THE PRIMARY EDUCATION JOURNAL
https://primedu.org

REVIEW ARTICLE

OPEN ACCESS

From Prompts to Pedagogy: A Pedagogical Prompting Framework for Generative AI Integration in Primary Education

Kawiwat Wichitchokthananon [a]

[a] Department of Elementary Education, Faculty of Education and Human Development, Sisaket Rajabhat University, Thailand

ABSTRACT

Generative artificial intelligence is increasingly used by teachers to produce lesson plans, learning materials, questions, images, rubrics, and feedback. However, current discussions of prompt engineering in education often remain technically oriented, focusing on how teachers can obtain better AI outputs rather than how prompting can become a pedagogical practice that supports meaningful learning. This conceptual article proposes the Prompt-to-Pedagogy Framework, a pedagogically grounded model for transforming AI prompting from a technical input skill into an instructional design practice for integrative learning in primary education. Drawing on sociocultural theory, scaffolding, integrative learning, AI literacy, and teacher professional judgment, the article introduces pedagogical prompting as the intentional use of generative AI prompts to scaffold learners' thinking, bridge knowledge across disciplines, facilitate co-creative classroom dialogue, and support teacher-led formative feedback. The framework consists of three phases: pre-class co-design, in-class collaborative prompting, and post-class feedback and reflection. Across these phases, AI is positioned as a limited support system rather than an autonomous teacher, evaluator, or curriculum authority. The article contributes to research on digital technology and education by shifting the focus from AI productivity and automation toward pedagogy, learner agency, ethical safeguards, and teacher professional judgment. Implications are discussed for teacher education, including AI-Pedagogy Labs, prompt portfolios, ethical micro-teaching, and reflective design practices for pre-service primary teachers.

ARTICLE HISTORY Received 19 May 2026; Accepted 29 May 2026

KEYWORDS Pedagogical prompting; Generative AI; Primary education; Integrative learning; Teacher education; AI literacy; Teacher judgment

Introduction

From technical prompting to pedagogical transformation

Generative artificial intelligence has become one of the most consequential developments in contemporary education. Large language models and multimodal generative systems can now assist teachers in producing lesson plans, classroom activities, assessment rubrics, learning materials, images, stories, and feedback with unprecedented speed. International policy discussions increasingly recognize that AI is reshaping the teacher-student relationship into a more complex teacher-AI-student dynamic, requiring renewed attention to teachers' roles, professional judgment, and ethical responsibilities (Miao & Cukurova, 2024; UNESCO, 2023). As generative AI becomes more accessible, teacher education programs and professional development initiatives have increasingly introduced prompt engineering as an emerging skill for educators.

Prompt engineering has been discussed as a practical strategy for improving AI outputs in educational contexts, including the generation of instructional materials, differentiated tasks, feedback, and classroom resources (Park & Choo, 2025; Qian, 2025). However, this growing emphasis on prompt engineering has also created a conceptual problem. Prompting is often framed as a technical skill concerned with input optimization, output quality, and

CONTACT Kawiwat Wichitchokthananon kw956.2m@gmail.com Department of Elementary Education, Faculty of Education and Human Development, Sisaket Rajabhat University, Thailand

productivity, rather than as a pedagogical practice grounded in curriculum, child development, inquiry, assessment, and ethical judgment. Such a view may help teachers use AI tools more efficiently, but it remains insufficient for explaining how AI can support meaningful learning.

Teaching is not merely the production of instructional materials. It is a complex professional practice involving curricular interpretation, developmental sensitivity, classroom interaction, ethical decision-making, and the orchestration of meaningful learning experiences (Biesta, 2015; Shulman, 1986). When prompting is reduced to a technique for generating faster outputs, its pedagogical potential remains underdeveloped. The central argument of this article is that the educational value of AI prompting lies not in the prompt itself, but in the teacher's capacity to transform prompting into a pedagogical act.

This issue is particularly important in primary education. Primary classrooms require learning experiences that are holistic, concrete, developmentally appropriate, culturally meaningful, and connected to children's lived experiences. Learning at this level is rarely confined to isolated disciplinary boundaries. A meaningful lesson on environmental sustainability, for example, may integrate science, language, mathematics, art, social studies, and moral reasoning. Therefore, the use of AI in primary education should not be evaluated only by whether it helps teachers generate worksheets or lesson plans more efficiently. It must be examined in terms of whether it helps teachers design richer opportunities for inquiry, imagination, collaboration, reflection, and cross-disciplinary understanding.

The OECD Digital Education Outlook 2026 similarly cautions that generative AI can support learning when guided by clear pedagogical purposes but may weaken learning if used as a shortcut rather than as a scaffold for thinking (OECD, 2026). This distinction is central to the present article: generative AI should not substitute for children's cognitive effort or teachers' professional reasoning but should be used selectively and purposefully to enrich human learning.

The pedagogical gap in current AI use

Although the literature on generative AI in education has expanded rapidly, much of the discussion still emphasizes productivity, efficiency, and tool use. Teachers are often advised to use AI to generate lesson plans, adapt texts, create quizzes, summarize content, or produce classroom materials. These uses are valuable, but they do not necessarily transform teaching practice. A teacher may use AI to generate a lesson plan quickly while still relying on conventional, teacher-centred, fragmented, or developmentally inappropriate instruction. In such cases, AI enhances speed but not necessarily pedagogical quality.

This reveals a critical gap between technical prompting and pedagogical prompting. Technical prompting focuses on the structure of the input and the quality of the AI-generated output. Pedagogical prompting, by contrast, focuses on the learning purposes, learner characteristics, classroom interactions, disciplinary connections, ethical boundaries, and teacher decisions that shape how AI-generated outputs are interpreted and used. A technically well-written prompt may still produce pedagogically weak learning if it is not grounded in curriculum, child development, integrative learning, and classroom realities.

For pre-service primary teachers, this gap is especially consequential. Student teachers may learn how to ask AI for a lesson plan, but they may not yet know how to evaluate whether the plan aligns with curriculum standards, supports inquiry, connects disciplines meaningfully, respects children's developmental levels, or reflects local culture. Without pedagogical grounding, prompt engineering may unintentionally encourage superficial lesson design, overreliance on AI-generated content, and a weakening of teacher professional judgment. UNESCO's guidance on generative AI emphasizes the need for human-centred approaches, data privacy protection, age-appropriate use, institutional readiness, and responsible regulation in educational contexts (UNESCO, 2023). These concerns are especially important in primary education, where learners are children and where teachers must protect students' data, developmental needs, cultural identity, and learning agency.

The challenge, therefore, is not simply to teach future teachers how to use AI. The deeper challenge is to help them understand how AI prompting can be integrated into pedagogical reasoning. Teacher education needs a framework that enables pre-service teachers to move from asking AI for outputs to using prompts as tools for designing, facilitating, and reflecting on learning.

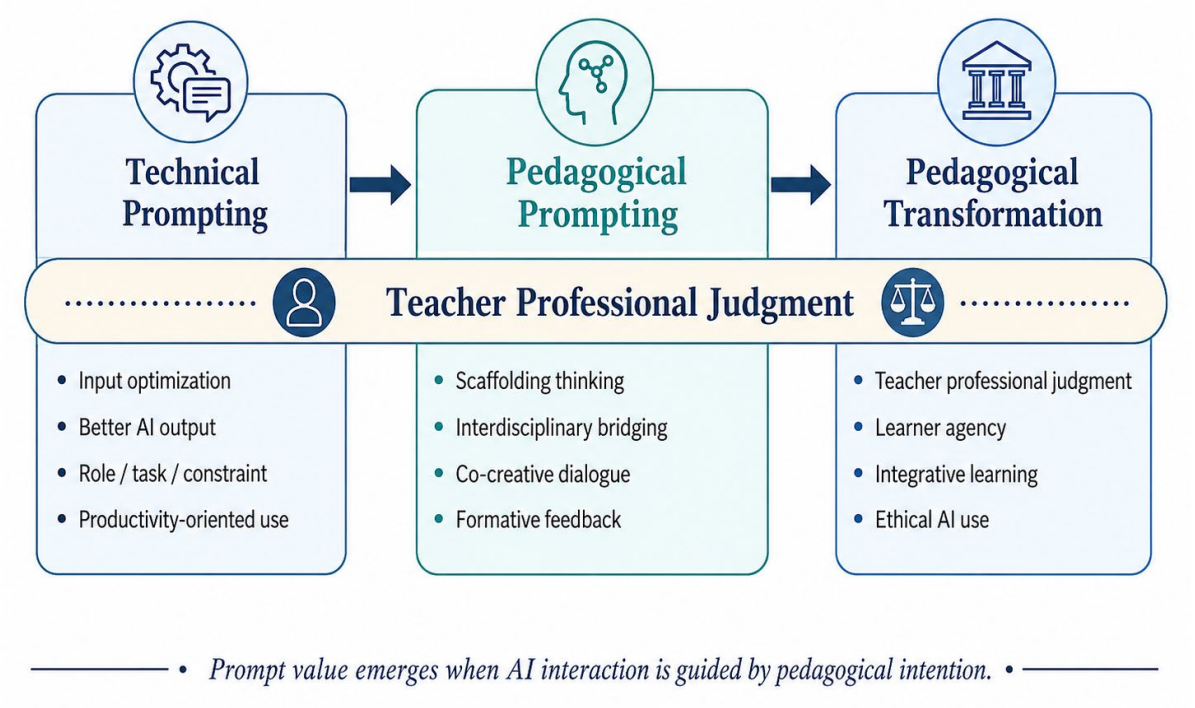

Figure 1. From Technical Prompting to Pedagogical Prompting. The figure illustrates the conceptual shift from technical prompting, which focuses primarily on input structure and AI-generated output, toward pedagogical prompting, which positions prompts as tools for scaffolding learners' thinking, bridging disciplines, supporting co-creative dialogue, and informing teacher-led formative feedback.

