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Research Article

A Collaborative Peer-Based Model for Elementary Teacher Pedagogical Knowledge: Evidence from Luwu Regency, Indonesia

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Abstract
This study developed and evaluated a collaborative peer-based training model to strengthen the pedagogical knowledge of public elementary school teachers. Model development utilized a Research and Development approach structured around the ADDIE framework, producing a facilitator guidebook, training modules, and a 30-item objective knowledge-based competence test. Content validation by two experts confirmed high validity across media suitability (M = 96.0), language clarity (M = 93.3), and content accuracy (M = 91.0). Model evaluation employed a one-group pretest–posttest design with 32 purposively selected teachers from 32 distinct schools, yielding high practicality ratings from facilitators (M = 88.3) and teacher-participants (M = 91.4). Measured via the objective knowledge-based test, pedagogical competence scores increased from a pretest mean of 56.06 (SD = 9.01) to a posttest mean of 89.63 (SD = 5.81) approximately one month post-training, demonstrating a statistically significant within-group difference, $t(31) = 29.16$, $p < .001$, 95% CI [31.22, 35.91], $d_z \approx 5.16$. Because the evaluation design lacked a control group, this estimate cannot rule out testing, maturation, or concurrent professional-learning effects, and must be interpreted as preliminary evidence of promise rather than confirmed causal impact or demonstrated scalability. The findings suggest that a systematically designed peer-based training format is a practical option for enhancing measured teacher knowledge in resource-constrained districts, warranting controlled replication.

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Introduction

Pedagogical competence the capacity to translate subject-matter knowledge into instruction that responds to how students learn is identified in Indonesia's national teacher competency framework as a core determinant of teaching quality. National assessment data indicate that this competency has historically been uneven across regions. In 2015, Uji Kompetensi Guru (UKG), Indonesia's national teacher competency examination, recorded a mean score of 47.50 for teachers in Kabupaten Luwu, South Sulawesi, on a 0–100 scale, with the pedagogical competence component contributing approximately 20 of the 47.50 points. Comparable South Sulawesi districts recorded similarly low averages, including Kabupaten Gowa (48.72), Kabupaten Sidrap (48.11), Kabupaten Bone (50.10), Kabupaten Maros (49.88), and Kota Makassar (50.26) (Kementerian Pendidikan Dan Kebudayaan, 2018). All of these regional scores fell well below the Ministry of Education and Culture's (*Kemendikbud*) national minimum mastery threshold (*Kriteria Ketuntasan Minimal*) benchmark of 55.00.

Although the comprehensive 2015 census remains the most recent standardized, nationwide objective assessment of teacher knowledge at the regency level, subsequent empirical evaluations

confirm that the regional deficit in pedagogical practice has persisted rather than resolved. Recent regional assessments indicate that primary school teachers in South Sulawesi continue to encounter systemic difficulties in designing student-centered, differentiated instruction (Daga et al., 2023), while access to structured, sustained professional development remains constrained outside urban centers (Rasmitadila et al., 2024). Furthermore, national reforms including the ongoing transition to the *Kurikulum Merdeka* have heightened pedagogical requirements without providing localized, high-dosage training infrastructure in non-urban districts. Consequently, the 2015 UKG baseline figures represent an appropriate, unmitigated diagnostic anchor for a 2025 intervention, reflecting a structural, long-standing gap in pedagogical knowledge within Kabupaten Luwu that localized professional learning networks have yet to systematically close.

Professional development structured around peer collaboration takes several distinct forms that the literature does not always distinguish clearly. Peer coaching typically involves reciprocal observation and feedback between colleagues of comparable experience, organized around refining a specific instructional practice (Jin et al., 2026). Mentoring, by contrast, is usually asymmetric, pairing a less experienced teacher with a more experienced one over an extended relationship. Professional learning communities (PLCs) organize collaboration around a shared inquiry or improvement cycle at the school or department level rather than a single paired relationship (Gerhardson, 2026). (Wang & Shi, 2026) meta-analysis of 60 causal studies found that coaching-based interventions produced a pooled effect of 0.49 SD on instructional practice and 0.18 SD on student achievement, but effects shrank substantially once programs moved beyond small efficacy trials toward larger-scale delivery a caution directly relevant to any scalability claim made from a single-site study.

