

FROM PREPARATION TO PERFORMANCE: MAPPING HOW PRE-SERVICE TEACHER EDUCATION SHAPES TEACHER PERFORMANCE

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Abstract

Pre-service teacher education is expected to translate academic knowledge into the professional capabilities required for effective classroom practice, yet evidence concerning how specific programme components contribute to teacher performance remains fragmented across practicum, pedagogical competence, self-efficacy, mentoring, assessment, data use, digital competence, and emerging artificial intelligence (AI) capabilities. This systematic literature review synthesised and mapped evidence on how pre-service teacher education contributes to teacher performance. The review followed the PRISMA 2020 reporting framework. The source manuscript reports 385 records identified through academic database searching, 50 records retained after initial screening, 31 considered highly relevant after title, abstract, keyword, and thematic assessment, and 25 studies included in the final synthesis. The included literature, published between 2019 and 2025, represented diverse national and methodological contexts. Thematic synthesis identified six interrelated contribution domains: (1) practicum and authentic teaching practice; (2) pedagogical competence and instructional efficiency; (3) preparedness, self-efficacy, and professional engagement; (4) mentoring, feedback, assessment, and data literacy; (5) digital and AI competence; and (6) professional identity and subject-specific competence. Across the evidence base, programme inputs alone were insufficient to explain performance development. Contribution was more consistently associated with the quality of the learning process connecting coursework and clinical experience through modelling, feedback, reflection, assessment, and professional reasoning. The review therefore proposes an input–process–performance framework in which programme components function through structured professional learning processes to shape observable and perceived performance capabilities. The synthesis also identifies important boundary conditions, including the authenticity of classroom experience, mentoring quality, assessment design, technological support, and the continued reliance on self-report measures. The findings support a shift from viewing teacher preparation as a collection of courses toward viewing it as an integrated professional learning system.

Keywords: pre-service teacher education, teacher performance, teaching practicum, mentoring, self-efficacy, digital competence, artificial intelligence, systematic literature review

Abstrak

Pendidikan calon guru diharapkan dapat mentransformasikan pengetahuan akademis menjadi kemampuan profesional yang diperlukan untuk praktik pembelajaran di kelas yang efektif; namun, bukti mengenai bagaimana komponen program tertentu berkontribusi terhadap kinerja guru masih tersebar secara terpisah di berbagai aspek, seperti praktik lapangan, kompetensi pedagogis, efikasi diri, bimbingan, penilaian, pemanfaatan data, kompetensi digital, serta kemampuan kecerdasan buatan (AI) yang sedang berkembang. Tinjauan literatur sistematis ini mensintesis dan memetakan bukti mengenai bagaimana pendidikan calon guru berkontribusi terhadap kinerja guru. Tinjauan ini mengikuti kerangka pelaporan PRISMA 2020. Naskah sumber melaporkan 385 catatan yang diidentifikasi melalui pencarian basis data akademik, 50 catatan yang disaring setelah penyaringan awal, 31 catatan yang dianggap sangat relevan setelah penilaian judul, abstrak, kata kunci, dan tematik, serta 25 studi yang dimasukkan dalam sintesis akhir. Literatur yang disertakan, yang diterbitkan antara tahun 2019 dan 2025, mewakili konteks nasional dan metodologis yang beragam. Sintesis tematik mengidentifikasi enam domain kontribusi yang saling terkait: (1) praktik lapangan dan praktik mengajar yang autentik; (2) kompetensi pedagogis dan efisiensi pengajaran; (3) kesiapan, efikasi diri, dan keterlibatan profesional; (4) bimbingan, umpan balik, penilaian, dan literasi data; (5) kompetensi digital dan kecerdasan buatan (AI); serta (6) identitas profesional dan kompetensi khusus mata pelajaran. Secara keseluruhan, masukan program saja tidak cukup untuk menjelaskan perkembangan kinerja. Kontribusi lebih konsisten dikaitkan dengan kualitas proses pembelajaran yang menghubungkan materi perkuliahan dan pengalaman klinis melalui pemodelan, umpan balik, refleksi, penilaian, dan penalaran profesional. Oleh karena itu, tinjauan ini mengusulkan kerangka kerja masukan–proses–kinerja di mana komponen program berfungsi melalui proses pembelajaran profesional yang terstruktur untuk membentuk kemampuan kinerja yang dapat diamati dan dirasakan. Sintesis ini juga mengidentifikasi kondisi batas yang penting, termasuk keaslian pengalaman di kelas, kualitas bimbingan, desain penilaian, dukungan teknologi, dan ketergantungan yang terus-menerus pada pengukuran laporan diri. Temuan ini mendukung pergeseran pandangan dari memandang persiapan guru sebagai kumpulan mata kuliah menuju memandangnya sebagai sistem pembelajaran profesional yang terintegrasi.

