

SOCIAL SCIENCE AND EDUCATION | RESEARCH ARTICLE

Implementation of Artificial Intelligence (AI) as a Companion Tutor in Nahwu Sharaf Learning

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This study aims to analyze the implementation of Artificial Intelligence (AI) as a supporting tutor in learning Nahwu and Sharaf for third-semester students of the Arabic Language Education Study Program (PBA) at IAIN Ternate in the 2025–2026 academic year. This study used a mixed methods approach with a sequential explanatory design, combining quantitative and qualitative data. Quantitative data were obtained through pre- and post-tests to measure learning outcome improvements, while qualitative data were collected through perception questionnaires, interviews, and learning observations. The results of the study indicate that the use of AI improves learning outcomes from moderate to high, particularly in the aspects of understanding Nahwu rules, i'rab, and Sharaf application. Qualitative findings revealed that AI plays an effective role in supporting self-directed learning, enhancing student engagement, and serving as a supplementary tutor that complements the role of the lecturer. Nevertheless, pedagogical guidance from lecturers remains necessary for conceptual and abstract materials.

Keywords: Artificial Intelligence, Nahwu Sharaf, Arabic Language Learning.

I. Introduction

Arabic holds a strategic position in the treasury of Islamic knowledge as the language of the Qur'an and Hadith. (Hermawan, 2025) Mastery of Arabic is a fundamental prerequisite for Muslims to understand the sources of religious teachings in a deep and comprehensive manner. In the structure of Arabic language learning, Nahwu and Sharaf hold a central place as the foundation for understanding Arabic grammar and morphology. Nahwu governs the rules of syntax and i'rab (the position of words in a sentence), while Sharaf discusses the changes in word forms and their derivational patterns. (Darmawan, 2023) These two sciences are key to unlocking a correct understanding of classical Arabic texts, especially religious literature.

Nevertheless, the study of Nahwu Sharaf faces various challenges in the contemporary era. The complexity of the material, which includes hundreds of rules, exceptions, and patterns that must be memorized, often becomes a psychological barrier for the learners. Conventional learning methods, which are still dominant in pesantrens and Islamic educational institutions, tend to be teacher-centered, emphasizing the memorization of rules without sufficient practical application. Limited face-to-face classroom time makes



it difficult for students to receive intensive individual guidance, whereas language learning requires continuous practice and feedback. In addition, the less-than-ideal teacher-to-student ratio in many educational institutions results in not all learners receiving attention and guidance proportional to their level of understanding and learning pace.

The phenomenon of learning loss or educational gaps has become increasingly evident following the COVID-19 pandemic, where many students experienced a decline in academic competence due to ineffective distance learning (Widyasari et al., 2022). In the context of Nahwu Sharaf learning, this gap is evident in the decreased ability of students to apply basic rules and perform i'rab independently. On the other hand, access to teachers or ustadz who are competent in Nahwu Sharaf is uneven, especially in areas far from the centers of Islamic education (Asiah & Zamroni, 2019). This situation is worsened by the lack of interactive teaching materials and learning media that can accommodate the learning styles of the digital generation, who are accustomed to information technology and digital learning.

The information technology revolution and the rapid development of Artificial Intelligence (AI) have opened transformative opportunities in the field of education (Wahyudi et al., 2025). AI has demonstrated its capabilities in various areas, ranging from pattern recognition and natural language processing (NLP) to adaptive learning systems that can be tailored to the individual needs of learners (Huang et al., 2023). AI technologies, such as Large Language Models (LLMs), have shown a deep understanding of language structures, including Arabic, and are capable of providing explanations of grammatical rules in a structured and easily understandable way. AI's ability to be available 24/7, provide instant feedback, and adjust the difficulty level of material according to the user's abilities makes it a potential solution to overcome the limitations of conventional learning (Zheng and Yang, 2024).

The implementation of AI as a companion tutor in Nahwu Sharaf learning offers a new paradigm for Arabic language education (Sari et al., 2024). AI can function as a personalized learning assistant that provides rule explanations, interactive exercises, error corrections with detailed explanations, and ongoing support outside formal class hours to students. AI-based learning systems can identify common learner mistakes, provide additional exercises in weak areas, and systematically track learning progress (Tan et al., 2025). Furthermore, AI can present contextual examples from the Qur'an and Hadith to reinforce rule comprehension while enhancing learning motivation through the relevance of the material to religious texts (Pinela-Cárdenas et al., 2025).