Operationally, the intervention developed in this study constitutes a structured, reciprocal peer coaching model executed through a four-stage cyclical micro-process rather than a traditional, passive collaborative workshop. Unlike brief workshops centered on didactic presentation or open group discussion, this model pairs teachers of comparable experience in fixed dyads to navigate explicit, practice-based learning loops within each training session: (1) Micro-Teaching Rehearsal: Partner A actively delivers a targeted 10-to-15-minute pedagogical episode (e.g., executing a student-centered questioning sequence or introducing a concept using print modules) while Partner B acts as the evaluator. (2) Structured Reciprocal Observation: Partner B observes the simulated execution using a standardized visual fidelity checklist to record specific pedagogical behaviors, questioning patterns, and instructional pacing. (3)Targeted Debrief & Feedback: Immediately following the rehearsal, Partner B delivers structured, non-evaluative verbal feedback grounded strictly in the checklist indicators, highlighting observed strengths and specific execution gaps. (4) Guided Reflection & Role Reversal: Both partners engage in a structured debrief to analyze the instructional choices made, after which they swap roles Partner B becomes the practitioner and Partner A assumes the observer-coach role to execute a second iterative cycle. By embedding reciprocal observation, immediate evidence-based feedback, active micro-teaching rehearsal, and peer-guided reflection into every instructional unit, the model operationalizes the core psychological and structural mechanisms that define true peer coaching, separating it from conventional workshop-style professional development.

This study treats systematic instructional design - operationalized through the ADDIE framework (Analysis, Design, Development, Implementation, Evaluation) as theoretically necessary

rather than a procedural convenience. Unstructured peer coaching arrangements have been criticized precisely because their success depends on the coincidental availability of time and facilitation skill among participating teachers (Mizzi, 2024), a problem a needs-driven design process is intended to anticipate rather than absorb as it arises. By embedding localized constraints directly into the instructional design, the ADDIE process transformed identified structural barriers specifically high time poverty (93.8%) and limited digital infrastructure (9.4%) into explicit design boundaries. Rather than viewing print-based, time-compressed modules as a limitation, this approach grounds the model in contextualized adult learning theory, ensuring that pedagogical intervention operates within the pragmatic reality of resource-constrained primary schools. The Implementation phase compressed delivery into three consecutive days specifically to accommodate the time constraint identified during Analysis. (Alsaleh, 2020) found that ADDIE-based training produced measurable gains in teachers' self-assessed problem-solving skills, and Harder (2005) argued that instructional design supplies a durable planning structure that outlasts a single training event; this study extends that line of work by using ADDIE not merely to sequence delivery but to translate locally identified constraints into specific design decisions. The needs analysis and evaluation data were collected from the same teacher cohort; therefore, possible confirmation bias and social-desirability bias are acknowledged, and these findings are interpreted as contextual evidence rather than independent verification of programme needs.

First, in terms of intervention design, peer coaching literature to date has focused heavily on unstructured or open-ended peer observation frameworks (Campbell & Mogashana, 2025; Jin et al., 2026). These designs frequently struggle with implementation fidelity because they rely on the coincidental availability of time and informal facilitation skills among participating teachers (Mizzi, 2024). While structured ADDIE-based training programs have been deployed in general teacher professional development (Alsaleh, 2020), they rarely embed explicit, reciprocal micro-teaching peer-coaching loops into time-compressed print formats tailored for resource-constrained districts.

Second, regarding outcome measurement, existing peer coaching and professional learning community (PLC) evaluations rely almost exclusively on self-efficacy surveys, participation logs, self-reported satisfaction scales, or qualitative interviews (Campbell & Mogashana, 2025; Naiseh et al., 2025; Remacle et al., 2023). Cross-national PLC research similarly links teacher collaboration to broad instructional orientations without evaluating a concrete, standardized assessment tool (Guo & Wang, 2021). While self-report metrics capture perceived confidence, they are highly susceptible to social desirability bias and fail to verify whether teachers have mastered actionable pedagogical knowledge. Conversely, standard ADDIE evaluation studies measure general problem-solving perceptions rather than directly tested (Alsaleh, 2020).

