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Artificial Intelligence in Arabic Writing Instruction: Exploring Its Role in Students' Writing Practices

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ABSTRACT

This study explored the role of Artificial Intelligence (AI) in *maharah al-kitabah* (Arabic writing) instruction by analyzing the relationship between final Arabic essay products and student writing practices. Employing a mixed-methods design, the study involved 56 third-semester undergraduate students in the Arabic Language Education program at IAIN Parepare. Data were gathered through analytic rubric evaluations of essay assignments and process tracking of student-AI interaction logs. Findings revealed an overall good writing performance (Mean=79.8), but highlighted a structural asymmetry between technical correctness, writing mechanics (85.0), vocabulary use (84.5), and grammatical accuracy (82.0), and conceptual depth in idea development (71.2). Process analysis identified four interaction patterns: AI as language support (39.3%), idea support (25.0%), revision support (21.4%), and text generator (14.3%). Superior outcomes were achieved when students utilized AI as a strategic scaffolding tool for linguistic refining and selective editing rather than passive text generation. The study concludes that while AI effectively scaffolds surface linguistic features within students' Zone of Proximal Development, unguided text generation leads to cognitive offloading and diminishes conceptual depth. Pedagogically, higher education Arabic writing instruction should integrate structured prompt literacy and process-oriented assessments to foster critical human agency alongside AI tools.

Keywords: Artificial Intelligence; Mahārah Al-Kitabah; Arabic Writing Practices; Second Language Writing; Generative AI

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INTRODUCTION

Artificial Intelligence (AI) has entered higher education writing practices and transformed how students generate ideas, develop texts, refine language, and complete academic tasks. The presence of generative AI, such as ChatGPT, provides quick access to linguistic assistance, so students no longer rely solely on textbooks, lecturers, or conventional digital resources when engaging in writing activities (Aljuaid, 2024; Malik et al., 2023). In the context of Arabic language learning, this development is increasingly relevant because students face the simultaneous demands of mastering vocabulary, grammatical structures, text cohesion, and idea development in Arabic. Numerous studies have shown that AI can assist students in generating ideas, providing feedback, correcting grammar, enhancing fluency, and aiding the text revision process (Asikin et al., 2025; Zubair, 2026). Therefore, the integration of AI into maharah al-kitabah (Arabic writing instruction) not only introduces new technologies but also alters students' practices in producing Arabic texts.

Previous research on AI and writing instruction demonstrates rapid growth, yet it still shows a tendency to evaluate AI primarily based on learning outcomes or user perceptions (Chen, 2025; Tossell et al., 2024). Some studies position AI as a tool to improve writing quality, particularly through providing feedback, correcting grammar, enhancing text structure, cohesion, vocabulary, and writing fluency (Mekheimer, 2025; Setiawan & Alkhowarizmi, 2025). Another trend focuses on students' perceptions regarding the benefits, ease of use, efficiency, and challenges of utilizing AI in writing activities (Chen, 2025; Utami & Winarni, 2023). Recent systematic evidence indicates that Generative AI applications in second language writing instruction remain concentrated in feedback, revision, and text-polishing activities, while their implications for the broader writing process require further investigation. Furthermore, Lu and Jia found that higher-performing EFL students tended to seek language-focused assistance and revise AI-generated outputs more extensively, whereas lower-performing students relied more heavily on content generation, highlighting the importance of examining students' actual interaction patterns rather than evaluating writing products alone (Lu & Jia, 2026). In the context of Arabic language instruction, research on ChatGPT has also demonstrated its potential to assist students' academic writing; however, studies that simultaneously examine writing outcomes, writing practices/processes, and students' perceptions of AI's role remain limited (Qomariah et al., 2025; Zubaidi et al., 2025). Thus, a research gap exists to understand the use of AI in maharah al-kitabah instruction more comprehensively through the relationship between writing products, writing processes, and student experiences.

