DIDACTIC CONDITIONS FOR DEVELOPING PROSPECTIVE TEACHERS' PEDAGOGICAL INTELLIGENCE

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ABSTRACT

This article explores how teacher-education programs can strengthen prospective teachers' pedagogical intelligence—the ability to think reflectively, manage emotions, and make adaptive instructional decisions in real classrooms—by clarifying which didactic conditions most consistently support its development. A systematic literature review was conducted using PRISMA-style screening and thematic synthesis. Peer-reviewed studies published between 1980 and 2025 were searched in Scopus, Web of Science, ERIC (via ProQuest), PsycINFO, and Google Scholar, and 20 studies met the inclusion criteria. The synthesis identified five recurring conditions. First, social-emotional competence training supports well-being and classroom efficacy. Second, practice-based pedagogy helps candidates connect theory to core teaching practices and pedagogical reasoning. Third, structured feedback and mentoring strengthen self-regulated professional growth. Fourth, video-based learning develops professional vision by improving noticing, interpretation, and evidence-based discussion of classroom events. Finally, emerging work on AI highlights the need for ethical, human-centered judgment in technology-supported teaching. Taken together, the findings suggest that pedagogical intelligence grows most effectively when programs align coursework, practicum experiences, and guided reflection into a coherent developmental pathway. Future research should test integrated models longitudinally across diverse contexts and refine shared measures of pedagogical intelligence.

Key words: Pedagogical intelligence; pre-service teachers; didactic conditions; practice-based teacher education; mentoring and feedback; professional vision.

INTRODUCTION

In today's rapidly shifting teacher-education landscape, one persistent challenge is helping prospective (pre-service) teachers develop what Rubin (1989) termed pedagogical intelligence. In practical terms, this refers to a teacher's ability to think reflectively, make sound judgments in real time, and apply educational principles in ways that actually work in the classroom. It is not limited to knowing subject matter. Rather, it combines cognitive understanding with emotional awareness and practical skill—qualities that allow teachers to respond flexibly to the unpredictable demands of learning environments.

The central issue addressed in this article is how teacher-education programs can intentionally cultivate this capacity by designing the right didactic conditions—that is, purposeful teaching strategies, learning settings, and instructional routines that support growth over time. This challenge has become even more pressing as programs adapt to major educational shifts, including increased reliance on technology and the expanding role of social-emotional learning (SEL). Many pre-service teachers still find it difficult to connect what they

learn in coursework with what they must do in real classrooms, which can leave them underprepared for professional practice (Grossman et al., 2009; Depaepe & König, 2017a).

Research on teacher development has long emphasized that professional growth is not linear. Clarke and Hollingsworth's (2002a) interconnected model, for example, highlights the continuous interaction between external inputs (such as training experiences), teachers' beliefs and knowledge, and their classroom actions. Building on this foundation, practice-based approaches in teacher education have gained influence, focusing on structured opportunities to rehearse and analyze core teaching practices—such as eliciting student thinking, responding to misconceptions, and giving feedback that moves learning forward (McDonald et al., 2013 a ; Gotwalt, 2022; Matsumoto-Royo & Ramírez-Montoya, 2021). In this context, feedback is not a minor instructional detail; it is a key mechanism for developing self-regulated learning and professional judgment (Hattie & Timperley, 2007). Similarly, mentoring during practicum experiences can strengthen what some scholars call teachers' "learning to notice"—the skill of detecting meaningful classroom patterns and responding thoughtfully to them (Goldshaft, 2024; Nesje & Lejonberg, 2021a).

At the same time, an expanding body of research connects pedagogical intelligence with teachers' social and emotional competencies. These competencies have been linked to both teacher well-being and classroom effectiveness, suggesting that professional readiness depends not only on instructional technique but also on emotional regulation, relationship skills, and reflective resilience (Braun & Hooper, 2024; Choquette et al., 2024; Jennings & Greenberg, 2008; Schelhorn et al., 2023 a ; Savina et al., 2025). For instance, interventions aimed at developing emotional competence can lead to stronger instructional practice, aligning with the prosocial classroom perspective that teachers' SEL capacities shape student outcomes (Jennings & Greenberg, 2008).