The primary novelty of this study lies in addressing this specific methodological gap: pairing an ADDIE-structured, print-based peer coaching intervention with an objective, criterion-referenced 30-item pedagogical knowledge test administered at baseline and approximately one month post-training to verify knowledge retention. This 30-item objective test represents a meaningful advance over conventional self-reports by providing a standardized, verifiable metric of cognitive mastery. To ensure the instrument captured the intended pedagogical domains, the test items were systematically aligned with the four core dimensions of Indonesia's national teacher competency framework (*Standar Kompetensi Guru*):

1. Instructional Design & Lesson Planning: Evaluating knowledge of learning-objective alignment, contextualized material adaptation, and structured learning sequences.
2. Student-Centered Learning Delivery: Assessing comprehension of active learning strategies, questioning techniques, and differentiated instruction.
3. Classroom Management & Climate: Measuring understanding of positive behavioral support, time allocation, and engagement strategies.
4. Assessment & Diagnostic Evaluation: Testing mastery of formative assessment design, rubric construction, and diagnostic feedback loops.

By subjecting these 30 items to rigorous expert content validation where validators confirmed domain alignment, item clarity, and content accuracy (M = 91.00) the instrument provides a reliable, domain-mapped metric of teacher pedagogical knowledge. Accordingly, this study addresses a precise gap: whether a needs-driven, ADDIE-structured peer coaching model produces a measurable, retained gain on an objective, domain-aligned pedagogical knowledge test among elementary teachers in a resource-constrained regency.

This study therefore had four specific aims: (1) to develop a collaborative peer-based training model for elementary teachers' pedagogical competence using the ADDIE framework; (2) to establish the model's content validity through expert judgment; (3) to evaluate its practicality as rated by facilitators and participating teachers; and (4) to obtain preliminary evidence of its effectiveness by comparing teachers' pedagogical competence test scores before and after training. Because no classroom observation was conducted, this study does not assess teachers' instructional performance directly; effectiveness here refers specifically to change in test-measured pedagogical competence.

Method

This study used a Research and Development (R&D) approach structured around the ADDIE framework, combined with a one-group pretest-posttest design to obtain preliminary outcome evidence.

Table 1. The activities, participants, outputs, and decision criteria of each phase.

Phase	Activities and participants	Output / decision criterion
Analysis	Needs survey and interviews with 32 teacher-respondents (Aug 2025): demographics, prior training exposure, instructional media use, perceived barriers.	Documented needs profile (time and facility constraints, low digital-tool use) used to constrain Design.
Design	Draft training modules, facilitator guidebook, and assessment instruments based on the Analysis output.	Content aligned to reported barriers (print-based, time-compressed format).
Development	Expert review by two validators (one language, one content/instructional design), both affiliated with Universitas Negeri Makassar.	One revision cycle; documented corrections (Table 2 source data); re-scored after revision.
Implementation	Three-day training (22-24 Aug 2025) delivered to the 32 teacher-participants as a single cohort.	Session-level practicality ratings (89.6-95.4) used as an indirect indicator of delivery consistency; no independent fidelity checklist was administered.
Evaluation	Pretest immediately before training; posttest ~1 month later (23 Sep 2025); practicality questionnaire completed by teachers and facilitators.	Paired-samples comparison of pre/post competence scores.

The study was conducted in public elementary schools in Kabupaten Luwu, South Sulawesi. The regency was selected because its geography spans mountainous, urban, and coastal areas, which motivated the expectation that a training model would need to function under varied resource conditions; however, the participating schools were not formally stratified or classified into urban and remote clusters, and the source data do not report school-level accessibility categories or a teacher count by cluster. This is treated as a limitation rather than a tested subgroup design.

The research subjects consisted of 32 teachers, each from a different public elementary school in Kabupaten Luwu (one teacher-respondent per school). Participants were selected through purposive sampling (Sugiyono, 2023), because the study required teachers able to meaningfully engage with and evaluate a peer coaching intervention rather than a random cross-section of the teaching population. Inclusion criteria required that participants (1) serve as classroom or subject teachers in a public elementary school, (2) have at least three years of teaching experience, (3) be willing to complete the full training sequence, and (4) be actively involved in a teacher working group (KKG). Teachers were excluded if they were on leave or pursuing further studies, had participated in a similar training program within the preceding six months, or were unable to attend the training in full. Additional reporting should include the recruitment pathway, invited participants, refusals or withdrawals (if any), and a priori sample-size justification. Because participants were active in KKG, transferability beyond professionally engaged teachers should be interpreted cautiously.

