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FROM USING AI TO DESIGNING LEARNING: PRIMARY TEACHERS' EXPERIENCES WITH PROMPT ENGINEERING AND HYPERMEDIA MATERIALS

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Abstract

Generative AI tools are now accessible to teachers, but knowing how to use an application does not necessarily mean knowing how to use it well for teaching. This study reports a professional development program involving 25 teachers at SDN Pandanwangi 3, Malang, Indonesia. The program addressed a practical need identified by the teachers: support in preparing more engaging English activities for early-grade pupils, particularly activities related to sounds and beginning reading. It combined discussion of AI literacy and responsible use with hands-on prompt writing, guided development of a Hypermedia Mission Book, and peer reflection. Program records show that teachers were already familiar with tools such as ChatGPT, Gemini, and Microsoft Copilot, although their use was mainly limited to finding information, generating ideas, and preparing questions. During the program, they tried prompts for learning objectives, phonological activities, assessment tasks, and media components. They also began drafting a Mission Book that brought together written text, illustrations, pronunciation audio, short videos, and interactive tasks. The process gave teachers opportunities to examine AI-generated material, revise prompts, and discuss whether the results suited their pupils and learning goals. The findings point to the value of professional development that connects AI use with a real instructional task and gives teachers time to create and review materials together. Since the available records do not include pre- and post-assessment scores or classroom-based measures of pupil learning, the study makes no claim that the program caused measurable gains in teacher competence or student achievement. Further work is needed to validate the materials and examine their use in classrooms.

Keywords: artificial intelligence literacy; teacher professional development; prompt engineering; hypermedia; primary education

Abstrak

Perangkat kecerdasan buatan generatif (Generative AI) kini dapat diakses oleh para guru, namun mengetahui cara menggunakan suatu aplikasi tidak serta-merta berarti memahami cara memanfaatkannya secara efektif untuk keperluan pengajaran. Studi ini melaporkan sebuah program pengembangan profesional yang melibatkan 25 guru di SDN Pandanwangi 3, Malang, Indonesia. Program ini menjawab kebutuhan praktis yang diidentifikasi oleh para guru, yaitu dukungan dalam menyusun kegiatan pembelajaran

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bahasa Inggris yang lebih menarik bagi siswa kelas awal, khususnya yang berkaitan dengan pengenalan bunyi (fonologi) dan kemampuan membaca dasar. Program ini mengombinasikan diskusi mengenai literasi AI dan penggunaan teknologi secara bertanggung jawab dengan praktik langsung penulisan perintah (prompt), pengembangan *Hypermedia Mission Book* (buku misi berbasis hipermedia) dengan pendampingan, serta refleksi bersama rekan sejawat. Catatan program menunjukkan bahwa para guru sebenarnya sudah familier dengan perangkat seperti ChatGPT, Gemini, dan Microsoft Copilot, meskipun penggunaannya selama ini terbatas pada pencarian informasi, penggalian ide, dan penyusunan pertanyaan. Selama program berlangsung, mereka mencoba menyusun *prompt* untuk merumuskan tujuan pembelajaran, merancang aktivitas fonologis, membuat tugas penilaian, serta menyiapkan komponen media. Mereka juga mulai menyusun draf *Mission Book* yang mengintegrasikan teks tertulis, ilustrasi, audio pelafalan, video singkat, dan tugas-tugas interaktif. Proses ini memberikan kesempatan bagi para guru untuk menelaah materi yang dihasilkan oleh AI, merevisi *prompt*, serta mendiskusikan apakah hasil yang diperoleh sudah sesuai dengan kebutuhan siswa dan tujuan pembelajaran. Temuan ini menunjukkan pentingnya pengembangan profesional yang mengaitkan penggunaan AI dengan tugas instruksional nyata, serta memberikan waktu bagi guru untuk berkreasi dan meninjau materi secara kolaboratif. Mengingat data yang tersedia tidak mencakup skor penilaian awal dan akhir (*pre-test* dan *post-test*) maupun pengukuran hasil belajar siswa di kelas, studi ini tidak mengklaim bahwa program tersebut menghasilkan peningkatan yang terukur dalam kompetensi guru ataupun prestasi siswa. Diperlukan penelitian lebih lanjut untuk memvalidasi materi yang dikembangkan serta mengkaji penerapannya di dalam kelas.