Purpose and contribution of the article

This article addresses the above gap by proposing the Prompt-to-Pedagogy Framework, a conceptual model for AI-powered integrative learning in primary education. The framework is designed to explain how prompting can be transformed from a technical interaction with generative AI into a structured pedagogical practice.

The article has three objectives. First, it reconceptualizes prompting as pedagogical prompting, a deliberate teaching practice through which teachers use AI prompts to scaffold thinking, bridge disciplines, support co-creative dialogue, and inform formative feedback. Second, it proposes the Prompt-to-Pedagogy Framework as a three-phase instructional design cycle consisting of pre-class co-design, in-class collaborative prompting, and post-class feedback and reflection. Third, it discusses implications for teacher education, particularly the need for AI-Pedagogy Labs, prompt portfolios, ethical micro-teaching, and reflective preparation for pre-service primary teachers.

The contribution of this article is both conceptual and practical. Conceptually, it extends the discussion of generative AI beyond technical prompt engineering by positioning prompting as a pedagogically mediated practice. Practically, it provides a framework that teacher educators, pre-service teachers, and primary school practitioners can use to guide lesson design, classroom facilitation, and formative assessment in AI-supported integrative learning environments. By proposing pedagogical prompting as a bridge between generative AI capability and teacher-led learning design, the article contributes to broader debates on how digital technologies can enhance education through human-centred and developmentally appropriate practice.

Conceptual Approach and Model Development

Conceptual synthesis as the article's approach

This article adopts a conceptual synthesis approach to develop the Prompt-to-Pedagogy Framework. It does not report empirical findings from classroom intervention or experimental research. Rather, it integrates theoretical, pedagogical, and technological insights from multiple bodies of literature in order to construct a framework for

understanding how generative AI prompting can be transformed into a pedagogical practice for primary integrative learning.

A conceptual synthesis is appropriate because generative AI is developing faster than many empirical research traditions can fully capture. While classroom-based evidence remains essential, there is also a need for theoretically grounded models that can help educators interpret emerging practices, identify risks, and design responsible forms of AI integration. The purpose of the present article is therefore not to claim causal effects, but to offer a coherent conceptual architecture that can guide future research, teacher education, and classroom innovation.

The development of the framework draws on five interrelated knowledge bases. First, literature on generative AI in education provides the technological context and identifies opportunities and risks associated with AI-supported teaching, feedback, and content generation (Kasneci et al., 2023; OECD, 2026). Second, literature on prompt engineering in education provides insight into how teachers interact with generative AI systems through structured prompts (Chen et al., 2024; Park & Choo, 2025; Qian, 2025). Third, sociocultural theory and scaffolding provide theoretical grounding for understanding prompts as mediational tools that can support learners within social and instructional contexts (Vygotsky, 1978; Wood et al., 1976). Fourth, integrative learning literature supports the need for cross-disciplinary, holistic, and meaningful learning experiences in primary classrooms (Bruner, 1960; Dewey, 1938; Sawyer, 2014). Fifth, literature on teacher professional judgment and AI ethics ensures that AI remains subordinate to human educational purposes, ethical responsibility, and child-centred pedagogy (Biesta, 2015; Miao & Cukurova, 2024; UNESCO, 2023).

Through the synthesis of these knowledge bases, the article develops the concept of pedagogical prompting and organizes it into the Prompt-to-Pedagogy Framework.

Logic of model development

The development of the Prompt-to-Pedagogy Framework follows three conceptual moves. The first move is reconceptualization. Prompting is reframed from a technical act of input design into a pedagogical act of learning design. This move shifts the central question from "How can teachers obtain better outputs from AI?" to "How can teachers use prompting to support better learning?"

The second move is operationalization. The concept of pedagogical prompting is translated into an instructional cycle that corresponds to teachers' actual work: planning before class, facilitating learning during class, and interpreting learning evidence after class. This leads to the three phases of the P2P Framework: pre-class co-design, in-class collaborative prompting, and post-class feedback and reflection.

The third move is professionalization. The framework is connected to teacher education through the proposed AI-Pedagogy Lab, prompt portfolio, ethical micro-teaching, and reflective feedback practices. This move ensures that pedagogical prompting is not treated as a casual tool-use habit, but as a professional competence that can be developed, observed, assessed, and refined in teacher preparation programs.

Literature Positioning: From Technical Prompting to Pedagogical Prompting

The growing literature on generative AI in education can be organized into several streams. Each stream contributes important insights, yet each also leaves limitations that justify the need for a pedagogical prompting framework. Research on generative AI in education has identified opportunities for personalized learning, feedback, tutoring, and teacher support, while also warning about accuracy, bias, academic integrity, and overreliance on AI-generated outputs (Kasneci et al., 2023; OECD, 2026). Literature on prompt engineering for educators has begun to offer practical strategies for designing more effective prompts, but much of this work remains concerned with output quality rather than the transformation of prompting into pedagogical practice (Park & Choo, 2025; Qian, 2025).

Table 1. Positioning pedagogical prompting within existing literature

Literature stream	Main contribution	Limitation	Extension offered by this article
Generative AI in education	Explains opportunities for content generation, feedback, tutoring, and teacher support	Often emphasizes tool use, productivity, or system capability	Repositions AI use around pedagogical reasoning and teacher-led learning design
Prompt engineering in education	Provides strategies for writing structured prompts and improving AI outputs	Often remains technically oriented and output-focused	Reframes prompting as a pedagogical practice for scaffolding, integration, dialogue, and feedback
AI literacy	Emphasizes responsible understanding and use of AI by teachers and learners	Often framed as broad competency development	Connects AI literacy to concrete classroom prompting practices
Integrative learning	Supports cross-disciplinary, holistic, and meaningful learning	Often lacks mechanisms for AI-supported curriculum design	Shows how AI prompting can help teachers bridge disciplines in primary classrooms
Teacher education and professional judgment	Emphasizes teacher agency, reflection, and ethical decision-making	Often discusses AI readiness without a specific classroom design model	Proposes AI-Pedagogy Lab and prompt portfolio as professional learning structures
AI ethics in education	Highlights privacy, bias, transparency, and human agency	Often remains at policy or principle level	Embeds ethical judgment into each phase of pedagogical prompting

This positioning indicates that the article does not merely add another discussion of AI tools in education. Instead, it addresses the missing link between technical prompt engineering and pedagogical design. The proposed framework contributes a language and structure for understanding how prompts can mediate learning processes rather than simply generate instructional products.