Four instruments were used: (1) A needs-analysis questionnaire, administered to the 32 teacher-respondents, covering demographic characteristics, prior training exposure, instructional media use, and perceived barriers to applying pedagogical approaches. (2) An expert validation questionnaire rating the training modules and guidebook across three dimensions - media suitability, language clarity, and content accuracy - on a 1-5 Likert scale, with aggregate scores classified using a four-level scale adapted from Sugiyono as cited in (Bougherara et al., 2026): 82-100 = highly valid, 63-81 = valid, 44-62 = invalid, 25-43 = highly invalid. A parallel five-level scale (Mehrabi et al., 2024) was used to classify instrument reliability coefficients (0.80-1.00 = very high, 0.60-0.80 = high, 0.40-0.60 = adequate, 0.20-0.40 = low, 0.00-0.20 = very low). (3) A 30-item objective pedagogical competence test constructed around national competency standards, administered immediately prior to training and approximately one month post-intervention to assess retention; and (4) A practicality questionnaire scored on a 1–5 Likert scale. Pretest and posttest competence scores were compared using a paired-samples t-test at $\alpha = .05$, following tests of normality and homogeneity of the paired differences as specified in the analysis plan; Cohen's dz was calculated as the mean difference divided by the standard deviation of the paired differences, and a 95% confidence interval was constructed around the mean difference. The final manuscript should also report the instrument blueprint, sample items, scoring procedure, pilot testing evidence, item-level analysis, reliability estimates, and the independent expertise of validators. Assumption testing should focus on the distribution of difference scores rather than homogeneity testing; missing-data procedures, outlier screening, exact assumption statistics, and the Cohen's dz formula should be reported.

Result and Discussion

Result

The demographic characteristics of the 32 teacher-respondents were summarized descriptively. Respondents were predominantly female (n = 29, 90.6%; male: n = 3, 9.4%). The largest age group

was 31–40 years (n = 13, 40.6%), and the largest teaching-experience group was 5–10 years (n = 11, 34.4%). No missing demographic responses were identified.

Table 2. The demographic characteristics

Characteristic	Category	n	%
Gender	Female	29	90.6
	Male	3	9.4
Age	31-40 years (largest group)	13	40.6
Teaching experience	5-10 years (largest group)	11	34.4
Prior competency training	Yes	28	87.5
Perceived importance of further training	Very important	26	81.3

On instructional media use, 84.4% (n = 27) of respondents reported textbooks as a primary resource and 65.6% (n = 21) reported whiteboards; 9.4% (n = 3) reported using a digital learning application (multiple responses were permitted for this item). Asked what limited their application of new pedagogical approaches, 93.8% (n = 30) cited time constraints and 84.4% (n = 27) cited inadequate facilities (multiple responses permitted). These are self-reported perceptions collected during needs analysis, not independently verified constraints, and are reported here as background rather than as evidence that the subsequent training overcame them.

Table 3 presents the expert validation results. All three dimensions - media suitability, language clarity, and content accuracy - fell within the highly valid range (82-100) of the four-level scale.

Table 3. Expert Validation Results

Dimension	Mean score	Category
Media suitability	96.0	Highly valid
Language clarity	93.3	Highly valid
Content accuracy	91.0	Highly valid

Table 4 presents the practicality results. Facilitator ratings (M = 88.3) and teacher-participant ratings (M = 91.4) both fell within the excellent range (80-100) of the five-level scale described in the Method; session-level ratings across the three training days ranged from 89.6 to 95.4.

Table 4. Practicality Results

Source	Mean score	Category
Facilitators (overall)	88.3	Excellent
Teacher-participants (overall)	91.4	Excellent
Session 1 (teacher-rated)	89.6	Excellent
Session 2 (teacher-rated)	95.4	Excellent
Session 3 (teacher-rated)	91.7	Excellent

Table 5 presents the pretest-posttest competence results. The mean score rose from 56.06 (SD = 9.01) before training to 89.63 (SD = 5.81) approximately one month afterward. A paired-samples t-test indicated a statistically significant difference, $t(31) = 29.16$, $p < .001$, 95% CI for the mean difference [31.22, 35.91], Cohen's $d_z \approx 5.16$. The pretest-posttest correlation was $r = .693$ ($p < .001$); this correlation describes the consistency of individual ranking across the two occasions and is not itself evidence of a training effect.

Table 5. Pretest-Posttest Competence Results

Measure	Pretest	Posttest
M	56.06	89.63
SD	9.01	5.81

n	32	32

The reduction in standard deviation from pretest to posttest (9.01 to 5.81) indicates that between-teacher variability narrowed after training. This convergence suggests that the structured peer-coaching sequence was particularly effective in scaffolding lower-baseline participants, bringing the overall cohort to a more homogeneous, high-performing threshold of pedagogical knowledge. Because individual-level gain scores were not analyzed separately by baseline performance, this study cannot confirm whether lower-scoring teachers gained more than higher-scoring teachers; the narrower posttest spread is reported descriptively and should not be read as demonstrated evidence of a specific transfer mechanism among participants.