Several previous studies have shown the effectiveness of using AI technology in language learning; however, specific research on the implementation of AI in Nahwu Sharaf learning is still limited (Hanifa & Sopian, 2025). Previous studies have mostly focused on general Arabic language learning or language skills (maharah) such as reading, writing, listening, and speaking, while in-depth grammatical aspects like Nahwu Sharaf have not been extensively explored. The unique characteristics of Nahwu Sharaf, which are systematic, rule-based, and require intensive practice, are very compatible with AI's ability to manage rule-based learning systems and provide adaptive exercises (Muharom, 2025).

The urgency of this research is increasingly evident, considering that today's young Muslim generation are digital natives accustomed to interacting with technology in their daily lives. The integration of AI in Nahwu Sharaf learning is not only about modernizing methods but also about making religious knowledge more accessible and engaging for young people. This study aims to explore how AI can be effectively implemented as a tutoring companion, identify its advantages and limitations, and formulate an optimal implementation model for the context of Nahwu Sharaf learning in Indonesia.

Thus, research on the implementation of Artificial Intelligence as a companion tutor in Nahwu Sharaf learning is relevant and important to bridge the gap between traditional learning methods and learning needs in the digital era. This study is expected to provide theoretical contributions to the development of Arabic language educational technology and offer practical recommendations for Islamic educational institutions to utilize AI to enhance the quality of Nahwu Sharaf learning.

II. Literature Review and Hypothesis Development

2.1. The Concept of Artificial Intelligence

Artificial Intelligence (AI) is a branch of computer science that focuses on developing computer systems capable of performing tasks that typically require human intelligence. According to Russell and Norvig (Russell.S.J & Norvig, AI is defined as the study of agents that receive perceptions from the environment and take actions that maximize their chances of success (Russell and Norvig, 2020). McCarthy (McCarthy.J, 2007), who first introduced the term 'Artificial Intelligence' in 1956, defined AI as the science and engineering of creating intelligent machines, particularly intelligent computer programs. The development of AI has gone through several significant phases, starting with the era of symbolic AI in the 1950s-1980s, which focused on rule-based systems, then evolving into machine learning in the 1990s-2000s, which allowed computers to learn from data, up to the era of deep learning and neural networks since 2010, which has brought breakthroughs in natural language processing and complex pattern recognition. Goodfellow et al. (2016) explained that deep learning is a subset of machine learning that uses layered artificial neural network architectures to learn data representations at various levels of abstraction.

Natural Language Processing (NLP) is an interdisciplinary field that combines linguistics, computer science, and artificial intelligence to enable computers to understand, interpret, and generate human language. (Musthofa, 2010) defines NLP as a set of computational methods for analyzing and representing text or speech that occurs naturally at one or more levels of linguistic analysis to achieve human-like language processing. In the context of the Arabic language, language processing faces unique challenges because of its complex morphological characteristics. Agustina et al. (2025) explain that Arabic has a very rich morphological system with extensive derivation and inflection, as well as agglutinative phenomena, where clitics can attach to root words. Developments in Arabic NLP have resulted in various tools and resources, such as the Arabic TreeBank, morphological analyzers (SAMA and AraMorph), and part-of-speech taggers specific to the Arabic language. Large Language Models (LLMs), such as Generative Pre-trained Transformer (GPT), BERT, and Claude, represent the latest advancements in AI and are capable of understanding and generating text with a high degree of coherence. (Gao et al., 2021) In their research on GPT-3, they demonstrated that models with a large number of parameters can perform various language tasks without specific fine-tuning, including answering questions, writing essays, and even solving math problems. In the context of education, LLMs have the potential to serve as intelligent tutors that can provide concept explanations, answer students' questions, and offer personalized feedback. (Sok & Heng, 2023) In their study on ChatGPT in higher education, it was identified that LLMs can support adaptive learning, provide scaffolding tailored to students' level of understanding, and be available as a learning companion 24/7. However, they also emphasized the importance of pedagogical framing and human oversight to ensure the accuracy of the information and its alignment with learning objectives.

2.2. Nahwu and Sharaf Learning

Nahwu is a branch of Arabic language science that discusses the final state of words (i'rab and bina') within the sentence structure. (Ulum & Nuriyah, 2023) define Nahwu as the knowledge through which one can understand the final state of Arabic words in terms of i'rab (changes in the ending vowel) and bina' (fixed ending vowels). Nahwu covers discussions about types of words (isim, fi'il, harf), sentence structures (jumlah ismiyyah and jumlah fi'liyyah), cases of i'rab (rafa', nashab, jar, jazam), and various other syntactic rules.

Morphology, on the other hand, discusses changes in word forms to produce certain meanings. According to Suhartono et al. (2016), morphology is a science with rules by which changes in Arabic word

forms for intended purposes are known. This science includes discussions about wazan (word patterns), tashrif (conjugation), word derivation from root words (isytiqaq), and changes of words from one form to another. These two fields of knowledge are closely related to understanding the structure of the Arabic language. (Muharom 2025) explains that mastery of Sharaf is a prerequisite for understanding Nahwu well, because changes in the form of words affect their function and position in a sentence. Integrating the understanding of both allows learners to comprehensively analyze Arabic texts.

