

## From Reactive to Reflective: Pappaseng-AI's Innovation in Crisis Management Digital-Age Students' Metacognition Based on Local Culture

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**Abstract.** The widespread use of generative artificial intelligence (AI) among students has triggered the emergence of an instant-answer culture, which is gradually weakening students' metacognitive abilities. Most students in Indonesia now utilize generative AI in their learning, but few applications are specifically designed to stimulate metacognitive reflection. This situation is further exacerbated by the low integration of local wisdom as a pedagogical approach, particularly in South Sulawesi. This article aims to examine the metacognitive crisis in the use of generative AI, to outline the epistemological values of *Pappaseng* as the basis for a reflective system, and to develop a conceptual framework for Pappaseng-AI as an alternative pedagogical solution based on local culture. The research was conducted using a qualitative approach using the Literature Study and Review (LSR) method. The study results indicate that the values of *Pappaseng*, *amaccang*, *agettengeng*, and *sipakainge* have strong epistemological alignment with components of modern metacognition. Based on this synthesis, Pappaseng-AI was formulated as a five-stage pedagogical framework that reconstructs students' interaction patterns with AI, from simply receiving answers to a process of co-constructing understanding through reflective questioning. The application of this framework is projected to increase metacognitive awareness, strengthen academic self-efficacy, and shape students' epistemic identities that are rooted in local wisdom and remain adaptive to global digital developments.

**Keywords:** Metacognition; Artificial Intelligence; *Pappaseng*; Instant Answer Culture; ChatGPT.



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### INTRODUCTION

The digital era has fundamentally changed the way the younger generation acquires and understands information. The advent of generative AI like ChatGPT and Gemini has given rise to the phenomenon of instant answer culture, a tendency among students to prefer instant answers over in-depth thought processes. This phenomenon not only reflects changes in learning habits but also indicates a cognitive shift that has the potential to weaken students' metacognitive capacity. Gerlich (2025) found a significant negative correlation between the frequency of AI use and critical thinking skills, mediated by increased cognitive offloading, the

tendency to delegate thinking processes to external systems. At the global level, this impact has been empirically measured. Fan et al. (2024) found that the use of generative AI like ChatGPT encourages students to become dependent on technology and triggers what they call metacognitive laziness, a condition in which students stop actively reflecting on and regulating their own learning processes. Metacognitive awareness itself refers to an individual's ability to actively monitor and control their thinking processes, a capacity that is increasingly eroded when students habitually hand over the entire reasoning process to machines. A UNESCO report (2023) asserts that the integration of

AI in education without an adequate pedagogical framework risks widening the gap in higher-order thinking competencies among students. In line with this, Bauer et al. (2025) in their critical review in Educational Psychology Review asserted that the implementation of AI in education tends to result in shallow learning, where the orientation toward efficient task completion actually distorts the pedagogical goal of encouraging reflection and deep understanding.

A similar situation is also evident in Indonesia. The high rate of adoption of generative AI among students is not matched by adequate pedagogical preparedness. PISA 2022 data ranks Indonesia 68th out of 79 countries in critical thinking and complex problem-solving skills (OECD, 2023). Research by Ainaya and Saragih (2025) on students at Medan State University found that 40.3% of respondents copied ideas from AI without further development, while 54.8% of students were not accustomed to independently seeking learning resources. These findings indicate that the problem lies not simply in the use of technology, but rather in the absence of mentoring that encourages students to remain active and critical thinkers.

In the context of South Sulawesi, the widespread use of AI has triggered a dependency that significantly reduces students' critical thinking skills because they tend to skip the in-depth analysis process (Sahabuddin et al., 2025). This has resulted in scientific work losing its "authenticity, depth of analysis, and interconnectedness of ideas" due to the unwise use of technology (Rahman et al., 2025). This gap between the high use of AI and the low level of reflective thinking demonstrates the need for a more contextual, alternative approach. As a solution, the local wisdom of *Pappaseng*, through the principle of *Pikkiri' manengngi, na gaukengnge* ("Think about everything, then do it"), offers a highly relevant reflective framework for filtering digital information (Rosvita et al., 2025). Therefore, integrating local values such as honesty (*lempu'*) into the curriculum is key to ensuring that the use of AI remains based on academic integrity and students' independent thinking skills.

