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AI-Assisted Learning in Arabic Grammar: Investigating the Use of ChatGPT and Digital Platforms in Arabic Learning

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Abstract

Artificial intelligence (AI) technologies are increasingly being integrated into language learning; however, empirical evidence regarding their use in Arabic grammar and translation (Nahwu wa Tarjamah/I'rab) learning remains limited, particularly in Islamic higher education contexts. Existing studies have predominantly focused on general language learning applications, leaving insufficient understanding of how AI-supported platforms facilitate the learning of complex grammatical analysis and translation skills. This study aims to identify the AI-based platforms employed in I'rab learning and examine their impact on students' learning experiences and outcomes. A quasi-qualitative design was employed involving 30 fifth-semester students enrolled in the Nahwu course at STAIN Mandailing Natal. Data were collected through classroom observations, questionnaires, and in-depth interviews and analyzed using the Miles and Huberman interactive model. The findings reveal that students utilized four categories of AI-supported resources: digital learning repositories, generative AI applications, machine translation tools, and Arabic grammar support websites. The integration of these technologies enhanced students' awareness of digital learning resources, promoted autonomous learning practices, increased learning motivation, and received positive instructional support from lecturers. Furthermore, students demonstrated strong academic performance, achieving a mean final course score of 88.2 (A). This study contributes to the growing literature on AI-assisted Arabic language learning by providing empirical evidence of AI's role as a digital scaffolding tool in facilitating the acquisition of advanced Arabic grammatical and translation competencies.

Keywords: Artificial Intelligence; Arabic Language Learning; Digital Scaffolding; I'rab; Nahwu wa Tarjamah; Self-Regulated Learning

Abstrak

Teknologi kecerdasan buatan (Artificial Intelligence/AI) semakin banyak diintegrasikan ke dalam pembelajaran bahasa. Namun, bukti empiris mengenai pemanfaatannya dalam pembelajaran *Nahwu wa Tarjamah* (I'rab) masih terbatas, khususnya pada konteks pendidikan tinggi Islam. Studi-studi sebelumnya lebih banyak berfokus pada penggunaan AI dalam pembelajaran bahasa secara umum, sehingga pemahaman mengenai bagaimana platform berbasis AI mendukung pembelajaran analisis gramatikal dan keterampilan penerjemahan bahasa Arab yang kompleks masih belum memadai. Penelitian ini bertujuan untuk mengidentifikasi platform berbasis AI yang digunakan dalam pembelajaran I'rab serta mengkaji dampaknya terhadap pengalaman dan hasil belajar mahasiswa. Penelitian ini menggunakan desain kuasi-kualitatif yang melibatkan 30 mahasiswa semester V pada mata kuliah Nahwu di STAIN Mandailing Natal. Data dikumpulkan melalui observasi kelas, angket, dan wawancara mendalam, kemudian dianalisis menggunakan model analisis interaktif Miles dan Huberman. Hasil penelitian menunjukkan bahwa mahasiswa memanfaatkan empat kategori sumber belajar berbasis AI, yaitu repositori pembelajaran digital, aplikasi AI generatif, alat penerjemahan mesin, dan situs pendukung kaidah nahwu bahasa Arab. Integrasi teknologi tersebut meningkatkan literasi mahasiswa terhadap sumber belajar digital, mendorong kemandirian belajar, meningkatkan motivasi belajar, serta memperoleh dukungan positif dari dosen. Selain itu, mahasiswa menunjukkan capaian akademik yang tinggi dengan rata-rata nilai akhir sebesar 88,2 (A). Penelitian ini berkontribusi pada pengembangan kajian pembelajaran bahasa Arab berbantuan AI dengan menyediakan bukti empiris mengenai peran AI sebagai digital scaffolding dalam memfasilitasi penguasaan kompetensi gramatikal dan penerjemahan bahasa Arab tingkat lanjut.

Kata Kunci: Kecerdasan Buatan (*Artificial Intelligence*); Pembelajaran Bahasa Arab; *Digital Scaffolding*; *I'rab*; *Nahwu wa Tarjamah*; Pembelajaran Mandiri.