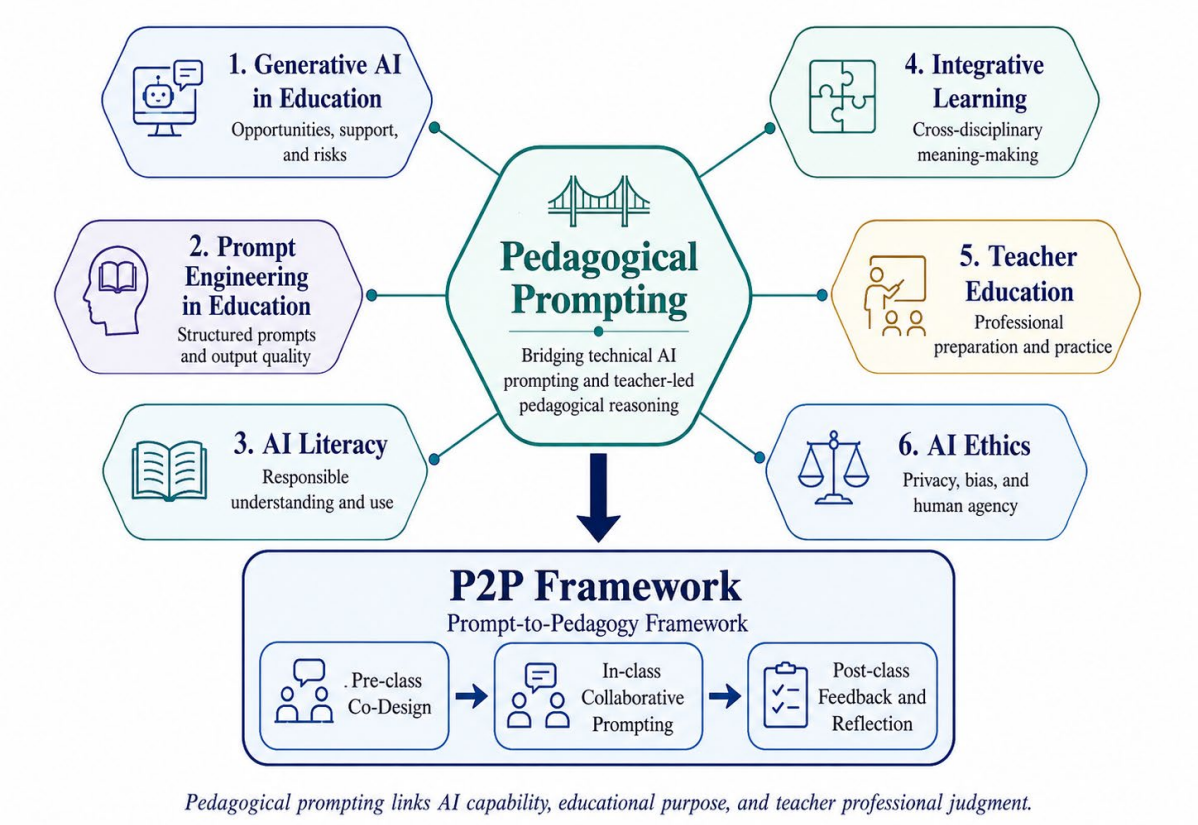

Figure 2. Literature Positioning of Pedagogical Prompting. The figure maps pedagogical prompting at the intersection of generative AI in education, prompt engineering, AI literacy, integrative learning, teacher education, and AI ethics.

Defining Pedagogical Prompting

Formal definition

The key concept proposed in this article is pedagogical prompting. Pedagogical prompting refers to the intentional design and use of generative AI prompts by teachers to scaffold learners' thinking, connect knowledge across disciplines, facilitate co-creative classroom dialogue, and support teacher-led formative feedback while preserving teacher professional judgment and learner agency.

This definition builds on three theoretical assumptions. First, from a sociocultural perspective, learning is mediated by tools, language, social interaction, and more knowledgeable others (Vygotsky, 1978). In the context of generative AI, prompts can function as mediational tools when teachers use them to structure inquiry, dialogue, and guided participation. Second, the concept of scaffolding suggests that learners benefit from temporary support that enables them to perform beyond their current independent level, provided that such support is gradually adjusted and removed as competence grows (Wood et al., 1976). Third, teacher professional judgment remains central because the value of AI-generated outputs depends on how teachers interpret, adapt, and ethically mediate them for specific learners and contexts (Biesta, 2015; Shulman, 1986).

Four dimensions of pedagogical prompting

Pedagogical prompting can be understood through four dimensions.

Table 2. Four dimensions of pedagogical prompting in primary classrooms

Dimension	Core meaning	Example in primary classrooms
Prompting as scaffolding	Using AI to generate questions, hints, examples, and thinking sequences that support learners within their developmental range	Asking AI to create age-appropriate guiding questions for Grade 3 students investigating local environmental problems
Prompting as interdisciplinary bridging	Using AI to connect curriculum areas into coherent integrative learning experiences	Designing a unit that connects science, language, mathematics, and art through a local sustainability project
Prompting as co-creative dialogue	Using prompts as a shared classroom activity in which teachers and learners negotiate ideas, keywords, images, stories, or explanations	Students suggest keywords for an AI-generated picture storybook and then critique whether the output reflects their intended meaning
Prompting as formative feedback	Using AI to support preliminary analysis of learning evidence while the teacher remains the final interpreter	Asking AI to identify possible misconceptions in anonymized student work and suggest teacher-led feedback questions

These four dimensions clarify that pedagogical prompting is not reducible to prompt syntax. Its quality depends on how prompts are connected to learning goals, classroom interaction, curriculum integration, and teacher judgment.

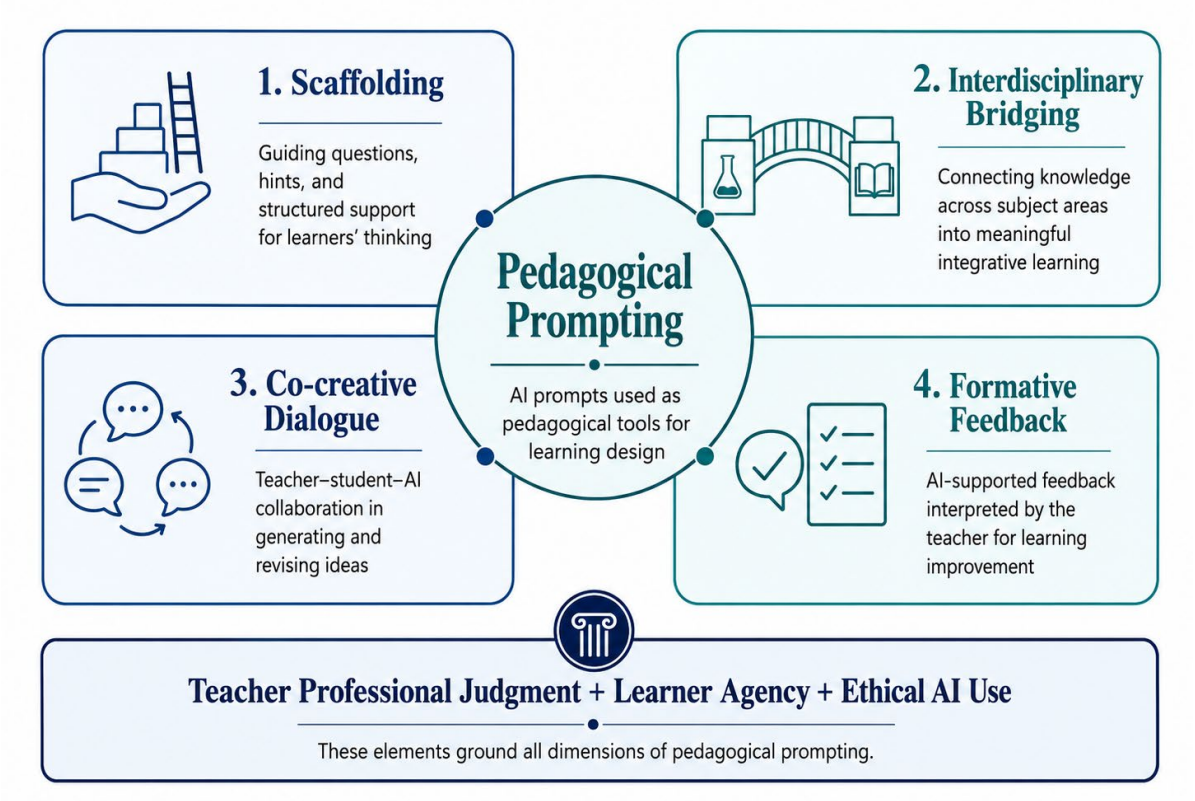

Figure 3. Four Dimensions of Pedagogical Prompting. The figure presents the four dimensions of pedagogical prompting: scaffolding, interdisciplinary bridging, co-creative dialogue, and formative feedback.

The Prompt-to-Pedagogy Framework

Overview of the P2P Framework

The Prompt-to-Pedagogy Framework is a three-phase model for using generative AI to support integrative learning in primary education. It is organized around the actual instructional work of teachers: designing learning before class, facilitating learning during class, and interpreting learning evidence after class. The framework draws on the view that technology integration in teaching requires more than technical competence; it requires the integration of technological, pedagogical, and content knowledge (Koehler & Mishra, 2009; Mishra & Koehler, 2006).