Kata kunci: pendidikan calon guru, kinerja guru, praktik mengajar, bimbingan, efikasi diri, kompetensi digital, kecerdasan buatan, tinjauan literatur sistematis

INTRODUCTION

Initial teacher education is a critical site in which prospective teachers learn to translate disciplinary and pedagogical knowledge into professional action. Contemporary teacher preparation is consequently expected to develop more than declarative knowledge: prospective teachers must learn to plan instruction, manage classrooms, assess learning, interpret evidence, adapt to learner diversity, collaborate with colleagues, and make context-sensitive pedagogical decisions. The challenge is therefore not simply whether teacher education contains practicum, coursework, mentoring, or assessment, but how these components are organised into a coherent professional learning trajectory. Reviews of teacher education have similarly emphasised the importance of systematic design, clinical experience, and mentoring rather than treating preparation as a collection of disconnected activities (Ellis et al., 2020; Mok & Staub, 2021).

The literature reviewed in the source manuscript provides evidence for several pathways. Practicum and teaching practice create opportunities to connect theoretical knowledge with classroom activity, including lesson planning, classroom management, instructional delivery, and reflection. Evidence from long-term internship research, however, indicates that additional time in schools does not automatically translate into uniformly higher teaching performance; the quality and structure of the experience matter (Greve et al., 2020). Similarly, research on coaching, mentoring, and supervision suggests positive but differentiated effects on instructional skills, with cognitive modelling emerging as an important moderator (Mok & Staub, 2021). These findings imply that practical exposure should be understood as a learning process rather than as a simple dosage variable.

A second strand concerns psychological and professional readiness. Studies of pre-service teachers have linked preparedness, self-efficacy, curriculum literacy, and professional engagement with teaching-related capabilities (Abraham et al., 2021; Brown et al., 2021; Ene et al., 2020). Yet perceived readiness and self-efficacy should not be equated with actual performance. Self-report measures are valuable for understanding beliefs and perceived capability, but they provide only indirect evidence of instructional quality. A rigorous account of teacher performance therefore needs to distinguish between psychological resources, professional competencies, and observable instructional performance.

A third strand concerns mentoring, feedback, assessment, and the use of evidence. Mentoring can support professional learning and teacher identity when mentors possess appropriate knowledge of mentoring and connect feedback to professional standards (Ellis et al., 2020). Meta-analytic evidence further indicates that coaching, mentoring, and supervision have a small overall effect on instructional skills, while cognitive modelling can strengthen these effects (Mok & Staub, 2021). Assessment literacy and data use extend this process by enabling prospective teachers to interpret evidence of student learning and make instructional decisions rather than relying solely on intuition.

Teacher preparation is also being reshaped by digitalisation and generative AI. Recent evidence shows that digital competence requires more than technical familiarity; it involves pedagogical integration, content-related application, critical judgement, collaboration, and attention to ethical and social dimensions (Tomczyk, 2024). Research on AI-integrated teacher education similarly indicates that prospective teachers need capabilities that combine AI knowledge, pedagogical application, critical evaluation, and professional identity formation (Guan et al., 2025). Intervention evidence suggests that explicit initial teacher education can improve professional generative-AI competence, reinforcing the importance of curriculum design rather than assuming that digital or AI competence develops automatically (Moorhouse et al., 2024).