INTRODUCTION

The teaching of *Nahwu wa Tarjamah* (Arabic grammar and translation) in Islamic higher education continues to face significant pedagogical challenges. As a discipline that requires advanced grammatical reasoning and linguistic analysis, Nahwu is frequently perceived by students as abstract, complex, and cognitively demanding. Consequently, instructional practices often rely on traditional approaches centered on the explanation and memorization of grammatical rules, resulting in teacher-dominated learning environments with limited student participation and academic interaction (Hamid 2008; Sulaikho et al. 2025; Cholidah and Muid 2024). Such instructional patterns are increasingly questioned because meaningful grammatical understanding is not developed through passive knowledge transmission but through active engagement, dialogue, and reflective inquiry.

From a constructivist perspective, knowledge is actively constructed through cognitive activity and social interaction rather than received as fixed information (Nugraha and Syafe'i 2025; Zawacki-Richter et al. 2019; Kasneci et al. 2023). This perspective is particularly relevant for Arabic grammar learning, where

students must continuously analyze sentence structures, identify grammatical relationships, and justify linguistic interpretations. Therefore, learning environments that facilitate interaction, feedback, and independent exploration are essential for promoting deeper grammatical understanding.

Recent advances in artificial intelligence (AI) have introduced new opportunities for language learning. Generative AI systems such as ChatGPT and Gemini, alongside digital translation and grammar-support platforms, provide learners with immediate explanations, interactive feedback, and opportunities for self-directed learning (Sharma and Garg 2021). Within educational settings, AI can function as a cognitive support tool that assists learners in organizing ideas, solving linguistic problems, and engaging in exploratory learning processes (Abidah et al. 2024). These characteristics align closely with the Community of Inquiry (CoI) framework, which emphasizes the integration of cognitive presence, social presence, and teaching presence in meaningful learning experiences (Garrison et al. 1999).

Previous studies have demonstrated the educational potential of AI-assisted platforms in supporting writing, translation, speaking, listening, reading, and language production skills (Harsita et al. 2024; Rahmouni 2024; Subhan and Qomariyah 2025). Research has also shown that ChatGPT can facilitate translation activities and provide relatively accurate semantic interpretations, although limitations remain when dealing with complex linguistic structures and less frequently used vocabulary (Faris and Abdurrahman 2023). Similarly, studies indicate that ChatGPT and Gemini are capable of identifying many grammatical features of Arabic sentences but still encounter difficulties when processing advanced syntactic phenomena such as *ḥadhf* (ellipsis) and *taqdīm wa ta'khīr* (word-order variation) (bin Wan Adnani and bin Shaiful Baharum 2024). Other AI-based platforms, such as NahwuAI, have been developed specifically to assist learners in analyzing Arabic grammatical structures, *i'rāb*, and sentence composition (Bustam et al. 2024; L. Sari 2023).

Despite these developments, existing research has largely focused on the technical capabilities and linguistic accuracy of AI systems rather than their pedagogical implications in Arabic grammar instruction. Empirical evidence remains limited regarding how students actually utilize AI-assisted platforms in Nahwu learning and how these technologies influence learning engagement, academic interaction, and learning outcomes within Islamic higher education contexts. Moreover, studies examining AI as a form of digital scaffolding for complex grammatical analysis and translation tasks are still scarce.

Addressing this gap, the present study investigates the integration of AI-assisted learning tools in a *Nahwu wa Tarjamah* course at STAIN Mandailing Natal. Specifically, this study seeks to identify the AI-based platforms utilized by students and examine their impact on learning engagement, academic interaction, and learning achievement. By situating AI within constructivist learning theory and the Community of Inquiry framework, this study contributes to the emerging literature on AI-assisted Arabic language learning by providing empirical evidence of how generative AI and digital language-support platforms function as digital scaffolding tools in the development of advanced Arabic grammatical and translation competencies.