The framework positions AI in three limited but productive roles: AI as co-design support in the pre-class phase, AI as co-facilitation support in the in-class phase, and AI as formative feedback support in the post-class phase. Importantly, the framework does not position AI as an autonomous teacher, evaluator, or curriculum authority. In every phase, the teacher remains the pedagogical decision-maker. This aligns with human-centred AI principles that emphasize teacher agency, ethical responsibility, and the need to ensure that AI supports rather than replaces human educational purposes (Miao & Cukurova, 2024; OECD, 2026; UNESCO, 2023).

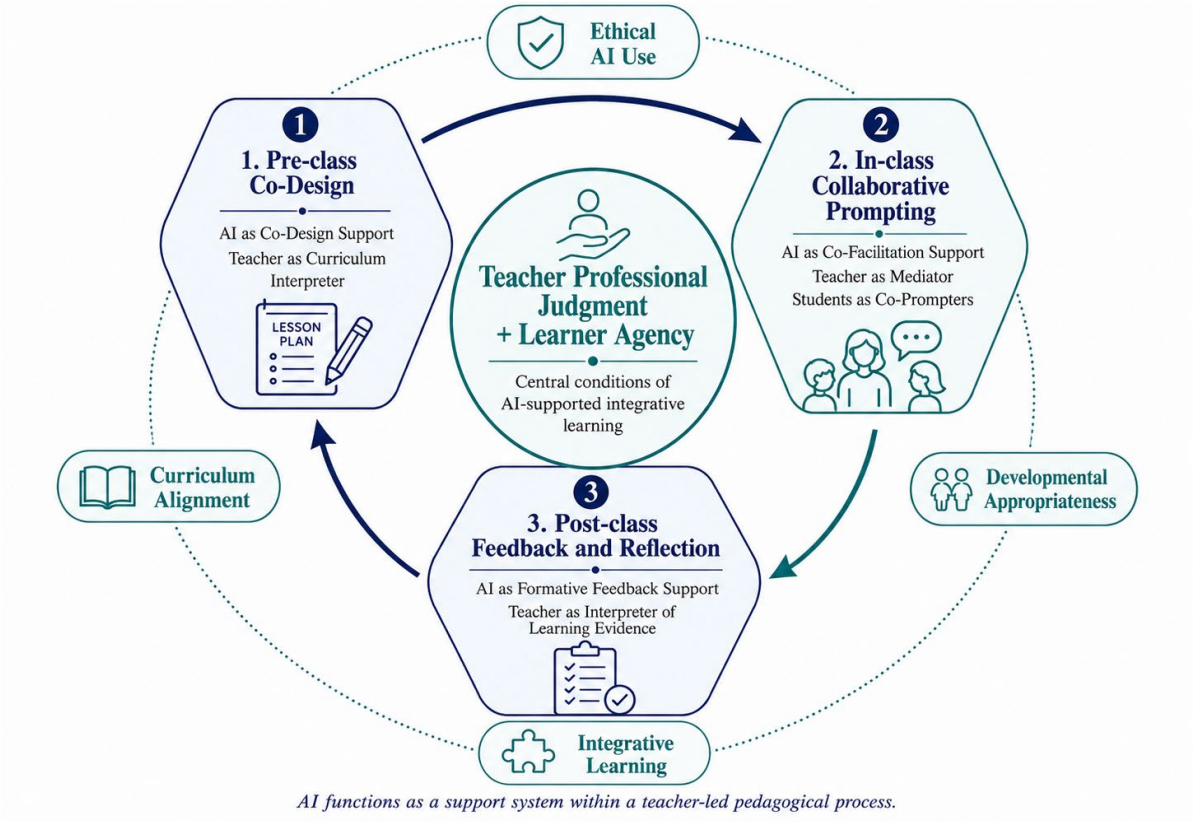

Figure 4. The Prompt-to-Pedagogy Framework for Generative AI Integration in Primary Education. The figure illustrates the framework as a three-phase cycle consisting of pre-class co-design, in-class collaborative prompting, and post-class feedback and reflection.

Phase 1: Pre-class co-design

In the first phase, generative AI supports the teacher in designing integrative learning experiences before classroom implementation. The teacher uses structured pedagogical prompts to ask AI to connect curriculum standards, identify possible interdisciplinary themes, generate inquiry questions, suggest hands-on activities, and propose differentiated learning supports.

The pedagogical purpose of this phase is not to outsource lesson planning to AI. Rather, it is to expand the teacher's design space. AI can generate multiple possibilities, but the teacher evaluates which possibilities are developmentally appropriate, culturally relevant, feasible within classroom constraints, and aligned with curriculum goals. A strong pre-class pedagogical prompt should include role, learner profile, curriculum focus, pedagogical intention, constraints, and expected output.

Act as a primary curriculum integration specialist. Design a Grade 3 integrative learning activity that connects environmental science, language, mathematics, and visual arts. The activity should promote inquiry, collaboration, creativity, and local environmental awareness. It must be developmentally appropriate, use low-cost classroom materials, and include guiding questions, group activities, and formative assessment criteria.

The value of this prompt lies not only in its structure, but in its pedagogical orientation. It does not ask AI simply to "make a lesson plan." It asks AI to support curriculum integration, learner-centred activity design, inquiry, collaboration, and formative assessment.

Phase 2: In-class collaborative prompting

The second phase shifts AI use from private teacher preparation to shared classroom meaning-making. In many AI-supported teaching practices, the teacher uses AI outside the classroom and presents the finished output to students. The P2P Framework proposes a different approach: collaborative prompting, in which students participate in generating, refining, and evaluating prompts under teacher guidance.

In this phase, prompting becomes a visible learning process. The teacher asks students to contribute ideas, keywords, questions, descriptions, examples, or criteria. The teacher then helps transform these contributions into a structured prompt. When AI produces an output, students examine whether the output matches their ideas, whether it is accurate, what should be improved, and how it connects to the learning topic.

This phase supports language development through precise word choice, critical thinking through comparison between intention and AI output, creativity through co-design of stories or projects, interdisciplinary understanding through linking concepts across subjects, and AI literacy through understanding that AI output depends on human input and must be evaluated (Gu & Ericson, 2025; Walter, 2024). The most important point is that students are not passive consumers of AI-generated content. They become co-prompters, co-creators, and critical evaluators of technology-mediated meaning.

Phase 3: Post-class feedback and reflection

The third phase focuses on formative feedback and teacher reflection after classroom learning. In this phase, AI may support the teacher in reviewing anonymized student work, identifying possible misconceptions, generating feedback questions, and suggesting follow-up activities.

This phase must be framed carefully. AI should not be treated as an autonomous evaluator of children's learning. It should not assign final grades, make high-stakes judgments, or replace teacher interpretation. Instead, AI functions as a formative feedback assistant that provides preliminary insights for teacher review.

Analyze the following anonymized Grade 3 student reflection from an environmental storybook project. Identify possible strengths, misconceptions, and areas for further support. Do not assign a grade. Suggest three developmentally appropriate feedback questions that the teacher can use to guide the student's next revision.

This prompt sets clear ethical and pedagogical boundaries. It asks AI to support formative interpretation, not to make final assessment decisions. The teacher remains responsible for verifying the analysis, considering the learner's context, and deciding what feedback is appropriate.

Table 3. Operational matrix of the Prompt-to-Pedagogy Framework

P2P phase	AI role	Teacher role	Learner role	Pedagogical function	Main risk	Safeguard
Pre-class co-design	Co-design support	Curriculum interpreter	Indirect beneficiary	Integrative unit design, questions, scaffolds	Overreliance on AI plans	Check alignment, developmental fit, and cultural relevance
In-class collaborative prompting	Co-facilitation support	Dialogue mediator	Co-prompter, co-creator, critic	Inquiry, language, creativity, interdisciplinary meaning-making	Uncritical acceptance of AI output	Guide critique, revision, and evidence-based discussion
Post-class feedback and reflection	Formative feedback support	Interpreter of evidence	Recipient of teacher-led feedback	Misconception analysis and follow-up support	Inaccurate or biased feedback	Anonymize data and avoid high-stakes AI judgment

Classroom Scenarios for Primary Integrative Learning

Scenario-based illustration of the framework

To demonstrate how the Prompt-to-Pedagogy Framework can be translated into classroom practice, this section presents three illustrative scenarios for primary integrative learning. These scenarios are grounded in the principle that children learn most meaningfully when knowledge is connected to lived experience, inquiry, communication, and social participation (Dewey, 1938; Sawyer, 2014; Vygotsky, 1978). They also align with the view that AI-supported learning should be designed with clear pedagogical purposes rather than used as a shortcut for producing instructional materials (OECD, 2026).

The scenarios are not intended as fixed lesson templates. Rather, they function as conceptual-practical examples showing how pedagogical prompting may support curriculum integration, learner participation, and teacher-led formative reflection in primary classrooms.

