards continuous professional learning.

Several studies indicate positive PPG contributions. A literature review by Mardhatillah and Surjanti [4], for example, found contributions to pedagogical and professional competence. Abbas et al. [5] reported positive participant perceptions of the programme's contribution to teaching ability. More recent comparative evidence from Muluk and Lubis [6] found statistically significant differences in favour of teachers who had participated in PPG.

These findings must be interpreted in light of the type of evidence. Participant perceptions provide valuable insights into learning experiences and perceived benefits, but they do not necessarily demonstrate independently observed performance changes. Group comparisons can strengthen evidence of an association between PPG and competence, but causal interpretations remain problematic because participants and non-participants may differ in experience, motivation, institutional support, and other professional characteristics. A responsible synthesis therefore does not assign equal inferential weight to all findings.

Daud et al. [7] and Huda et al. [8] broaden this perspective by associating PPG experiences with processes, perceptions, and soft-skill development. Mukrim et al. [9], meanwhile, examined the teaching practices of PPG graduates in rural schools in eastern Indonesia. Together, these studies support a cautious conclusion: PPG has genuine potential to foster professionalism, but its effects must be understood through the interaction of programme design, practicum experiences, participant characteristics, and the contexts in which competence is applied.

Evidence of PPG contributions does not imply that programme design is free from shortcomings. Aisyah et al. [10] found that participants in the pre-service PPG pathway still sought stronger practical experiences, classroom management, and technology integration. In a systematic review of pre-service PPG, Kurniadi [11] similarly identified challenges involving programme support, facilities, and implementation alongside evidence of effectiveness. These findings point to a gap between success at programme level and the sustained transfer of competence into classroom practice.

This gap matters because professional education should not end with participants meeting graduation requirements. Professional competence becomes meaningful when acquired knowledge informs pedagogical decisions in authentic classrooms. Zeichner [12] emphasised a practice-based orientation in teacher education. Cochran-Smith et al. [13] likewise argued that teacher preparation evaluation must move beyond administrative indicators to examine process quality and the professional consequences of teacher education.

Within practice-based teacher education, practicum is not merely a setting for applying previously acquired theory. It is where professional knowledge is reconstructed through authentic situations. Participants encounter uncertainty: student responses may diverge from plans, assessments may reveal unexpected misconceptions, and strategies effective in one class may fail in another. Practicum should therefore involve successive approximations of practice, guided teaching, evidence analysis, and repeated refinement rather than serving only as a final demonstration of procedural competence.

Goldhaber [14] argued that evidence-based teacher preparation requires clearer links between programme characteristics and graduate quality. For PPG, this means producing evidence about which components genuinely contribute to professional growth rather than merely documenting programme completion. This perspective reinforces the need for longitudinal assessment and practice-oriented indicators.

Within PPG, practicum should integrate theory, observation, action, feedback, and reflection. Purniningtyas et al. [15] found that content enrichment, lesson-material development, and teaching practice contributed to participants' classroom-management self-efficacy. Vianty et al. [16] showed that action research experiences among pre-service PPG students can foster a reflective orientation towards improving teaching quality.

The relationship between practice and reflection is crucial because experience alone does not guarantee professional learning. Two participants may complete equally long practicums yet develop differently according to feedback quality, opportunities to repeat practice, and the use of learning evidence. Feedback that focuses only on lesson-plan format, for example, is insufficient for developing pedagogical diagnosis. Conversely, feedback connecting teacher actions with student responses helps participants formulate professional reasons for their instructional choices.

Self-efficacy must also be interpreted proportionately. Confidence in managing classrooms can support persistence and willingness to try new strategies, but it should be calibrated against evidence of authentic performance. PPG therefore needs to combine confidence building with opportunities for critical feedback so that participants not only feel capable but demonstrate effective pedagogical decisions in varied settings.

Technological competence is another increasingly important dimension. Digital technologies, artificial intelligence, learning platforms, and multimodal resources mean that teacher competence can no longer be understood simply as technical proficiency with applications. Teachers must connect technologies to subject matter and pedagogical needs. Mishra and Koehler's [17]Technological Pedagogical Content Knowledge (TPACK) framework is relevant here. Research involving PPG students indicates that the relationships among technological, pedagogical, and content knowledge are complex and do not automatically generate higher-order thinking skills in instructional design.

This complexity becomes more apparent as generative artificial intelligence becomes widely accessible. Teachers must do more than operate applications: they need to assess information validity, maintain assessment integrity, protect student data, consider bias, and determine which learning processes should still require independent human reasoning. Digital competence therefore includes epistemic and ethical, as well as operational, dimensions.

For professional education design, technology should be a means of addressing clearly defined pedagogical problems. Participants should consider what evidence shows that technology enhances understanding, when automation improves feedback, when applications increase cognitive load, and how equitable access can be ensured. This orientation turns TPACK into a decision-making framework rather than an isolated checklist of technological skills.

