

Exploring AI-assisted Arabic learning for linguistic intelligence development among Indonesian university students

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ABSTRACT

Artificial intelligence (AI) is increasingly used in language classrooms, yet empirical accounts of how it supports linguistic intelligence in Arabic learning remain limited in Indonesian higher education. This study explores how AI-assisted learning supports students' perceived development of linguistic intelligence and identifies the benefits and challenges experienced during its implementation. Using a descriptive qualitative design supported by descriptive questionnaire data, the study involved 78 undergraduate students who had used AI-supported Arabic learning tools for at least one academic semester. Data were collected through a Google Forms questionnaire, semi-structured interviews with 10 students, nine non-participant classroom observations, interviews with five lecturers, and analysis of AI-generated learning artifacts. The findings show that students reported development in vocabulary recognition (53 of 78 students; 67.95%), morpho-syntactic awareness (50 students; 64.10%), pronunciation accuracy (45 students; 57.69%), reading comprehension (41 students; 52.56%), and analytical reasoning in language tasks. On the overall learning experience, 18 students (23.08%) reported very favorable experiences, 47 students (60.26%) reported favorable experiences, and 13 students (16.67%) reported neutral experiences. Interviews, observations, and document data indicate that AI feedback helped students notice lexical errors, revise sentence structure, practice pronunciation, and analyze Arabic texts more independently. However, limited digital literacy, unstable infrastructure, and AI's limitations in interpreting cultural and pragmatic meanings remained important constraints. The study suggests that AI should be used as a complementary pedagogical tool within teacher-guided, culturally responsive Arabic instruction.

Keywords: Arabic language learning; artificial intelligence; digital pedagogy; higher education; linguistic intelligence

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INTRODUCTION

The rapid expansion of educational technology has reshaped language instruction in higher education, with artificial intelligence (AI) becoming one of the

most visible innovations in contemporary learning environments. In language education, AI-supported tools provide adaptive feedback, automated language analysis, individualized practice, and

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interactive opportunities for learners to test and revise their linguistic output (Chen et al., 2020; Ouyang & Jiao, 2021; Wang et al., 2024). These affordances are relevant to Arabic language learning because many university courses still rely heavily on grammar explanation, memorization, and textbook-based exercises. Such practices remain valuable for introducing grammatical foundations, but they may not always provide sufficient opportunities for repeated practice, immediate feedback, and reflective language use needed by contemporary learners (Haq et al., 2023).

Arabic has distinctive learning demands because of its root-pattern morphology, inflectional system, syntactic variation, script conventions, and close relationship with cultural and religious discourse (Almanea, 2024; Bratlie et al., 2022; Uzum, 2021). Students, therefore, need to develop not only lexical knowledge but also the ability to recognize morphological patterns, construct meaningful sentences, interpret texts, and communicate with appropriate pronunciation and contextual awareness. These abilities are closely connected with linguistic intelligence, which Gardner (2011) describes as sensitivity to spoken and written language, the ability to use language to accomplish goals, and the capacity to understand the structure and functions of language. Armstrong (2009) further explains that linguistic intelligence involves verbal memory, semantic sensitivity, phonological awareness, and the ability to manipulate language for communication and meaning-making. In applied language learning, this construct can be operationalized through vocabulary acquisition, morpho-syntactic awareness, pronunciation accuracy, reading comprehension, and analytical reasoning in language tasks (Aminatun et al., 2019; Winarti et al., 2019).

AI may support these components because it allows students to receive immediate and repeated feedback during independent learning. Automated writing evaluation systems can identify lexical and grammatical errors, speech-recognition tools can provide pronunciation feedback, and AI chatbots can generate examples, explanations, and contextualized practice tasks. Recent research on AI in education suggests that such tools can support learner autonomy, motivation, and feedback-based revision when they are integrated with appropriate teacher guidance (Chiu, 2023; Kohnke et al., 2023; Zhai et al., 2021). In Arabic, advances in computational processing and deep learning have also improved the capacity of AI systems to handle written Arabic, classify Arabic content, and support speech-related learning tasks (Aljabri et al., 2024; Almanea, 2024; Shao et al., 2022).