Scenario 1: Environmental storybook project

The first scenario involves a Grade 3 environmental storybook project. The learning activity integrates science, language arts, visual arts, and civic education. The central theme is local environmental care, such as reducing waste, protecting a river, improving a school garden, or caring for community animals.

In the pre-class co-design phase, the teacher uses AI to generate possible integrative learning pathways. Instead of asking AI to produce a generic lesson plan, the teacher provides a structured pedagogical prompt:

Act as a primary curriculum integration specialist. Design a Grade 3 project-based learning activity that integrates environmental science, language arts, visual arts, and civic responsibility. The project should guide students to create a picture storybook about solving a local environmental problem. Include inquiry questions, collaborative activities, vocabulary development, art-making tasks, and formative assessment criteria. The activity must be developmentally appropriate, culturally relevant, and feasible with low-cost classroom materials.

The AI may generate several possible themes and activities, such as a story about a child who helps clean a village canal, a school group that builds a recycling corner, or a community that turns food waste into compost. The teacher reviews these suggestions and selects or adapts the option most appropriate to the learners' context.

In the in-class collaborative prompting phase, the teacher invites students to contribute ideas for the story. Students may suggest characters, settings, problems, solutions, emotions, and visual details. Their contributions are written on the board and gradually organized into categories such as place, problem, character, action, and message. The teacher then models how to transform students' ideas into a prompt:

Create a child-friendly picture storybook scene about a Grade 3 student helping friends reduce plastic waste near a village river. The scene should include children collecting bottles, sorting waste into colored bins, fish swimming in cleaner water, and a warm community atmosphere. The style should be suitable for primary students and should emphasize cooperation, responsibility, and care for nature.

When AI produces the image or story draft, students do not simply accept it. They evaluate it. The teacher may ask: Does this picture show our community accurately? What part of our idea did AI understand well? What part should be changed? Is the environmental message clear? What words should we add to make the next prompt better? Through this process, prompting becomes a language-development activity, a critical thinking activity, and an AI literacy activity at the same time.

Scenario 2: Local market mathematics

The second scenario focuses on mathematics through a local market theme. It integrates mathematics, language, social studies, and financial literacy. The purpose is to help primary students understand arithmetic operations, price comparison, data organization, and everyday problem-solving through a familiar community context.

In the pre-class co-design phase, the teacher prompts AI to generate a local market learning activity:

Act as a primary mathematics educator and integrative learning designer. Create a Grade 4 learning activity that teaches addition, subtraction, multiplication, and simple comparison through a local market context. Integrate language learning through oral explanation and social studies through community roles. Include realistic market situations, student group tasks, teacher questions, and formative assessment prompts. Use simple numbers appropriate for Grade 4 learners.

AI may suggest activities such as creating a classroom market, comparing prices of vegetables, calculating change, planning a meal within a budget, or representing sales data in a table. The teacher adapts the activity to local context by using familiar goods, local currency, and culturally relevant market practices.

In the in-class collaborative prompting phase, students help construct market situations. They may suggest items such as rice, eggs, bananas, vegetables, snacks, local fruits, or handmade products. The teacher asks students to decide prices, roles, and problems. Together, the class creates a prompt:

Create five Grade 4 word problems set in a local market. The problems should involve buying fruits, comparing prices, calculating total cost, finding change, and explaining choices. Use simple numbers and include one problem where students must decide which option is more economical. Make the language clear for primary students.

After AI generates the word problems, students examine them critically. The teacher may ask: Are these prices realistic? Which problem is too easy or too difficult? What information is missing? Can we rewrite one problem using our own market? How can we explain the solution in words? This interaction changes the role of AI-generated word problems. They are not final worksheets. They become draft materials for student critique, revision, and mathematical discussion.

Scenario 3: Community wisdom inquiry

The third scenario focuses on local knowledge and community wisdom. It integrates social studies, science, language arts, art, and local curriculum. The aim is to help primary students investigate community practices such as traditional food, local plants, weaving, farming, festivals, water use, or folk stories.

In the pre-class co-design phase, the teacher uses AI to brainstorm inquiry pathways:

Act as a primary social studies and local curriculum specialist. Design an inquiry-based Grade 5 unit on community wisdom. The unit should integrate social studies, science, language arts, and art. Students should investigate one local practice, interview family or community members, create a visual explanation, and present what they learned. Include inquiry questions, ethical interview guidelines, classroom activities, and formative assessment criteria.

AI may suggest different inquiry themes, such as traditional rice farming, local herbs, natural dyes, community food preservation, or local architecture. The teacher selects themes that are appropriate to the school community and ensures that students' investigations respect cultural knowledge and community members.

In the in-class collaborative prompting phase, students generate questions they want to ask about community wisdom. The teacher collects their questions and helps them group them into categories such as: What is it? Who practices it? Why is it important? What materials are used? How is it connected to nature? How has it changed over time? How can young people preserve it? The teacher then demonstrates how AI can help organize inquiry questions, not replace real community investigation:

Organize the following Grade 5 student questions about local community wisdom into inquiry categories. Suggest child-friendly follow-up questions for each category. Do not invent answers. The purpose is to help students prepare for interviews with family or community members.

This prompt is pedagogically important because it explicitly tells AI not to invent content. AI is used to organize student inquiry, while authentic knowledge still comes from community engagement. This scenario shows that pedagogical prompting can strengthen local curriculum rather than replace it with generic AI-generated knowledge. It also helps students develop respect for community knowledge while practicing inquiry, communication, and critical reflection.

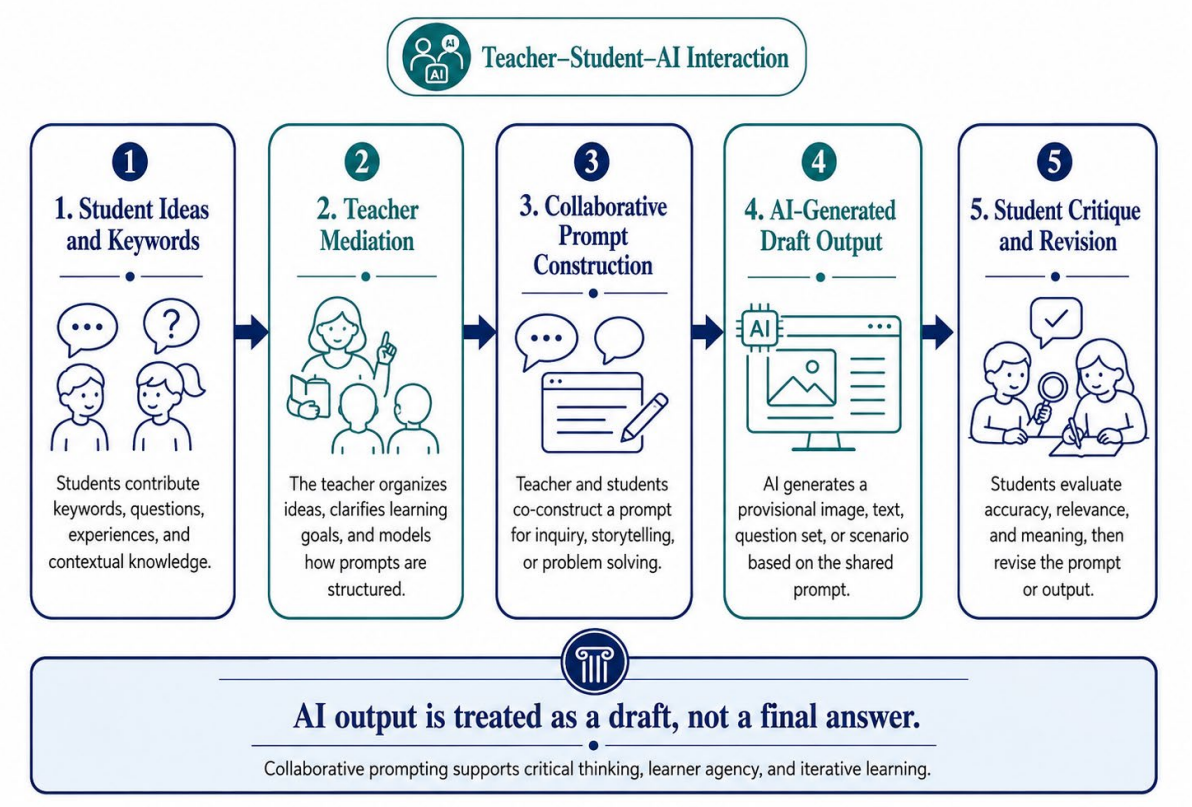

Figure 5. Classroom Enactment of Collaborative Prompting. The figure illustrates how collaborative prompting transforms classroom interaction into a shared meaning-making process among teacher, learners, and AI.