The urgency of this research is based on the gap between the high use of AI, which erodes independent thinking skills, and the unoptimized value of *Pappaseng* as an instrument for strengthening reflective character. students. Fan et al. (2025) found that using ChatGPT without proper guidance leads to metacognitive laziness, a condition in which students completely transfer their cognitive evaluation and monitoring processes to the AI, thereby losing their ability to self-regulate. Based on

this reality, this article explores PAPPASENG-AI: a pedagogical framework that integrates Pappaseng's values into the design of interactions between students and AI. This approach aims to shift the paradigm from simply consuming answers to conscious and meaningful co-construction of understanding.

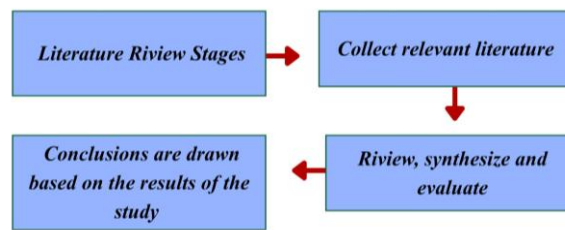
Therefore, this study aims to: (1) analyze the phenomenon of metacognitive crisis in the context of generative AI use; (2) describe relevant Pappaseng epistemological values as the foundation of reflective systems; (3) formulate the concept and operational mechanisms of PAPPASENG-AI; and (4) describe the expected impact of implementing this system in shifting the learning paradigm from a focus on quick results to a conscious and meaningful process.

## METHOD

This research uses a qualitative approach with a literature review. This approach aims to collect, process, identify, summarize, synthesize, and evaluate various previous research results relevant to the study topic (Agus et al., 2023). In its implementation, this research applies a literature review method, which focuses on collecting and analyzing data sourced from various sources such as books, scientific journals, articles, and other related documents to gain a comprehensive understanding of the problem under study (Adlini et al., 2022).

This method was chosen based on the consideration that LSR allows researchers to build strong conceptual arguments by utilizing available empirical evidence, without the need for direct primary data collection. Furthermore, a qualitative approach was chosen because the purpose of this research is interpretive and conceptual, namely to deeply understand the phenomenon of the metacognitive crisis, map *Pappaseng's* epistemological values, and formulate a PAPPASENG-AI pedagogical framework through a synthesis of various relevant research findings (Creswell & Poth, 2018).

The research stages using the literature review method include several steps. First, collect relevant literature from various sources, such as Google Scholar and credible online media articles, using the keywords "Metacognition," "Artificial Intelligence," *Pappaseng*," "Instant Answer Culture," and "Reflective Learning." Second, review, synthesize, and evaluate the selected literature (how many articles). Third, draw conclusions from the study results. The literature review research procedure can be visualized in the following diagram.



**Figure 1.** Stages of Literature Review

## RESULTS AND DISCUSSIONS

A total of 24 sources were reviewed related to this research topic. Of these, 8 sources were selected and paraphrased and presented in Table 1 as the primary references in the analysis.

**Table 1.** Literature Review Results

No	Author	Year	Titel	Result
1.	Fan, Y., Tang, L., Le, H., et al.	2025	Beware of metacognitive laziness: Effects of generative artificial intelligence on learning motivation, processes, and performance	The use of generative AI without guidance encourages metacognitive laziness, where students hand over the cognitive evaluation process to AI, thereby losing the ability to self-regulate in learning.
2.	Gerlich, M.	2025	AI tools in society: Impacts on cognitive offloading and the future of critical thinking	There is a significant negative correlation between frequency of AI use and critical thinking abilities, mediated by increased cognitive offloading.
3.	Bauer, E., Greiff, S., Graesser, A. C., Scheiter, K., & Sailer, M.	2025	Looking beyond the hype: Understanding the effects of AI on learning	Implementing AI without an adequate pedagogical framework results in shallow learning, where efficiency shifts learning goals that should be reflective.
4.	Fakour, H., & Imani, M.	2025	Socratic wisdom in the age of AI: a comparative study of ChatGPT and human tutors in enhancing critical thinking skills	The Socratic questioning approach through AI is effective in increasing student reflection, self-correction and internalization of understanding.
5.	Ilham & Rahman	2024	Character education of local wisdom-based: A study of moral aspect of quotes belong to Bugis people	<i>Pappaseng Bugis</i> has great potential in digital character education, but has not yet been operationalized pedagogically in formal learning.
6.	Flavell, J. H.	1979	Metacognition and cognitive monitoring	Metacognition is the ability to monitor and evaluate thought processes; this ability weakens when students stop reflecting on their own understanding.
7.	Guo, L..	2022	Using metacognitive prompts to enhance self-regulated learning and learning outcomes: A meta-analysis of experimental studies in computer-based learning environments	Metacognitive prompting intervention significantly increases self-regulated learning.
8.	Vygotsky, L. S.	1978	Mind in Society: The Development of Higher Psychological Processes	Internalization occurs through a shift from external regulation to internal regulation, becoming the theoretical basis for the use of AI in reflective learning.