Nevertheless, AI integration in Arabic learning also raises pedagogical and contextual concerns. AI systems can detect formal patterns, but they are less reliable in interpreting pragmatic meaning, dialectal

variation, culturally embedded expressions, and discourse intention (AL-anazi et al., 2025; Bedu, 2024; Dwivedi et al., 2021). This limitation is crucial because Arabic learning in Indonesian universities is often connected to religious texts, academic communication, and culturally specific meanings. In addition, Indonesian students' use of AI is shaped by unequal access to devices, internet stability, and digital readiness. National data show that Indonesia's internet penetration reached 79.5% in 2024, yet the national digital literacy index was still categorized as moderate in the 2022 survey (Asosiasi Penyelenggara Jasa Internet Indonesia, 2024; Kementerian Komunikasi dan Informatika & Katadata Insight Center, 2023). These conditions suggest that AI-supported learning cannot be understood only as a technological issue; it must also be examined as a pedagogical and institutional practice.

Although research on AI in language education is expanding, recent studies have mainly examined general AI applications in education, chatbot-supported motivation, language instructors' AI preparedness, Arabic speech tutoring, and Arabic computational processing (Almanea, 2024; Chen et al., 2020; Chiu, 2023; Kohnke et al., 2023; Shao et al., 2022; Wang et al., 2024). These studies provide important evidence about AI affordances, yet empirical studies that connect AI-assisted learning with specific components of linguistic intelligence in Arabic language learning remain limited, especially in Indonesian higher education. Existing studies more commonly examine general achievement, attitudes toward technology, translation, or AI readiness, while fewer studies analyze how AI relates to vocabulary acquisition, morpho-syntactic awareness, pronunciation accuracy, reading comprehension, and analytical reasoning during actual learning processes. This gap is important because Indonesia has an extensive Islamic higher education sector in which Arabic is taught for religious, academic, and professional purposes (World Bank, 2021). More contextual evidence is needed to explain how students use AI to develop these components of linguistic intelligence and what challenges they encounter in Arabic language learning.

Responding to this gap, the present study has two aims. First, it explores how AI-assisted learning supports the perceived development of linguistic intelligence among Indonesian university students learning Arabic. Second, it identifies the benefits and challenges experienced by students and lecturers during AI integration. The study addresses these aims through questionnaire data, student and lecturer interviews, classroom observations, and analysis of AI-generated learning artifacts. By connecting learner perceptions with observed learning behavior and documenting evidence, this study contributes to a more contextual

understanding of AI-assisted Arabic language learning in Indonesian higher education.

METHOD

Research Design

This study employed a descriptive qualitative design supported by descriptive questionnaire data. The design was selected because the study sought to understand students' experiences, classroom behaviors, and learning artifacts rather than to test a causal relationship between AI use and language achievement. The focus of the study was limited to AI-assisted Arabic language learning among undergraduate students in Indonesian higher education. Linguistic intelligence was assessed through five observable and reportable components: vocabulary acquisition, morpho-syntactic awareness, pronunciation accuracy, reading comprehension, and analytical reasoning in Arabic language tasks. These components were derived from Gardner's (2011) concept of linguistic intelligence and applied language learning literature that links language development with lexical, grammatical, phonological, textual, and reasoning abilities (Aminatun et al., 2019; Winarti et al., 2019).

The study did not use standardized proficiency testing or experimental treatment. Instead, it combined students' self-reported perceptions with qualitative evidence from interviews, observations, lecturer perspectives, and AI-generated learning artifacts. This approach allowed the researchers to examine whether patterns reported by students were supported by classroom behavior and learning documents. The design is consistent with interpretive approaches in applied linguistics research, where learner experience, meaning-making, and contextual conditions are central to understanding language development (Dörnyei, 2007; Mackey & Gass, 2015).

Participants and Ethical Considerations

The participants were 78 undergraduate students enrolled in Arabic language and Islamic studies programs at Indonesian universities. Purposive sampling was used because the study required participants who had direct experience with AI-supported Arabic learning. The inclusion criteria were: (1) active enrollment in Arabic language courses, (2) experience in using AI-supported learning tools for at least one academic semester, and (3) willingness to participate voluntarily in the research. The AI tools used by students included chatbots, automated writing evaluation applications, AI-supported dictionary and grammar tools, and pronunciation applications with speech-recognition features.