Previous PPG research has generally examined programme effectiveness, participant perceptions, pedagogical and professional competence, technology, or practicum experiences separately. Kurniadi [11]mapped perspectives on the effectiveness and challenges of pre-service PPG, but research explicitly explaining the mechanisms linking authentic practice, evidence-informed reflection, digital pedagogical decisions, and post-certification support remains limited. This gap matters because teacher education research shows that practice does not automatically yield learning without support, approximations of practice, feedback, and opportunities for iteration [12], [18], [19].

The gap concerns mechanisms as well as research topics. Literature may establish that practice, reflection, technology, and mentoring each matter, yet policy requires an explanation of how these components interact and where success should be assessed. Without a mechanistic framework, recommendations risk becoming an unconnected list of normatively desirable activities.

This article therefore synthesises the literature to develop a conceptual proposition: sustained professional growth requires a cycle linking authentic experience, evidence, reflection, pedagogical decision-making, and social-professional support. The PPG-4P Model organises these relationships. It is not presented as an empirically validated causal model but as a conceptual framework derived from thematic patterns in the literature and requiring further empirical testing.

Against this background, this study aims to (1) analyse PPG contributions and challenges based on recent findings; (2) identify elements of professional education that should be strengthened to translate participant competence into teaching practice; and (3) develop a conceptual model for reorienting PPG towards continuous professional learning. Its novelty lies in the PPG-4P Model, integrating Intensive Practice, Reflective Learning, Digital Pedagogy, and Continuous Mentoring.

2. METHOD

This study adopts an integrative literature review approach, which allows studies with diverse designs to be brought together for a more comprehensive understanding of Teacher Professional Education. Rather than asking only whether PPG is effective, the review examines mechanisms through which professional education may develop teacher competence and professional practice.

2.1. Rationale for the Review Design

An integrative literature review is appropriate for research questions that span conceptual and empirical forms of evidence. PPG scholarship includes perception studies, evaluations, case studies, investigations of self-efficacy, TPACK and teaching practice,

and systematic reviews. Given this heterogeneity, synthesising the evidence into a single effect-size estimate would be inappropriate. An integrative review instead allows different designs to be compared to identify recurring patterns, tensions, and mechanisms.

This review is neither a meta-analysis nor an attempt to estimate a pooled effect size. It also does not claim the comprehensiveness of a systematic review with a registered protocol and PRISMA procedures. Its inferences concern conceptual coherence and thematic consistency rather than national prevalence or the magnitude of PPG effects. This limitation ensures that the conclusions remain commensurate with the review design.

Literature searches were conducted iteratively from 6 to 15 August 2026 using Google Scholar, GARUDA/SINTA, journal publishers' websites, DOI/Crossref searches, and official government websites. Indonesian and English search terms included "Pendidikan Profesi Guru", "PPG Prajabatan", "PPG Guru Tertentu", "teacher professional education Indonesia", "PPG teacher competence", "reflective practice PPG", "TPACK PPG", "teaching practicum PPG", "teacher self-efficacy PPG", and "teacher professional learning". Empirical publications from 2020 to 2026 were prioritised to reflect contemporary PPG arrangements, while seminal references were retained where needed to explain theoretical constructs and mechanisms.

2.2. Search Strategy and Scope of the Literature

The search encompassed two bodies of evidence. The first comprised studies directly examining PPG in Indonesia, providing contextual empirical evidence about participant experiences, competencies, practices, and implementation challenges. The second comprised broader teacher education scholarship used to interpret PPG findings, especially practice-based teacher education, teacher preparation evaluation, professional reflection, self-efficacy, and TPACK. Separating these bodies prevents international frameworks from displacing Indonesian contextual evidence. Theory was used to interpret and organise findings, not to assume identical mechanisms across contexts.

The 2020–2026 priority period was intended to keep the review aligned with contemporary PPG developments. Seminal works such as Mishra and Koehler [20] and Zeichner [12] were nevertheless retained for their foundational theoretical constructs. Older literature served a conceptual function and was not used to describe the current state of PPG.

Inclusion criteria comprised (1) empirical studies directly examining PPG in Indonesia; (2) systematic or integrative reviews relevant to teacher education and professional development; (3) reputable conceptual scholarship explaining core practices, reflection, teacher education evaluation, or digital pedagogy; and (4) official policy documents relevant to programme design. Sources were excluded if they were opinion pieces, provided inadequate methodological information, duplicated other sources, or lacked a direct link to the analytical questions. As a critical integrative rather than PRISMA-protocol review, this study did not use search-engine hit counts to claim exhaustive coverage.

2.3. Relevance Criteria and Critical Appraisal

Source relevance was determined by contributions to at least one of five analytical domains: competence, theory–practice connections, reflection, digital pedagogy, and continuity of professional support. The critical reading distinguished research designs and permissible claims. Perception studies provided evidence of participant experiences; comparative studies, evidence of group differences; case studies, rich context-sensitive insights; and systematic reviews, mappings of broader research trends. This approach reduces overclaiming, such as inferring causality from favourable participant perceptions.

Policy documents were used to describe formal mandates and programme structures, not to establish effectiveness. Conceptual scholarship was used to explain theoretical mechanisms connecting PPG experiences with professional development. Thus, each source type played a distinct inferential role.