Design Principles for Pedagogical Prompting

Although the Prompt-to-Pedagogy Framework provides a three-phase model for AI-supported integrative learning, its implementation requires a set of design principles to prevent AI use from becoming superficial, automated, or ethically problematic.

First, pedagogy should precede technology. Teachers should not begin with the question, "What can AI generate?" but rather with the question, "What kind of learning should be supported?" If technology becomes the starting point, AI outputs may shape the lesson in unintended ways. If pedagogy becomes the starting point, AI

functions as a support for educational purpose.

Second, learner agency and co-creation should be protected. In primary classrooms, children can participate in AI-supported learning through age-appropriate forms of collaborative prompting. They can suggest keywords, choose story elements, evaluate images, revise questions, compare AI output with real-life experience, and explain why a prompt should be improved. This principle helps learners see that technology is shaped by human language, intention, and judgment.

Third, developmental and cultural appropriateness must be ensured. Primary learners require concrete examples, familiar contexts, accessible language, visual clarity, emotional safety, and meaningful connection to lived experience. AI-generated content may be impressive but still unsuitable for children. Teachers should therefore include developmental constraints in prompts and review all outputs before classroom use.

Fourth, AI output should be treated as provisional. It should be reviewed, questioned, revised, and contextualized. This is especially important in primary education, where children may assume that AI-generated text or images are automatically correct. Teachers can transform AI limitations into learning opportunities by asking students to critique outputs.

Fifth, ethical protection of children is non-negotiable. Because primary learners are children, AI use must be guided by strict safeguards concerning privacy, consent, data security, bias, and emotional safety. Teachers should not upload identifiable student data, images, voices, personal stories, or sensitive information into AI systems without institutional approval and appropriate consent.

Finally, reflective teacher judgment should guide all AI use. Pedagogical prompting is not a mechanical procedure. It requires teachers to make decisions before, during, and after AI use. Teachers must decide what to ask, how to interpret AI output, what to accept, what to reject, what to revise, and how to adapt output to learners.

Challenges and Ethical Considerations

The implementation of pedagogical prompting requires careful attention to ethical, developmental, and professional risks. UNESCO emphasizes that generative AI in education should be guided by a human-centred vision, protection of data privacy, age-appropriate access, institutional readiness, and teacher capacity building (UNESCO, 2023). Similarly, OECD cautions that generative AI may create risks of cognitive offloading, weak learning, and overreliance if it is used without clear pedagogical design (OECD, 2026).

Superficial prompting

A central challenge in implementing the P2P Framework is the risk of superficial prompting. Pre-service teachers may initially use AI through short, generic commands such as "create a lesson plan," "make a worksheet," or "write questions for Grade 4." While such prompts may produce usable materials, they often fail to communicate learner characteristics, curriculum goals, developmental constraints, cultural context, ethical boundaries, or pedagogical intention. This risk is consistent with concerns that prompt engineering in education may remain technically oriented unless explicitly connected to pedagogical reasoning (Park & Choo, 2025; Qian, 2025).

Pedagogical outsourcing

Pedagogical outsourcing occurs when teachers allow AI to decide what should be taught, how it should be taught, or how learning should be evaluated. This undermines the teacher's responsibility to interpret curriculum, understand learners, and make context-sensitive decisions. The P2P Framework addresses this risk by placing teacher professional judgment at every phase. AI-generated possibilities are treated as materials for professional reasoning, not as ready-made pedagogical decisions (Biesta, 2015; OECD, 2026).

Developmental appropriateness

Primary education requires special attention to developmental appropriateness. Children in primary classrooms are still developing language, attention, abstract reasoning, emotional regulation, social interaction, and moral understanding. AI-generated content may easily become too abstract, too text-heavy, too culturally distant, too visually overwhelming, or too cognitively demanding. Pedagogical prompting therefore requires teachers to specify developmental constraints clearly.

Bias, cultural mismatch, and local knowledge

Generative AI systems are trained on large datasets that may overrepresent particular languages, cultures, values, and knowledge traditions. As a result, AI output may reflect cultural assumptions that do not align with local communities. In primary classrooms, this issue is especially important because children are still forming their understanding of identity, place, community, and cultural meaning. The P2P Framework does not assume that AI will automatically represent local knowledge accurately. Instead, it treats cultural mismatch as an opportunity for critical discussion.

Privacy and child data protection

Using AI in primary classrooms raises serious concerns about privacy and child data. Student work, names, images, voices, locations, and personal stories should not be entered into AI systems without appropriate protection, institutional policy, and informed consent. The post-class phase of the P2P Framework therefore requires strict safeguards. Student work should be anonymized, sensitive personal information should be removed, and AI should not be used to make high-stakes decisions about children (UNESCO, 2023).

Assessment validity

AI can assist teachers in identifying patterns, suggesting feedback questions, and generating possible follow-up activities. However, AI feedback is not equivalent to valid assessment. Assessment in primary education requires contextual interpretation, knowledge of the child, awareness of classroom participation, understanding of language development, and sensitivity to emotional and social factors. Therefore, AI-generated feedback should be treated as provisional and must be interpreted by teachers before being used in instructional decision-making.

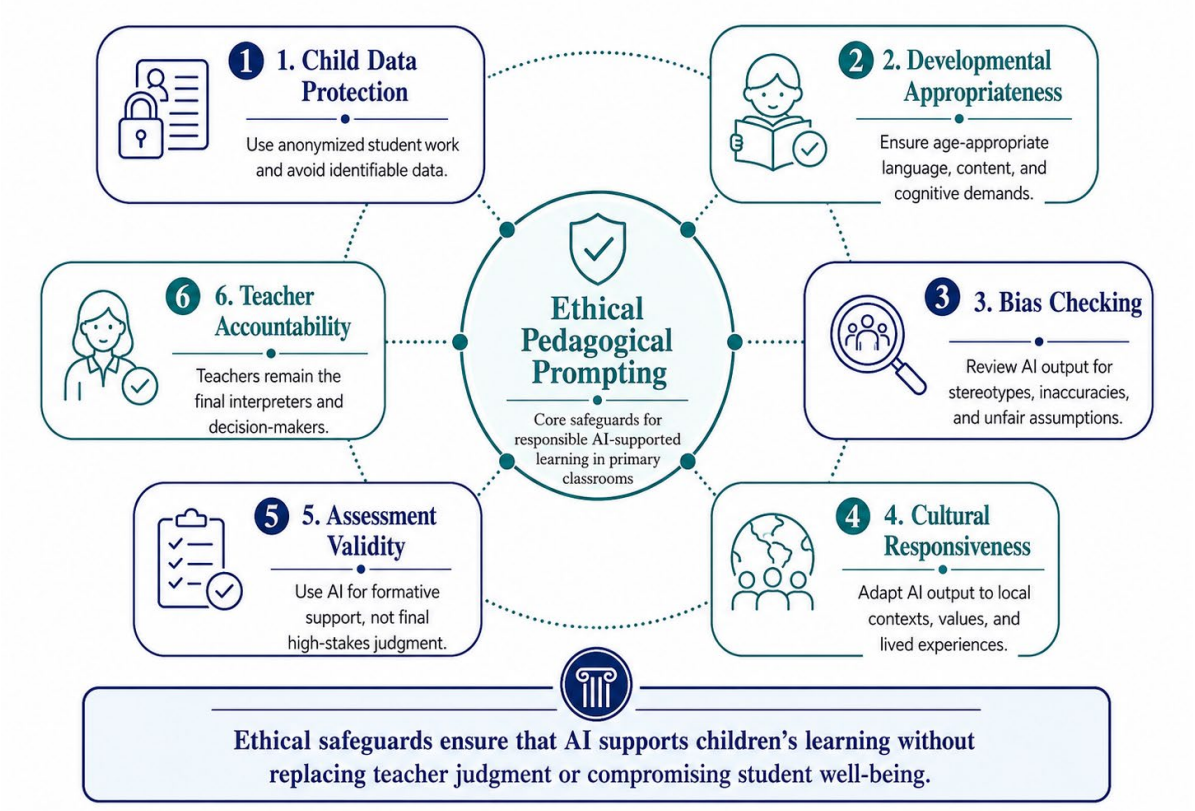

Figure 6. Ethical Safeguards for Pedagogical Prompting. The figure summarizes ethical safeguards required for pedagogical prompting in primary education, including child data protection, developmental appropriateness, bias checking, cultural responsiveness, assessment validity, and teacher accountability.