Another promising direction is the use of video-based learning and assessment, which has been shown to support the development of professional vision—the ability to interpret classroom events, focus on relevant evidence, and choose effective responses. Through modeling, targeted prompts, and guided analysis tasks, video-supported training can help pre-service teachers build the analytic and decision-making skills that pedagogical intelligence requires (Seidel & Stürmer, 2014; Kaiser et al., 2015 a ; Janeczko et al., 2025; Weng et al., 2023).

Finally, the rise of artificial intelligence (AI) in education creates new demands and new possibilities for teacher preparation. Díaz and Nussbaum (2024a) argue that AI-enhanced environments require educators to strengthen human-centered pedagogical judgment—ensuring that technology supports learning without replacing professional responsibility. Yet, despite progress across these research strands, the field still lacks a well-integrated synthesis of didactic conditions that deliberately combine cognitive, emotional, and technological dimensions in ways that fit the needs of pre-service teachers.

Against this background, the present article examines the didactic conditions most likely to strengthen pedagogical intelligence in teacher-education programs and uses prior research to propose an actionable framework for designing coursework, practicum experiences, and learning supports.

METHODOLOGY

This study used a systematic literature review to identify and synthesize didactic conditions that support the development of pedagogical intelligence in prospective (pre-service) teachers. The review was conducted in line with widely used reporting practices for

systematic reviews in education, drawing on PRISMA-style procedures adapted for thematic synthesis.

Search strategy. A comprehensive search was performed to capture both foundational and recent work, with particular attention to emerging discussions on AI-supported teacher education and emotional competence. Searches covered the period January 2024 to November 2025 for database retrieval, while eligible publications ranged from 1980 to 2025 (with an analytic emphasis on post-2000 studies to reflect contemporary teacher-education practices).

Search queries combined controlled vocabulary (where available) and free-text terms using Boolean operators. The core search logic was:

- ("pedagogical intelligence" OR "teacher intelligence" OR "pedagogical reasoning") AND
- ("pre-service teachers" OR "prospective teachers" OR "teacher education" OR "teacher training") AND
- ("didactic conditions" OR "teaching methods" OR "instructional strategies" OR "professional development" OR "mentoring" OR "video-based learning" OR "feedback" OR "social-emotional learning" OR "AI in education")

Truncation (e.g., teacher), spelling variants, and close synonyms were used to improve recall. No language limits were applied at the search stage; however, only English-language publications were retained for full-text analysis due to resource constraints.

Databases. The following databases were searched because of their strong coverage of education, psychology, and interdisciplinary teacher-education research: Scopus, Web of Science, ERIC (via ProQuest), PsycINFO, and Google Scholar.

Eligibility criteria

Studies were included if they:

Were peer-reviewed journal articles or book chapters published between 1980 and 2025 (with an emphasis on post-2000 literature);

Reported empirical, theoretical, or review evidence relevant to didactic elements in pre-service teacher preparation (e.g., mentoring, video analysis, feedback, emotional competence training);

Addressed pedagogical intelligence explicitly or examined closely related constructs such as professional vision, pedagogical knowledge, pedagogical reasoning, or emotional competence; and Were clearly relevant to prospective teachers' development of adaptive reasoning, instructional decision-making, or classroom responsiveness.

Studies were excluded if they:

Were not peer reviewed (e.g., theses, conference proceedings, other gray literature);

Focused only on in-service teachers or non-education contexts;

Lacked sufficient methodological clarity or offered limited contribution to understanding didactic conditions; or Were duplicates across databases.

Study selection. The search returned approximately 450 records. All records were imported into Zotero, and duplicates were removed (n = 120), leaving 330 unique items. Two reviewers independently screened titles and abstracts for relevance, resulting in 85 articles for full-text assessment. Inter-rater agreement was high (κ = 0.85), and disagreements were resolved through discussion. Following full-text review, 65 articles were excluded (most commonly due to insufficient focus on pre-service teachers or limited attention to didactic

conditions), yielding 20 studies for final synthesis. The screening procedure is summarized in a PRISMA-style flow (available upon request).

Data extraction and synthesis. Data were extracted using a standardized form capturing: study aims, design and sample, the didactic conditions described, reported outcomes linked to pedagogical intelligence (or adjacent constructs), and implications for teacher-education practice.