This study aims to explore the role of Artificial Intelligence in *maharah al-kitabah* instruction among students of the Arabic Language Education Study Program at IAIN Parepare. Specifically, this study examines the quality or characteristics of Arabic texts produced by students with AI assistance, as well as students' practices in utilizing AI during the writing process. This study also identifies how students perceive the role of AI in writing activities, including its benefits, ease of use, linguistic assistance, and various experiences encountered during its usage. Data regarding writing outcomes and writing processes are brought together to obtain a more comprehensive picture of AI usage practices in Arabic writing instruction. Accordingly, this study does not position AI from the outset as an entirely beneficial or detrimental technology, but rather explores how its role emerges in students' real-world practices.

The role of Artificial Intelligence in Arabic writing instruction can be understood through Vygotsky's Zone of Proximal Development (ZPD), which emphasizes the distinction between what learners can accomplish independently and what they can achieve with appropriate assistance (Ritonga et al., 2026). Within *mahārah al-kitābah* instruction, AI may function as digital scaffolding by providing vocabulary suggestions, grammatical explanations, sentence-level feedback, and revision support that help students overcome immediate linguistic difficulties (Yasin et al., 2026). However, the effectiveness of such assistance depends on students' active engagement in evaluating, modifying, and integrating AI-generated suggestions rather than accepting them uncritically (Majid et al., 2026). Consequently, improvements in linguistic accuracy do not necessarily indicate equivalent development in conceptual reasoning or independent writing competence. This distinction highlights the importance of examining both students' final writing products and the processes through which they interact with AI, particularly whether technological assistance supports independent thinking or substitutes for essential cognitive activities during composition.

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METHODS

Research Design

This study employed a mixed-methods approach with a convergent parallel design to comprehensively explore the role of Artificial Intelligence (AI) in *maharah al-kitabah* (Arabic writing) instruction. This design was selected because the investigation examined AI integration through two complementary data strands: students' Arabic writing outcomes (products) andstudents' writing processes and practices while interacting with AI. Quantitative data were utilized to evaluate writing quality scores across five core linguistic dimensions. Concurrently, qualitative data were collected to document and describe the prompt-response-revision chains and patterns of AI engagement during writing. Both data sets were gathered during the same timeframe and subsequently integrated to generate a holistic understanding of AI-assisted Arabic writing practices.

Unit of Analysis, Research Setting, and Participants

The central unit of analysis in this research was students' Arabic writing practices within AI-assisted *maharah al-kitabah* instruction. The research was conducted at the Arabic Language Education (PBA) Study Program, State Islamic Institute (IAIN) Parepare. The participants comprised 56 third-semester undergraduate students enrolled in the compulsory *Maharah Al-Kitabah* course. All 56 students actively participated in AI-assisted writing tasks and completed the full data collection procedures. The research focused specifically on two interconnected dimensions: the evaluation of students' final writing products and the documentation of students' AI-assisted writing processes.

Data Sources

Data for this study were collected from two main sources to ensure analytical depth:

Student Writing Products: A total of 56 final Arabic essay assignments produced by students with Generative AI assistance.

Writing Process Data: Documentation of students' interaction sequences with AI tools, including initial ideas/drafts, submitted prompts, AI-generated responses, text selection and modification records, and student revision logs.

Data Collection Techniques

Data collection was carried out through two primary techniques: documentation, and observational tracking. Documentation was utilized to archive student essay products and digital evidence of AI interaction, such as prompt logs, raw AI responses, and track-change revision logs. Observational tracking was conducted during writing sessions to identify procedural patterns and behavioural stages as students used AI-specifically focusing on brainstorming, vocabulary searching, sentence construction, output verification, and text editing.

Data Analysis Procedures

Data analysis was aligned with the specific nature of each data source, followed by an integrative synthesis:

Analysis of Writing Products: Student Arabic essays were evaluated using a standardized maharah al-kitabah analytic scoring rubric (scale 0–100) assessing five dimensions: Idea Development, Text Organization, Vocabulary Use, Grammatical Accuracy, and Writing Mechanics. Descriptive statistics (mean scores and qualitative category placements) were computed to establish overall writing quality (Mean = 79.8, Good category) and identify performance discrepancies across sub-skills (e.g., highest in Mechanics at 85.0 and Vocabulary at 84.5; lowest in Idea Development at 71.2).