## Discussions

### Problem Statement: The Metacognitive Crisis as a Measurable Educational Crisis

The term "crisis" in the context of digital-era metacognition is not merely academic rhetoric; it has empirical weight that can be measured, detailed, and mapped systematically. Declaring that students are "experiencing a metacognitive crisis" without explaining its concrete manifestations is like diagnosing a disease without addressing its symptoms. Therefore, it is important to identify at least three key indicators that are clinical signs of this crisis in everyday learning practices.

The first indicator is premature closure of inquiry, namely the tendency of students to become satisfied and stop thinking once an answer appears on the screen, without questioning its validity, depth, or relevance. This behavior is not simply individual cognitive laziness, but rather an adaptive response to the design of AI systems, which are designed to produce answers quickly and seemingly comprehensively (Stadler et al., 2024, cited in Fan et al., 2025). When answers are presented convincingly with a neat structure, technical terms, and an authoritative tone, students tend to readily accept them as "sufficient." This aligns with Kahneman's (2011) concept of the dominance of System 1, a fast, intuitive, and effortless thinking pattern, compared to System 2, which is slower, analytical, and reflective. In this context, generative AI tends to encourage students to rely on System 1, thereby reducing engagement in deeper thinking processes.

A second indicator is the absence of critical verification: students fail to check the accuracy of information obtained from AI, trace its original source, and compare it with other perspectives. This phenomenon is more dangerous than mere inaccuracy because it reflects the breakdown of the monitoring and evaluating components within Flavell's (1979) metacognitive framework. When students no longer feel the need to monitor the quality of their own understanding, the learning process loses its reflective dimension and becomes merely a one-way transfer of information. Gerlich (2025) found that the more frequently a person uses AI, the more their critical thinking skills decline. This pattern is found consistently across different age groups and educational backgrounds, suggesting that this is not a unique phenomenon, but rather a widespread problem.

The third and most fundamental indicator is a lack of understanding of the process: students may produce products (essays, reports, answers to questions) that appear to be of high quality on the surface, but fail to explain why an argument is constructed, how a conclusion is drawn, or what they still don't understand about the topic.

This is known as the illusion of competence, a condition in which students feel they understand

something when they actually only have access to a superficial representation of that knowledge (Dunning & Kruger, 1999). These three indicators are exacerbated by three structural factors: (1) information overload, which overwhelms students' cognitive processing capacity, encouraging them to resort to mental shortcuts; (2) an instant culture that socially validates speed as a measure of intelligence, not depth of thought; and (3) the unreflective use of AI positioning technology as an end in itself, rather than as a means to a richer understanding. These three factors interact synergistically and reinforce each other, forming a cognitive ecosystem that actively inhibits the development of metacognition.

### Critique of the Paradigm of AI Use in Learning

It would be a serious intellectual error to position generative AI as inherently harmful to education. Technology, by its very nature, is neutral; it has no inherent pedagogical agenda, does not favor laziness or perseverance, and does not automatically undermine or build a person's thinking capacity. What is truly problematic is the paradigm of its use in learning contexts: AI is currently positioned and used primarily as an answering machine, not as a thinking tool. This distinction is not merely a play on words; it touches on the very core of how learning interactions are designed and what is expected to occur in students' cognition during those interactions.

