

# The Integration of Artificial Intelligence (AI) into Development of Javanese Language Instructional Material: Analysis of Teachers' Strategies and Practices

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## Abstract

The rapid development of Artificial Intelligence (AI) has expanded its potential use in education while generating pedagogical and ethical challenges, particularly in locality-based learning. Despite continuous studies on AI in education, research exploring how teachers utilize AI to develop instructional materials while maintaining local language and cultural characteristics remains limited. This research explores Javanese language teachers' perspectives on their strategies, challenges, and practices in utilizing AI to design instructional materials. Using a qualitative method, this study employed in-depth interviews with seven Javanese language teachers experienced in using AI for instructional material design. Data analysis revealed three main findings. First, teachers utilized AI to identify students' needs and materials, enhance content, and draft initial instructional materials. Second, AI implementation faced challenges, including teachers' limited digital competency, the time required for validation, AI's limitations in representing Javanese linguistic and cultural characteristics contextually, and uncertainty regarding the validity of information sources produced. Third, teachers developed adaptive strategies by positioning AI as a supporting partner rather than a pedagogical decision maker, improving professional competency in AI use, and conducting critical evaluation, verification, and triangulation of AI outputs before implementation. These findings expand the literature on AI integration in education by demonstrating its potential to support locality-based instructional material design when accompanied by strong pedagogical supervision and adequate teacher competency. The study highlights the importance of strengthening teachers' AI literacy and developing AI systems sensitive to local linguistic and cultural contexts to support contextual, inclusive, and meaningful learning.

## 1. Introduction

The advent of artificial intelligence (AI) and its rapid development have brought significant change into various fields (Nyholm & Rüther, 2023; Pinski & Benlian, 2024; Thompson et al., 2025). Particularly in educational field, AI is able to expand the accessibility of learning source information, better learning experience, and instructional material design, help learning administration, prepare test, and improve learning practice (Bettayeb et al., 2024; Mulyani et al., 2025; Netland et al., 2025; Ng et al., 2025; Pesovski et al., 2024). In addition, AI is also able to minimize human error such as writing, learning plan, and assessment errors (Almuhanna, 2024; Giray, 2024). Even, we have recently discover the presence of AI that can replace examiner in interview activity for practice (Caccavale et al., 2025). This technology sophistication offers innovative chance to improve learning process through adaptive system, smart effective efficient tutor, and automatic learning content development according to the students' needs (Tafazoli, 2024; Ulla et al., 2023).

AI has been admitted to have great potential to promote language learning domain through its sophistication and capability to adapt to the learners' individual needs (Mohebbi, 2025; Roll & Wylie, 2016). AI gives new nuance through its sophistication in helping educators design personalized learning system tailored to the students' needs (Almuhanna, 2025). Designing process can be carried out through result of analysis on student data, such as result of test, task completion duration, learning process, and their interaction with the learning (Mhlanga, 2022; Prasetya et al., 2025; Strielkowski et al., 2024; Zheng et al., 2023). This is highly promising for language learning to revive transformatively and to trigger new era in an innovative, directed, and highly expedient for learners (Alhusaiyan, 2025; Peña-Acuña & Durão, 2024). This development opens new opportunity in technology integration in both global and local language learning (Son et al., 2025; Yuen &

Schlote, 2024). Therefore, AI becomes important and needs to be integrated into learning, one of which is Javanese Language learning in Indonesia to design instructional material.

Javanese language, as one of local languages with the largest number of speakers in Indonesia, plays a strategic role not merely as a communication medium but also as a medium to articulate social and cultural values of its speech community (Yulianto et al., 2023; Zustiyanoro, 2024). Linguistically, this language has high complexity level, particularly through speech level system including *ngoko* (informal or casual register used for everyday communication among close friends, family members, peers, and people of the same age) and *krama* (high, formal, and polite register used when speaking to elders, superiors, or strangers to show respect) as reflection of social relation, politeness norm, and hierarchical structure in communication practice (Prayoga et al., 2026; Said, 2025; Zanah & Purnomo, 2025). The complexity indicates that Javanese language master cannot be limited to merely structural linguistic aspect but also required pragmatic and cultural competency to allow for the use of language appropriately, adaptively, and contextually (Agung et al., 2024; Jauhari, 2024; Sari et al., 2022). In the learning context, this demand presents significant challenges for teachers.