Qualitative Process Analysis: The archived prompt–response–revision sequences were examined to identify the functional role of AI in students' writing processes. Four operational categories guided the analysis: (a) idea support, involving requests for topic suggestions, outlines, and possible points for development; (b) language support, involving requests for vocabulary, translation of short expressions, sentence construction, and grammatical clarification; (c) revision support, involving feedback and improvements to student-prepared drafts; and (d) text generation, involving requests for AI to produce complete paragraphs or short essays. The distinction between language support and text generation was determined by the scope of textual production

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requested: localized linguistic assistance with student-initiated writing versus the delegation of substantial textual composition to AI. The coding outcomes were summarized as frequencies and percentages of students (n = 56), as presented in Table 2.

Convergent Integration: Finally, findings from product evaluations and interaction process patterns. This side-by-side synthesis identified points of alignment and divergence between what students produced (scores) and how they produced it (process patterns).

RESULTS

Students' Arabic Writing Outcomes in AI-Assisted Writing

The analysis of students' Arabic writing outcomes provides an initial picture of the texts produced through AI-assisted writing practices. The writing products of the 56 students were assessed based on five aspects of *maharah al-kitabah*, namely idea development, text organization, vocabulary use, grammatical accuracy, and writing mechanics. The assessment was intended not only to determine the overall quality of students' writing but also to identify the characteristics and variations of the texts that would subsequently be examined in relation to students' writing practices with Artificial Intelligence.

Table 1. Students' Arabic Writing Outcomes

No.	Writing Aspect	Mean Score	Category
1	Idea development	71.2	Moderate
2	Text organization	76.5	Good
3	Vocabulary use	84.5	High
4	Grammatical accuracy	82.0	High
5	Writing mechanics	85.0	High
Overall Writing quality		79.8	Good

*Note: Scores are based on the evaluation of 56 students' Arabic writing products (0–100 scale).

Table 1 shows the distribution of students' writing performance across the five assessed aspects. The highest score was found in writing mechanics, with a mean score of 85.0, closely followed by vocabulary use (84.5), while the lowest score was found in idea development, with a mean score of the overall writing score reached 79.8, indicating a good overall writing quality category. These results indicate that the quality of students' writing was not uniform across the different components of maharah al-kitābah.

Further examination of the writing products identified several key characteristics in the texts produced by students:

Idea Development (M = 71.2): Texts showed a tendency toward generalized statements with limited depth of original argumentation, often relying on formulaic expressions without deep elaboration.

Text Organization (M = 76.5): Students' texts demonstrated clear paragraph structures and logical cohesive transitions, maintaining smooth flow between ideas.

Vocabulary Use (M = 84.5): Writing products exhibited rich, varied, and sophisticated Arabic diction, incorporating contextually appropriate academic terminology.

Grammatical Accuracy (M = 82.0): Grammatical analysis indicated high precision in sentence construction, particularly in agreement rules, case endings (i'rāb), and basic syntactic structures (nahw).

Writing Mechanics (M = 85.0): Texts displayed consistent punctuation, accurate orthography, and precise spelling of Arabic root-derived words.

The distribution of scores indicates that the strongest and weakest aspects of students' writing occurred in different components of the writing task. The gap between the highest (mechanics: 85.0) and lowest (idea development: 71.2) scores suggests that the use of AI did not produce an identical level of performance across all writing components. Instead, the writing products demonstrated technical linguistic perfection alongside relative conceptual passivity, requiring further examination through the lens of students' writing processes.

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An analysis of the writing products also revealed significant variation in the degree of textual modification and individual expression. Certain texts showed active personal revisions and critical adaptation of AI suggestions, whereas other texts demonstrated strong stylistic similarity and minimal modification from raw AI output. These differences are critical because the final writing product alone cannot fully explain how students arrived at their texts or how they interacted with AI during the writing process.