Analysis involved four stages. First, sources were examined to identify their focus, research design, participants, and principal findings. Second, recurring issues were coded. Third, codes were clustered into broader themes. Fourth, relationships among themes were synthesised to construct a conceptual framework for PPG reorientation. Five themes emerged: competence development, the theory–practice gap, professional reflection, digital pedagogy, and continuity of professional support.

2.4. Thematic Synthesis and Model Development

Coding focused on meaning units related to PPG conditions, processes, outcomes, or areas requiring improvement. Statements about strengthening practical experiences, for example, were coded as practice opportunities; feedback and action research findings were grouped under professional reflection; and technology integration findings were mapped to digital pedagogy. Synthesis extended beyond clustering topics to examining functional relationships: practice generates experiences and data; reflection interprets those data; digital pedagogy provides a context for pedagogical decisions; and mentoring sustains cycles of improvement.

This procedure follows thematic synthesis, which moves from descriptive findings to analytical themes [21]. The PPG-4P Model emerged at the analytical-theme stage, when literature patterns were translated into conceptual relationships relevant to programme design and evaluation. Because the model derives from conceptual synthesis, its validity must subsequently be assessed empirically across teacher education institutions (LPTK) and partner schools.

The integrative approach also avoids reducing PPG effectiveness to one indicator. Quantitative competence findings were read alongside qualitative evidence concerning participant experiences, reflection, teaching practice, technology, and institutional contexts. Interpretation thus emphasises processes supporting programme success rather than certification outcomes alone.

2.5. Interpretive Trustworthiness and Methodological Limitations

Two principles guided interpretive trustworthiness. First, claims were aligned with source designs. Terms such as “associated with”, “indicates”, and “perceived” were used

when evidence did not support causal inference. Second, themes were developed only when supported by more than one body of literature or by a combination of empirical evidence and conceptual frameworks. This strategy reduced the risk of deriving the model from a single highly specific finding.

To strengthen the audit trail, principal sources were recorded in a matrix specifying study focus, design, context/participants, key findings, permissible inference, and limitations. This facilitated comparison without giving studies with different methodological strengths equal argumentative weight. Policy documents described the formal programme architecture and were not treated as evidence of effectiveness.

Nevertheless, this review has limitations. It does not estimate effect sizes, undertake quantitative risk-of-bias assessment, or claim to represent every PPG publication. Heterogeneity across subject areas, teacher education institutions, and geographical contexts also restricts generalisability. These limitations underscore why the PPG-4P Model should be treated as a framework to be tested, not a definitive conclusion about the most effective PPG design.

3. RESULTS AND DISCUSSION

3.1. PPG and the Development of Teacher Competence

The literature synthesis reveals a generally positive pattern regarding PPG contributions to teacher competence. Mardhatillah and Surjanti [4] reported improvements in pedagogical and professional competence, while the comparative study by Muluk and Lubis [6]found statistically significantly higher competence scores among teachers who had completed PPG than in the comparison group. Comparative evidence is stronger than perceived benefits alone but should not be treated as an estimate of nationwide impact without considering sampling, regional context, and baseline group equivalence.

These findings can be interpreted at three levels. At the knowledge and skills level, PPG structures learning to deepen content understanding, plan instruction, conduct assessments, and practise teaching. At the professional-disposition level, it may strengthen self-efficacy, collaboration, and awareness of professional responsibilities. At the identity level, professional education situates participants within communities with explicit standards of practice and professional discourse. These levels are interconnected: competence without professional identity risks becoming procedural, while professional identity without demonstrable competence lacks a performance foundation.

However, competence indicators measured during the programme do not automatically establish enduring effects. The more substantive question is whether graduates maintain pedagogical decision-making quality when programme support declines, workloads increase, and classroom contexts differ from practicum settings. PPG effectiveness must therefore be assessed through evidence of transfer and sustainability rather than short-term achievement alone.

These findings reinforce the argument that professional education has a broader function than administrative certification. PPG can integrate disciplinary knowledge, pedagogy, teaching practice, assessment, technology use, and professional identity

formation. A teaching certificate, in this perspective, recognises a professionalisation process rather than representing the programme's ultimate pedagogical goal.

PPG contributions also extend to professional psychological dimensions. Purniningtyas et al. [15] found that participants associated their PPG experiences with greater classroom-management self-efficacy. Such self-efficacy matters because it shapes teachers' confidence in addressing student diversity, classroom management challenges, and the need to adapt instruction.

Nevertheless, competence gains require cautious interpretation. Evidence from particular samples, subjects, and regions cannot automatically be generalised to uniform outcomes for all PPG participants in Indonesia. Differences among teacher education institutions, mentor teachers, partner schools, technology access, subject areas, and geographical contexts may lead to divergent experiences. PPG evaluation must therefore combine programme-level indicators with authentic classroom performance measures.