From the 78 questionnaire participants, 10 students were selected as key informants for semi-

structured interviews. Selection was based on frequency of AI use, representation of different learning experiences, and willingness to provide detailed reflections. Five Arabic language lecturers were also interviewed to provide pedagogical perspectives on AI implementation, particularly regarding teacher guidance, classroom integration, and the limitations of AI feedback. Ethical procedures were applied throughout the study. Participants received information about the study aims, voluntary participation, confidentiality, and the right to withdraw. Written informed consent was obtained before data collection, and all names were anonymized in transcripts, field notes, and reports (Creswell & Poth, 2018).

Data Collection

Data were collected through four main techniques: questionnaire, semi-structured interviews, classroom observations, and document analysis. The questionnaire was distributed digitally through Google Forms to all 78 participants. It contained Likert-scale items and open-ended questions addressing the five components of linguistic intelligence: vocabulary acquisition, morpho-syntactic awareness, pronunciation accuracy, reading comprehension, and analytical reasoning. The Likert-scale items asked students to report the extent to which AI tools helped them notice vocabulary, correct sentence structures, practice pronunciation, understand Arabic texts, and analyze language patterns. The open-ended questions invited students to explain concrete learning experiences and difficulties.

Semi-structured interviews were conducted with 10 student participants and five lecturers. Student interviews explored the types of AI tools used, the nature of AI feedback received, perceived changes in language learning behavior, and difficulties in interpreting AI-generated responses. Lecturer interviews focused on instructional design, students' digital readiness, classroom monitoring, and the pedagogical role of teachers when AI was used. All interviews were recorded with participants' consent and transcribed verbatim for analysis. Each student interview lasted approximately 30-45 minutes, while lecturer interviews lasted approximately 25-40 minutes.

Classroom observations were conducted during nine instructional sessions over a nine-week period. The observations were non-participant in nature and focused on how students interacted with AI tools during Arabic tasks. The observation checklist included indicators such as frequency of AI use, responsiveness to automated feedback, revision behavior, pronunciation practice, peer discussion, and teacher guidance. Field notes were recorded after each session to document classroom events, student responses, and patterns of learning behavior. Observation data were used to corroborate or

question the patterns found in questionnaire and interview data (Marshall et al., 2023; Valdés & Mendoza, 2025).

Document analysis examined AI-generated learning artifacts, including writing feedback logs, grammar correction histories, pronunciation reports, vocabulary suggestions, and revised student assignments. These artifacts were collected with participants' consent and selected because they provided direct traces of students' interaction with AI feedback. The analysis focused on recurring lexical errors, morpho-syntactic corrections, pronunciation indicators, reading support, and signs of improved organization in written summaries. The document data helped the researchers identify whether perceived development was reflected in learning products and revision patterns (Elshawaf, 2022; Taha et al., 2025).

Research Procedures

The research was conducted in three phases. In the preparation phase, the questionnaire, interview guides, observation checklist, and document analysis grid were developed based on the theoretical framework of linguistic intelligence and literature on AI-assisted language learning. Two senior lecturers in applied linguistics reviewed the instruments to examine content relevance, clarity, and alignment with the study aims. Revisions were made to ensure that each instrument addressed the same five components of linguistic intelligence.

In the data collection phase, the Google Forms questionnaire was distributed to eligible students and completed by 78 participants. All submitted responses were complete and met the inclusion criteria. The researchers then conducted interviews with selected students and lecturers, observed nine classroom sessions, and collected AI-generated learning artifacts from consenting participants. In the analysis phase, questionnaire responses were tabulated descriptively, interview recordings were transcribed, observation notes were organized chronologically, and documents were grouped according to the five linguistic components.

Data Analysis and Trustworthiness

Data were analyzed using thematic analysis following the systematic procedures described by Naeem et al. (2023). First, questionnaire results were summarized using frequencies and percentages to identify patterns in students' reported development. These figures were not used to infer causality, but to describe the distribution of students' perceptions. Second, interview transcripts were coded to identify recurring statements about vocabulary learning, grammar awareness, pronunciation, reading comprehension, analytical reasoning, benefits, and challenges. Third, observation notes were examined to identify behavior patterns such as feedback use, self-

correction, peer collaboration, and teacher intervention. Fourth, AI-generated learning artifacts were reviewed to trace examples of lexical correction, sentence revision, pronunciation feedback, and textual organization.