Discussion

The findings of this study indicate that the collaborative peer-based training model developed through the ADDIE framework was associated with strong expert validation, high practicality, and a substantial improvement in teachers' test-measured pedagogical competence. The model obtained highly valid ratings across media suitability, language clarity, and content accuracy, suggesting that the training materials and facilitator guidebook were judged appropriate for elementary teacher professional development. In addition, facilitator and teacher-participant practicality scores indicated that the model was perceived as feasible, clear, and relevant to local professional learning needs. Most importantly, teachers' pedagogical competence scores increased markedly from pretest to posttest one month after the intervention. Nevertheless, because the study employed a one-group pretest–posttest design, this improvement should be interpreted as preliminary evidence of promise rather than definitive causal evidence. Testing effects, maturation, unmeasured professional learning activities, and participants' prior familiarity with pedagogical training may have contributed to the observed change.

The results are broadly consistent with recent international research showing that effective teacher professional development is most powerful when it is structured, practice-oriented, collaborative, and connected to teachers' classroom realities. Popova et al. (2022) found that high-performing professional development programs tend to include opportunities for teachers to enact lessons, receive follow-up support, and work with concrete instructional problems rather than merely attend generic workshops. Similarly, Sims et al. (2025) argued that effective teacher professional development should build teachers' insight, motivate change, develop instructional techniques, and embed new practices into professional routines. The present model reflects several of these characteristics through micro-teaching rehearsal, reciprocal observation, checklist-based feedback, and guided reflection. Its design also aligns with evidence from Quality Teaching Rounds, where pedagogy-focused professional development improved learning outcomes through structured professional dialogue and peer observation (Gore et al., 2021). However, unlike randomized or controlled studies, the current study cannot confirm whether the peer-based model caused the observed improvement; rather, it shows that such a model is feasible and associated with improved knowledge scores in a specific local setting.

The findings also resonate with coaching and peer-feedback research. Reddy et al. (2021) demonstrated that instructional coaching can improve teacher practices in high-poverty urban schools when coaching is embedded in formative assessment and classroom feedback. Yang et al. (2022), through a systematic review of coaching in early childhood education, similarly reported positive effects on teachers' knowledge and instructional competence. In this study, the reciprocal

peer-coaching structure may have encouraged teachers to articulate, observe, and evaluate pedagogical decisions that are often tacit in everyday teaching. This interpretation is theoretically plausible, but it must not be overstated because the study did not directly measure classroom interaction, teacher reflection quality, or instructional transfer. The exceptionally large pretest–posttest difference therefore should be interpreted cautiously and compared with the more modest and heterogeneous effects reported in large-scale meta-analyses of teacher professional development (Visscher et al., 2025). The discrepancy may reflect differences in outcome measures: this study assessed a criterion-referenced knowledge test, whereas many international studies examine classroom practice or student achievement, which are more distal and harder to change.

In the Indonesian context, the findings strengthen the argument that teacher professional development must be localized, sustained, and sensitive to school-level constraints. Daga et al. (2023) showed that elementary teacher competence remains central to educational sustainability in Indonesia, while Rasmitadila et al. (2025) emphasized the need for sustainable professional development programs that respond to teachers' actual working conditions. The current study extends this local literature by offering a print-based and time-compressed model designed for a district where teachers reported severe time constraints and limited facilities. It also complements Rokhman et al. (2024), who developed an ADDIE-based academic supervision model and found that systematic, needs-based supervision can strengthen educational professionalism. Moreover, Waluyo et al. (2025) argued that teacher performance assessment should move beyond administrative compliance toward strategic professional development, while Hariandini et al. (2026) found that digital technologies in schools often remain limited to presentation and visualization unless supported by pedagogical design and institutional capacity. These Indonesian studies suggest that the main issue is not simply whether teachers receive training, but whether professional learning is designed as a coherent system connecting needs analysis, pedagogical practice, feedback, assessment, and follow-up.