Table 1. Mapping the Functions of Evidence in the Literature Synthesis

Source	Evidence focus	Contribution to synthesis	Limits of inference
Daud et al. (2020); Abbas et al. (2023)	PPG participant experiences and perceptions	Identifies perceived benefits for learning processes and teaching ability	Perceptions do not equal observed performance changes
Huda et al. (2021)	Soft-skill development	Extends PPG outcomes beyond technical pedagogical competence	Context-specific participants and study setting
Mardhatillah & Surjanti (2023); Muluk & Lubis (2026)	Pedagogical and professional competence	Supports a positive association between PPG and teacher competence	Generalisability and causality depend on each study design
Aisyah et al. (2024)	Content adequacy and practical readiness	Identifies needs for improved practice, classroom management, and technology	Based on evaluation and participant perspectives
Purniningtyas et al. (2024); Cania et al. (2024)	Self-efficacy and practicum experience	Highlights the role of practice in professional confidence	Self-efficacy must be calibrated against authentic performance
Vianty et al. (2024)	Action research and reflection	Supports reflection as a mechanism for practice improvement	Does not establish sustainability after graduation
Wakhidah et al. (2025)	TPACK and HOTS	Shows that integration of technology, pedagogy, and content does not automatically produce HOTS-oriented design	Requires evidence across subjects and contexts
Mukrim et al. (2023)	Post-PPG practice in rural schools	Highlights transfer of competence to professional settings	Case-study depth but limited generalisability
Kurniadi (2025)	Systematic review of pre-service PPG	Maps benefits and challenges related to facilities, support, and participant experience	Depends on available studies and does not test causal mechanisms
Cohen et al. (2025); Zeichner (2012, 2023)	Practice-based teacher education and approximations	Explains the need for decomposition, rehearsal, support, and iteration	International scholarship requires adaptation to Indonesian PPG institutions
Amemasor et al. (2025); Yoon et al. (2026)	Digital and AI-related professional development	Supports contextual training, mentoring, ethics, and career-stage differentiation	Not Indonesian PPG studies; informs mechanisms, not PPG effectiveness

From an evaluation perspective, authentic indicators require more than verifying the completeness of lesson plans or assessing a single teaching demonstration. Assessment should capture development: how participants respond to feedback, whether subsequent decisions improve, and whether evidence of student learning strengthens. This developmental focus makes assessment part of professional learning rather than solely a selection mechanism.

3.2. The Gap between Professional Knowledge and Classroom Practice

One of the most consistent themes concerns the relationship between educational theory and authentic practice. Aisyah et al. (2024) found that although participants perceived the theoretical aspects of PPG curricula as relatively adequate, they still needed stronger practical skills, classroom management, and educational technology use.

The theory–practice gap does not necessarily mean there is too much theory or too little practice in quantitative terms. A deeper problem may be the weak pedagogical connection between them. Theory studied separately from real cases can become difficult to activate in classrooms. Conversely, practice without conceptual language can become imitation of mentor teachers' routines without understanding their rationale or limitations. The key issue is therefore not choosing theory over practice but designing reciprocal connections between them.

Cania et al. [22] demonstrated the importance of practicum experiences for prospective teachers' confidence. Such findings suggest that practice should present progressively demanding challenges, moving from observation and simulation towards more complex teaching responsibilities. This sequence allows competence to develop while retaining support when participants encounter early difficulties.

These findings align with practice-based teacher education. Zeichner [12], [18] argued that moving teacher preparation closer to schools does not automatically make it practice-based; learning quality depends on how practice is decomposed, modelled, rehearsed, supported by feedback, and reconnected to professional knowledge. McDonald et al. [23]introduced the concepts of core practices and pedagogies of enactment. The systematic review by Cohen et al. [19]found that approximations of practice, including rehearsal, role-play, and simulation, can support teacher candidates when complexity is reduced and guidance provided, although the research base has methodological limitations. PPG therefore needs a progression from controlled rehearsal to authentic practice rather than relying on field placement alone.

Field experience should consequently function as a professional learning cycle rather than a requirement to accumulate hours in schools. The cycle may include contextual observation, planning, guided practice, documentation of learning evidence, feedback, reflection, revision, and renewed teaching. Stronger links among these stages increase the likelihood of developing adaptive expertise rather than merely mastering instructional procedures.

Operationally, such cycles require specific objects of feedback. Video recordings, observation notes, student-work artefacts, formative assessment results, and transcripts of teacher questions can provide shared evidence. Concrete evidence reduces overly general comments such as "the lesson went well" or "the class should be more active". Mentors can instead focus discussion on the relationships among objectives, teaching actions, and student responses.

Repetition must also allow participants to improve the same dimension of practice across different contexts. When a teaching episode is assessed only once, participants cannot establish whether revisions are more effective. The rehearse–feedback–revise–reteach sequence is therefore a suitable foundation for PPG school experiences.

The quality of mentor teachers and university supervisors is consequently critical. Even extended practical experience may have limited value when feedback addresses only documentation completeness. Mentors should help participants interpret classroom events: why a strategy failed to stimulate participation, why an assessment failed to reveal student understanding, or how teacher responses should change across classroom contexts.