To enhance trustworthiness, the study used a triangulation method by comparing evidence from questionnaires, interviews, observations, and document analysis. When questionnaire data indicated perceived development in a component, the researchers examined whether similar patterns appeared in interviews, classroom behavior, or learning artifacts. Member checking was conducted by inviting selected participants to review preliminary interpretations of interview data. Peer debriefing with two applied linguistics lecturers was also used to discuss coding decisions and reduce interpretive bias (Creswell & Poth, 2018; Lincoln & Guba, 1985).

FINDINGS

This section presents findings based on four data sources: questionnaire responses from 78 students, semi-structured interviews with 10 students and five lecturers, nine classroom observations, and analysis of AI-generated learning artifacts. The findings are organized according to the two aims of the study. The first part describes students' perceived development of linguistic intelligence through five components: vocabulary acquisition, morpho-syntactic awareness, pronunciation accuracy, reading comprehension, and analytical reasoning. The second part describes the benefits and challenges of AI integration as experienced by students and lecturers.

Vocabulary Acquisition

Vocabulary recognition showed the highest level of reported development. Based on questionnaire responses, 53 of 78 students (67.95%) reported that AI tools helped them recognize new vocabulary, distinguish meanings, and understand lexical use in context. Interview data support this pattern. Several students explained that AI-generated examples made it easier to compare synonyms, identify root-related vocabulary, and understand how words changed meaning across sentences. One student stated that AI was helpful because it "does not only translate the word, but also gives examples of how the word is used in a sentence" (Student 3, interview).

Document analysis also showed repeated evidence of vocabulary-related feedback. AI-generated logs provided students with alternative words, contextual explanations, and corrections of inappropriate lexical choices. In earlier assignments, students often relied on direct translation from Indonesian to Arabic. In later revisions, more students used vocabulary that better matched the sentence context. Observation notes from the fifth to

ninth sessions showed that students increasingly asked AI to compare related words before choosing vocabulary for writing tasks. These patterns indicate that AI supported students' vocabulary acquisition by functioning as a source of immediate lexical clarification and contextualized examples.

Morpho-Syntactic Awareness

Morpho-syntactic awareness was the second most frequently reported area of development. A total of 50 students (64.10%) reported that AI tools helped them notice errors in sentence structure, agreement, word order, and inflection. Classroom observations showed that students initially made recurrent errors in nominal and verbal sentence patterns, especially in agreement between subject and predicate, verb and subject, and adjective and noun. Across nine observed sessions, students became more attentive to AI feedback that marked incorrect structures and suggested revised forms.

Interview data provide further explanation. Student 7 reported that AI feedback was useful because it highlighted grammatical mistakes and offered model sentences. However, several students also noted that AI explanations were sometimes too general and needed confirmation from lecturers. Lecturer interviews supported this concern. Lecturers observed that students were able to identify more errors after using AI feedback, but they still needed teacher explanation to understand why a sentence was correct or incorrect. Thus, the evidence suggests that AI-assisted morpho-syntactic awareness mainly through error noticing and revision prompts, while deeper grammatical understanding continued to depend on teacher mediation.

Pronunciation Accuracy

Pronunciation accuracy also showed reported development. In the questionnaire, 45 students (57.69%) stated that AI-supported pronunciation applications helped them practice Arabic sounds, compare their pronunciation with model audio, and repeat difficult words. Observation notes showed that students were more willing to practice pronunciation individually when speech-recognition feedback was available. Some students repeated words several times until the application indicated better accuracy. This pattern was especially visible in tasks involving unfamiliar vocabulary and phonetically difficult sounds.

Student interviews indicated that AI reduced anxiety in pronunciation practice. Student 5 explained that practicing with AI felt less intimidating because mistakes could be corrected privately before speaking in front of classmates. AI-generated pronunciation reports also showed gradual improvement in selected students' repeated pronunciation tasks. However, lecturer interviews emphasized that AI feedback could not fully replace

teacher modeling, especially for articulatory explanation and correction of subtle phonetic distinctions. Therefore, AI was useful as a rehearsal tool, but human feedback remained necessary for accurate and meaningful pronunciation development.

Reading Comprehension

Reading comprehension was reported by 41 students (52.56%) as an area supported by AI. Students used AI tools to identify vocabulary meanings, analyze sentence components, and clarify grammatical cues in Arabic texts. Observation data showed that students gradually moved from using AI as a direct translation tool toward using it to ask about sentence structure, word function, and contextual meaning. This change was observed in classroom tasks where students were asked to explain the meaning of short Arabic passages rather than simply translate them word by word.