The findings therefore indicate that students' AI-assisted Arabic writing produced strong linguistic correctness alongside moderate conceptual depth, with notable differences across idea development, organization, vocabulary, grammar, and mechanics. The variations identified in these final texts establish the empirical foundation for examining the next stage of the analysis, namely how students utilized Artificial Intelligence during the writing process and how different patterns of AI use reflected in their final products.

Students' Writing Practices with Artificial Intelligence

The analysis of students' writing practices was conducted to examine how the writing outcomes presented in the previous section were produced through interaction with Artificial Intelligence. The process data were obtained from students' writing activities, including their initial ideas or drafts, prompts submitted to AI, AI-generated responses, students' selection or modification of those responses, and the final revisions incorporated into their texts. The analysis focused on the different ways students positioned AI during the writing process, ranging from generating ideas and providing linguistic assistance to revising and producing parts of the text.

Table 2. Patterns of AI Use in Students' Arabic Writing Practices

No.	Pattern of AI Use	Main Writing Activity	Number of Students	Percentage
1	AI as idea support	Generating and developing ideas	14	25.0%
2	AI as language support	Vocabulary and sentence construction	22	39.3%
3	AI as revision support	Checking and improving drafts	12	21.4%
4	AI as text generator	Producing paragraphs or complete texts	8	14.3%
Total			56	100.0%

*Note: Categories and frequencies are documented based on 56 students' Arabic writing process records.

To provide concrete evidence of the interaction patterns identified in Table 2, selected prompt–response–revision sequences were examined to illustrate the operational differences between language support and text generation. Particular attention was given to the scope of assistance requested, the type of response generated by AI, and the extent to which students modified or incorporated the generated content into their final Arabic essays. The selected excerpts are presented in Table 3, with student identities anonymized.

Table 3. Examples of Student–AI Interactions in Arabic Writing

AI Interaction Category	Student Prompt	AI Response	Student Action
Idea Support	أعطني ثلاث أفكار عن أهمية اللغة العربية.	١. اللغة العربية لغة القرآن. ٢. اللغة العربية لغة جميلة. ٣. اللغة العربية مهمة للطلاب.	The student selected two ideas and wrote a short paragraph using their own words.
Language Support	أنا "هل هذه الجملة صحيحة؟ يحب اللغة العربية".	الجملة الصحيحة: "أنا أحب اللغة العربية".	The student corrected the sentence and added: " أنا أحب اللغة العربية لأنها لغة القرآن".
Revision Support	أنا أحب " :صحح هذه الفقرة اللغة العربية.	أنا أحب اللغة العربية لأنها لغة جميلة. أنا أتعلم اللغة العربية كل يوم.	The student used the corrections and improved the original paragraph.

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	أنا تعلم اللغة العربية كل جميلة يوم".		
Text Generator	اكتب لي فقرة قصيرة عن أهمية اللغة العربية.	هي لغة القرآن. اللغة العربية لغة مهمة نتعلم اللغة العربية في المدرسة. الكريم اللغة العربية تساعدنا على فهم والجامعة. القرآن الكريم.	The student copied most of the AI-generated paragraph and changed only a few words.

Table 3 illustrates four patterns of students' interactions with AI during Arabic writing activities. Students used AI to find ideas, correct sentences, improve paragraphs, and generate texts. In the language support category, students asked AI to correct simple grammatical mistakes and then used the corrected sentences in their writing. In contrast, students in the text generator category asked AI to write complete paragraphs and made only minor changes to the generated texts. These examples illustrate different levels of student involvement in AI-assisted writing activities.

Table 2 shows that students employed AI in different ways during the writing process. The most frequently observed pattern was AI as language support, used by 22 students (39.3%), while the least frequent pattern was AI as text generator, used by 8 students (14.3%). The distribution indicates that students did not interact with AI through a single pattern of use, but employed the technology at different stages and for different writing needs.