Despite this expanding evidence base, the literature remains fragmented. Studies often isolate one component—such as practicum, self-efficacy, mentoring, assessment, digital competence, or AI—without explaining how these components interact across a professional learning sequence. Moreover, evidence is heterogeneous in design, outcome definition, and measurement. Some studies examine perceived readiness or self-efficacy, whereas others assess classroom performance through observation or video. This heterogeneity makes it difficult to determine what is meant by a contribution to teacher performance and under what conditions a programme component is likely to matter.

The present review addresses this problem by moving beyond a component-by-component summary toward a mechanism-oriented synthesis. Rather than asking only which programme components are associated with teacher performance, the review asks how programme inputs are translated into professional capabilities through processes such as authentic practice, mentoring, feedback, reflection, assessment, and professional reasoning. This approach is consistent with systematic-review methodology that treats the value of a review as dependent on transparent searching, explicit eligibility criteria, rigorous synthesis, and a contribution that goes beyond descriptive accumulation of studies (Snyder, 2019).

The review makes three contributions. First, it consolidates fragmented evidence into six domains of contribution spanning practical, pedagogical, psychological, relational, technological, and identity-related dimensions. Second, it identifies a recurring mechanism: teacher-education components appear to contribute most meaningfully when they are connected through structured professional learning processes rather than delivered as isolated inputs. Third, it proposes an input–process–performance framework that clarifies the role of contextual conditions and distinguishes perceived capability from performance evidence.

Accordingly, the review addresses four questions: (RQ1) What components of pre-service teacher education are associated with teacher performance? (RQ2) What dimensions of performance or professional capability are reported in the literature? (RQ3) Through what processes do teacher-education components contribute to performance? and (RQ4) What contextual conditions and limitations shape the effectiveness of these contributions?

Conceptual framing

Pre-service teacher education as an integrated professional learning system

For this review, pre-service teacher education is defined broadly as the structured preparation undertaken before full entry into the teaching profession, including academic coursework, teaching practice, practicum or internship, mentoring, supervision, assessment, reflection, and technology-related preparation. This definition avoids treating practicum as an isolated activity and instead positions it within an integrated programme architecture. The literature on mentoring supports this view: high-quality mentoring is not simply interpersonal support but a professional learning practice that connects experience, professional knowledge, standards, feedback, and identity development (Ellis et al., 2020).

Defining teacher performance

Teacher performance is treated in this review as a multidimensional construct. It includes observable instructional capabilities—such as lesson planning, classroom management, instructional clarity, assessment, and adaptation—as well as closely related professional capabilities such as preparedness, self-efficacy, data literacy, digital competence, and professional identity. These dimensions should not be interpreted as interchangeable indicators of performance. Instead, the synthesis distinguishes proximal capabilities that support performance from evidence of performance itself. This distinction is important because several studies rely on self-report measures, whereas performance-oriented studies use classroom observation, teaching performance assessments, portfolios, or video-based assessment.

An input–process–performance logic

The review uses an input–process–performance logic as a synthesis device rather than as a tested causal model. Inputs include coursework, practicum, internship, mentoring, assessment tasks, and digital or AI preparation. Processes include modelling, teaching practice, feedback, reflection, peer interaction, data use, and professional reasoning. Performance-related outcomes include pedagogical competence, instructional skills, classroom management, assessment and data literacy, digital and AI competence, preparedness, self-efficacy, professional identity, and observed teaching performance. The framework is therefore intended to organise heterogeneous evidence and make the mechanisms visible; it does not imply that every input produces every outcome or that the review establishes causal effects.

METHOD

Review design and reporting

This study used a systematic literature review (SLR) to identify, select, and synthesise research on pre-service teacher education and teacher performance. Reporting was aligned with PRISMA 2020, which emphasises transparent reporting of eligibility criteria, information sources, search strategies, selection processes, data collection, synthesis, and study limitations (Page et al., 2021; Page et al., 2021b). The review also follows methodological guidance that systematic reviews should make their search and selection procedures sufficiently explicit for readers to assess trustworthiness and applicability (Snyder, 2019).