Interview data revealed that AI helped students reduce confusion when reading complex sentences. Several students stated that AI explanations helped them identify the subject, predicate, verb, object, and modifiers in Arabic sentences. Nevertheless, students and lecturers agreed that AI sometimes produced explanations that were linguistically acceptable but contextually incomplete. This limitation was most visible when texts contained idiomatic expressions, religious references, or culturally embedded meanings. Consequently, AI-supported reading comprehension helps students unpack linguistic structure, but teacher guidance remains necessary to interpret broader discourse and cultural context.

Analytical Reasoning

Analytical reasoning appeared in the way students used AI to compare language forms, evaluate sentence choices, and revise written summaries. Although this component was less visible in questionnaire percentages than vocabulary or grammar, document analysis showed clearer organization in several students' revised Arabic summaries. Students used more coherence markers, improved the sequence of ideas, and demonstrated better awareness of relationships between clauses and sentences. These patterns suggest that AI feedback encouraged some students to analyze how Arabic texts were structured and how meaning was organized.

Observation data also showed that students increasingly asked follow-up questions to AI tools, such as why a sentence was incorrect, how two expressions differed, or how an idea could be expressed more formally. Such questioning behavior indicates a shift from passive acceptance of AI output toward reflective engagement with language. Lecturer interviews confirmed that students who used AI critically tended to show more active

revision behavior than those who used AI only for translation. The findings, therefore, indicate that AI-supported analytical reasoning, when used by students as a dialogic learning aid rather than as a shortcut for producing answers.

Summary of Linguistic Intelligence Development

Table 1 summarizes the indicators of students' perceived development of linguistic intelligence

based on triangulated data, and is presented before the explanation of qualitative patterns to clarify how each component was supported by multiple sources of evidence. It shows that vocabulary and morpho-syntactic awareness were the most frequently reported areas of development, while pronunciation, reading comprehension, and analytical reasoning also showed meaningful patterns across data sources.

Table 1

Indicators of Linguistic Intelligence Development Supported by AI

Component	Questionnaire indicator	Qualitative evidence	Interpretation
Vocabulary acquisition	53 students (67.95%)	Interview examples and AI logs showed lexical clarification, synonym comparison, and fewer inappropriate word choices.	AI-supported contextual vocabulary noticing and semantic precision.
Morpho-syntactic awareness	50 students (64.10%)	Observation and correction histories showed more attention to agreement, word order, and sentence patterns.	AI feedback helped students notice and revise structural errors.
Pronunciation accuracy	45 students (57.69%)	Pronunciation reports and observations showed repeated practice and greater willingness to rehearse difficult sounds.	AI functioned as a private rehearsal tool for phonological practice.
Reading comprehension	41 students (52.56%)	Students used AI to identify grammatical cues, sentence components, and contextual meanings.	AI-supported structural analysis of Arabic texts.
Analytical reasoning	Not measured as a separate percentage item	Document analysis showed improved coherence markers, logical sequencing, and follow-up questioning behavior.	AI encouraged reflective revision when used critically.

The findings should be interpreted as evidence of perceived and observed development within a descriptive qualitative design, not as proof of causal impact. The triangulated evidence indicates that AI was most useful when students used it for feedback, revision, and repeated practice rather than for direct translation only.

Benefits of AI Integration

Students generally perceived AI as beneficial for independent learning, immediate feedback, and self-correction. In the questionnaire, 18 students (23.08%) reported very favorable experiences, 47 students (60.26%) reported favorable experiences, and 13 students (16.67%) reported neutral experiences. Students in the very favorable category emphasized that AI helped them practice outside class, receive rapid corrections, and repeat exercises without waiting for lecturer feedback. Students in the favorable category recognized similar benefits but noted that AI use still depended on internet access, device quality, and their ability to formulate prompts. Neutral respondents tended to use AI less frequently or preferred direct explanation from lecturers.

Interview data illustrated these patterns. Seven of the 10 interviewed students stated that AI made Arabic practice more interactive because they could ask questions repeatedly and receive instant responses. Five students specifically mentioned that AI helped them revise writing more confidently, while four students emphasized pronunciation

practice. Lecturer interviews also indicated that AI increased students' willingness to revise their work, especially when lecturers asked them to compare AI feedback with grammar rules discussed in class. These findings suggest that AI created additional opportunities for practice, but its benefit increased when connected with structured classroom tasks.