METHOD

Research Design

This study employed a qualitative case study design with supporting descriptive quantitative data to explore the implementation of artificial intelligence (AI)-assisted learning in a *Nahwu wa Tarjamah* (Arabic grammar and translation) course. A qualitative case study was considered appropriate because the study aimed to investigate an educational phenomenon within its real-life context, focusing on how students utilized AI-assisted platforms and how these technologies influenced their learning experiences, academic interaction, and learning outcomes. The quantitative data derived from questionnaires and students' achievement records were used to complement and strengthen the qualitative findings rather than to test causal relationships (Creswell, 2015; Nassaji, 2020).

Research Context and Participants

The study was conducted during the 2025–2026 academic year at STAIN Mandailing Natal, Indonesia. The case examined was a fifth-semester Nahwu III course in the Arabic Language Education Program, where AI-assisted learning tools were systematically integrated into instructional activities. Participants consisted of 30 undergraduate students enrolled in the course. Purposive sampling was employed because all participants had direct experience using AI-based platforms during grammar and translation learning activities.

The participants came from diverse educational backgrounds, including Islamic boarding schools (*pesantren*) and general secondary schools. Throughout the semester, students were introduced to several AI-assisted learning platforms, including ChatGPT, Gemini, NahwuAI, Arabic Keyboard, Tashkeel, digital Islamic libraries, online dictionaries, and Arabic grammar learning websites. These platforms were utilized to support grammatical analysis (*i'rāb*), sentence structure identification, translation exercises, and independent learning activities.

Learning Intervention

The AI-assisted learning intervention was implemented throughout one academic semester. Before using the platforms independently, students received guidance from the lecturer regarding the ethical and effective use of AI technologies in Arabic language learning. The lecturer demonstrated how AI tools could be used to analyze sentence structures, determine grammatical functions, provide Arabic diacritics (*tashkīl*), support translation activities, and access digital Arabic learning resources.

Students were encouraged to compare AI-generated outputs with traditional Arabic grammar references and classroom explanations. This process positioned AI not as a replacement for instructional authority but as a digital scaffolding tool that supported students' analytical reasoning and self-regulated learning. Throughout the intervention, the lecturer continuously monitored students' work, provided feedback, and encouraged critical evaluation of AI-generated responses.

Data Collection

Data were collected from four complementary sources to ensure a comprehensive understanding of the phenomenon.

Classroom Observation

Non-participant observations were conducted throughout the semester to document students' engagement, interaction patterns, learning behaviors, and

responses to AI-assisted learning activities. Field notes were recorded during classroom sessions focusing on how students interacted with AI platforms and how lecturers facilitated their use.

Questionnaire

A structured questionnaire was administered to all participants at the end of the learning intervention. The instrument consisted of seven categories addressing: (1) frequency of AI use, (2) perceived usefulness of AI platforms, (3) AI utilization for grammatical analysis and i'rāb, (4) willingness to recommend AI platforms, (5) educational background, (6) preferred AI platforms, and (7) additional AI resources known and used by students. The questionnaire generated descriptive quantitative data in the form of frequencies and percentages.

Semi-Structured Interviews

Semi-structured interviews were conducted with selected participants representing different levels of AI usage and learning experiences. The interviews explored students' perceptions of AI-assisted learning, benefits and challenges encountered, strategies used when interacting with AI tools, and the role of lecturer guidance during the learning process. Interview excerpts were transcribed and analyzed thematically.

Document Analysis

Documentary data included students' assignments, i'rāb exercises, translation tasks, AI-generated outputs, and final course assessment records. These documents were examined to identify evidence of AI utilization and to evaluate students' learning performance during the intervention period. The average final achievement score of the participants was also analyzed as supplementary evidence of learning outcomes.

Data Trustworthiness

To enhance research rigor, methodological triangulation was employed by integrating evidence obtained from observations, questionnaires, interviews, and document analysis. Data from multiple sources were compared to identify convergent findings and minimize potential bias. Member checking was also conducted during the interview process to ensure the accuracy of participants' statements and interpretations. Furthermore, prolonged engagement throughout one academic semester enabled the researchers to develop an in-depth understanding of the learning context and participants' experiences.