Important reporting qualification. The supplied manuscript records that the search was conducted through academic databases and reports the numerical screening pathway, but it does not preserve the exact database names, final search date, complete Boolean search strings, deduplication procedure, or a registered review protocol. These details cannot be reconstructed reliably from the manuscript alone and therefore should be inserted from the original search log before submission. They are essential for full PRISMA 2020 compliance and reproducibility.

Eligibility criteria

Studies were eligible when they (a) were published within the 2019–2026 publication window; (b) addressed pre-service teachers, student teachers, or prospective teachers; (c) examined one or more components of teacher preparation, including coursework, practicum, internship, mentoring, feedback, assessment, digital training, AI-related preparation, or performance assessment; and (d) reported outcomes related to teaching performance or closely related professional capabilities. Studies were excluded when they were outside education or psychology, did not address pre-service teacher preparation, did not provide a relevant performance or professional-capability outcome, were preprints, had insufficient topical relevance, or could not be accessed in full.

The eligibility criteria were deliberately broad enough to accommodate quantitative, qualitative, mixed-methods, and observational studies. Because the evidence base was heterogeneous, the review did not calculate a pooled effect size. Instead, it used thematic synthesis to identify recurring mechanisms and patterns across study designs.

Search and selection process

The source manuscript reports 385 records identified through academic database searching. After an initial relevance screening, 335 records were excluded, leaving 50 records for more focused assessment. A subsequent title, abstract, keyword, and thematic-fit assessment retained 31 highly relevant records. Six records were then excluded because full text was unavailable or the review could not be completed, resulting in 25 studies for the final synthesis. The eligible publication window was 2019–2026, while the included studies in the final set were published from 2019 through 2025.

The numerical sequence is internally consistent ($385 \rightarrow 50 \rightarrow 31 \rightarrow 25$), but the manuscript should distinguish clearly between records, reports, and studies in the PRISMA flow diagram and should document whether duplicate records were removed before or during screening. The final version should also report the exact reasons for full-text exclusion rather than using only 'unavailable' or 'unable to review' as aggregate reasons.

Data extraction and synthesis

For each included study, the review extracted author and year, context, research design, study focus, teacher-education component, performance or professional-capability dimension, and principal findings. The synthesis proceeded through repeated reading, descriptive coding of programme components and outcomes, grouping of related codes, and development of higher-order themes. The analytic logic was thematic rather than statistical: the objective was to identify recurrent relationships and mechanisms across heterogeneous studies.

The thematic synthesis was informed by established approaches to systematic synthesis of heterogeneous evidence (Thomas & Harden, 2008). Three analytic questions guided interpretation: what constitutes the educational input; what professional-learning process connects the input to an outcome; and what conditions appear to enable or constrain that process. This procedure was used to move from study-level findings to cross-study mechanisms rather than simply counting how often a topic appeared.

Methodological limitations of the evidence base

The supplied manuscript does not report a formal risk-of-bias or critical-appraisal tool for the 25 included studies. This is a substantive limitation for a Scopus-level systematic review because differences in study quality can affect the confidence that should be placed in a synthesis. The revised interpretation therefore avoids presenting frequency of citation or recurrence across studies as equivalent to strength of evidence. Before submission, the authors should conduct and report a study-quality appraisal appropriate to the included designs, or explicitly justify why appraisal was not undertaken.

RESULTS AND DISCUSSION

Characteristics of the evidence base

The final synthesis comprised 25 studies published between 2019 and 2025. The studies represented diverse contexts, including the Philippines, South Africa, Türkiye, Malaysia, the United States, Hong Kong, Tanzania, Myanmar, South Korea, China, Ukraine, Nigeria, Finland, Australia, Spain, Germany, and Indonesia. The evidence base included quantitative surveys and correlational studies, qualitative interviews and reflective studies, mixed-methods designs, classroom observations and video analysis, instrument validation, and review-based studies.