Teachers encounters obstacles in designing learning strategy capable to integrate linguistic dimension with social-cultural context effectively (Pusparani et al., 2017; Ramadhansyah et al., 2022). This is exacerbated by limited quantity of instructional materials representing language use authentically and contextually (Anggraini et al., 2025; Rahadini et al., 2022; Supriyono et al., 2018). The challenges are corroborated by social dynamic in modern civilization, where the frequency of Javanese language use in daily communication tends to lower among students (Aristiyanto et al., 2023; Bashori, 2026; Supeni & Saddhono, 2013). Civilization transformation marked with digital technology acceleration requires educational system to adapt to technology-based learning environment (Gill et al., 2024; Rohman et al., 2023).

A number of recent studies verified that the use of AI for designing instructional materials has developed significantly as it is able to adapt to the learners' need more comprehensively (Huang et al., 2023; Li et al., 2025; Ouyang et al., 2023; Park et al., 2023; Preiksaitis & Rose, 2023; Rad & Roohani, 2026; Rakuasa, 2023; Syahrizal et al., 2024). Instructional materials designed with AI help lead to smart tutorial system, adaptive learning, and data-based instructional material development capable to adapt to the learners' individual needs (Baillifard et al., 2025; Chen et al., 2022; Kabudi et al., 2021; Margono et al., 2024; Woodruff, 2024). Although AI is able to help teachers design various adaptive, smart, and automatic instructional materials successfully dealing with learning challenges in modern era through students' individual experience, the implementation of AI is still inhibited by various problems related dependence, ethics, privacy and impact on cognitive aspect (Akgun & Greenhow, 2021; Klimova et al., 2023; Morales-García et al., 2024; Rahm & Rahm-Skågeby, 2023). On the other hand, teachers still requires skills, expertise, and adequate facilities and infrastructures to be able to adopt AI effectively in supporting instructional material design. Therefore, further expansive investigation is needed into teachers' perspective on AI's contribution to creating instructional materials meeting ethical standard, global demand, and effectiveness to improve students' achievement (Aluko et al., 2026; Pesovski et al., 2024; Tasdelen & Bodemer, 2025; Tsai et al., 2023).

Artificial intelligence (AI) has become a fundamental innovation increasingly integrated into various aspects of daily life, including education (Laupichler et al., 2022; Mintz & Brodie, 2019). Although AI is defined differently across the literature (Cox & Mazumdar, 2022), it generally refers to technologies capable of simulating human cognitive processes through data processing, machine learning, and algorithmic principles (Chassignol et al., 2018; Gignac & Szodorai, 2024; Katsantonis & Katsantonis, 2024), enabling machines to imitate human sensory and cognitive abilities (Kühl et al., 2022; Stolpe & Hallström, 2024). In education, AI supports academic guidance, content delivery, collaborative learning, instructional material design, assessment, and evaluation, making learning more adaptive, student-centered, and efficient (Hanshaw & Sullivan, 2025; Kamalov et al., 2023; Labadze et al., 2023; Luo et al., 2025; Meng et al., 2025; Ouyang & Jiao, 2021; Shao et al., 2025; Song et al., 2022; Tran et al., 2025; Wang, 2025). AI also promotes innovative pedagogical approaches, enhances collaboration between teachers and technology, personalizes learning, supports students' critical thinking and confidence, automates administrative tasks, provides real-time learning analytics, and facilitates project-based, hybrid, and collaborative learning environments (Arrooqi & Alruqi, 2025; Baillifard et al., 2025; Ezzaim et al., 2025; Fakour & Imani, 2025; Järvelä, 2015; Madanchian et al., 2025; Ngwu et al., 2026; Pahi et al., 2024; Rapaka et al., 2025; Reddy et al., 2002; Samsudin, 2025; Walter, 2024; Zhong & Zhao, 2025).

Despite these benefits, AI implementation also presents significant pedagogical and ethical challenges. Concerns include academic integrity, originality, information validity, privacy, and security (Lee, 2026), particularly because AI-generated outputs, such as synthetic voice, can closely resemble authentic human performance (Jaggy et al., 2025), raising questions about assessment validity (Carobene et al., 2024; Mazzi, 2024). While AI can strengthen academic credibility by reducing plagiarism (Fitria, 2021), its effective use requires adequate AI literacy, teacher training, and careful selection of appropriate tools (Aljemely, 2024; Dai et al., 2024; Lademann et al., 2026). Excessive dependence on AI may also reduce students' creativity, critical thinking, and cognitive development, while unequal access and limited funding remain major barriers (Cai et al., 2024; Linde et al., 2025; Wang et al., 2024). At the same time, AI supports teachers through automated content

generation, assessment, feedback, and personalized learning management (Candal-Pedreira et al., 2023; ElSayary et al., 2025; Segooa et al., 2025). Therefore, responsible AI implementation requires attention to ethics, privacy protection, bias mitigation, and human oversight to maximize its educational benefits while minimizing potential risks (Aal, 2025; Shoukat et al., 2024).