Implications for Teacher Education

Reframing AI preparation for pre-service primary teachers

The rise of generative AI requires teacher education programs to reconsider how future teachers are prepared. It is not sufficient to offer isolated workshops on how to use AI tools. Nor is it sufficient to teach prompt engineering as a technical skill detached from curriculum, child development, assessment, and ethics. Teacher education should support pre-service teachers in developing AI-related professional competence, including AI pedagogy, ethical judgment, human-centred mindset, and professional learning (Miao & Cukurova, 2024).

Pre-service primary teachers need structured opportunities to learn how AI can support pedagogical reasoning. They must understand how to design prompts that reflect learning goals, how to evaluate AI output, how to involve children in collaborative prompting, how to protect student data, and how to maintain teacher judgment in AI-supported environments.

AI-Pedagogy Lab as a professional learning space

A key implication of this article is the need for an AI-Pedagogy Lab in teacher education institutions. Unlike a traditional computer laboratory, an AI-Pedagogy Lab is not primarily a space for learning software operation. It is a professional learning environment where pre-service teachers practice the integration of AI, pedagogy, curriculum, ethics, and classroom interaction.

An AI-Pedagogy Lab should include five components. First, it should include a Prompt Design Studio, where pre-service teachers practice writing, revising, and evaluating pedagogical prompts for different grade levels, subject areas, and classroom purposes. Second, it should include AI-supported micro-teaching, where pre-service teachers simulate classroom teaching with AI-supported materials and receive feedback from peers and teacher educators. Third, it should include collaborative prompting practice, where pre-service teachers rehearse how to involve children in generating keywords, questions, stories, and evaluation criteria. Fourth, it should include an Ethical AI Reflection Clinic, where pre-service teachers analyze cases involving bias, privacy, cultural mismatch, hallucination, developmental inappropriateness, and overreliance on AI. Fifth, it should include Prompt Portfolio Assessment, where pre-service teachers collect prompts, AI outputs, revisions, teaching rationales, ethical reflections, and evidence of pedagogical growth.

Through these components, the AI-Pedagogy Lab transforms AI preparation from tool training into professional formation.

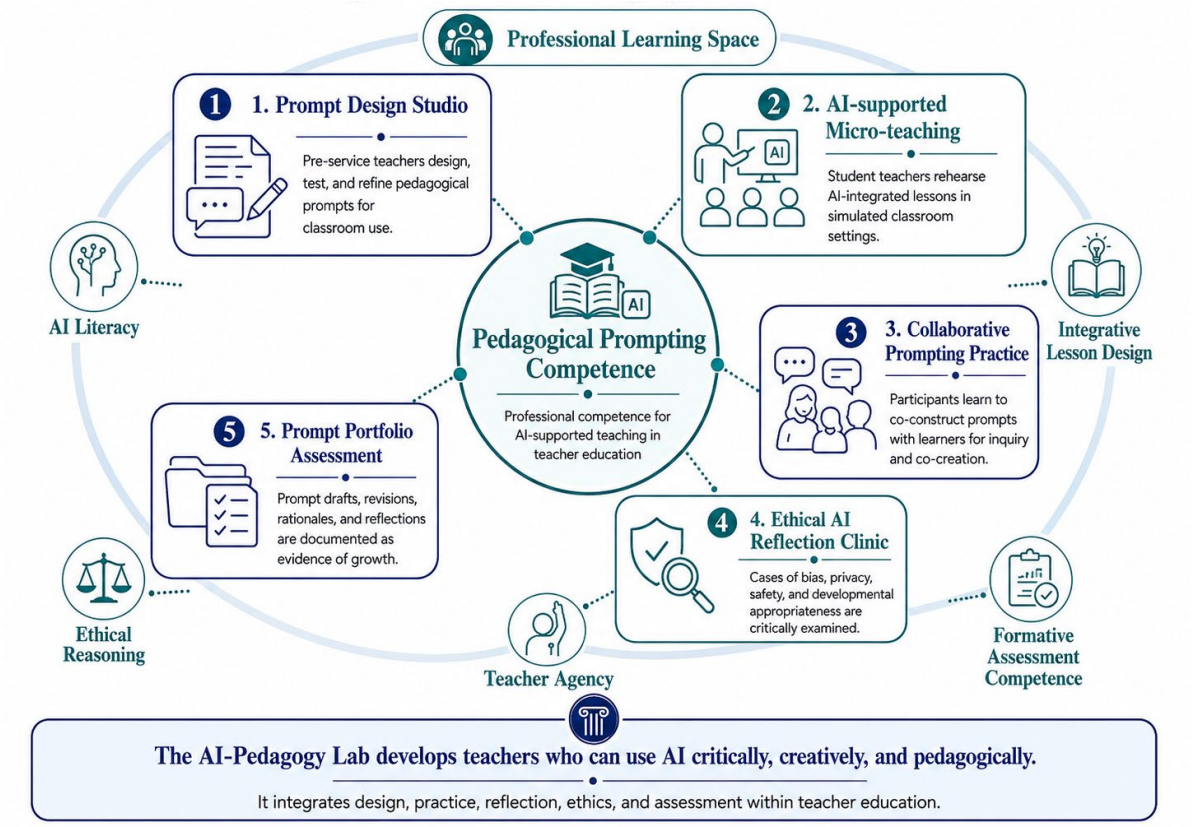

Figure 7. AI-Pedagogy Lab Model. The figure presents the AI-Pedagogy Lab as a professional learning environment for developing pedagogical prompting competence among pre-service primary teachers.

Prompt portfolio as evidence of pedagogical growth

The prompt portfolio is especially important because it makes pre-service teachers' thinking visible. A prompt alone does not show professional competence. What matters is whether the teacher can explain why the prompt was designed in a particular way, how the AI output was evaluated, what was revised, what ethical issues were considered, and how the final teaching decision was made.

Table 4. Prompt portfolio as evidence of pedagogical growth

Portfolio element	Purpose
Initial prompt	Shows the teacher's first design attempt
AI output	Provides material for critique
Revised prompt	Shows refinement of pedagogical intention
Teaching rationale	Explains curriculum alignment and learner relevance
Ethical reflection	Identifies privacy, bias, and developmental concerns
Classroom adaptation	Shows how the output was modified for actual learners
Reflection on learning	Documents growth in teacher judgment

Prompt portfolios can be used in methods courses, practicum supervision, and micro-teaching assessment. They encourage pre-service teachers to see prompting not as a one-time command, but as an iterative process of pedagogical reasoning. This aligns with reflective approaches to teacher professional learning and with

contemporary AI competency frameworks that emphasize professional growth, ethical application, and teacher agency (Miao & Cukurova, 2024; Schön, 1983).

Pedagogical prompting competency rubric

Teacher educators also need a rubric to assess the progression of pre-service teachers from technical prompt users to reflective pedagogical designers. Such a rubric can be used in AI-Pedagogy Labs, methods courses, and practicum seminars.

Table 5. Pedagogical prompting competency rubric

Level	Description	Prompt characteristics	Evidence of competence
Level 1: Technical prompting	Uses AI mainly to produce outputs	Generic, short, task-only prompts	AI output used with little critique
Level 2: Contextual prompting	Includes grade level and subject context	Specifies topic, level, and output format	Some alignment with classroom needs
Level 3: Pedagogical prompting	Embeds learning goals, learner needs, scaffolding, ethics, and feedback	Includes role, context, task, constraints, learner profile, and assessment intention	Teacher critically adapts output and explains pedagogical rationale
Level 4: Reflective pedagogical prompting	Uses prompting as iterative professional reasoning	Revises prompts based on classroom evidence and ethical reflection	Prompt portfolio shows growth in judgment, adaptation, and learner-centred design

Preparing teachers for human-centred AI pedagogy

Teacher education should emphasize that the goal of AI integration is not to make teaching more automated, but to make teaching more thoughtful, responsive, and human-centred. AI can support planning and reflection, but it cannot replace the relational, ethical, emotional, and contextual dimensions of teaching.

For primary education, this point is crucial. Young learners need teachers who understand their language, emotions, friendships, fears, imagination, cultural background, and emerging sense of self. AI cannot fully understand these dimensions. Therefore, the professional identity of future teachers should not be built around technological dependence, but around wise mediation of technology for human learning. The P2P Framework supports this orientation by positioning AI as a limited assistant in a teacher-led pedagogical system.

Future Research Agenda

Because the Prompt-to-Pedagogy Framework is proposed as a conceptual model, future research is necessary to examine its practical value, limitations, and contextual adaptability.

First, future studies should investigate how the P2P Framework operates in actual primary classrooms. Classroom-based qualitative studies could examine how teachers and students engage in collaborative prompting, how children interpret AI-generated outputs, and how teachers mediate discussion. Design-based research may be especially appropriate because it allows researchers and teachers to iteratively refine AI-supported learning activities across multiple classroom cycles.