This heterogeneity is analytically important. The reviewed studies do not operationalise 'teacher performance' in a single way. Some examine observed teaching behaviours; others assess pedagogical competence, preparedness, self-efficacy, assessment literacy, digital competence, or professional identity. The synthesis therefore treats these constructs as related but non-equivalent dimensions within a broader professional-performance ecology.

Six domains of contribution

DOMAIN	WHAT THE EVIDENCE INDICATES	PRIMARY MECHANISM	KEY BOUNDARY CONDITION
1. PRACTICUM AND AUTHENTIC TEACHING PRACTICE	Connects coursework with lesson planning, classroom management, instructional delivery, adaptation, and reflection.	Situated application of knowledge; repeated enactment and reflection.	Authenticity, duration, supervision, and opportunities to teach real learners.
2. PEDAGOGICAL COMPETENCE AND INSTRUCTIONAL EFFICIENCY	Strengthens instructional planning, pedagogical knowledge, teaching strategies, and clarity of instruction.	Practice-based rehearsal, modelling, and feedback.	Alignment between programme expectations and actual classroom demands.
3. PREPAREDNESS, SELF-EFFICACY, AND PROFESSIONAL ENGAGEMENT	Builds perceived readiness, confidence, and willingness to engage with teaching tasks.	Mastery experiences, preparation, reflection, and supportive practice contexts.	Self-report measures may overestimate actual instructional performance.
4. MENTORING, FEEDBACK, ASSESSMENT, AND DATA LITERACY	Supports refinement of teaching, interpretation of evidence, and professional judgement.	Dialogic feedback, cognitive modelling, formative assessment, peer learning, and data use.	Mentor quality, feedback specificity, assessment design, and access to evidence.
5. DIGITAL AND AI COMPETENCE	Extends teacher preparation toward	Explicit curriculum, guided	Technical skill alone does not

	technology integration, AI literacy, ethical use, and digitally mediated pedagogy.	practice, pedagogical integration, and critical reflection.	guarantee pedagogical or ethical integration.
6. PROFESSIONAL IDENTITY AND SUBJECT-SPECIFIC COMPETENCE	Supports development of a teacher identity and domain-specific professional capability.	Participation in authentic professional activity, reflection, and disciplinary pedagogy.	Identity development is contextual and may be disrupted by practicum conditions or uncertainty.

From programme components to performance: the cross-study mechanism

Across the six domains, the evidence suggests that programme components are best understood as inputs into a professional learning system rather than as direct determinants of performance. Coursework supplies conceptual and pedagogical knowledge; practicum provides opportunities for enactment; mentoring and supervision make professional reasoning visible; feedback and assessment identify discrepancies between intended and enacted practice; reflection converts experience into learning; and data, digital tools, and AI resources expand the repertoire available for instructional decision-making. Performance-related outcomes emerge when these processes are coherently connected.

This synthesis also explains why the presence of a practicum or internship alone is an insufficient indicator of programme quality. Studies of long-term internships and distance practicums show that exposure without adequate authenticity, supervision, or interaction can produce limited or uneven gains (Greve et al., 2020; Koşar, 2021). Conversely, meta-analytic evidence indicates that coaching, mentoring, and supervision can support instructional skills, particularly when mentors make pedagogical reasoning explicit through cognitive modelling (Mok & Staub, 2021). The mechanism is therefore not 'more practice' in isolation, but 'better supported practice'.

Contextual conditions and evidence limitations

The synthesis identifies four recurring boundary conditions. First, clinical authenticity matters: prospective teachers need opportunities to work with real classroom complexity rather than only simulated or highly controlled tasks. Second, relational and supervisory quality matters: mentoring is most useful when it provides specific, actionable guidance and connects experience to professional standards. Third, assessment architecture matters: formative assessment, peer assessment, teaching-performance assessment, and data use can convert classroom evidence into professional learning. Fourth, technological and institutional conditions matter: digital and AI competencies require curriculum integration, infrastructure, ethical guidance, and opportunities for pedagogical application.