This study investigates the Javanese language teachers' perspective on AI use in preparing instructional material in Javanese language learning. Contribution given is the exploration of teachers' strategies having impact on pedagogy, integrity, technology adoption, enthusiasm in designing instructional material of Javanese language to improve learning process. The primary objective to be achieved is to investigate how the Javanese language teachers' perspective on AI support in creating instructional materials that is able to meet the students' needs in global demand era. Therefore, the research questions posed are as follows: (1) RQ1: What are recent strategies used by Javanese language teachers in involving AI in designing instructional materials of Javanese language capable to meet students' needs in global demand era? (2) RQ2: What are latest challenges encountered by Javanese language teachers in involving AI in designing instructional materials of Javanese language capable to meet students' needs in global demand era? (3) RQ3: What are comprehensive practices carried out by teachers capable to deal with the latest challenges?

## 2. Method

### 2.1. Research Design

This research used a qualitative research to achieve its objective. A qualitative research examines an individual's perception and belief on a phenomenon, and thereby allows for an in-depth understanding of participants' experience and gets meaning from their testimony (Merriam & Grenier, 2019). Recalling the research focuses on the causality of a phenomenon, an interpretative qualitative method was also used through semi-structured interview. This was intended to acquire comprehensive information about Javanese language teachers' experience with using AI in the learning.

### 2.2. Research Participants

Invitations for participation were distributed to 20 Javanese Language teachers in two provinces teaching in senior high schools via WhatsApp or email. To the invitations, information was attached on research objective, experience with using AI in learning, procedure, potential risk, privacy guarantee, anonymity, voluntary characteristic of their participation, and right to withdraw without any consequence. Seven teachers were found responding to and confirming their availability to be participants and to share their experience. They were two teachers with master degree and the rests with bachelor and professional teacher degree, aged between 35 and 45 years. The teachers participating had more than 5 (five)-year teaching experience and had used AI in the learning at least in the last two years. The assignment of participants was intended to ensure that they have rich experience and detailed perception on the use of AI technology and the information acquired from the teachers is not only theory but also real application in Javanese Language learning and information received has been validated comprehensively.

### 2.3. Protocol of Data Collection

Data collection was performed through semi-structured interview to acquire accurate in-depth information from individuals concerning their score, confidence, and experience (Dolczewski 2022). Interview became an effective method in conceptualizing in-depth and understanding broadly teachers' strategies, challenges, and practices in using AI during learning process, thereby providing broader understanding. This interview technique holds significant potential to acquire information from participants concerning their experience with using AI in the learning, including in the aspects of strategy, challenge, and practice. The interview process was executed in two methods: face-to-face and through video call, due to the substantial distance between participants and interviewers. The interview lasted approximately 60 minutes. Three main questions were posed in accordance with research question and some additional questions would be posed if the data obtained has not been sufficient. The participants were also re-informed about research objective and its process before interview. Information about voluntary participation, data security and privacy, and anonymity were also delivered. Therefore, the name of participants was disguised to protect their identity.

### 2.4. Data Analysis

Data analysis was performed following Almuhanha (2025), suggesting an inductive approach with manual analysis in accordance with research question. Inductive approach was performed by reading information from participants comprehensively, coding, and constructing through organization and finding to get answer for research question (Azungah 2018). As explained by Vears and Gillam (2022), five steps were performed. Firstly, reading and comprehending data obtained from participants repeatedly. Secondly, the process was followed with first-stage coding by identifying and labeling parts of text according to broad content category relevant to research question. In this stage, labeling was performed related to recent strategies, challenges, and practices done by teachers. Thirdly, second-stage coding was performed by the researcher through observing in more

detail each part having been coded in the first stage to find information more specific as subcategory. After data coded in subcategory, comparison and refinement were performed to ensure whether information share commonalities or must stand independently to obtain data's distinctiveness and meaningfulness. Finally, the researcher synthesized and interpreted data to give rich answer to the research question that is also practically relevant to the research context.