Data Analysis

The data were analyzed using the interactive model proposed by Miles and Huberman, consisting of data reduction, data display, and conclusion drawing/verification (Miles & Huberman, 2002). First, observation notes, interview transcripts, questionnaire responses, and documentary evidence were organized and coded. Second, recurring themes related to AI utilization, learning engagement, academic interaction, digital scaffolding, and learning outcomes were identified and categorized.

The quantitative data obtained from questionnaires and student achievement records were analyzed descriptively using frequencies, percentages, and mean scores. These numerical findings were subsequently integrated with qualitative themes to provide a richer interpretation of students' experiences with AI-assisted Arabic grammar learning. Through this analytical process, the study

generated a holistic understanding of how AI-supported platforms functioned as digital scaffolding tools in *Nahwu wa Tarjamah* learning.

Ethical Considerations

Prior to data collection, all participants were informed about the purpose of the study and voluntarily agreed to participate. Informed consent was obtained from all participants. To protect confidentiality, students' identities were anonymized using initials in interview excerpts and research records. All data were used exclusively for academic and research purposes.

RESULT AND DISCUSSION

AI-Assisted Platforms Used in *Nahwu wa Tarjamah* Learning

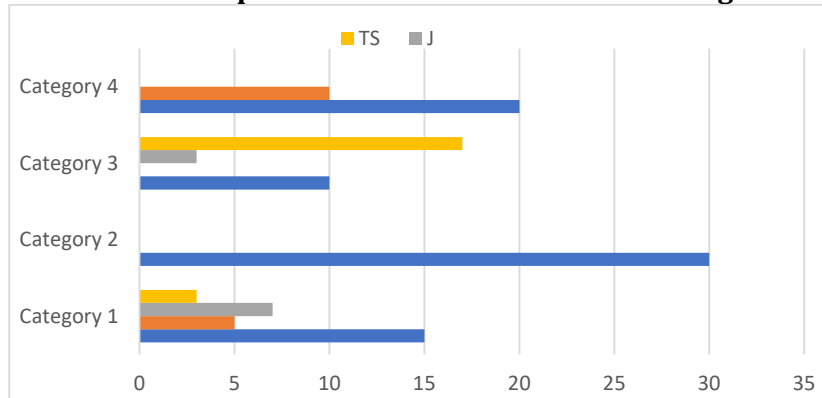
The first objective of this study was to identify the AI-assisted platforms utilized by students in *Nahwu wa Tarjamah* learning. Questionnaire findings revealed that AI-supported technologies had become an integral part of students' learning practices. Half of the participants (50%) reported using AI-assisted platforms almost daily, while only 10% indicated that they had never used such tools for academic purposes. Furthermore, all participants acknowledged the usefulness of AI platforms in supporting learning activities, indicating a high level of acceptance toward AI-assisted learning resources.

Table 1: Categories related to the use of AI

NO	Category	SS	S	J	TS
1	Frequency of using AI website	15	5	7	3
2	The benefits of using the AI website for students themselves	30	0	0	0
3	Using the AI website to find out sentence structure (i'rab) and nahwu theory	10	0	3	17
4	Recommendations for using AI websites	20	10	0	0
5	Graduate Students	Traditional and modern schools			
6	AI website used for I'rab & for sentence structure and harakat	Arabic keyboard, tashkeel, ChatGPT			
7	Another website: known to make it easier to learn nahwu & translation from both lecturers & colleagues.	ChatGPT, Gemini, Nahwu AI			

To provide a clearer overview of students' responses regarding AI utilization, the distribution of responses across Categories 1–4 is presented in Chart 1.

Chart 1. Students' Responses toward AI-Assisted Learning Platforms



Information:

Category 1: Frequency of using AI website: SS (very often) with a scale of 5-7 times a week or almost every day; S (often) with a scale of 3-4 times a week; J (sometimes) with a scale of 1-2 times a week; TS (Never) with a scale of 0 times.

Category 2: Usefulness of using the AI website: SS (strongly agree); S (agree); J (sometimes); TS (disagree).