The evidence base also has important measurement limitations. A substantial proportion of studies rely on perceived competence, preparedness, self-efficacy, or attitudes. Such constructs are relevant proximal resources but should not be treated as direct substitutes

for observed teaching performance. Future reviews and primary studies should therefore triangulate self-report data with classroom observation, performance assessment, teaching portfolios, video analysis, mentor ratings, or student-learning evidence where appropriate.

DISCUSSION

RQ1: Which components contribute to performance?

The review indicates that practicum, coursework, mentoring, supervision, feedback, assessment, and technology-related preparation are not equally valuable in isolation. Their contribution depends on how they are sequenced and connected. The strongest synthesis is therefore organisational rather than component-specific: high-value teacher preparation creates repeated cycles in which prospective teachers encounter a professional task, enact a response, receive evidence-rich feedback, reflect on the discrepancy between intention and performance, and re-enact the task with improved reasoning.

This interpretation is consistent with evidence that high-quality mentors require more than willingness to support a student teacher; mentoring itself involves professional knowledge, standards, identity development, and structured interaction (Ellis et al., 2020). It is also consistent with the meta-analysis by Mok and Staub (2021), which found a small overall effect of coaching, mentoring, and supervision on instructional skills and a stronger effect when cognitive modelling was used. The implication is that programmes should evaluate the instructional quality of mentoring rather than merely count whether a mentor has been assigned.

RQ2: What dimensions of performance develop?

Pedagogical competence is the most central dimension across the reviewed evidence, but the synthesis suggests that it should be conceptualised as an integrated capability rather than a single skill. Planning, classroom management, instructional clarity, assessment, data use, and adaptation are interdependent. Preparedness and self-efficacy support willingness and confidence to enact these practices, but they remain psychologically proximal constructs. A teacher may feel highly efficacious without consistently demonstrating high-quality instruction. Consequently, teacher-education evaluation should separate perceived capability from performance evidence.

The review also expands the performance conversation beyond conventional instructional competence. Assessment and data literacy position prospective teachers as evidence users; digital and AI competence position them as technology-informed pedagogical decision makers; and professional identity positions performance within a developing sense of what it means to be a teacher. Recent work on digital competence shows that teacher preparation must address curriculum integration, content creation, social and ethical dimensions, and advanced digital practices rather than technical tool use alone (Tomczyk, 2024).

RQ3: Through what mechanisms does preparation contribute?

Three mechanisms recur across the evidence. The first is enactment: prospective teachers transform abstract knowledge into action through authentic classroom practice. The second is guided sense-making: mentors, supervisors, peers, and assessment processes help prospective teachers interpret what happened and why. The third is iterative

professional reasoning: reflection, data use, digital tools, and AI resources support the redesign of subsequent instructional decisions. The contribution of teacher education is therefore better represented as a developmental cycle than as a linear input-to-output relationship.

The evidence on AI reinforces this interpretation. Recent studies indicate that prospective teachers' readiness for AI-integrated education involves perceptions, capabilities, AI literacy, and changes in professional identity, rather than simple tool adoption (Guan et al., 2025). Intervention evidence in initial language teacher education further suggests that explicit training can develop professional generative-AI competence (Moorhouse et al., 2024). Thus, digital and AI preparation should be embedded within pedagogical reasoning, assessment, ethics, and professional identity rather than treated as an additional technical module.

RQ4: What conditions constrain effectiveness?

The synthesis indicates that effectiveness is contingent on the ecology surrounding the prospective teacher. Weak mentoring, limited access to authentic classrooms, unclear performance standards, inadequate feedback, insufficient technological support, and heavy reliance on self-report can all weaken the relationship between programme participation and performance. Distance practicum evidence is particularly instructive because it demonstrates that replacing physical classroom exposure with online activity can change the kinds of professional learning available (Koşar, 2021). The appropriate response is not to reject digital practicum, but to design it deliberately around observation, interaction, modelling, feedback, and evidence of teaching.