3.3. Reflection as the Core of Professional Education

The third finding concerns reflective practice. Vianty et al. [16] found that pre-service PPG students regarded action research as a means of improving teaching quality and reflection as a starting point for iterative improvement.

Professional reflection should be distinguished from personal introspection. Introspection may remain at the level of feelings or subjective judgments, whereas professional reflection connects claims to evidence. When participants describe a lesson as "successful", for example, they should substantiate that claim with engagement indicators, response quality, student work, or evidence of conceptual change. Reflection thus functions as an epistemic discipline that prevents teachers from equating pedagogical intentions with pedagogical effects.

Professional education can cultivate this habit through a consistent reflective protocol: identify objectives, select evidence, explain discrepancies between intended and observed outcomes, formulate explanatory hypotheses, determine revisions, and retest. Such a structure makes reflective journals more meaningful than post-lesson narratives alone.

Reflection should move beyond descriptive questions such as "what went well?" High-quality reflection requires evidence. Participants should compare learning objectives with student work, classroom interaction recordings, assessment outcomes, observation notes, or mentor feedback. Reflection should then generate pedagogical hypotheses that can be tested in subsequent lessons.

Classroom action research can therefore be treated not simply as an academic assignment but as professional inquiry. Teachers identify learning problems, gather evidence, select actions based on theory and context, evaluate their effects, and refine their practices. This orientation positions teachers as professional decision-makers and lifelong learners.

Framing action research as professional inquiry also links PPG to post-graduation development. If participants see classroom research merely as an assignment, the practice may cease when academic requirements end. When understood as professional work, however, it can take the form of a manageable inquiry cycle: teachers define a limited problem, try an intervention, interpret evidence, and share findings with colleagues. This approach is more sustainable under actual school working conditions.

Successful professional education should thus foster enduring reflective habits rather than merely the ability to write reflection reports as students. Learning communities, mentoring, classroom-based research, and professional portfolios should sustain these habits when graduates enter or return to schools.

3.4. Digital Pedagogy Beyond Application Use

Digital transformation requires PPG to develop technological competence integrated with pedagogy and subject knowledge. TPACK conceptualises technology, pedagogy, and content knowledge as interacting domains. Wakhidah et al. [24] identified relationships among these domains among PPG students but found that their integration did not automatically produce higher-order thinking skills (HOTS) in lesson planning.

These findings challenge the assumption that proficiency with more applications necessarily produces better digital pedagogy. PPG should establish decision criteria applicable across technologies, including alignment with learning objectives, quality of conceptual representations, opportunities for interaction and feedback, accessibility, cognitive load, data security, and proportionality between benefits and complexity. Such criteria reduce dependence on rapidly changing applications.

Digital pedagogy must also address equity. Device availability, connectivity quality, family digital literacy, and student accessibility needs vary. A technological solution effective in one school may be unsuitable elsewhere. The capacity to select low-technology or non-digital alternatives is therefore part of digital competence, not evidence of unsuccessful integration.

This matters because technology training often prioritises operating tools. Proficiency with digital presentations, learning management systems, quiz applications, or artificial intelligence does not establish digital pedagogical competence unless teachers can explain why they select a technology and how it improves learning.

Technology-related PPG assignments should therefore adopt a pedagogical problem-solving approach. Rather than being instructed to "use application X", participants should address problems such as improving feedback, visualising abstract concepts, accommodating diverse learning needs, or identifying misconceptions more rapidly. Technology selection should follow its pedagogical purpose.

Developments in artificial intelligence make this principle even more important. Teacher competence must include evaluating output validity, designing assessments that protect learning integrity, ensuring transparency in AI use, safeguarding data, respecting copyright, recognising bias, and deciding when not to use technology. Amemasor et al. [25] found in a systematic review that effective digital professional development tends to be contextual, practical, collaborative, and supported by mentoring and institutions. Yoon et al. [26] further demonstrated that AI-digital competence needs vary by career stage. Digital literacy should therefore be developed along a professional trajectory rather than through a single training package.

Pedagogical digital judgment positions teachers as decision-makers rather than technology consumers. In AI-related contexts, PPG participants must distinguish use for administrative efficiency, material development, feedback, and student learning activities because each entails different risks. They should also judge whether technology strengthens reasoning or replaces cognitive work students ought to undertake themselves. These principles connect TPACK, AI literacy, and teacher professional ethics.

3.5. PPG as the Beginning, Not the End, of Professionalisation

Continuity presents another major challenge. PPG has a limited duration, whereas teacher competence develops throughout a career. Challenges encountered in the first year of teaching may differ from those experienced during supervised practice. Competence acquired through PPG therefore needs a professional environment that supports ongoing learning.

Continuity must also reflect differences across PPG pathways. The 2026 prospective-teacher pathway offers two semesters of field practice and mentoring, whereas the pathway for specified practising teachers focuses on completing certification for teachers already working in schools. Because practising teachers bring employment experience, their developmental needs differ from those of prospective teachers. Follow-up activities should emphasise needs diagnosis, coaching around classroom problems, and career-stage-appropriate competence building. The continuity principle in PPG-4P must therefore adapt to participant pathways and profiles rather than impose identical support [1], [2].