A thematic analysis was used to synthesize findings, following Braun and Clarke's (2006) approach: familiarization, initial coding, theme development, theme review, theme definition, and reporting. Themes were generated inductively and included: social-emotional competence, video-based learning/professional vision, mentoring and feedback, practice-based pedagogies, and AI-assisted didactic conditions. A descriptive synthesis integrated qualitative and quantitative insights, with interpretive links to established professional-growth frameworks (e.g., Clarke & Hollingsworth, 2002 a). A meta-analysis was not conducted due to heterogeneity in study designs, measures, and outcomes.

RESULTS

The review synthesized evidence from 20 studies and identified a consistent set of didactic conditions associated with the development of pedagogical intelligence in prospective (pre-service) teachers. Across the included literature, pedagogical intelligence—understood as a multidimensional capacity combining reflective thinking, adaptive instructional judgment, and emotional insight (Rubin, 1989)—was most commonly supported through interventions designed to connect coursework with authentic teaching demands.

Five overarching themes emerged from the thematic synthesis: (1) social-emotional competencies, (2) practice-based pedagogies, (3) feedback and mentoring, (4) video-based learning for professional vision, and (5) emerging AI-related integrations. Together, these themes capture structured strategies and learning environments that help pre-service teachers translate theoretical knowledge into responsive classroom practice, strengthening decision-making under real-world complexity. Table 1 summarizes the themes, the number of studies contributing to each category, and representative references.

Summary of didactic themes for developing pedagogical intelligence, with study counts and key references.

Table 1

Theme	Number of Studies	Key References
Social-Emotional Competencies	5	Braun & Hooper (2024); Choquette et al. (2024); Jennings & Greenberg (2008); Schelhorn et al. (2023a); Savina et al. (2025)
Practice-Based Pedagogies	6	Clarke & Hollingsworth (2002a); Depaepe & König (2017a); Gotwalt (2022); Grossman et al. (2009); McDonald et al. (2013a); Matsumoto-Royo & Ramírez-Montoya (2021)
Feedback and Mentoring	3	Hattie & Timperley (2007); Goldshaft (2024); Nesje & Lejonberg (2021a)
Video-Based Learning for Professional Vision	4	Janeczko et al. (2025); Kaiser et al. (2015a); Seidel & Stürmer (2014); Weng et al. (2023)

AI Integrations in Pedagogy	2	Díaz & Nussbaum (2024a)

Social-Emotional Competencies. A consistent finding across the reviewed studies was that social-emotional competencies function as a foundational condition for developing pedagogical intelligence. Research indicates that emotional competence shapes pre-service teachers' well-being, relationship quality, and instructional effectiveness—capacities that directly support reflective and adaptive teaching. For instance, Braun and Hooper (2024) reported that stronger SEL competencies were associated with better occupational health, while Choquette et al. (2024) linked relationship-oriented SEL skills to more robust beliefs and readiness for SEL implementation. Intervention studies also point to measurable developmental gains. Schelhorn et al. (2023a) found improvements in domains such as empathy and self-regulation following emotional competence training, reinforcing Jennings and Greenberg's (2008) prosocial classroom model in which teachers' social-emotional capacities influence classroom climate and student outcomes. Extending this line of work, Savina et al. (2025) proposed a conceptual framework positioning emotional regulation as a core mechanism enabling teachers to make adaptive decisions under classroom pressure.

Practice-Based Pedagogies. The synthesis also showed strong support for practice-based pedagogies as a key didactic condition for building pedagogical intelligence, particularly through structured opportunities to enact, analyze, and refine instructional decisions. Gotwalt (2022) demonstrated that pedagogies grounded in realistic teaching scenarios strengthened pre-service teachers' capacity to apply core practices and justify decisions using evidence from instruction. This aligns with arguments by Grossman et al. (2009) and McDonald et al. (2013a) that teacher education should emphasize decomposable, teachable "core practices," such as eliciting student thinking and responding to learner ideas. Depaepe and König (2017a) further clarified that experiential learning strengthens instructional practice by helping candidates connect general pedagogical knowledge with classroom enactment and confidence. These findings are consistent with Clarke and Hollingsworth's (2002a) professional growth model, which conceptualizes development as an interaction among external inputs, internal beliefs/knowledge, and practice. Supporting evidence also appears in Matsumoto-Royo and Ramírez-Montoya's (2021) review, which highlights the importance of assessment processes that make practice-based learning visible and improvable.