The findings also support a more cautious interpretation of self-efficacy. Self-efficacy is valuable because it influences willingness to undertake challenging tasks and persistence, but it is not synonymous with instructional quality. This distinction should be reflected in programme evaluation: a strong evaluation architecture would combine self-report measures with direct performance evidence. Such triangulation would also reduce the risk of overestimating programme effects from confidence gains alone.

Theoretical and conceptual contribution

The central contribution of this review is a shift from a component inventory to a mechanism-oriented account of teacher preparation. Existing studies frequently establish that practicum, mentoring, self-efficacy, assessment, or digital competence matter. The present synthesis asks what connects them. The answer emerging across the evidence is an integrated professional-learning process in which authentic practice is converted into professional capability through modelling, feedback, reflection, assessment, and contextualised reasoning.

The proposed input–process–performance framework should therefore be interpreted as a conceptual synthesis rather than a causal theory. Its value lies in specifying where future empirical work can test relationships: whether the quality of mentoring moderates the relationship between practicum and observed teaching performance; whether feedback and reflection mediate the development of pedagogical competence; whether self-efficacy predicts persistence but not necessarily performance; and whether digital or AI competence contributes to performance only when pedagogically integrated.

Implications for teacher-education programme design

Four design implications follow. First, practicum should be treated as a clinical learning sequence with explicit goals, modelling, observation, feedback, reflection, and opportunities for re-teaching. Second, mentoring should be quality-assured through mentor preparation, structured feedback protocols, and alignment with professional standards. Third, assessment should triangulate perceived capability with observed or performance-based evidence. Fourth, digital and AI competence should be integrated into subject pedagogy, assessment, ethics, and professional reasoning rather than delivered as stand-alone technology training.

At programme level, these implications favour coherence over accumulation. Adding more courses, more practicum hours, or more technology sessions will not necessarily improve teacher performance if the elements remain disconnected. Programme evaluation should therefore examine the quality of the transitions between coursework, clinical experience, feedback, reflection, and performance assessment.

Limitations and directions for future research

This review has four important limitations. First, the final evidence base contains only 25 studies and spans diverse contexts, designs, and definitions of performance; therefore, the synthesis should not be interpreted as a pooled estimate of programme effectiveness. Second, the supplied manuscript does not preserve the exact database names, search date, complete search strings, or deduplication procedure, limiting reproducibility until those details are recovered from the original search log. Third, the review does not report a formal critical appraisal or risk-of-bias assessment of the included studies. Fourth, several included records are proceedings or review-type publications rather than conventional empirical journal articles. Before submission to a selective Scopus journal, the authors should verify the eligibility of every included record against the protocol and, if the protocol requires journal articles, re-run the screening.

Future research should use longitudinal and multi-source designs to examine whether changes in preparedness and self-efficacy translate into observed improvements in teaching performance. Experimental and quasi-experimental studies could test specific mentoring, feedback, or AI-literacy interventions. Comparative research should examine how programme structures operate across countries and teacher-education systems. Future systematic reviews should also consider formal quality appraisal and, where outcome definitions permit, meta-analytic synthesis.

CONCLUSION

Pre-service teacher education contributes to teacher performance through a network of interdependent professional-learning processes rather than through isolated programme components. The review identifies six domains—authentic practicum, pedagogical competence, preparedness and self-efficacy, mentoring and evidence use, digital and AI competence, and professional identity—that together describe the contemporary architecture of teacher preparation. The most important synthesis is that programme inputs become professionally consequential when they are connected through authentic practice, modelling, feedback, reflection, assessment, and professional reasoning.

The resulting input–process–performance framework provides a parsimonious way to integrate fragmented evidence while preserving the distinction between proximal capabilities and actual performance. For teacher-education providers, the implication is clear: programme quality should be judged not by the presence of individual components

but by the quality of the professional learning system that connects them. For researchers, the framework identifies testable mechanisms and boundary conditions that can support stronger longitudinal, comparative, and performance-based studies.

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