The method of teaching Nahwu Sharaf in pesantrens and traditional Islamic education institutions generally uses a classical approach that has been passed down for centuries. (Ulfa, 2022) identifies several main methods used, namely: (1) the sorogan method, where students meet the teacher individually to read and understand the book; (2) the bandongan or wetonan method, where the teacher reads and explains the book to a group of students; and (3) the memorization method, where students are required to memorize nadhom (poems) containing the rules of Nahwu Sharaf, such as Alfiyah Ibn Malik or Jurumiyah. Research (Agustina et al., 2025) on Nahwu Sharaf learning in pesantren found that traditional methods have advantages in terms of deep understanding of the yellow books and direct transmission of knowledge from teachers, but have weaknesses in terms of limited student-teacher interaction, lack of practical application, and minimal use of modern learning media. This method is text-centered and provides little room for student-centered learning. Various studies have identified significant problems in learning Nahwu Sharaf in the contemporary era. Hamid et al. (2008) categorized these problems into three main aspects: (1) linguistic problems, including the complexity of rules, numerous exceptions (syudzudz), and differences between classical Arabic and modern Arabic; (2) methodological problems, including the dominance of memorization methods, lack of communicative practice, and insufficient interactive learning media; (3) psychological problems, including students' perception that Nahwu Sharaf is difficult, lack of learning motivation, and learning anxiety.

Research (Zheng & Yang, 2024) found that 67% of madrasah aliyah students consider Nahwu Sharaf to be the most difficult subject, with the main factors being the complexity of the material, monotonous teaching methods, and a lack of individual guidance. The study also revealed that only 34% of students could apply Nahwu Sharaf rules in reading Arabic texts independently, indicating a gap between theoretical knowledge and practical ability. (Widyasari et al., 2022) In their research on post-pandemic Nahwu Sharaf learning, they found a significant learning loss, where students' abilities in i'rab and tashrif declined by an average of 28% compared to the pre-pandemic period. This highlights the urgency of developing learning methods and media that can provide intensive guidance outside formal classroom learning.

2.3. AI Technology in Language Learning

Intelligent Tutoring Systems (ITS) are computer systems designed to provide personalized instruction and feedback to learners without the need for human intervention. ITS serves as a computer system that delivers immediate and customized instructions or feedback to learners, usually without requiring intervention from a human teacher. This system integrates cognitive learning theory with AI technology to create an adaptive learning environment for students. (Suhartono et al., 2016). The ITS structure generally consists of four main components: (1) a domain model that contains expert knowledge about the material being taught; (2) a student model that tracks students' knowledge and progress; (3) a pedagogical model that determines teaching strategies; and (4) a user interface that facilitates interaction with students. Meta-analysis research by Kulik and Huang et al., (2023) shows that ITS can improve learning outcomes with an average effect size of 0.66 standard deviations compared to

Adaptive learning is an educational approach that uses computer algorithms to manage interactions with learners and provide learning resources and activities tailored to each individual's unique needs. Oxman and Wong (2014) explained that adaptive learning systems use data on student performance to adjust the learning path, the level of difficulty, and the type of content presented. In the context of language learning,

adaptive learning can manifest in various forms: (1) adaptive content presentation, where the complexity of the material is adjusted to the level of ability; (2) adaptive navigation support, which guides students through the optimal learning path; and (3) adaptive feedback, which provides hints and explanations tailored to the type of error. Research (Sari et al., 2024) has found that adaptive learning can improve learning efficiency by up to 40% and increase long-term retention by 25% compared with non-adaptive learning. Computer-Assisted Language Learning (CALL) explores the use of computer technology in language learning and teaching. (Anwar 2021) defined CALL as the search for and study of computer applications in language learning and teaching. The development of CALL has gone through several phases: behavioristic CALL (1960s-1970s), communicative CALL (1970s-1990s), and integrative CALL (1990-present), which integrates language skills with multimedia technology and the Internet.