Challenges of AI Integration

Despite these benefits, several challenges emerged. The first challenge was digital literacy. Some students had difficulty writing effective prompts, evaluating AI output, or identifying inaccurate explanations. The second challenge was infrastructure. Unstable internet connections and unequal access to suitable devices limited the consistency of AI use. The third challenge concerned the cultural and pragmatic dimensions of Arabic. Students and lecturers reported that AI sometimes struggled to explain idiomatic expressions, religiously embedded meanings, or context-specific usage. These challenges show that AI integration requires more than tool availability; it requires teacher guidance, digital literacy training, and culturally responsive instructional design.

Overall, the findings answer the two aims of the study. First, AI-assisted learning supported students' perceived development of linguistic intelligence across vocabulary, morpho-syntax, pronunciation, reading comprehension, and analytical reasoning. Second, students and lecturers identified AI as beneficial for feedback, autonomy,

and engagement, while also recognizing limitations related to digital readiness, infrastructure, and cultural-pragmatic interpretation.

DISCUSSION

The findings indicate that AI-assisted Arabic learning supported several components of linguistic intelligence, especially when AI feedback was combined with teacher guidance and reflective classroom tasks. This discussion interprets the findings according to the same components used in the findings section: vocabulary acquisition, morpho-syntactic awareness, pronunciation accuracy, reading comprehension, analytical reasoning, and the benefits and challenges of AI integration.

Vocabulary Acquisition

The high percentage of students reporting vocabulary development suggests that AI tools were particularly useful for lexical clarification and contextualized examples. This finding supports previous research indicating that AI-based learning environments can provide adaptive input and immediate feedback that help learners notice and revise language errors (Chen et al., 2020; Chiu, 2023). In Arabic learning, vocabulary acquisition is closely connected with root-pattern awareness, semantic fields, and contextual meaning. When students ask AI tools to compare related words or generate sample sentences, they engage not only in memorization but also in semantic analysis. This process aligns with Gardner's (2011) notion of linguistic intelligence as sensitivity to meaning and language function.

However, the findings also show that AI vocabulary support must be treated critically. Some students still required the lecturer's explanation to determine whether a suggested word was contextually appropriate. This is important in Arabic because lexical choices may carry religious, cultural, or formal-register implications. Therefore, AI can enrich vocabulary learning, but teacher mediation is needed to help students evaluate the appropriateness of AI-generated suggestions.

Morpho-Syntactic Awareness

The development of morpho-syntactic awareness reflects the usefulness of AI as a feedback and revision tool. Students were able to notice grammatical errors in word order, agreement, and inflection because AI feedback made errors visible. This finding is consistent with studies emphasizing the role of automated feedback in supporting language accuracy and learner autonomy (Kohnke et al., 2023; Li & Hafner, 2022). In Arabic, where morphology and syntax are highly interrelated, such feedback can help learners connect forms with

meanings and identify patterns that may be overlooked during conventional exercises.

At the same time, the study confirms that noticing errors is not the same as fully understanding grammar. Lecturer interviews showed that students needed a human explanation to interpret the reasons behind AI corrections. This finding reinforces the view that AI should not replace teachers. Instead, AI can serve as a preliminary layer of feedback that allows teachers to focus on deeper explanation, contextualization, and conceptual clarification.

Pronunciation Accuracy

Pronunciation findings show that AI-supported speech tools provided a private and repetitive environment for practice. This is pedagogically important because students often experience anxiety when practicing Arabic pronunciation in front of peers. AI feedback allowed learners to repeat difficult sounds, compare their output with model audio, and build confidence before classroom performance. This finding supports Shao et al. (2022), who highlight the potential of AI-based Arabic speech tutoring for pronunciation practice.

Nevertheless, speech-recognition feedback has limitations. It may identify accuracy scores or mispronounced words, but it cannot always explain articulatory processes in a way that suits learners' needs. Arabic sounds that are unfamiliar to Indonesian learners may require direct modeling, mouth-position explanation, and teacher correction. Thus, AI pronunciation tools are best understood as supplementary rehearsal media rather than complete pronunciation instruction.