Feedback and Mentoring. Across the included studies, feedback and mentoring emerged as powerful mechanisms through which pedagogical intelligence becomes more explicit, reflective, and self-regulated. Hattie and Timperley (2007) emphasize that feedback is most effective when it is timely, specific, and linked to clear goals—conditions that support teachers' capacity to diagnose learning needs and adjust instruction accordingly. Empirical mentoring studies strengthen this point. Goldshaft (2024) showed that supportive mentoring structures and collaborative observational tools during practicum can enhance pre-service teachers' ability to "learn to notice" meaningful classroom dynamics. Likewise, Nesje and Lejonberg (2021 a) identified structured school-based mentoring tools as essential for developing candidates' professional judgment, especially when mentoring moves beyond general encouragement toward targeted analysis of instructional choices.

Video-Based Learning for Professional Vision. Another prominent theme was the role of video-based learning in developing professional vision, which the reviewed studies treat as a critical component of pedagogical intelligence. Seidel and Stürmer (2014) conceptualized

professional vision as an ability to selectively attend to relevant classroom events and interpret them using pedagogical principles, showing that structured video analysis can strengthen these skills in pre-service teachers. Weng et al. (2023) provide further support through a meta-analytic synthesis, reporting consistent gains in analytic and interpretive competencies associated with video-based learning. Janeczko et al. (2025) extend this evidence by demonstrating that modeling videos combined with prompts in virtual environments can promote multiperspective interpretation, which is particularly important for navigating complex instructional situations. At the same time, Kaiser et al. (2015 a) caution that video-based assessment requires careful design to avoid measurement and validity limitations, suggesting that scaffolding and clear analytic frameworks are crucial didactic conditions for effectiveness.

AI Integrations in Pedagogy. Although fewer studies explicitly addressed AI, the review suggests that AI integration is an emerging didactic condition with growing relevance. Díaz and Nussbaum (2024 a) argue that teacher education must cultivate "pedagogical intelligence" specifically for AI-supported contexts, including the capacity to use tools ethically and maintain human-centered judgment. From this perspective, AI-related didactic conditions are not only technical (learning to use platforms) but also pedagogical (deciding when and why to use them) and ethical (protecting equity, agency, and professional responsibility).

Synthesis of outcomes. Taken together, the findings suggest that pedagogical intelligence develops most strongly under multifaceted didactic conditions that combine (a) social-emotional competence building, (b) structured practice-based learning, (c) high-quality feedback and mentoring, and (d) analytic tools such as video-based reflection—while AI-related conditions are increasingly relevant as teacher education adapts to digitally mediated learning. These themes have direct implications for teacher-education program design, especially in aligning coursework, practicum experiences, and reflective scaffolds into a coherent developmental pathway.

DISCUSSION

The findings of this systematic literature review highlight the importance of purposefully designed didactic conditions for developing pedagogical intelligence in prospective teachers—an integrated capacity that combines reflective judgment, emotional sensitivity, and adaptive instructional action (Rubin, 1989). Across the 20 included studies, five interrelated themes—social-emotional competencies, practice-based pedagogies, feedback and mentoring, video-based learning for professional vision, and AI-related conditions—consistently pointed to structured approaches that help candidates connect theoretical preparation with the realities of classroom decision-making. In doing so, these conditions address enduring weaknesses in teacher preparation and strengthen pre-service teachers' ability to build inclusive, responsive learning environments.

A particularly strong signal in the evidence base concerns social-emotional competencies. Multiple studies suggest that SEL-related capabilities predict occupational well-being, relational effectiveness, and classroom efficacy (Braun & Hooper, 2024; Choquette et al., 2024). These individual benefits matter because they connect to broader educational outcomes, including classroom climate, student engagement, and student well-being (Jennings & Greenberg, 2008; Savina et al., 2025). From a program and policy perspective, the implication is clear: teacher education should treat SEL not as an optional add-on but as a core

component of professional preparation, with potential downstream effects on burnout prevention and retention.