Category 3: Use of AI website to find out sentence structure (i'rab) and nahwu theory: SS (very often) with a scale of every nahwu course and assignment; S (often) with a scale of when the answer is not in the book; J (sometimes) with a scale of sometimes looking for it, sometimes not; TS (Never).

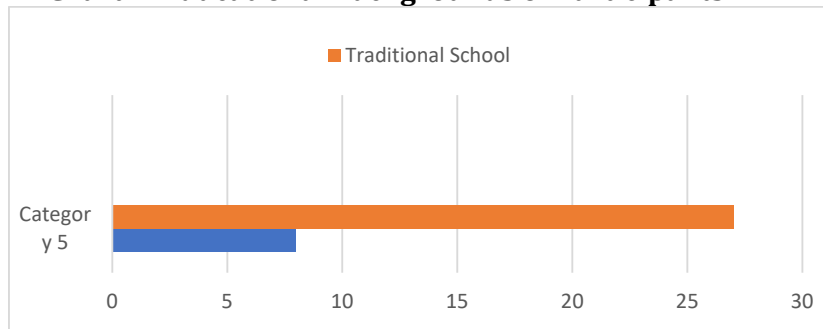
Category 4: Recommendations for using AI websites: SS (strongly agree); S (agree); J (sometimes); TS (not Stuju).

The findings demonstrate a generally positive perception of AI-assisted learning. Half of the participants (50%) reported using AI-assisted platforms almost every day for academic purposes, while all respondents acknowledged the usefulness of these technologies in supporting Nahwu and translation learning. Furthermore, a majority of students expressed willingness to recommend AI platforms to other learners, suggesting a high level of acceptance of AI-supported learning environments.

These findings indicate that AI-assisted learning is no longer perceived merely as a supplementary technological innovation but has become part of students' everyday learning practices. The widespread acceptance of AI tools reflects the increasing role of digital technologies in supporting self-directed language learning and grammatical analysis.

The educational backgrounds of participants are presented in Chart 2.

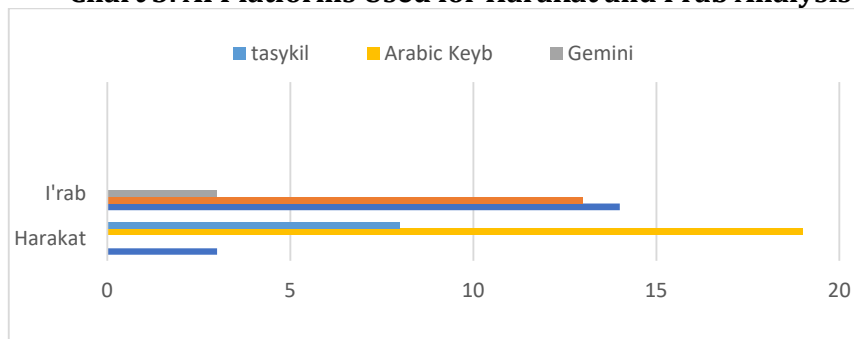
Chart 2. Educational Backgrounds of Participants



The chart shows that most participants (90%) came from traditional Islamic educational institutions (*pesantren*), while only a small proportion originated from general secondary schools. This finding is significant because it demonstrates that AI-assisted learning was adopted even among students who had previously been exposed to conventional Arabic grammar instruction through classical texts and traditional learning approaches.

The distribution of AI platforms used by students for grammatical analysis and Arabic diacritization is illustrated in Chart 3.

Chart 3. AI Platforms Used for Harakat and I'rab Analysis



The findings reveal distinct patterns of platform utilization. Arabic Keyboard and Tashkeel were primarily employed for adding Arabic diacritics (*harakat*), whereas ChatGPT, NahwuAI, and Gemini were more frequently used for grammatical analysis (*i'rāb*). ChatGPT emerged as the most frequently used platform for *i'rāb* analysis, followed closely by NahwuAI.

These findings suggest that students strategically selected different AI-assisted platforms according to specific learning objectives. Rather than relying on a single platform, students developed a digital learning ecosystem consisting of complementary resources designed to address different linguistic challenges.