At the initial stage of writing, 14 students (25.0%) used AI to generate, clarify, or expand ideas related to the assigned topic. The interaction generally involved prompts requesting topic suggestions, outlines, examples, or explanations of possible points to include in the text. In 9 cases, students subsequently developed the suggested ideas into their own sentences, while 5 cases showed that AI-generated ideas were incorporated with limited modification. This pattern provides an initial explanation for the variation in idea development identified in the writing outcomes. Students who used AI primarily to stimulate or organize ideas showed stronger individual perspective and logical flow, whereas texts in which AI generated substantial portions of the content showed more generalized argumentation with standardized rhetorical structures.

The second pattern involved the use of AI to address linguistic difficulties during writing. Students used AI to search for Arabic vocabulary, translate expressions, construct sentences, and check grammatical accuracy. This pattern was observed among 22 students (39.3%). The interaction records show that students generally submitted isolated vocabulary phrases and short draft sentences to AI and then selectively modified and integrated the responses into their paragraphs. The use of AI at this stage corresponded directly with the writing outcomes, particularly in the aspects of vocabulary use and grammatical accuracy, which obtained high category scores of 84.5 and 82.0, respectively. However, the process data also showed differences in how actively students evaluated the linguistic suggestions provided by AI prior to insertion.

Another pattern emerged when students used AI after producing an initial draft. 12 students (21.4%) submitted their completed drafts to AI to identify grammatical errors, improve word choice, reorganize sentences, or enhance the overall quality of the text. In these cases, the students had already produced a full initial version before interacting with AI. The revision records showed that 68% of the suggested changes were accepted and incorporated by students, while 32% were modified or rejected. Some students compared the AI suggestions with their original sentences and made selective revisions, while others incorporated most of the suggested changes. This pattern helps explain differences observed between students' initial drafts and final writing products, particularly in text organization and mechanical precision.

A further pattern involved the use of AI to generate substantial portions of the writing. This pattern was identified in 8 students (14.3%), who submitted prompts requesting AI to produce complete paragraphs or entire short texts based on the assigned topic. The subsequent treatment of AI-generated texts varied. 3 students substantially revised the generated text before submitting it, whereas 5 students made only limited modifications. In some cases, the final texts retained substantial elements of the AI-generated response, including formulaic connective phrases, highly uniform sentence lengths, and generic introductory statements. This pattern provides an important basis for interpreting the variations identified in the writing outcomes, particularly the lower scores in idea development.

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The comparison between students' writing practices and their writing outcomes revealed different patterns of correspondence. Students who used AI primarily as language and revision support demonstrated the highest overall writing quality, balancing high linguistic accuracy with genuine personal voice, while students who relied more extensively on AI-generated text demonstrated high grammatical accuracy but noticeably weaker conceptual depth and originality. These differences indicate that the presence of AI itself does not sufficiently explain the characteristics of students' final writing; rather, the way students interacted with AI during the writing process was crucial.

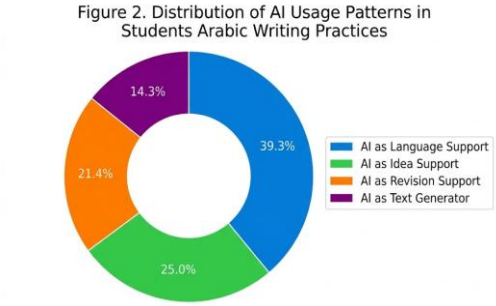


Figure 2. Distribution of AI Usage Patterns in Students Arabic Writing Practices

The process data further showed differences in students' treatment of AI-generated responses. Some students evaluated, selected, modified, and integrated AI suggestions into their own writing, whereas others used AI-generated content with minimal modification. These variations corresponded with differences in the final texts identified in Section 3.1 and provide a basis for examining how students themselves perceived the role of AI in their writing practices.