The synthesis also aligns with and extends established models of teacher development. Clarke and Hollingsworth's (2002a) interconnected model is reflected in the reviewed interventions, especially those grounded in practice-based pedagogy that supports the shift from knowledge "about" teaching to the ability to enact teaching in context (Gotwalt, 2022; Grossman et al., 2009; McDonald et al., 2013a; Matsumoto-Royo & Ramírez-Montoya, 2021). While earlier work such as Depaepe and König (2017 a) focused on separating pedagogical knowledge from self-efficacy, the present review underscores how contemporary teacher education increasingly targets the processes of noticing, interpreting, and deciding—often through structured practice and guided reflection.

In this regard, video-based learning appears especially influential. Studies included in the review show that video-supported analysis can strengthen professional vision and improve pre-service teachers' interpretation of classroom events (Seidel & Stürmer, 2014; Weng et al., 2023). More recent work suggests that prompts and modeling may further support multiperspective analysis in virtual settings (Janeczko et al., 2025), while methodological discussions also remind researchers and program designers that video-based assessment requires careful attention to design and validity (Kaiser et al., 2015a). Similarly, feedback—long recognized as essential for learning and performance (Hattie & Timperley, 2007)—shows continued evolution in teacher education when embedded in mentoring structures that emphasize collaborative observation and evidence-based discussion (Goldshaft, 2024; Nesje & Lejonberg, 2021 a).

Finally, although represented by fewer studies, AI-related didactic conditions emerged as a forward-looking theme. Díaz and Nussbaum (2024 a) argue that teacher education must develop pedagogical intelligence that remains human-centered in AI-supported environments, where professional judgment includes ethical and instructional decisions about when and how technology should be used. This theme signals an emerging gap: existing frameworks have not yet fully integrated the pedagogical, ethical, and relational demands of AI-mediated teaching.

Overall, the findings suggest a shift in emphasis from static knowledge acquisition toward dynamic, multi-component professional development. At the same time, the evidence base remains limited by heterogeneity in designs, constructs, and outcome measures, which prevents meta-analytic synthesis. Future research should test integrated models empirically—especially in diverse cultural and institutional contexts—to examine generalizability and clarify which combinations of didactic conditions produce the strongest and most sustainable gains in pedagogical intelligence.

CONCLUSION

This systematic review brings together evidence on how teacher-education programs can deliberately strengthen pedagogical intelligence in prospective teachers—understood as the combined ability to reflect well, regulate emotions, and make flexible instructional decisions in real classrooms (Rubin, 1989). Rather than treating key areas of teacher preparation as separate tracks, the synthesis shows that pedagogical intelligence is most likely to grow under a set of connected didactic conditions. Across the selected studies, five conditions appeared repeatedly: developing social-emotional competencies, using practice-based pedagogy, ensuring meaningful feedback and mentoring, supporting professional vision through video-based learning, and—more recently—preparing candidates for AI-supported teaching.

The main contribution of this article is the way it integrates these strands into a single, usable picture for program design. The reviewed literature suggests that strong teacher preparation is not achieved by adding one more workshop or one more digital tool. It is achieved when programs align coursework and practicum experiences so that candidates repeatedly practice, analyze, and improve core teaching decisions, while also building the emotional skills needed to sustain effective relationships and cope with pressure. Video-based reflection and structured mentoring appear especially valuable because they make classroom complexity visible and discussable. At the same time, the emerging work on AI signals a new requirement: future teachers need support not only in using technology, but also in maintaining ethical, human-centered judgment in technology-rich classrooms.

Despite these insights, the evidence base remains uneven. Studies vary widely in how they define pedagogical intelligence, how they measure outcomes, and what kinds of interventions they test, which makes it difficult to compare results directly or to compute a single overall effect. This limitation points to a clear next step for the field.

Future work. Future research should (1) test integrated models that combine SEL, practice-based learning, mentoring/feedback, and video analysis within the same program rather than as isolated initiatives; (2) use longitudinal designs to see whether gains persist into real teaching practice; (3) examine these conditions in diverse cultural and institutional contexts to strengthen generalizability; and (4) expand empirical work on AI-related didactic conditions, especially how pre-service teachers develop ethical decision-making and human-centered pedagogy when AI tools are part of everyday instruction.

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