### 3. Results and Discussion

#### 3.1. Results

##### 3.1.1. Javanese Language Teachers' Recent Strategies in Involving AI to Design Instructional Material in Accordance with Global Demand

Teachers conveyed diverse view on various recent strategies in involving Artificial Intelligence (AI) to design instructional material for Javanese Language responsive to global demand. Winasis, Nugroho, and Diah, for example, explained strategies they used, i.e. utilizing AI to identify the students' learning need and global demand to enable teachers to design a contextual, innovative, and adaptive instructional material for Javanese Language and to adjust its content with civilization development. In addition, teachers can use AI to enhance contents of Javanese Language learning, integrate it into global dynamics, and present it in interesting way stimulating students' activeness in thinking critically and creatively. This strategy is considered important to keep the teachers' instructional materials developing, adaptive, relevant, quality, and fulfilling the students' need according to global demand. Their explanation can be seen in the citation below.

"Strategy of utilizing AI to design instructional material for Javanese language in accordance with global demand can start with utilizing it to identify students' learning needs and global demand appearing. This will be a basis for designing contextual, innovative, and adaptive instructional material for Javanese language in accordance with civilization development ... (Winasis)."

"Recent strategy applied in utilizing AI to design Javanese Language instructional material in accordance with global demand is to enhance content of instructional material designed and to connect it with global dynamic existing. AI also can help teachers present the instructional material in creative and innovative manner, stimulating the students' critical and creative thinking ... (Nugroho)."

"Strategy the teachers can use in using AI to design Javanese Language instructional material in accordance with global demand is to design instructional material content based on students' identified needs. Additionally, AI can help deliver the learning content in innovative and adaptive manner relevant to the present learning ... (Diah)."

Using this strategy, students have great potential to acquire knowledge on Javanese language integrated into global development so that they can implement it in real life. Innovative, attractive, and adaptive presentation will encourage students' interest and increase their curiosity and enthusiasm to explore Javanese Language learning still relevant to modern civilization.

Another strategy applied by teachers in involving AI to design Javanese Language instructional material in accordance with global demand is the development of differentiated inclusive instructional material. Sometimes, there are some students with disabilities in a school. Teachers can use AI to design instructional material for students with disabilities. Mira, for instance, revealed that there is blind student in her class needing instructional material format different from her normal counterparts need. IA was really helped with AI in designing audio-based instructional material by integrating voice feature. This strategy facilitates the blind students optimally to receive the material delivered. For example, in learning *unggah-ungguh basa Jawa* (Javanese speech etiquette), audio helps students comprehend appropriate vocabulary in accordance with communication context.

The third finding reveals that teachers' strategy is to utilize AI for evaluating and refining Javanese Language instructional material sustainably. This strategy puts AI not only as aid to design instructional material, but also as a means of guaranteeing its quality. Two teachers explained that evaluation performed included the suitability of language for students' level, the alignment of material with learning outcome, readability and clarity of content presentation, and the alignment of assessment with learning objective and material. Additionally, AI will review whether or not instructional material is still relevant to science development and dynamic global demand. Through its analysis, AI provides assessment and feedback concerning the shortage still existing, so that teachers can recommend refinement and improves quality of material and assessment formulated. The information becomes a basis for teachers to make revision,

refinement, and sustainable innovation so that the instructional material produced will have better quality, relevant to the students' needs, and be able to support student competency development in accordance to modern era demand.

The fourth finding shows that Javanese Language teachers utilize AI to improve students' performance through designing a more interactive contextual instructional material concentrating on students' learning activity. Prakosa, for instance, explained that in the material of Javanese *adat mantu* (wedding custom) procession, AI was used to select factual video not explaining symbolic meaning of each procession explicitly. This was intended to motivate students to design quiz and collaborative activity done in group to identify, analyze, and interpret symbolic meaning contained in the customary procession. This activity requires students to analyze, discuss, and arrange argumentation based on their finding. This strategy evidently improves students' learning participation, critical thinking ability, problem solving skill, and understanding of Javanese language material.