Kata kunci: literasi kecerdasan buatan; pengembangan profesional guru; rekayasa perintah (*prompt engineering*); hipermedia; pendidikan dasar

INTRODUCTION

Generative AI has become one more resource that teachers can draw on when preparing lessons. A teacher can ask a chatbot to suggest activities, simplify a text, draft questions, or produce ideas for visual materials. These tasks may save preparation time, but the output still needs a teacher's judgement. A suggested activity may not match the curriculum, the language level may be too difficult, and an apparently plausible explanation may contain errors. For primary teachers, these checks matter because materials need to be suitable for children's age, prior knowledge, and learning needs. UNESCO (2023) therefore calls for the use of generative AI in education to remain human-centred, with attention to accuracy, ethics, privacy, and the role of educators.

Research on generative AI in education describes both its possible uses and the problems that accompany them. Kasneci et al. (2023), for example, discuss how large language models may support explanation, feedback, and the preparation of learning resources, while also drawing attention to inaccurate or biased responses. Ogunleye et al. (2024) report a similarly mixed picture in their review of generative AI for teaching and learning. More specifically, Tan et al. (2025) examine AI use in teaching and teacher professional development and point to the need to understand what support teachers require. Taken together, these studies suggest that the central question is not simply whether teachers

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have access to AI, but how they learn to use it in ways that serve particular learning purposes.

The knowledge teachers need for this work extends beyond operating an application. UNESCO's AI Competency Framework for Teachers identifies five related areas: a human-centred mindset, ethics of AI, AI foundations and applications, AI pedagogy, and AI for professional learning (Miao & Cukurova, 2024). Sperling et al. (2024), in their review of AI literacy in teacher education, also note that teachers' practical knowledge and professional judgement have not received enough attention in the literature. These perspectives are useful for primary education, where teachers must decide not only what an AI tool can produce, but whether its output is appropriate for a particular class and subject.

The way professional development is organized also matters. Teachers need opportunities to work with the content they teach, try out new approaches, receive feedback, and discuss their work with colleagues. Desimone (2009) offers a framework for examining the features of professional development, while Darling-Hammond et al. (2017) highlight active learning, collaboration, coaching, feedback, and reflection. Asterhan and Lefstein (2024) caution that such features should be considered in relation to the setting rather than applied as a fixed checklist. In this study, the professional learning activities were built around a task familiar to the participants: preparing learning materials for their own pupils.

The program focused on English learning in the early grades. At this stage, children need opportunities to hear and distinguish sounds, connect sounds with letters, and use these connections when reading simple words. Phonological awareness and decoding are related aspects of early reading, but they are not interchangeable. Ehri (2014) explains how connections between spellings and pronunciations contribute to word learning, while the National Reading Panel (2000) identifies phonemic awareness and phonics as important components of early reading instruction. Digital materials can offer ways to combine print, pictures, and sound, provided that each element supports the learning task. Mayer (2021) cautions that multimedia should be designed to help learners process relevant information, not simply to add more visual or audio features.

The need for the program emerged from discussions and a needs analysis involving 25 teachers at SDN Pandanwangi 3, Malang. According to the program report, many teachers had tried ChatGPT, Gemini, or Microsoft Copilot, mostly to search for information, obtain teaching ideas, and prepare questions. They were less confident about writing prompts that took account of learning objectives, pupils' characteristics, and the content being taught. Teachers also described difficulties in preparing English materials that were interactive and offered structured practice with sounds and beginning reading. They expressed interest in resources that combined text, images, audio, animation, and practice activities (Calleja & Camilleri,2025).

Studies have begun to examine AI literacy in teacher education (Sperling et al., 2024), teachers' readiness for AI-related pedagogy (Yue et al., 2024), and the use of generative AI in preparing language-learning materials (Xin, 2024). However, accounts of how primary teachers work through a practical design task—moving from general use of AI

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tools to developing subject-related materials with colleagues—remain useful. This study addresses that concern by examining a professional development program in which teachers explored AI literacy and prompt engineering while preparing a Hypermedia Mission Book for early-grade English learning.