The findings on reading comprehension suggest that AI helped students shift from direct translation to structural and contextual analysis. This shift is significant because reading Arabic requires attention to morphology, syntax, discourse markers, and contextual clues. AI tools helped students identify sentence components and infer meaning from grammatical relationships. This supports the argument that AI can function as a cognitive scaffold when learners use it to ask analytical questions rather than simply request translations (Ouyang & Jiao, 2021; Zhai et al., 2021).

However, the limitations found in this study are equally important. AI explanations were sometimes insufficient for interpreting religious references, cultural connotations, or pragmatic intent. This finding is consistent with research showing that AI systems may struggle with contextual and socio-cultural interpretation (Bedu, 2024; Dwivedi et al., 2021). Therefore, AI-assisted reading should be designed as a guided activity in which students compare AI output with teacher explanation, dictionaries, grammar references, and contextual discussion.

Analytical reasoning emerged through students' revision behavior, follow-up questioning, and improved organization of written summaries. This finding extends the discussion of linguistic intelligence beyond vocabulary and grammar. Linguistic intelligence also involves the ability to organize meaning, evaluate language choices, and construct coherent discourse (Armstrong, 2009; Gardner, 2011). When students used AI to compare expressions, revise summaries, or ask why a construction was incorrect, they engaged in reflective language analysis. This suggests that AI can support higher-order language learning when tasks require students to justify, compare, and revise rather than merely copy outputs.

The finding also has implications for classroom design. If AI is used only as a translation or answer-generating tool, its contribution to analytical reasoning may be limited. However, when lecturers design tasks that ask students to verify AI output, explain revisions, or compare alternative expressions, AI can become a tool for metalinguistic reflection. This supports recent discussions of AI in language learning as a partner for inquiry and revision rather than a substitute for learning effort (Fedorets et al., 2024; Kohnke et al., 2023).

Benefits and Challenges of AI Integration

Students generally perceived AI as beneficial for independent learning, immediate feedback, self-correction, and confidence building. In the questionnaire, 18 students (23.08%) reported very favorable experiences, 47 students (60.26%) reported favorable experiences, and 13 students (16.67%) reported neutral experiences. The benefit pattern consisted of four interrelated aspects: immediate feedback, increased practice opportunities, independent revision, and greater confidence in completing Arabic tasks. Students in the very favorable category emphasized that AI helped them practice outside class, receive rapid corrections, and repeat exercises without waiting for lecturer feedback. Students in the favorable category recognized similar benefits but noted that AI use still depended on internet access, device quality, and their ability to formulate prompts. Neutral respondents tended to use AI less frequently or preferred direct explanation from lecturers.

Interview data illustrated these patterns. Seven of the 10 interviewed students stated that AI made Arabic practice more interactive because they could ask questions repeatedly and receive instant responses. Five students specifically mentioned that AI helped them revise writing more confidently, while four students emphasized pronunciation practice. Lecturer interviews also indicated that AI increased students' willingness to revise their work, especially when lecturers asked them to compare AI feedback with grammar rules discussed in class. These findings suggest that AI created additional

opportunities for practice, but its benefit increased when connected with structured classroom tasks.

These perceived benefits are consistent with previous findings that students often perceive AI tools as supportive when feedback is timely and personalized (Anis, 2023; Chiu et al., 2023). In the Indonesian context, such affordances are valuable because classroom time is often limited and students may need additional opportunities to practice Arabic outside formal instruction.

Despite these benefits, three main challenges emerged in AI integration. The first challenge was digital literacy. Some students had difficulty writing effective prompts, evaluating AI output, or identifying inaccurate explanations. The second challenge was infrastructure. Unstable internet connections and unequal access to suitable devices limited the consistency of AI use. The third challenge concerned the cultural and pragmatic dimensions of Arabic. Students and lecturers reported that AI sometimes struggled to explain idiomatic expressions, religiously embedded meanings, or context-specific usage. These challenges show that AI integration requires more than tool availability; it requires teacher guidance, digital literacy training, and culturally responsive instructional design.

Overall, the findings answer the two aims of the study. First, AI-assisted learning supported students' perceived development of linguistic intelligence across vocabulary, morpho-syntax, pronunciation, reading comprehension, and analytical reasoning. Second, students and lecturers identified AI as beneficial for feedback, autonomy, and engagement, while also recognizing three limitations related to digital literacy, infrastructure, and cultural-pragmatic interpretation.