### 3.1.2. Latest Challenges Encountered by Javanese Language Teachers in Involving AI to Design Javanese Language Instructional Material in Accordance with Students' Need and Global Demand

AI evidently contributes significantly to helping teacher solve various problems in both their learning and administrative tasks. However, they encounter many challenges in its implementation. One of the challenges is related to digital competency, time, and resource. Not all teachers have adequate competency to operate various AI tools and integrate them into instructional material design. This process requires not only operational skill, but also ability to craft effective prompt, data literacy, and ability to monitor and evaluate AI output in order to align with learning objective and characteristic. Limitations in understanding system complexity and various AI features can impede productivity and produce less optimum output. Instead of saving time, in the beginning stage of implementation teachers often take longer time to study AI platform, craft appropriate prompt, verify output produced, and make revision in order to align with the learning needs. Additionally, AI utilization also needs adequate resource supports, such as digital devices, stable internet access, relevant AI platform, and opportunity to attend sustainable training. These challenges are getting more complex in Javanese Language learning requiring accuracy in linguistic aspect, appropriate use of *unggah-ungguh basa*, and reinforcement of cultural values contained within it. Therefore, comprehensive and sustainable training accompanied with the provision of adequate resource are urgently needed for Javanese Language teachers to be able to integrate AI effectively in designing instructional materials relevant to students' need and global demand.

Resta, for instance, explained his experience when designing Javanese Language instructional material with dialog topic of *unggah-ungguh basa* between students and teachers. He gave an example when designing instructional material for the material of *crita cekak* (short stories). If the prompt given to AI did not contain details such as theme, language difficulty level, structure of *unggah-ungguh*, cultural values emphasized, the output would not be maximal. Although, the flow is presented coherently, there are many shortages including linguistic aspect: inconsistent *ragam ngoko* or *krama*, the presence of less contextual vocabularies for Junior High School students, and sometimes inappropriate theme. Consequently, a comprehensive verification needs to be performed in order to align with students' learning objective and cognitive level. This is explained as follows.

"A challenge encountered in using AI in designing instructional material is the need for comprehensive understanding of *prompt* and detailing information. Based on my experience in designing Javanese Language instructional material, particularly in the material of short stories, language difficulty level and the presence of cultural value content are not written in detail in AI; therefore the outcome is not maximal. Although the flow of story is logical, there is inappropriateness in the term of language difficulty level, structure of *unggah-ungguh*, and cultural values wanted to be emphasized. I need to perform thorough re-verification to make the instructional material aligned with learning objective and students' cognitive level. This takes a sufficiently long time ... (Resta)."

This is the manifestation of teachers' precision and caution in assessing AI product for learning purpose. Teachers must have adequate competency, be able to manage time efficiently, and be supported with resource. Although AI gives some advantages, a comprehensive review is required to make what is delivered to students appropriate for their needs and learning objective.

The second challenge is that AI has not been able to accommodate the material of Javanese Language learning entirely, particularly the distinctive and contextual ones. Rahajeng and Diah, for example, explained that there are some subject matters in Javanese Language learning, the instructional materials of which are not designed using AI such as *nembang Macapat* (singing *Macapat*) practice. *Tembang Macapat* (Macapat song) learning, particularly *nembang* practice, requires voice, pacing, *cengkok* (melodic ornamentation), intonation, depth of feeling, emotion, and expression, in addition to text and structure that cannot be represented



completely by AI system. Another material includes writing Javanese letters (*aksara*) accurately and contextually. AI is indeed able to display the form of Javanese letter in accordance with instruction given, but complexity aspect involving the rule of writing *pasangan*, *sandhangan*, and type of letter sometimes is not accommodate. For example, the word *lenga* (oil) with “*le*” that must be written using letter “*nga lelet*” written “*la pepet*”. In this case, teachers must play main role in designing instructional material and providing concrete example and principles to be understood. This limitation requires teachers to play active role independently in designing, developing, and modifying instructional material of *tembang Macapat* manually to keep the learning process aligning with learning principle and objective, and capable to generate authentic learning experience for students.

The second challenge found is related to source validation. Generative AI mode usually provides information without enclosing specifically its information source. This limitation becomes a challenge for Javanese Language teachers in designing instructional material. Nugroho, for instance, explained that although AI is capable to create Javanese Language instructional material, its content accuracy and validity cannot be fully accountable for. To illustrate, in designing local cultural text-based instructional material based on locality, AI sometimes does not store locality information as it has not been documented yet. As a result, the manuscript produced even leads to other culture and does not represent characteristic and local wisdom of a certain area. This condition requires teachers to curate and validate content to make the local cultural text used in the learning not only meeting language aspect but also reflecting cultural identity and social context of local community. His explanation is presented below.