The transition from professional education to full teaching responsibility is particularly vulnerable. Intensive support from university supervisors and mentor teachers decreases while responsibilities become more complex. Beginning teachers must simultaneously navigate administration, parental relationships, school culture, collegial collaboration, and diverse student needs. Without support, strategies learned during PPG may be displaced by survival routines or conventional practices prevalent in the workplace.

Continuity must therefore be designed as a transition. Early-career mentoring, communities of practice, peer observation, and continued access to teacher education institution resources can bridge the divide between “learning to teach” and “working as a teacher”. Graduation should mark a shift from intensive to lighter and context-responsive support, not an institutional rupture.

Kurniadi [11]reported that although pre-service PPG benefits participants’ skills and confidence, implementation and support challenges persist. Studies of post-PPG teaching also indicate the importance of examining how competence is enacted after the programme, rather than only during professional education.

Professional education should consequently be understood as a continuum comprising initial preparation, guided practice, beginning-teacher induction, professional development, learning communities, and instructional leadership. Professional development scholarship indicates that teacher learning is stronger when sustained, focused on content and practice, and supported by active learning, collaboration, models of effective practice, feedback/coaching, and sufficient time for implementation and reflection [27]. Relationships between teacher education institutions and schools should therefore extend beyond graduation.

Teacher education institutions can become professional learning centres for alums through instructional clinics, case-based seminars, action research mentoring, subject communities, and digital learning. Partner schools can likewise become professional laboratories in which lecturers, mentors, students, and alums collaboratively develop evidence-informed instruction.

This reciprocal relationship also benefits teacher education institutions. Authentic data and problems from schools can inform professional curricula, while institutional academic expertise can support school-based instructional evaluation. Partnerships can thus move beyond student placement to provide infrastructure for producing and applying professional knowledge.

Such partnerships require incentives, role allocation, and quality assurance. Mentor teachers should be recognised as teacher educators with mentoring competencies, not merely experienced practitioners. University supervisors also need strong knowledge of school contexts to avoid excessively abstract feedback. Mentoring quality is therefore an institutional capability requiring systematic development.

3.6. The PPG-4P Model as a Framework for Reorientation

Based on the synthesis, this study proposes the PPG-4P Model as its conceptual contribution. The model comprises Intensive Practice, Reflective Learning, Digital Pedagogy, and Continuous Mentoring.

The model rests on three design principles. First, continuity requires components to connect before, during, and after practice. Second, an evidence orientation grounds professional decisions in learning evidence rather than compliance with prescribed formats. Third, iteration develops competence through cycles of action, feedback, revision, and renewed action. Accordingly, the four P components are not four separate courses or programmes.

Table 2. Conceptual Design of the PPG-4P Model

Component	Problem addressed	Core mechanism	Example artefacts/evidence	Initial indicator
Intensive Practice	Difficulty transferring theory to classrooms	Repeated, progressive practice with feedback	Teaching videos, observations, student work	Improvement in decision quality across cycles
Reflective Learning	Descriptive or unsupported reflection	Interpretation of learning data and development of pedagogical hypotheses	Evidence-based journals, assessment analyses, feedback notes	Ability to connect action, evidence, and revision
Digital Pedagogy	Application-oriented technology use	Selecting technology based on objectives, context, ethics, and added value	TPACK designs, tool evaluations, AI/data protocols	Quality of pedagogical justification for adopting or rejecting technology
Continuous Mentoring	Discontinuity after certification	Mentoring, communities of practice, and early-career support	Alumni portfolios, mentoring notes, inquiry cycles	Sustained improvement and competence transfer

Intensive Practice places school experience at the centre of knowledge and skill integration. Practice should be repeated, progressive, and supported by evidence-based

feedback. Participants should demonstrate improvement across successive cycles rather than competence only once during a performance examination.

Reflective Learning establishes data-informed reflection as a central mechanism of professional improvement. Reflective journals, lesson videos, student work, assessment outcomes, and observation notes help teachers explain the relationships between teaching actions and learning effects.

Digital Pedagogy shifts the emphasis from operating technologies to making informed decisions about their use. Participants should be able to select, evaluate, modify, or reject technology when its pedagogical value is insufficient.

Continuous Mentoring connects professional education with early-career teaching and subsequent professional development. PPG alums need access to mentors, communities of practice, microlearning, classroom research, and opportunities to develop professional portfolios after certification.

The four components operate cyclically. Practice generates data for reflection; reflection identifies pedagogical needs; technology may support solutions when appropriate; and mentoring sustains improvement after programme completion. PPG success should thus be measured not only by the number of certified teachers but by graduates' sustained ability to improve learning.

Mechanistically, PPG-4P can be summarised as practice → evidence → reflection → pedagogical decision → renewed practice → mentoring and reinforcement. Digital pedagogy may contribute at any stage where technology adds value, for example by recording lessons, analysing evidence, providing feedback, or representing concepts. Technology is not the model's centre; the central concern remains improving decision-making quality and learning outcomes.