The "as long as the answer is there" paradigm contains at least two fundamental epistemological errors. First, it assumes that the end product (the answer) is more valuable than the process of constructing understanding itself, when in fact, it is precisely in this process that true competence is built, tested, and consolidated. Second, this paradigm reduces the function of education to merely transferring information, rather than developing adaptive and sustainable thinking capacity. Research by Kang and Ahn (2025) explicitly asserts that AI acting as an all-knowing oracle is contradictory and becomes a barrier to authentic learning, because it eliminates uncertainty, and it is precisely from this uncertainty that critical and reflective thinking processes truly arise. Conversely, when AI is designed to respond to students not with answers but with follow-up questions, when it encourages elaboration rather than replacing it, its transformative potential as a learning agent reaches its peak (Clark et al., 2025). This critique is not a call to reject AI, but rather an invitation to redesign the way we interact with it, moving from a model of consuming answers to a model of co-constructing understanding. If the primary problem lies in how AI is used, then an approach is needed that can guide these interactions more reflectively. One potential approach comes from local wisdom, namely *Pappaseng*.

## Local Cultural Integration: *Pappaseng* as Reflective Epistemology

If the metacognitive crisis is essentially a crisis of reflection the individual's inability to pause, question, and interpret their own thought processes then the solution must be rooted in traditions that have historically succeeded in cultivating reflection as a lived practice, not merely a academic techniques. This is where *Pappaseng* finds its strongest relevance. As a legacy of Bugis oral and written language, *Pappaseng* is not merely a collection of beautiful proverbs with nostalgic value, but rather a cognitive ethical system that has served for centuries as a guide for individuals in facing decisions, managing uncertainty, and developing wisdom based on reflection on real-life experiences (Abbas, 2013).

The three core values of *Pappaseng* have precise epistemological equivalents with the components of modern metacognition. The value of *amaccang* (scholarship). The urgency of *amaccang* as a mainstream is empirically grounded in a study (Ilham & Rahman 2024), which proves that Bugis *Pappaseng* holds great potential for character education for the digital generation, but has never been operationalized pedagogically. In PAPPASENG-AI, *amaccang* is translated as a design principle that prevents the system from providing a final answer before students ask follow-up questions, transforming AI from an answering machine into a questioning machine that sparks intellectual curiosity. It refers not only to the possession of knowledge, but also to a person's ability to continually question the limits of their knowledge, an attitude that directly aligns with the metacognitive knowledge component in Flavell's framework.

The value of *agetengeng* (reflection-based steadfastness) reflects the ability to maintain a direction of thinking based on careful consideration, rather than simply following the flow of incoming information. This aligns with the self-regulation component of learning. The local wisdom values of South Sulawesi, including *Pappaseng*, are strongly relevant in supporting contextual and meaningful character formation, particularly self-regulation and steadfastness, which are the foundation of in-depth learning. *Agetengeng* in PAPPASENG-AI is operationalized as an encouragement for students to verify each AI output based on their own reasoning, rather than simply accepting it (Saputra et al., 2025). Meanwhile, the value of *sipakainge* (reminding each other for good) embodies the principle of reflective dialogue, which states that true understanding arises not from passively receiving information, but from a process of mutual questioning, correcting, and testing shared understanding. This approach has been successfully operationalized as bibliocounseling content designed in a structured manner to encourage students to engage in the process of mutual

correction, reflection, and internalization of understanding collectively. Within the PAPPASENG-AI framework, this principle serves as the philosophical foundation and operational basis for the reflective prompting mechanism. Through this mechanism, artificial intelligence does not act as an answer provider, but rather as a cognitive facilitator that actively asks provocative questions to encourage students' metacognitive awareness and help them evaluate and reflect on their own thinking processes (Fakour H & Imani M, 2025). This principle is strikingly identical to what modern cognitive psychology calls the Socratic questioning approach, which has proven effective in fostering in-depth reasoning (Paul & Elder, 2019). This congruence is not a historical coincidence; it reflects the fact that human wisdom that endures across generations has always rested on the same principle: thinking needs to be experienced as a process, not consumed as a product. This is the novelty this article offers: bridging rich local epistemologies with the pressing pedagogical needs of the digital age (Rasdia & Hernah, 2024).