“AI, with all of its sophisticated features, is very helpful for teachers to design a contextual instructional material, but some challenges are still encountered in the term of source and content produced. I encountered this phenomenon when I designed text-based instructional material discussing local culture in a certain region. Some information given by AI does not reflect the culture, perhaps because this data has not been documented by AI. The output appearing even took example from other region, thereby less appropriate for the characteristic of local culture. I had to reexamine and to revalidate it to enable the product to actually reflect local wisdom and context of students’ culture ... (Nugroho).”

### 3.1.3. Comprehensive Practices Performed by Teachers to Deal with Latest Challenges Existing

The complexity of challenges encountered by Javanese Language teachers in integrating AI into instructional material design has encouraged the advent of comprehensive practices designed to deal with the constraint. The first practice performed by teachers was to utilize AI as an aid limited to the function of initial draft generator, without putting it as final decision maker in the instructional material design. This practice was performed as the manifestation of teachers’ professional consciousness to maintain the balance between technology utilization and pedagogical control, remaining in the educators’ hands.

Several teachers participating explained that AI should be employed only as assistant to help speed-up the instructional material design including conceptual construction, idea organization, and presentation form. The product produced by AI should be not adopted directly, but through selection, editing, and adjustment processes performed by teachers remaining to hold professional authority based on pedagogical and scientific considerations, so that the instructional material produced meets accuracy, relevance and meaningfulness aspects. This was intended to prevent the role of AI from replacing that of teachers in learning, but to increases their capacity as the designer of reflective and adaptive learning. Thus, technology is positioned to be partner in supporting teachers’ work efficiency without reducing their central role in making educational decision.

Another comprehensive practice performed by teachers is to improve their professional competency by attending training on the utilization of AI in education, including prompt technique. All participants agreed that this training is the teachers’ best practice in developing their competency in order to be adaptive to technology development and global demand. Through this training, teachers acquired in-depth information on AI’s workings, potentials, and limitations in the learning context. In addition, training of prompt technique enables teachers to develop their ability to interact with AI effectively and in directed manner, so that the output of instructional material produced is more precise and keeps aligning with learning objectives, students’ characteristics and pedagogical needs. Thus, practice of attending the training not only focuses on improving technical skill, but also contributes to strengthening teachers’ reflective, critical, and adaptive capacities in utilizing AI ethically, responsibly, and oriented toward humanistic educational principles. Some teachers’ explanations are presented as follows.

“Good practice needing to perform is to attend AI training periodically. I have personally attended AI training, particularly discussing an effective prompt technique. This is needed to enable teachers to understand in-depth how AI works, what its capabilities are, and what its limitations are, so that we can communicate well. Post-training attendance, I have

learned many things about prompt and AI's workings. Now I can produce instructional material more relevant to learning objectives and students' characteristics ... (Winasis)."

"What needs to perform is to attend AI training comprehensively. Through training, teachers can more deeply understand AI as well as its working and how to prepare good and correct prompt. So far, if the prompt is not appropriate, we will not be able to communicate learning objective or students' characteristics. Therefore, training needs to be performed and attended by teachers to improve technical skill, to design instructional material more critically and more creatively, and to make them technology literate ... (Diah)."

The third comprehensive practice performed by teachers to deal with the challenges in integrating AI into designing Javanese Language instructional material is source triangulation. This practice is performed as an epistemological mechanism to guarantee validity, reliability, and credibility of information used in instructional material development. Teachers will perform cross-verification against AI output with academic literature and their knowledge. This is performed because AI output is still potentially biased, less accurate and contextual, and there is a kind of hallucination. Through this practice, teachers are not only passive recipients but also validator, contractor, and final decision maker of instructional material designed by considering pedagogical, disciplinary, and contextual aspects. This also reflects teachers' professionalism in utilizing AI reflectively, ethically, and responsibly.

### 3.2. Discussion

This research shows AI's positive contribution to supporting Javanese Language teachers in designing a contextual instructional material. Although some findings are in line with previous studies' findings, this study also identifies specific aspects to provide more comprehensive information on the role of AI in a local culture-based learning context. Participants involved view AI as a means capable to improve pedagogical quality through supporting more personal learning design, instructional learning material appropriate for students' needs, and administrative task completion. This finding confirms the result of previous studies indicating that AI serves to effectively support teachers in designing and executing more relevant and differentiated learning, developing personalized material, facilitating evaluation and assessment, encouraging collaboration, optimizing time management, and improving teachers' psychological well-being through reducing workload (ElSayary et al., 2025; Omidvar & Meihami, 2025; Palmquist et al., 2026; Reddy & Leelavathi, 2026; Yadav et al., 2026).