The complete list of AI-assisted platforms identified in this study is summarized in Table 2.

Table 2. AI-Assisted Platforms Used in Nahwu wa Tarjamah Learning

No	AI Website	Function
1	https://almutadaber.com	for dictionary (meaning of words), terms, grammar theory
2	https://perpustakaanislamdigital.com/index.php/fp/kitab/30	list of I'rab books
3	https://arabic-for-nerds.com/grammar/irab-steps-formula/	learn nahwu theory
4	https://www.learnarabiconline.com/	learn nahwu theory
5	https://www.almaany.com/id/dict/ar-id/	For the dictionary (meaning of words) arab-indonesian, arab-arab
6	https://go.almaata.ac.id/	nahwuai application AI i'rab
7	https://rdi-tashkeel.com/ar/	home application harakat
8	https://www.arabic-keyboard.org/	harakat, translate, nahwu application
9	https://chatgpt.com/	harakat, translate, nahwu application. I'rab
10	http://gemini.google.com/app	harakat, translate, nahwu application. I'rab

As shown in Table 2, students utilized four major categories of digital resources: digital repositories and e-books, generative AI applications, machine translation tools, and Arabic grammar-support platforms. This diversity indicates that AI-assisted learning in Arabic grammar extends beyond the use of ChatGPT alone and encompasses a broader digital learning environment.

Interview findings further support the quantitative results. Students consistently reported that AI-assisted platforms facilitated access to grammatical explanations, translation assistance, and Arabic learning resources. At the same time, they emphasized the importance of verifying AI-generated responses through textbooks and lecturer guidance. This demonstrates that students did not treat AI as an authoritative source but rather as a supporting tool within a broader learning process.

FAN: "After being taught the theory of nahwu, then taught the theory of i'rab, then given practice in pronouncing sentences from the hadith and the Qur'an, the AI website is very helpful especially in determining the harakat with the Arabic keyboard

site, then I use the digital yellow book from the digital Islamic library site, I don't have to bring books, just search on the laptop, there are already answers to the tasks given."

NH: "I've been using chatGPT since I started college. I ask for information about courses, and then I research them to make sure what I get from chatGPT is accurate. ChatGPT isn't always correct; it provides answer options. To find the correct answer, we have to go back to the textbook."

RA: "Usually I borrow books from the library and I'm used to reading books offline, as for AI websites I usually use CHatGPT, and tashkeel and almaany, as well as nahwuAI"

MA: "I've used chatGPT a lot. I've tried using two applications for one assignment. I've tried Gemini, nahwuAi, and ChatGPT. I chose nahwuAI. As for my books, I prefer offline, and digital yellow books are also very helpful for us students with limited spending money."

K: "At first, I didn't understand how to use the AI website. Because I was learning independently, I finally learned how to use the AI website, and it was very helpful. Of course, the lecturer provided reviews and corrections to the website results. The lecturer asked us to ensure that the website's answers were only helpful. For the final answer, it required careful adjustments with references and revisions."

From a constructivist perspective, these findings indicate that AI-assisted platforms function as cognitive tools that enable learners to actively construct knowledge through exploration, comparison, and reflection (Nugraha & Syafe'i, 2025; Kasneci et al., 2023).

The Impact of AI-Assisted Learning on Student Engagement and Learning Outcomes

The second objective of this study was to examine the impact of AI-assisted learning on students' learning experiences and academic achievement.

Questionnaire results revealed that all respondents perceived AI-assisted platforms as beneficial for learning. Interview data further showed that students became more enthusiastic and actively engaged in learning activities. Several participants reported comparing outputs from multiple AI platforms before reaching conclusions regarding grammatical analysis and translation tasks. Such practices reflect the development of self-regulated learning behaviors supported by AI technologies.

These findings are consistent with previous studies reporting that AI-assisted learning environments enhance learner autonomy, confidence, and engagement in language learning contexts (Subhan & Qomariyah, 2025; Qomariah et al., 2025). The availability of immediate feedback and accessible learning resources encourages students to participate more actively in the learning process.