The study addresses three questions: (1) What needs and initial challenges did teachers identify in their use of AI for teaching? (2) How were AI literacy and prompt-engineering activities connected to the design of a Hypermedia Mission Book? and (3) What forms of professional learning and what initial teaching materials emerged from the program? The purpose is to describe the process and the materials produced, rather than to measure the program's impact on teacher competence or pupils' achievement.

METHOD

Research Design and Context

This study examines a professional development program at SDN Pandanwangi 3, Malang, Indonesia. It adopts a descriptive qualitative case-study approach because the focus is on what teachers needed, what they did during the program, and what materials they began to develop. The program was participatory: teachers took part in identifying needs, trying AI tools, writing and revising prompts, developing materials, and discussing their work with colleagues.

Participants

The participants were 25 teachers from SDN Pandanwangi 3. They took part in the needs analysis and the professional development activities. The school was involved because initial observation and consultation had identified a need for support in preparing interactive English learning materials, particularly for early-grade activities involving phonological awareness and decoding. The project report does not provide a detailed breakdown of participants' age, teaching experience, or previous AI proficiency; these details are therefore not reported here.

Program Procedures

The program was organized into five related phases. First, the team discussed the school's needs with the school leadership and teachers and gathered information through observation, discussion, and a questionnaire. Second, teachers were introduced to generative AI, including its possible uses, limitations, and ethical considerations. Third, they practised writing prompts for English learning objectives, phonological activities, diagnostic questions, media, and feedback. They tested the prompts, reviewed the responses, and revised the instructions where needed. Fourth, teachers received guidance as they planned a Hypermedia Mission Book, including its themes, sequence of missions, learning activities, and multimedia components. Finally, teachers shared their work, discussed suggestions from colleagues, and reflected on how AI might support their teaching.

Table 1. Phase, Activity, and Intended Professional Learning

Phase	Main Activities	Intended Professional Learning

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Needs analysis	School coordination, observation, questionnaire, discussion	Identify prior AI use and instructional needs
AI literacy	Demonstration and discussion of GenAI opportunities, limits, and ethics	Develop critical and responsible AI awareness
Prompt engineering	Iterative prompt writing, output review, and revision	Align AI outputs with objectives and learner needs
Hypermedia Mission Book	Guided design of text, visuals, pronunciation audio, video, and interactive tasks	Translate AI-supported ideas into a subject-specific artefact
Collaboration and reflection	Peer sharing, feedback, discussion, and reflection	Build confidence and a basis for continuing professional learning

Data Sources and Analysis

The article draws on the program documentation: responses and summaries from the needs-analysis questionnaire, observation records, notes from discussions and interviews as described in the report, descriptions of teachers' developing materials, and reflective feedback. These materials were read in relation to the three research questions. The analysis first grouped evidence by program phase and then examined recurring points concerning teachers' initial AI use, prompt-writing practices, the design of the Mission Book, and collaboration. The available report does not include raw questionnaire tables, full interview transcripts, a formal artefact-scoring rubric, or pre- and post-program competence measures. For that reason, the findings are presented descriptively; no percentages, statistical tests, or claims of measurable improvement have been added.

Trustworthiness and Ethical Considerations

The use of questionnaire information, observations, discussion records, and material descriptions allowed the account to draw on more than one type of program evidence. However, the project report does not document formal member checking, independent coding, or institutional ethics approval. Before submission, the authors should confirm the consent obtained from participating teachers, the permission to use photographs or examples of their work, and the procedures used to protect participants' information. These details should be added only after checking the project records.

RESULTS AND DISCUSSION

Teachers' Initial AI Use: Familiarity without Consistent Pedagogical Integration

The needs analysis suggested that teachers were not starting from zero: many had already used ChatGPT, Gemini, or Microsoft Copilot. Their use was mainly practical, such as looking up information, asking for ideas, or preparing questions. The difficulty arose when they needed to make the tool respond to a particular teaching situation. Teachers were not yet consistently specifying the learning objective, pupils' age and language level, the type of activity, or the form of the expected response. They also needed to check whether the generated material was correct and suitable for young learners.

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This distinction between using an AI tool and understanding how to use it is important. AI literacy involves more than knowing which buttons to press; it includes evaluating outputs and making informed decisions about when and how to use them. Sperling et al. (2024) point out that teacher education research has not yet given sufficient attention to teachers' practical knowledge and professional judgement in relation to AI. UNESCO's framework likewise places ethics, human agency, pedagogical use, and professional learning alongside knowledge of AI applications (Miao & Cukurova, 2024). The teachers' initial experiences in this study show why these dimensions need to be addressed together.