Overall, the analysis indicates that students employed Artificial Intelligence through four distinct writing practices, including idea development, linguistic assistance, revision, and text generation. The variation in these practices provides a process-based explanation for the differences observed in students' writing outcomes and establishes the basis for the subsequent analysis of students' perceptions of the role of AI in Arabic writing instruction.

DISCUSSION

The empirical findings of this study reveal that while the integration of Generative AI in mahārah al-kitābah instruction yielded a commendable overall Arabic writing performance (Mean = 79.8, Good category), it established a pronounced structural asymmetry across different writing dimensions. Students achieved their highest performance in surface-level and formal linguistic components, specifically writing mechanics (85.0), vocabulary use (84.5), and grammatical accuracy (82.0). Conversely, lower scores were recorded in text organization (76.5) and particularly idea development, which placed in the moderate category (71.2). This 13.8-point performance gap suggests that AI-assisted writing was characterized by stronger technical linguistic accuracy than conceptual elaboration, although the difference cannot be attributed solely to AI use without evidence from independent writing assessments.

This high performance in vocabulary, grammar, and mechanics directly corresponds to the predominant writing practices wherein AI functioned as language support (39.3%, n = 22) and revision support (21.4%, n = 12). Through these practices, students systematically utilized AI to resolve syntactic ambiguities, retrieve specialized Arabic terminology, and verify complex case endings (*i'rab*) and syntactic structures (*nahw*). Interpreted through Vygotsky's sociocultural theory, AI operates effectively as a digital More Knowledgeable Other (MKO), providing strategic scaffolding within the students' Zone of Proximal Development (ZPD). This form of linguistic scaffolding may help students address immediate lexical and grammatical challenges, although the extent to which such assistance contributes to their independent writing competence remains to be established.

The 13.8-point difference between writing mechanics (85.0) and idea development (71.2) suggests an important distinction between linguistic accuracy and conceptual elaboration in AI-assisted Arabic writing. This asymmetry may be explained by the different cognitive demands associated with these writing dimensions. AI-generated linguistic suggestions can be evaluated against relatively explicit grammatical, lexical, and orthographic conventions, making surface-level corrections more immediately accessible to

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students. In contrast, developing substantive arguments requires learners to formulate independent perspectives, establish logical relationships between ideas, provide supporting explanations, and critically evaluate the relevance of their arguments. The interaction records provide a plausible explanation for this discrepancy. Although 22 students (39.3%) primarily utilized AI for language support, eight students (14.3%) relied on AI to generate substantial textual content. Among the latter, five students made only limited modifications to AI-generated texts, which frequently displayed generalized statements and formulaic rhetorical structures. These findings suggest that grammatically accurate and stylistically polished Arabic texts do not necessarily reflect equivalent levels of conceptual engagement or independent argumentative development.

From a sociocultural and cognitive perspective, this discrepancy highlights the limitations of technological scaffolding when students delegate essential conceptual activities to AI. While linguistic assistance may help learners overcome immediate grammatical and lexical difficulties, the generation of arguments and meaningful content requires sustained cognitive engagement, including planning, reasoning, and critical evaluation. Extensive reliance on AI-generated paragraphs may therefore be associated with cognitive offloading, particularly when students adopt generated content without critically examining its underlying arguments. Conversely, the revision records indicate that students accepted 68% of AI-generated suggestions while modifying or rejecting the remaining 32%, illustrating opportunities for active learner mediation during revision. However, the observed score discrepancy should be interpreted cautiously because the rubric dimensions assess different writing competencies, and the study did not measure students' independent writing performance before AI assistance. Consequently, these findings do not establish that AI directly caused weaker conceptual development. Rather, they highlight the pedagogical importance of distinguishing linguistic improvement from genuine conceptual learning. Effective AI-assisted Arabic writing instruction should therefore require students to formulate their own arguments, justify their ideas, critically evaluate AI-generated content, and demonstrate how technological assistance contributes to their independent writing development.