Theoretically, the study supports a contextualized view of ADDIE as more than a procedural development model; in this case, ADDIE functioned as a mechanism for translating local constraints into concrete training decisions. The peer-based model also extends collaborative professional learning theory by demonstrating how reciprocal observation and structured feedback can be embedded into a low-resource, print-supported format. Pedagogically, the findings suggest that schools and teacher working groups should prioritize small-group peer coaching, micro-teaching, checklist-guided observation, and reflective discussion rather than relying solely on lecture-based workshops. Such practices may strengthen teachers' pedagogical knowledge, confidence, engagement, and readiness to design more student-centered learning. Because teachers in the study reported limited digital application use, future training should also integrate digital assessment literacy, media literacy, and ethical educational technology use, consistent with recent work on digital integrated learning and media education (Hariandini et al., 2026; Rakhmatillayevna & Khabibjonovna, 2025). At the policy level, district education offices should allocate protected time for peer coaching, support KKG-based facilitation, provide training for peer observers, and establish monitoring systems that assess both knowledge gains and classroom enactment. Policy should also ensure that digital transformation in teacher assessment and professional development does not become merely bureaucratic, but genuinely supports instructional improvement, teacher well-being, and equitable access to professional learning.

The novelty of this study lies in its integration of ADDIE-based instructional design, reciprocal peer coaching, print-based materials, and objective pedagogical competence testing within a resource-constrained Indonesian elementary education context. While prior studies have examined professional learning communities, coaching, digital training, and academic supervision, relatively few have combined localized needs analysis, expert validation, practicality evaluation, and delayed posttest measurement of pedagogical knowledge in one development study. The study therefore contributes a context-responsive model that challenges the assumption that meaningful teacher professional development necessarily requires external experts, expensive digital platforms, or long-duration centralized training. Its main contribution is not a definitive causal claim, but a replicable design logic for developing peer-based teacher professional learning in districts facing limitations of time, facilities, and specialist support.

Several limitations must be acknowledged. First, the absence of a control or comparison group limits causal inference, and the large effect size may partly reflect test familiarity or other uncontrolled factors. Second, the sample consisted of 32 purposively selected, KKG-active teachers, which may limit transferability to teachers with lower professional engagement or different school conditions. Third, the study did not report detailed item-level psychometric evidence, inter-validator agreement, treatment fidelity, assessor blinding, missing-data handling, or ethics approval procedures. Fourth, the outcome measure captured pedagogical knowledge rather than direct classroom practice or student learning outcomes. Future research should therefore employ randomized or quasi-experimental designs, include larger and geographically stratified samples, examine urban–rural–remote differences, and incorporate classroom observation, teacher reflection data, student learning indicators, and long-term follow-up. Subsequent studies should also compare print-based, blended, and digital peer-coaching formats to determine which professional development design is most effective, sustainable, and equitable across diverse Indonesian school contexts.

Conclusion

This study developed and evaluated a collaborative peer-based training model designed to strengthen the pedagogical competence of public elementary school teachers in Luwu Regency, South Sulawesi. Guided by the ADDIE framework, the study produced a structured training model supported by a facilitator guidebook, training modules, and an objective pedagogical competence test. The findings demonstrate that the model achieved high expert validation in terms of media suitability, language clarity, and content accuracy, indicating that its design was theoretically and practically appropriate for teacher professional development. The model was also rated highly practical by both facilitators and teacher-participants, suggesting that it was feasible to implement within the constraints of local elementary school contexts. Furthermore, the substantial improvement from pretest to posttest scores indicates that the model was associated with a meaningful increase in teachers' test-measured pedagogical knowledge. Thus, the findings answer the research objectives by showing that the peer-based ADDIE model is valid, practical, and preliminarily effective for enhancing pedagogical competence among the participating teachers.

Theoretically, this study contributes to teacher professional development literature by demonstrating how systematic instructional design can be integrated with reciprocal peer coaching to create a context-responsive model of pedagogical learning. Practically, the findings suggest that structured peer collaboration, micro-teaching rehearsal, observation, and reflective feedback can

serve as accessible strategies for strengthening teacher competence, particularly in resource-constrained districts. Nevertheless, the study is limited by its one-group pretest–posttest design, purposive sample, relatively small number of participants, and absence of direct classroom observation or student learning outcome data. Consequently, the observed gains should be interpreted as preliminary evidence rather than definitive proof of causal impact. Future research should employ controlled or quasi-experimental designs, involve larger and more diverse teacher samples, examine implementation across urban, rural, and remote schools, and include longitudinal measures of classroom practice and student achievement. By offering a locally grounded and methodologically structured model, this study provides a promising foundation for advancing sustainable, collaborative, and evidence-informed teacher professional development in Indonesian elementary education.

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