Second, future research should develop instruments to assess pedagogical prompting competence among pre-service teachers. Existing measures of digital competence or AI literacy may not sufficiently capture teachers' ability to translate prompts into pedagogical decisions. Rubrics or scales could assess clarity of pedagogical intention, curriculum alignment, learner-centred prompt design, ethical awareness, ability to critique AI output, capacity to design collaborative prompting activities, quality of formative feedback prompts, and evidence of teacher professional judgment.

Third, the P2P Framework should be tested across different subject combinations. Integrative learning may operate differently in science-mathematics contexts than in language-art contexts or social studies-local curriculum contexts. Comparative studies would clarify which AI functions are most useful, risky, or pedagogically valuable in different integrative learning contexts.

Fourth, longitudinal studies should examine how pre-service teachers' prompting practices evolve across coursework, micro-teaching, practicum, and early career teaching. Such studies could analyze prompt portfolios over time to examine whether student teachers move from generic technical prompts toward more sophisticated pedagogical prompts.

Finally, more research is needed on ethical and policy dimensions of AI use in primary education. Because children are involved, issues of data protection, consent, platform governance, bias, and developmental safety are especially important.

Limitations

As a conceptual article, this paper has several limitations. First, the Prompt-to-Pedagogy Framework is developed through theoretical synthesis rather than empirical classroom testing. Therefore, the model should be understood as a conceptual proposal that requires future validation in diverse educational contexts.

Second, the classroom scenarios presented in this article are illustrative rather than evidence of effectiveness. They demonstrate how the framework may be applied, but they do not prove that pedagogical prompting improves learning outcomes. Empirical studies are needed to examine student learning, teacher development, classroom interaction, and ethical challenges.

Third, the framework focuses primarily on primary education. Although some principles may be applicable to secondary or higher education, the emphasis on developmental appropriateness, concrete learning, local context, and child protection reflects the specific demands of primary classrooms.

Fourth, the article discusses generative AI broadly rather than evaluating specific AI platforms. This allows the framework to remain adaptable as technologies change, but it also means that implementation will vary depending on platform features, institutional policy, language support, and data privacy conditions.

Fifth, the framework assumes that teachers and teacher education institutions have some level of access to AI tools and digital infrastructure. In low-resource contexts, unequal access may limit implementation. Future work should examine how pedagogical prompting can be adapted for schools with limited technology, unstable internet access, or strict policy restrictions.

Recognizing these limitations is important because it prevents the framework from being interpreted as a universal solution. The P2P Framework should instead be viewed as a flexible conceptual guide for responsible experimentation, professional learning, and future empirical investigation.

Conclusion

The rapid expansion of generative AI has intensified interest in prompt engineering across education. However, if prompting remains framed primarily as a technical skill for obtaining better outputs, its educational value will remain limited. The central argument of this article is that prompting becomes educationally meaningful only when it is transformed into pedagogy.

To advance this argument, the article proposed the concept of pedagogical prompting and developed the Prompt-to-Pedagogy Framework for AI-powered integrative learning in primary education. Pedagogical prompting refers to the intentional use of generative AI prompts by teachers to scaffold thinking, bridge disciplines, support co-creative dialogue, and inform formative feedback while preserving teacher professional judgment and learner agency.

The P2P Framework organizes this practice into three phases: pre-class co-design, in-class collaborative prompting, and post-class feedback and reflection. Across these phases, AI is positioned not as an autonomous teacher, evaluator, or curriculum designer, but as a limited support system within a teacher-led pedagogical process. The framework therefore resists both technological determinism and pedagogical automation.

The article further argued that AI-supported integrative learning in primary classrooms must be guided by design principles, ethical safeguards, developmental appropriateness, cultural responsiveness, and reflective

teacher judgment. Classroom scenarios such as environmental storybook projects, local market mathematics, and community wisdom inquiry illustrate how AI can support meaningful cross-disciplinary learning when mediated by teachers and enriched through student participation.

For teacher education, the implications are significant. Pre-service primary teachers should not be trained merely to use AI tools. They should be prepared to design, critique, revise, and ethically mediate AI-supported learning. AI-Pedagogy Labs, prompt portfolios, collaborative prompting practice, ethical micro-teaching, and reflective feedback analysis are proposed as structures for developing this professional competence.

Ultimately, the movement from prompts to pedagogy is not simply a matter of technological adaptation. It is a redefinition of teacher professionalism in the age of generative AI. The future of AI in primary education will depend not on whether teachers can write technically effective prompts, but on whether they can transform those prompts into thoughtful, ethical, culturally responsive, and developmentally meaningful learning experiences for children.

Disclosure statement

The author declares no conflict of interest.

Data availability statement

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Funding

No external funding was received for the preparation of this conceptual manuscript.

Notes on contributor

Kawiwat Wichitchokthananon is a tenured lecturer in the Department of Elementary Education at Sisaket Rajabhat University, Thailand. His research expertise lies at the intersection of educational technology and modern instructional design, with a particular focus on integrating artificial intelligence into project-based learning (PBL) environments. Additionally, he explores the use of visual storytelling to enhance student engagement and educational outcomes. Dedicated to advancing the academic landscape, he aims to bridge the gap between digital tools and innovative teaching methodologies to foster highly effective and immersive learning experiences.

ORCID

Kawiwat Wichitchokthananon https://orcid.org/0009-0001-0979-8990

Authors' Contributions

Kawiwat Wichitchokthananon Conceptualization, methodology, framework development, literature synthesis, writing—original draft, writing—review and editing, visualization, and final approval of the manuscript.

References

Biesta, G. (2015). What is education for? On good education, teacher judgement, and educational professionalism. European Journal of Education, 50(1), 75–87. https://doi.org/10.1111/ejed.12109

Bruner, J. S. (1960). The process of education. Harvard University Press.

Chen, E., Wang, D., Xu, L., Cao, C., Fang, X., & Lin, J. (2024). A systematic review on prompt engineering in large

language models for K-12 STEM education. arXiv. https://doi.org/10.48550/arXiv.2410.11123

Dewey, J. (1938). Experience and education. Macmillan.

Gu, X., & Ericson, B. J. (2025). AI literacy in K-12 and higher education in the wake of generative AI: An integrative review. arXiv. https://doi.org/10.48550/arXiv.2503.00079

Kasneci, E., Sessler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., Gasser, U., Groh, G., Günnemann, S., Hüllermeier, E., Krusche, S., Kutyniok, G., Michaeli, T., Nerdel, C., Pfeffer, J., Poquet, O., Sailer, M., Schmidt, A., Seidel, T., Stadler, M., Weller, J., Kuhn, J., & Kasneci, G. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. Learning and Individual Differences, 103, Article 102274. https://doi.org/10.1016/j.lindif.2023.102274

Koehler, M. J., & Mishra, P. (2009). What is technological pedagogical content knowledge? Contemporary Issues in Technology and Teacher Education, 9(1), 60–70.

Miao, F., & Cukurova, M. (2024). AI competency framework for teachers. UNESCO.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. Teachers College Record, 108(6), 1017–1054. https://doi.org/10.1111/j.1467-9620.2006.00684.x

OECD. (2026). OECD digital education outlook 2026: Exploring effective uses of generative AI in education. OECD Publishing. https://doi.org/10.1787/062a7394-en

Park, J., & Choo, S. (2025). Generative AI prompt engineering for educators: Practical strategies. Journal of Special Education Technology, 40(3), 411–417. https://doi.org/10.1177/01626434241298954

Qian, Y. (2025). Prompt engineering in education: A systematic review of approaches and educational applications. Journal of Educational Computing Research, 63(7–8), 1782–1818. https://doi.org/10.1177/07356331251365189

Sawyer, R. K. (Ed.). (2014). The Cambridge handbook of the learning sciences (2nd ed.). Cambridge University Press.

Schön, D. A. (1983). The reflective practitioner: How professionals think in action. Basic Books.

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. Educational Researcher, 15(2), 4–14. https://doi.org/10.3102/0013189X015002004

UNESCO. (2023). Guidance for generative AI in education and research. UNESCO.

Walter, Y. (2024). Embracing the future of artificial intelligence in the classroom: The relevance of AI literacy, prompt engineering, and critical thinking in modern education. International Journal of Educational Technology in Higher Education, 21, Article 15. https://doi.org/10.1186/s41239-024-00448-3

Wood, D., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem solving. Journal of Child Psychology and Psychiatry, 17(2), 89–100. https://doi.org/10.1111/j.1469-7610.1976.tb00381.x

Vygotsky, L. S. (1978). Mind in society: The development of higher psychological processes. Harvard University Press.