## Innovation Concept: PAPPASENG-AI as a Reflective Framework

PAPPASENG-AI is not the name of an application, not merely an academic branding label, nor is it a technology platform requiring special infrastructure. It is a pedagogical framework that redefines how AI should interact with students, based on three operational principles rooted in *Pappaseng*'s values. The first principle is deliberate answer delay: when students ask questions, the AI does not immediately provide an answer, but instead responds with a counter-question designed to activate students' existing knowledge schemas, in line with the spirit of *amaccang*, which encourages students to first explore what they already know before seeking external information. The second principle is step-by-step, reflection-based guidance: the AI guides students through a series of structured thinking steps, from problem identification, assumption testing, exploration of alternative perspectives, to formulating conclusions supported by students' own arguments. This reflects the spirit of *agetengeng*, which values persistence in the process. The third principle is meaningful dialogue based on local values: AI occasionally presents analogies or advice from the *Pappaseng* tradition as a bridge between students' cultural experiences and the academic concepts being studied, in line with the spirit of *sipakainge*, which utilizes experience-based advice as a medium for transmitting wisdom. With these three principles, PAPPASENG-AI positions AI not as a source of knowledge, but as a thinking partner that actively strengthens the learner's reflective capacity (Ranieri & Biagini, 2025).

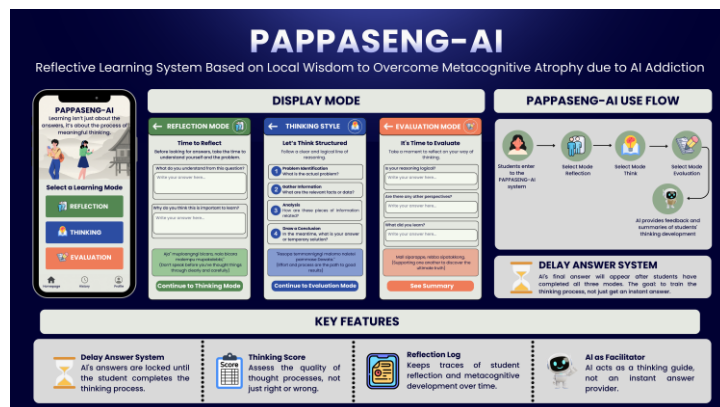


Figure 2. PAPPASENG-AI Prototype

### PAPPASENG-AI Implementation Mechanism

A pedagogical framework is only meaningful if it can be operationalized. PAPPASENG-AI describes an interaction cycle consisting of five sequential and interdependent phases. The first phase is activating prior knowledge: when students ask questions, the AI responds not by answering but by asking back questions, for example, "Before we discuss this further, what do you already know about this topic? Try explaining it in your own words." This step intentionally activates existing cognitive schemas while helping students recognize the limits of their actual knowledge.

The second phase is Pappaseng anchoring: the AI presents a piece of advice or analogy from Bugis tradition that is relevant to the context of the student's question as a conceptual anchor. As an illustration, when students ask about how to make decisions in complex situations, AI can present the principle "*Aja muanggih gau' marapekna, aja muisseng aga narekko tania gau' madeceng*" (don't do something that feels right if you're not sure it's right) as a starting point for reflection, then connect it to relevant academic concepts. This approach is rooted in the principle of culturally responsive teaching, which asserts that the most effective learning occurs when academic content is connected to students' existing frameworks of meaning (Gay, 2018).

The third phase is guided elaboration: AI provides information or concepts gradually rather than all at once, while periodically asking students to explain in their own words what they have just understood. This technique is known in the literature as a generative learning approach that encourages students to actively construct mental representations of the material being learned (Fiorella & Mayer, 2016). The fourth phase is metacognitive prompting: the AI explicitly asks questions that lead students to reflect on their own thinking processes, such as "How did you come to that conclusion?", "What makes you doubt it?", or "If you had to explain this to a friend, where would you start?" These types of questions have been shown to significantly improve

metacognitive awareness and the quality of self-regulated learning (Guo, 2022; Xu, 2025). The fifth phase is evaluative closure: at the end of the session, the AI encourages students to summarize what they have learned, identify what they still don't understand, and plan their next steps independently. These five phases operate in an integrated flow, making each interaction session with the AI not just a question-and-answer session, but a structured, iterative, and cumulative reflection exercise.