This study's main contribution is not only limited to confirming the benefit of AI to teachers in the learning in general but also involves how AI is interpreted in the context of Javanese Language learning with complex linguistic characteristic, culture and local wisdom. Instead of positioning AI as only an aid to produce instructional material automatically, teachers consider it as a pedagogical partner integrated into entire process of designing Javanese language instructional material. This finding enhances the understanding of AI's role in local culture-based learning, i.e. as technology supporting teachers' pedagogical capacity without replacing its professional authority.

As suggested by Tammets and Ley (2023), partnership between teachers and AI leads to positive construction for teachers in making pedagogical decision, facilitates alignment with competency frame, and eventually improves their professional vision. This partnership is actualized through AI use to analyze students' learning needs, to design contextual, differentiated, and inclusive content in line with global demand, and to develop learning activities encouraging critical thinking ability and problem solving. In addition, AI is also utilized as a formative evaluating instrument to review the quality of instructional material sustainably before being implemented in the learning.

Nevertheless, the effectiveness of AI use still relies on teachers' ability to perform critical assessment on the output produced, so that AI needs to be integrated into learning practice reflectively and cautiously to keep pedagogical decision making under teachers' professional control (Law, 2024). Thus, the position of AI as pedagogical partner will enhance teachers' capacity in designing learning without replacing their central role as pedagogical decision makers. As explained by Ramaul et al. (2026), human and AI can build partnership and collaborative relationship to establish joint agency to create beyond-traditional paradigm.

Amid dynamic and global demand, Javanese language teachers have attempted to design instructional material not only rooted in local tradition and wisdom, but also connecting the cultural values with reality of contemporary life through AI help. This finding becomes significant recalling instructional material is one of main instruments determining the quality of pedagogical practice and its successfulness. As explained by Carrete-Marín et al. (2024), instructional material is an important component for teachers in performing pedagogical practice and their teaching success, so that emphasis should be given to its contextuality and relevance. At the same time, local knowledge must be taught continuously because it plays an important role in helping students understand and solving various real problems in daily life, despite its implementation needing

to be aligned with educational characteristics developed and community's ever-changing needs (Dou et al., 2023; Nilsen et al., 2023). In this case, AI provides significant support through its ability to connect various forms of information such as text, idea, image, and other digital representation in integrative manner, thereby helping teachers produce more contextual instructional materials (Moorhouse et al., 2024). In addition, the integration of learning material and artificial intelligence allows for the adaptation to new situation, the reinforcement of critical thinking skill through abstraction process, and the establishment of more comprehensive learning interaction (Chen et al., 2020). Nonetheless, the process remains needing teachers' control and precise validation to maintain the quality of pedagogy. Thus, AI use in this study can be understood as a practice of transforming cultural knowledge into relevant competency for students to face global demand and a strategy of introducing AI literacy through integrating it into other disciplines without removing local culture identity.

Interestingly, although instructional material discussed leads to locality-based learning, teachers' enthusiasm is not reduced to integrate AI into instructional material design. Thus, teachers keep facing challenges in the form of limited digital competency, time and resource, AI's ability not fully capable to accommodate characteristics of Javanese Language material, and the need for validating the accuracy of information source provided. As suggested by Chiu and Chai (2020), many teachers have inadequate experience and knowledge on AI related to their disciplines, thereby worried to generate misinformation. In line with this, Su et al. (2022) explained that most teachers have not gotten formal education concerning AI during their study period so that they have some worries related to the implementation of AI in the class. Consequently, many teachers revealed their worry in implementing AI education in the class.

In contrast to the elaboration above, the finding of current study indicates that teachers respond to the challenges not by refusing AI use but by developing various adaptive strategies. The strategies include utilizing AI as a source of inspiration rather than as final decision maker, participating in various AI-related trainings to improve professional competency, and applying source triangulation as a mechanism of validation to ensure the quality, relevance, and contextuality of Javanese Language instructional materials designed. As explained by Lademann et al. (2026), AI training program among teachers effectively facilitates the integration of AI into educational environment. AI use accompanied with well-established pedagogical belief indicates openness to innovation by maintaining the continuity of pedagogical professionalism (Lan, 2024). This finding indicates that teachers keep positioning themselves as main authority in pedagogical decision making, particularly in harmonizing traditional pedagogical approach with AI use. Solving the systemic constraints is a comprehensive solution to facilitate a smoother integration process. Thus, this study finding provides empirical evidence that assumption about teachers' reluctance in adopting AI is not fully justifiable. On the contrary, teachers demonstrate tendency to integrate AI critically, selectively, and reflectively in line with Timms's (2016) explanation disapproving an assumption that teachers reluctantly use AI because the concern that they will be replaced by technology.