Pedagogical and Theoretical Significance

The study strengthens the significance of AI research in Arabic language education by showing how AI relates to multiple components of linguistic intelligence. Rather than treating AI as a general technological innovation, the study connects AI use with specific language abilities: vocabulary, morpho-syntax, pronunciation, reading, and analytical reasoning. This component-based view helps teachers identify which aspects of learning can be supported by AI and which aspects still require human explanation and cultural interpretation.

Theoretically, the study extends the application of linguistic intelligence to AI-assisted Arabic learning. It shows that linguistic intelligence can be examined through students' engagement with digital feedback, revision behavior, and reflective language analysis. Pedagogically, the findings suggest that AI should be integrated through guided tasks, not left as an individual and unguided activity. Teachers can ask students to use AI to generate examples, identify errors, compare structures, and reflect on revisions,

while also requiring them to verify AI output through classroom discussion and authoritative references. In this sense, AI becomes a complementary tool that expands learning opportunities while preserving the central role of teachers in interpretation, ethics, and cultural meaning.

The practical significance of the study is also visible in curriculum and assessment design. Arabic lecturers can use the five components of linguistic intelligence as a diagnostic map when selecting AI-supported tasks. Vocabulary tasks may focus on contextual word comparison; morpho-syntactic tasks may require students to explain AI corrections; pronunciation tasks may combine AI rehearsal with lecturer feedback; reading tasks may ask students to verify AI explanations of sentence structure; and analytical reasoning tasks may require students to justify revisions. This component-based integration helps prevent superficial AI use and encourages learners to treat AI feedback as material for reflection. For institutions, the findings indicate that AI policy should be accompanied by training in digital literacy, academic integrity, prompt formulation, and verification of AI output. Without such support, students may become dependent on AI-generated answers rather than developing linguistic intelligence.

The study further contributes to Indonesian Arabic language education by locating AI integration within the realities of Islamic higher education, where Arabic is learned not only as a foreign language but also as a medium for accessing religious, academic, and cultural knowledge. This context requires a balance between technological innovation and humanistic pedagogy. AI can accelerate feedback and expand practice opportunities, but it cannot independently interpret the ethical, cultural, and pragmatic dimensions of Arabic discourse. Therefore, the significance of AI in this study lies not in replacing established pedagogical traditions but in enriching them through carefully guided, reflective, and culturally responsive learning practices.

This study has several limitations. It relied partly on self-reported data and did not include standardized proficiency tests or experimental comparison groups. Therefore, the findings should be interpreted as descriptive evidence of perceived and observed learning development rather than causal evidence of AI effectiveness. Future research may employ mixed-method or experimental designs with pre-test and post-test measures to examine language gains more objectively. Further studies may also investigate how AI can be adapted to Arabic cultural discourse, religious texts, and different proficiency levels among Indonesian learners.

CONCLUSION

This study explored how AI-assisted learning in Arabic language learning supports the perceived development of linguistic intelligence among Indonesian university students and identified the benefits and challenges experienced during its implementation. Based on questionnaire responses, interviews, classroom observations, lecturer perspectives, and document analysis, the findings indicate that AI supported students' learning across five components of linguistic intelligence: vocabulary acquisition, morpho-syntactic awareness, pronunciation accuracy, reading comprehension, and analytical reasoning. Students most frequently reported development in vocabulary recognition and morpho-syntactic awareness, while pronunciation, reading comprehension, and analytical reasoning also showed consistent support from qualitative data.

The study also found that students generally perceived AI as helpful for independent practice, immediate feedback, revision, and confidence building in Arabic language learning. However, AI integration was constrained by three main challenges: limited digital literacy, unstable learning infrastructure, including unequal access to suitable devices, and AI's limited capacity to interpret cultural and pragmatic meanings in Arabic. These findings indicate that AI should be positioned as a complementary pedagogical tool rather than a replacement for teacher guidance. In Arabic learning, teachers remain essential for explaining grammatical reasoning, correcting subtle pronunciation issues, interpreting cultural meanings, and guiding ethical use of AI.

The contribution of this study lies in its component-based analysis of linguistic intelligence in AI-assisted Arabic learning. By linking AI use with vocabulary, morpho-syntax, pronunciation, reading comprehension, and analytical reasoning, the study offers a practical framework for designing more focused AI-supported Arabic instruction. For higher education institutions, the findings suggest the need to provide digital literacy training, improve technological infrastructure, and develop classroom strategies that require students to verify, reflect on, and revise AI-generated output.

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