The needs analysis also showed why the training had to be connected to a specific subject and age group. Teachers wanted to prepare English activities for younger pupils, including tasks that helped children listen to sounds, distinguish them, and connect them with written forms. A general introduction to chatbots would not have addressed this classroom need. The program therefore used early-grade English learning as the context for prompt-writing and material design. This gave teachers a concrete reason to consider whether an AI response matched the content and the children who would use it.

Prompt Engineering as Pedagogical Design and Critical Evaluation

During the sessions, teachers tried writing prompts for several teaching purposes: preparing learning objectives, creating phonological activities, drafting diagnostic questions, developing media, and preparing feedback. The process involved more than entering a request and accepting the first response. Teachers wrote a prompt, looked at the output, considered whether it met the task, and adjusted the instruction when it did not. They were encouraged to include information about the teaching context, the intended learners, the learning goal, the activity, and the required format.

The work with prompts brought teachers back to decisions they already make when planning a lesson. Before asking AI to produce an activity, a teacher has to decide what pupils should learn and what kind of task might help them learn it. The resulting material then needs to be checked for accuracy, language level, relevance, and suitability for the class. In this sense, prompt writing was tied to pedagogical planning rather than treated as a separate technical skill. This is consistent with concerns raised by Kasneci et al. (2023) and UNESCO (2023): AI-generated responses can be useful, but they require review and should not replace the teacher's judgement.

Other studies have examined how generative AI can assist teachers in preparing learning materials. Xin (2024), for example, explores EFL teachers' use of generative AI to develop reading materials. The present program dealt with a different age group and a more collaborative design process: teachers used prompts while planning early-grade English activities and developing components of a multimodal resource. The available evidence shows that teachers practised and began to apply prompt-writing strategies. It does not include a validated measure that would allow the authors to quantify a change in prompt-engineering competence.

Hypermedia Mission Book as an Instructional Artefact

One tangible outcome of the program was the initial design of a Hypermedia Mission Book for early-grade English learning. Teachers worked on themes, the order of learning

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missions, instructions, and the media to be included. The planned resource brought together written text, illustrations, pronunciation audio, short videos, and interactive activities. AI tools were used as aids when teachers generated or revised illustrations, questions, activity ideas, and wording. The report describes these materials as initial designs that still needed further refinement.

The planned activities were intended to give children more than a list of words to memorize. A mission could, for example, ask pupils to listen to a sound, identify a picture associated with it, connect the sound with a letter or letter pattern, and then try to read a simple word. Such activities relate to phonological awareness and decoding, which are important but distinct parts of early reading. Ehri (2014) discusses how children build connections between spellings and pronunciations as they learn words. The National Reading Panel (2000) also identifies phonemic awareness and phonics instruction as important elements of reading development.

The use of several media formats needs careful planning. Text, pictures, and audio can support one another when they direct children's attention to the same learning point. They can also distract if they are added without a clear purpose. Mayer (2021) argues that multimedia design should help learners select and organize relevant information. For the Mission Book, this means that an audio clip should support listening to a target sound, an illustration should clarify meaning, and an interactive task should give pupils a chance to practise the intended skill. The number of media elements is less important than their relationship to the learning objective.

At the time covered by the report, the Mission Book was still at the initial design stage. The report does not document completed expert validation, systematic usability testing, or classroom trials with pupils. It would therefore be premature to describe the resource as a validated product or to claim that it improved children's phonological awareness or decoding. What can be reported is that teachers began to translate their learning about AI and prompt writing into a subject-specific instructional resource. Product validation and classroom evaluation remain necessary next steps.

Collaborative Learning and the Emerging Professional Learning Community

The program also created opportunities for teachers to learn from one another. Participants shared their experiences with AI tools, showed parts of the materials they were developing, and discussed possible improvements. Teachers who were more comfortable with digital applications could share practical suggestions, while others had time to try the tools with support. The project report records that some teachers who had initially been hesitant became more willing to explore AI for lesson preparation. These observations are drawn from the program's discussion and reflection records; they should not be read as a measured change in confidence.