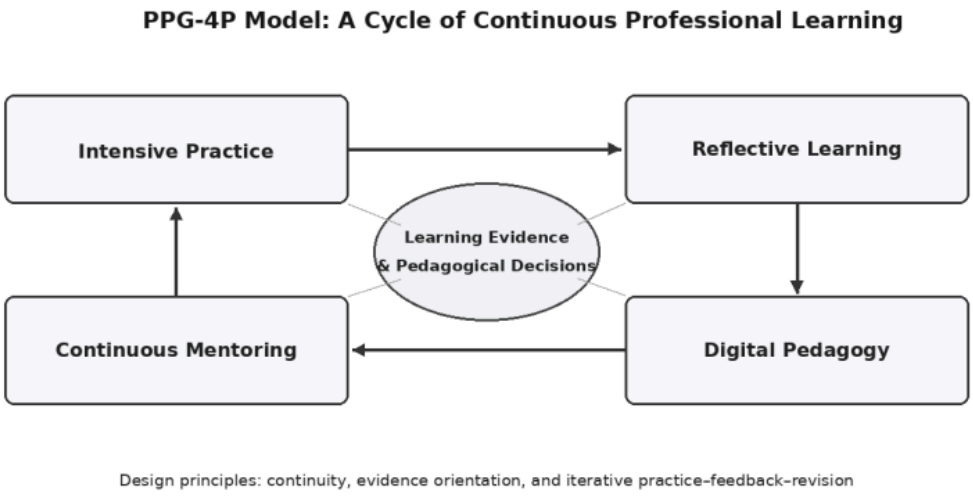


Figure 1. The PPG-4P Model as a Cycle of Continuous Professional Learning. Source: Authors' synthesis.

The model also generates testable propositions. For example, practice quality should be more strongly associated with competence growth when accompanied by

evidence-based feedback; reflection should be more productive when participants can repeat practice; and post-PPG mentoring should strengthen transfer of competence into schools. These propositions create a pathway from conceptual contribution to empirical investigation.

The model expands PPG from a time-limited programme into a professional ecosystem. At the policy level, this requires success indicators covering practice quality, professional growth, and continuing alum learning. At the institutional level, teacher education institutions need stronger relationships with partner schools. At programme level, assessment should track competence longitudinally.

3.7. Implementation Architecture of the PPG-4P Model

The model can be implemented in three phases. Preparation emphasises diagnosis of initial competence, individual development goals, and rehearsal of core practices in controlled settings. Guided practice places participants in partner schools for documented cycles of practice, feedback, reflection, and renewed practice. Professional transition continues support after graduation through early-career mentoring, communities of practice, and professional development portfolios.

During preparation, diagnostic assessment should identify needed support and challenge rather than label participants by ability. A participant strong in content knowledge but weak in formative assessment, for example, needs different development goals from an experienced teacher with limited data-informed planning skills. Such differentiation makes professional education more responsive to participant profiles.

During guided practice, partner-school and mentor quality are critical design variables. Placements should consider not only school availability but also the capacity to model good practice, provide safe opportunities for experimentation, and cultivate feedback. During professional transition, support may gradually decline so that teachers develop autonomy while retaining access to assistance with complex problems.

The three-phase architecture allows the four components to be embedded in programme processes without adding a burdensome package to the curriculum. Existing PPG activities can be reoriented: journals can become evidence-based reflection, practicum an iterative cycle, technology assignments pedagogical problem-solving, and alum networks mechanisms for continuing mentoring.

3.8. Implications for PPG Evaluation

PPG evaluation should employ multiple levels of indicators and distinguish programme pathways. The first level comprises achievements during the programme, such as professional knowledge, planning quality, teaching practice, and assessment completion. The second concerns competence transfer: whether teachers apply knowledge and skills adaptively in schools. The third concerns professional sustainability: whether teachers use evidence to improve practice after certification. This framework aligns with Cochran-Smith et al. [13], who cautioned against reducing teacher education evaluation to a single indicator and emphasised evidence connecting programme characteristics with professional consequences.

Table 3. A Multilevel and Longitudinal PPG Evaluation Framework

Evaluation level	Key question	Example indicators	Measurement period	Evaluation function
Programme achievement	Do participants meet standards and develop competence?	Professional knowledge, teaching practice, assessment quality, responsiveness to feedback	During and at the end of PPG	Certification decisions and instructional design improvement
Competence transfer	Are competencies used in authentic school contexts?	Classroom observations, task/assessment quality, student artefacts, strategy adaptation	6–12 months after graduation	Assess applicability and support needs
Professional sustainability	Do teachers continue improving their practice?	Inquiry cycles, communities of practice, portfolio development, mentoring	Years 1–3 and beyond	Evaluate longitudinal outcomes and ecosystem quality

This layered framework distinguishes proximal from distal indicators. Examination scores or observed performance during PPG are proximal outcomes that are relatively easy to measure. Transfer to daily school practice and sustained improvement are more distal outcomes, requiring longitudinal evidence and attention to contextual factors. The distinction prevents certification outcomes from being used as sufficient proxies for long-term professional development.