Within the Community of Inquiry framework (Garrison et al., 1999), AI-assisted platforms appear to strengthen cognitive presence by enabling students to investigate grammatical problems independently. However, teaching presence remained essential because lecturers continuously guided students in evaluating AI-generated outputs and identifying possible inaccuracies. Consequently, AI did not replace lecturers but complemented their instructional role. Evidence of positive learning outcomes is presented in Table 3.

Table 3. Students' Final Achievement Scores

NO	Value Range	Number of Students
1	100-85 (A)	17
2	84-70 (B)	11
3	69-55 (C)	2
4	54-30 (D)	0
5	29-0 (E)	0
Average value		88.2

The results indicate that most students achieved high levels of academic performance. More than half of the participants obtained Grade A, while the overall mean score reached 88.2. Although this qualitative case study does not establish a causal relationship between AI use and academic achievement, the findings suggest that AI-assisted learning may contribute to improved learning performance when accompanied by effective pedagogical guidance.

Interview data provide additional support for this interpretation. Students emphasized that lecturer supervision was critical in ensuring responsible AI use. Lecturers encouraged students to compare AI-generated analyses with authoritative grammar references and classroom explanations before accepting them as valid. This process cultivated critical thinking and reduced the risk of overreliance on technology.

AI as Digital Scaffolding in Arabic Grammar Learning

One of the most important findings of this study is the role of AI-assisted platforms as digital scaffolding tools in Arabic grammar learning. The platforms supported students by providing immediate grammatical explanations, translation assistance, Arabic diacritization, and access to relevant learning resources. These supports enabled learners to perform complex analytical tasks that might otherwise exceed their current level of competence.

Nevertheless, students and lecturers acknowledged several limitations. AI-generated responses were not always accurate, particularly when dealing with advanced grammatical phenomena such as *ḥadhf* (ellipsis) and *taqdīm wa ta'khīr* (word-order variation). Therefore, AI should not be viewed as a substitute for traditional grammatical scholarship but as a supplementary learning resource requiring human judgment and pedagogical mediation.

Overall, the findings demonstrate that the effectiveness of AI-assisted learning depends not only on technological capabilities but also on the quality of instructional guidance. Within this context, AI functions most effectively as digital scaffolding that promotes learner autonomy, facilitates grammatical reasoning, and enhances access to learning resources while preserving the central pedagogical role of lecturers.

CONCLUSION

This study demonstrates that AI-assisted platforms have become important learning resources in Nahwu wa Tarjamah instruction within Islamic higher education. Students utilized a diverse range of digital resources, including generative AI applications, machine translation tools, digital repositories, and Arabic grammar-support platforms, to assist grammatical analysis (*i'rāb*),

translation activities, and independent learning. The findings indicate that AI-assisted learning not only increases students' access to linguistic resources but also encourages greater learning engagement, self-directed learning, and active participation in the construction of grammatical knowledge.

From a theoretical perspective, this study extends the growing literature on AI-assisted language learning by conceptualizing AI as a form of digital scaffolding in Arabic grammar education. The findings suggest that AI-supported platforms facilitate cognitive support, immediate feedback, and exploratory learning opportunities that help students navigate complex grammatical and translation tasks. At the same time, the study confirms that effective learning outcomes emerge not from the technology itself but from the interaction between technological support, learner agency, and lecturer guidance. This finding reinforces constructivist learning theory and the Community of Inquiry framework by highlighting the complementary roles of cognitive presence, teaching presence, and digital mediation in language learning.

Practically, the study highlights the importance of integrating AI-assisted platforms into Arabic language instruction through structured pedagogical guidance rather than unrestricted technological adoption. While AI can enhance learner autonomy and academic performance, its limitations in handling complex grammatical phenomena underscore the continuing importance of lecturer supervision and critical evaluation of AI-generated outputs. Future research should investigate the long-term effects of AI-assisted learning on Arabic language proficiency across diverse educational settings and employ comparative or longitudinal designs to better understand the relationship between AI use, academic interaction, and learning outcomes.

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