The collaborative work is consistent with research that regards professional learning as more than attending a workshop. Desimone (2009) provides a framework for examining the design of teacher professional development, and Darling-Hammond et al. (2017) emphasize active learning, collaboration, feedback, and reflection. Asterhan and Lefstein (2024) remind us that the value of these features depends on how they are enacted in a particular setting. In this program, teachers had a shared task to work on and could

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respond to materials that colleagues were actually preparing. This made the discussion closely connected to their classroom responsibilities.

The project report describes the collaboration as a starting point for a professional learning community. That is a reasonable direction, but the available evidence does not yet show whether the collaboration continued after the program. To sustain it, teachers would need further opportunities to try the Mission Book in class, bring examples of pupils' work to meetings, review one another's materials, and revise the activities. Follow-up records would help establish whether the initial exchanges developed into an ongoing professional learning routine.

An Emerging Participatory Model for AI-Supported Teacher Capacity Building

The activities can be understood as a sequence that begins with a problem identified by teachers and moves toward the design of a teaching resource. Teachers first discussed their existing use of AI and the challenges they faced in preparing early English activities. They then explored the capabilities and limitations of generative AI, practised writing and revising prompts, and used the results as a starting point for developing the Mission Book. Peer discussion and reflection ran through the process. The sequence matters because it kept the technology connected to a teaching need rather than making the application itself the focus.

The main contribution of this case is its account of how AI-related professional learning was connected to a concrete instructional task in a primary school. Teachers were not only shown how to access AI tools; they were asked to use them while thinking about learning objectives, pupils' needs, and the design of English activities. The Mission Book provided a shared artefact around which teachers could practise, compare ideas, and give feedback. Further research should examine whether this approach can be sustained and whether it changes the quality of teachers' instructional materials or classroom practice.

Limitations

This study has several limitations. It involved 25 teachers in one school, and the findings are tied to that setting. The available documentation contains narrative summaries but not item-level questionnaire results, full interview transcripts, a systematic rubric for assessing the materials, or pre- and post-program measures of teacher competence. The Mission Book was at an initial design stage and had not yet undergone documented expert validation or classroom testing. The study also did not assess pupils' phonological awareness, decoding, or English achievement. These limitations mean that the findings should be read as a description of a professional learning process and its early outputs, not as evidence of program effectiveness.

Table 2. Component, Learning Focus, Evidence, and Evaluation Step

Component	Professional Learning Focus	Evidence Available	Next Evaluation Step
Needs-led entry	Recognize prior use and instructional challenges	Questionnaire, observation, and discussion with 25 teachers	Report item-level questionnaire results and teacher profiles

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AI literacy and ethics	Understand affordances, limits, and responsible use	Training content and program narrative	Use a validated AI-literacy or scenario-based assessment
Prompt engineering	Specify context, objectives, learner needs, and output; evaluate and revise	Examples/practice described in the program report	Collect prompt versions and score them with a transparent rubric
Artefact design	Create a multimodal Mission Book aligned with early English learning	Initial designs combining text, visuals, audio, video, and interaction	Conduct expert validation and usability testing
Collaboration and reflection	Share strategies, provide feedback, and plan continued learning	Peer discussion and reflective feedback described in the report	Document follow-up meetings and classroom enactment

CONCLUSION

This study examined a professional development program in which 25 teachers at SDN Pandanwangi 3 explored the use of generative AI for preparing early-grade English learning materials. The needs analysis showed that many teachers were familiar with AI applications but mainly used them for information searches, teaching ideas, and question preparation. They wanted further support in writing prompts that reflected learning objectives and pupils' needs, and in developing more interactive English materials.

The program combined AI literacy sessions, prompt-writing practice, guided development of a Hypermedia Mission Book, and opportunities for teachers to share and reflect on their work. Teachers began to use prompts for learning objectives, phonological activities, assessment tasks, and media components. They also prepared initial designs that combined text, illustrations, pronunciation audio, videos, and interactive tasks. These activities suggest that a subject-specific design task can give teachers a practical context in which to examine AI outputs and make decisions about their use.

The findings do not establish that teacher competence or pupil learning improved as a result of the program. The Mission Book also requires further development and validation. Future work should include expert review, usability testing, classroom trials, and systematic assessment of teachers' AI-related instructional design and pupils' learning. Such follow-up would provide a stronger basis for judging the value of the approach.

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