These findings align with and extend existing literature on Generative AI in second language acquisition. While previous studies broadly affirm that AI tools enhance linguistic fluency, vocabulary diversity, and grammatical precision, this study demonstrates that in Arabic academic writing (*maharah al-kitabah*), unguided AI usage creates a bifurcated writing profile where polished linguistic form can mask underlying conceptual passivity (Qomariah et al., 2025; Zubaidi et al., 2025). These results substantiate recent synthesis studies warning that without targeted pedagogical intervention, automated text generation risks fostering surface-level correctness at the expense of authentic argumentative development.

Consequently, these results carry vital pedagogical implications for higher education Arabic writing instruction. Instructors must transition from merely permitting or prohibiting AI tools toward cultivating students' "prompt literacy" and critical evaluation skills (Cai et al., 2025). Writing pedagogy should explicitly position Generative AI not as a surrogate author for text generation, but as an interactive cognitive partner for brainstorming, vocabulary expansion, and draft polishing, thereby preserving human responsibility for central thesis formulation, logical organization, and conceptual depth.

CONCLUSION AND IMPLICATIONS

This study investigated the role of Artificial Intelligence in mahārah al-kitābah instruction among 56 undergraduate students by analyzing the relationship between final Arabic essay products and AI-assisted writing practices. The empirical findings demonstrate that while AI integration elevates overall Arabic writing quality to a good category (M = 79.8), it produces a marked structural asymmetry between technical linguistic accuracy, manifested in high scores for writing mechanics (85.0), vocabulary use (84.5), and grammatical precision (82.0), and conceptual depth, which recorded the lowest performance in idea development (71.2). Process tracking revealed four distinct interaction patterns, AI as language support (39.3%), idea support (25.0%), revision support (21.4%), and text generator (14.3%), showing that superior writing outcomes were achieved when students utilized AI as a strategic scaffolding tool for linguistic refining and selective draft editing rather than a passive text generator. Theoretically, these findings contribute to second language writing scholarship by suggesting that generative AI can function as digital scaffolding for linguistic accuracy within students' Zone of Proximal Development, while extensive dependence on AI-generated content may be

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associated with reduced opportunities for independent conceptual elaboration and critical argumentation. Pedagogically, these insights necessitate a paradigm shift in Arabic language education toward integrating structured "prompt literacy" and process-oriented portfolio assessments that evaluate students' critical evaluative agency and human-AI interaction logs alongside final text products, thereby ensuring that AI technology enriches rather than replaces authentic L2 writing development.

Limitations and Future Research

Several limitations of this study should be acknowledged to contextualize the findings and guide future scholarly inquiry. First, the empirical investigation was confined to a single institutional setting involving 56 third-semester undergraduate students within the Arabic Language Education Program at IAIN Parepare, which may limit the direct generalizability of the results to diverse L2 Arabic learning environments. Second, the cross-sectional design evaluated a single essay task and generic Generative AI interactions, thereby capturing immediate procedural behaviors rather than tracking long-term developmental trajectories or tool-specific performance variations over time. To address these constraints, future research should employ longitudinal and quasi-experimental designs across multi-institutional cohorts to investigate the sustained impact of AI integration on students' independent Arabic writing competence. Furthermore, subsequent studies could incorporate real-time process analytics and targeted prompt-engineering interventions to explore how structured metacognitive scaffolding can optimize both conceptual depth and technical linguistic precision in academic mahārah al-kitābah instruction.

DECLARATIONS

Ethics approval: This study was approved by the Institutional Ethics Review Committee of Institut Agama Islam Negeri Parepare and was conducted in full accordance with ethical principles involving human participants who provided informed consent

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Author contributions: RJ conceptualized the research design and drafted the manuscript, H executed the data collection and quantitative analysis, and MI performed the qualitative process coding and finalized the draft.

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AI disclosure: Generative AI tools were utilized by participants within the observed instructional activities and by the authors solely for manuscript translation and English language refinement, while all core analytical interpretations, critical evaluation, and final conclusions remain the sole intellectual responsibility of the authors.

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