Overall, this study enhances understanding on how AI is utilized by Javanese Language teachers in designing local culture-based instructional materials. The finding indicates that the effectiveness of AI is determined not only by technology's ability in producing content but also by teachers' ability to adapt to, validate, and reinterpret AI output in order to keep aligning with linguistic characteristics, cultural values, and context of Javanese Language learning. The important point existing is that the use of AI in this context is more appropriately understood as a collaborative process strengthening Javanese Language teachers' pedagogical capacity rather than replacing their professional role. Although teachers have developed adaptive strategies to optimize AI use, evaluation, validation, and modification processes repeatedly over the content produces, they still encounter challenges needing very precise resolving practice. This finding also indicates that the implementation of AI in locality learning has not automatically provided result in accordance with instruction because of some aspects perhaps having not been documented yet by AI. In this case, teachers must keep responsible fully for making final decision. This finding all at once opens opportunity for further studies to investigate the most effective strategy in utilizing AI, particularly in locality learning to realize the AI potential more optimally in improving efficiency and quality of pedagogical decision making.

### 3.3. Implications

In terms of implications, the findings of this study suggest that the use of AI in the development of Javanese language teaching materials is best approached as a collaborative process between technology and teachers' expertise. Teachers remain the key decision-makers regarding the relevance, accuracy and suitability of teaching materials in relation to learning objectives and the cultural context of the learners. Therefore, improving AI literacy, the ability to formulate prompts, and the skills to evaluate and verify AI outputs need to form part of teachers' ongoing professional development. On a broader level, AI developers also need to pay greater attention to local languages and cultures so that the resulting technology is not only technically effective but also capable of representing the local context more authentically. Future research could expand the context and number of participants and empirically test the impact of AI integration on the quality of teaching materials and pupils' learning experiences.



### 3.4. Limitations

This study has several limitations that are important to bear in mind when interpreting the findings. The study involved only seven Javanese language teachers who already had experience using AI, consequently, the experiences described may not necessarily represent those of teachers with different backgrounds, school contexts and levels of digital competence. Furthermore, the research data were obtained through interviews; therefore, the findings primarily reflect the teachers' experiences and perceptions rather than directly demonstrating the impact of AI use on the quality of teaching materials or pupils' learning outcomes. Another limitation lies in AI's ability to understand the highly contextual characteristics of the Javanese language. Aspects such as *unggah-ungguh*, the Javanese script, *Macapat* poetry, as well as local cultural values and wisdom, cannot always be accurately represented by AI. Consequently, AI outputs still require review, editing and adaptation by teachers before they can be used in the classroom.

## 4. Conclusion

This study explored teachers' strategies, challenges, and practices in implementing artificial intelligence (AI) to design Javanese language instructional materials. The findings demonstrate that AI is not only relevant for supporting learning in general subjects but also has considerable potential to strengthen the development of locality-based instructional materials. Teachers employed adaptive strategies by critically evaluating, validating, triangulating, and repeatedly refining AI-generated outputs to ensure their accuracy, relevance, and alignment with learning objectives, students' characteristics, and the local cultural context. At the same time, they encountered challenges related to the reliability of AI outputs, the substantial time required for verification and refinement, and the need for stronger competencies in prompt engineering and AI output evaluation. These findings indicate that AI should be positioned as a collaborative partner that supports rather than replaces teachers' professional judgment, with teachers remaining the primary guardians of pedagogical quality through their expertise, pedagogical knowledge, and contextual understanding. Such reflective and responsible AI integration not only improves the quality and authenticity of instructional materials, enhances students' meaningful learning experiences, and reduces constraints in instructional material development, but also reinforces the effectiveness of local wisdom-based learning. Therefore, future research should focus on developing more effective, efficient, and contextual AI-integrated models that provide systematic implementation frameworks and pedagogical recommendations for designing authentic locality-based instructional materials that are responsive to students' needs.

## Author Contributions

All authors contributed equally to this paper. All authors have read and approved the final manuscript.

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## Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## Data Availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Declaration on AI Use

The authors declare that no artificial intelligence (AI) or AI-assisted tools were used in the preparation of this manuscript.

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