### Expected Impact: From Quick Results to Conscious Processes

The consistent implementation of PAPPASENG-AI is projected to produce a multi-level paradigmatic shift affecting the cognitive, affective, and cultural dimensions of students' learning experiences. On the cognitive dimension, the most direct impact is increased metacognitive awareness, the ability of students to actively monitor, regulate, and evaluate their own thinking processes. As students become accustomed to being confronted with structured reflective questions, they gradually internalize these patterns and begin to apply them independently, even outside the context of interactions with AI. This is what Vygotsky (1978) called the internalization process the transfer of function from external regulation (AI guidance) to internal regulation (student self-awareness). Guo's (2022) meta-analysis of 47 experimental studies confirmed that metacognitive prompting-based interventions resulted in significant improvements in self-regulated learning abilities, with an average effect size of  $d = 0.68$ , a substantial effect size in the context of educational interventions.

On the affective dimension, PAPPASENG-AI is projected to rebuild students' intellectual self-confidence, an impact no less significant than cognitive enhancement. One hidden consequence of relying on AI is a weakening of academic self-efficacy: when students become accustomed to externally obtaining answers, they gradually lose confidence in their ability to generate valuable thinking on their own (Amelia et al., 2024).

PAPPASENG-AI reverses this dynamic by consistently positioning students as active subjects whose thinking is valued, questioned, and developed, rather than simply passive recipients of AI-generated information. Through repeated experiences of successfully constructing arguments, validating assumptions, and drawing conclusions independently with guidance, rather than being handed over, students slowly rebuild their confidence in their own thinking capacity.

From a cultural perspective, the expected impact is the development of epistemic awareness among students that the local wisdom they have inherited is not obsolete or irrelevant in the digital age, but rather a foundation for thinking that can provide direction in facing the complexities of the technological era. By integrating Pappaseng into everyday interactions with AI, PAPPASENG-AI has the potential to foster what can be called a glocal epistemic identity—an intellectual identity that is simultaneously grounded in local cultural richness and capable of competently navigating the global knowledge landscape. Ultimately, the most fundamental shift that PAPPASENG-AI seeks is a shift from a “quick results” orientation to a “conscious process” orientation: from learning as an activity of finding answers to learning as an activity of building understanding—a shift that will not only produce more competent learners, but also more reflective, wiser, and more independent individuals in facing a constantly changing world.

## CONCLUSION

The metacognitive crisis affecting students in the era of generative AI is not simply a technological issue; it reflects a paradigm crisis: how we define learning, what we value in the educational process, and to whom or to what we delegate responsibility for thinking. When students become accustomed to accepting answers without asking questions, accepting certainty without embracing uncertainty, and producing products without understanding the process, what is truly lost is not only academic competence but also the capacity to be autonomous and reflective thinkers.

This article has shown that the response to this crisis does not always have to come from outside, from more advanced technology or from stricter policies. Sometimes, the answer lies within a long-standing legacy that has not yet been fully addressed. Pappaseng, as a system of ancestral Bugis cognitive ethics, offers more than just moral advice; it offers a perspective: that thinking is a responsibility, that wisdom is born from reflection, not from quick responses, and that intelligent humans are those who know the limits of their own knowledge. PAPPASENG-AI is not presented as a rejection of AI, but rather as an effort to mature our relationship with it. By positioning AI not as an

answering oracle, but as a thinking partner, asking layered, reflective questions inspired by the wisdom of the system, the Pappaseng system opens up the possibility that current technology and the oldest heritage can work hand in hand towards the same goal: developing humans who are able to think, feel, and act consciously.

Of course, this idea is still conceptual and requires further empirical testing through experimental studies, system prototype development, and user acceptance studies in the field. It is hoped that further research will be able to design valid measurement instruments to assess the improvement of students' metacognitive capacity within the PAPPASENG-AI ecosystem, explore its adaptability across educational levels, and investigate the potential for integration with other local wisdoms from the Indonesian archipelago that share similar epistemological alignments. Thus, PAPPASENG-AI is not simply an idea born out of anxiety over the education crisis; it is an open invitation for educators, researchers, technology developers, and policymakers to collectively rethink: what kind of education do we want in this fast-paced era?

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