This approach also reduces the risk of credentialism, in which certificates are regarded as the principal indicator of professional quality even though their relationship with continuing practice has not been established.

The implication is not to diminish certification but to position it appropriately. A certificate recognises that specific standards were met at a particular point; it cannot replace a professional obligation to update knowledge and improve practice. This logic applies across professions requiring continuing competence development and is especially relevant to teaching as curricula, technologies, student characteristics, and social challenges evolve.

Longitudinal alum evaluation is therefore a priority for future research. Studies could compare instructional quality before and after PPG, follow teacher development over several years, and link programme characteristics with classroom practice and students' learning experiences. Such evidence would strengthen policy evaluation beyond perceptions and final programme grades.

3.9. Policy and Research Priorities

At policy level, the priority is to clarify PPG success indicators beyond graduation rates. Transfer and sustainability indicators should evaluate system quality rather than

penalise individual teachers. Alumni evidence can identify components needing improvement, early-career mentoring needs, and disparities in partner-school quality.

The second priority is to professionalise mentor teachers' roles. Mentoring requires observing practice, providing evidence-based feedback, facilitating reflection, and helping participants design improvements. Extensive teaching experience is valuable but does not automatically confer competence in educating prospective teachers. Mentor capacity building and recognition should therefore form part of quality assurance.

The third priority is proportionate data infrastructure. Participant development portfolios, teaching artefacts, and alums follow-up information can provide richer evidence than final grades. However, data collection must account for administrative burden, privacy, and utility. Data not used for improvement merely increase workload.

For researchers, the PPG-4P Model opens several testing strategies. Longitudinal studies can examine competence stability; mixed-methods studies can explain why components work in some contexts but not others; quasi-experiments can compare mentoring intensity; and multilevel analyses can distinguish effects attributable to participants, teacher education institutions, mentors, and partner schools. This agenda can move PPG research beyond a broad judgment of whether the programme works towards design questions: what works, for whom, under which conditions, and through what mechanisms?

3.10. Review Limitations

This review has four main limitations. First, the integrative design does not estimate national effects or claim the completeness of a protocol-based systematic review. Second, much PPG evidence relies on perceptions, case studies, or small samples; consequently, links among programme experiences, changes in practice, and student outcomes remain insufficiently established. Third, the heterogeneity of prospective-teacher and practising-teacher PPG pathways limits aggregate claims about "PPG effectiveness" without differentiating pathways. Fourth, PPG-4P results from conceptual synthesis and its component relationships have not been causally tested. Its contribution is therefore a testable analytical framework and evaluation design, not a definitive prescription for PPG implementation.

4. CONCLUSION

Teacher Professional Education occupies a strategic position in Indonesia's teacher professionalisation, but available evidence calls for more precise interpretation than a simple dichotomy of "effective" versus "ineffective". Recent studies indicate positive associations with competence, self-efficacy, soft skills, and teaching practice, while evaluation studies identify continuing needs in practicum, classroom management, technology, facilities, and programme support. Effectiveness should therefore be understood as emerging from interactions among programme design, participant profiles, mentoring quality, school contexts, and continuing professional learning.

The synthesis also shows that the principal challenge is not simply to add programme components but to strengthen connections among existing activities. Practice

without evidence-based reflection, reflection without opportunities to reteach, technology without pedagogical objectives, and mentoring that ends at graduation all constrain continuing professional learning. Reorientation should therefore improve the architecture linking activities rather than merely increase the number of courses or assignments.

This review develops the PPG-4P Model, comprising Intensive Practice, Reflective Learning, Digital Pedagogy, and Continuous Mentoring. These elements establish cyclical relationships among classroom experience, learning evidence, reflection, pedagogical innovation, and professional development. The framework offers a shift from PPG as a certification programme towards an ecosystem of professional learning.

Conceptually, the model places learning evidence at the centre of component relationships. Practice generates evidence; reflection interprets it; digital pedagogy supplies appropriate tools and representations; and mentoring sustains improvement within professional contexts. The model can thus serve as a design-audit framework: every PPG activity can be examined for its contribution to practice, reflection, digital decisions, and continuity.

Policy implications include strengthening practicum quality, mentor teachers' and university supervisors' capacities, authentic performance-based assessment, digital pedagogical competence, and induction and alumni mentoring systems. Teacher education institutions and partner schools should maintain relationships after programme completion to ensure that professional learning continues beyond graduation.

Future research should test PPG-4P empirically through longitudinal studies, mixed methods, quasi-experimental designs, or multilevel analyses that distinguish the prospective-teacher and practising-teacher pathways. Outcomes should extend beyond perceptions or final scores to pedagogical decision quality, classroom observations, development of instructional artefacts, retention of improved practices, and, with appropriate designs, students' learning experiences and outcomes. Such testing is necessary to develop PPG-4P from a conceptual framework into an empirically grounded design model.

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