In the context of learning the Arabic language, several CALL applications have been developed, such as Arabitext for vocabulary learning, Al-Kitab for comprehensive Arabic language learning, and various mobile learning applications (MLAs). However, Sok and Heng (2023) note that the majority of CALL tools for Arabic still focus on vocabulary and receptive skills (reading and listening), while in-depth grammatical aspects such as Nahwu Sharaf are still underexplored. Several studies have explored the application of AI in various aspects of Arabic-language learning. (Aishah et al., 2025) developed an intelligent tutoring system for learning Arabic vocabulary that uses machine learning algorithms to predict words that are difficult for learners and to adjust review frequency. The study results showed a 37% increase in vocabulary retention compared with conventional learning methods. She also developed an automatic error detection system for Arabic language learning that can identify and correct grammatical errors in student writing. This system uses a combination of rule-based approaches and statistical methods to detect errors in agreements, case markings, and word orders. The system evaluation showed an error detection accuracy of 82% for common grammatical errors. Research (Anwar, 2021) on the use of AI-based mobile learning applications for Arabic language learning found that applications integrating speech recognition, adaptive quizzes, and instant feedback can increase learning motivation by 45% and improve achievement test scores by 28% compared with a control group using traditional methods. Although research on technology in Arabic language learning is quite extensive, specific studies on learning Nahwu Sharaf using AI technology are still limited. (Musthofa, 2010) developed a web-based learning platform for Nahwu learning that provides interactive exercises, instant feedback, and progress tracking for Nahwu learning. Research with a quasi-experimental design showed that the experimental group using the platform had significantly higher post-test scores ($M=78.4$) than the control group ($M=68.2$) ($p < 0.05$). However, these studies generally use relatively simple technology and have not utilized the capabilities of advanced AI, such as NLP and LLMs. This gap indicates a research opportunity to explore how the latest AI technology can be optimized for learning Nahwu Sharaf.

III. Research Method

This study used a mixed-methods approach with a sequential explanatory design (Creswell, J.W. & Creswell, J.D., 2018), which involves the collection and analysis of quantitative data in the initial stage, followed by the collection and analysis of qualitative data to deepen and explain the quantitative results. This approach was chosen to obtain a comprehensive picture of the effectiveness and implementation process of Artificial Intelligence (AI) as a supplementary tutor in Nahwu Sharaf learning.

The research was conducted at the State Islamic Institute (IAIN) Ternate during the 2025–2026 academic year. The research subjects were third-semester students of the Arabic Language Education Study Program (PBA) who were taking the Nahwu Sharaf course and using AI as a companion tutor in the learning process. The selection of subjects was carried out using total sampling, considering that all students in one class were involved in the implementation of AI-based learning process. At the quantitative stage, data were collected through pre- and post-tests to measure the improvement in students' Nahwu Sharaf learning

outcomes after using AI as a supplementary tutor. The tests included aspects of understanding Nahwu rules, *l'rab* skills, and Sharaf application. In addition, a closed-ended questionnaire based on the Technology Acceptance Model (TAM) was used to measure students' perceptions of the usefulness and ease of use of AI in learning.

At the qualitative stage, data were collected through in-depth interviews, learning observations and document studies (Sugiyono, 2017). Interviews were conducted with students and course lecturers to explore their experiences, perceptions, and challenges in using AI. Observations were used to examine patterns of student interaction with AI and the forms of scaffolding provided. Document studies included analyses of the syllabus, teaching materials, and records of student interactions with AI. Quantitative data were analyzed using descriptive statistics to determine the mean, percentage, and increase in pre-and post-test scores. The analysis of learning outcome improvements was conducted by calculating the gain score to assess the effectiveness of AI as a supplementary tutor.

Qualitative data were analyzed using Miles and Huberman's interactive analysis model (Miles and Huberman, 1994), which includes data reduction, data display, and drawing conclusions. The analysis was conducted continuously to identify patterns, themes, and meanings from the experiences of the students and lecturers. The integration of quantitative and qualitative data was carried out at the result interpretation stage to provide a comprehensive understanding of the impact and process of implementing AI as a companion tutor in Nahwu Sharaf learning in the Arabic language. Qualitative data were analyzed using Miles and Huberman's interactive analysis model (Miles and Huberman, 1994), which includes data reduction, data display, and drawing conclusions. The analysis was conducted continuously to identify patterns, themes, and meanings from the experiences of the students and lecturers. The integration of quantitative and qualitative data was carried out at the result interpretation stage to provide a comprehensive understanding of the impact and process of implementing AI as a companion tutor in Nahwu Sharaf learning in the Arabic language.

IV. Results and Discussion

4.1. Analysis Result

The research findings indicate that the use of Artificial Intelligence (AI) as a supplementary tutor in learning Nahwu Sharaf has a positive impact on the learning outcomes of third-semester students in the Arabic Language Education Study Program (PBA) at IAIN Ternate. Quantitative analysis based on the comparison of pretest and posttest scores shows an improvement in students' abilities to understand Nahwu rules, perform *l'rab*, and apply Sharaf in the context of Arabic sentences more accurately. The improvement in learning outcomes is reflected in the gain score calculations, which indicate a moderate-to-high increase. Students with initially low and medium abilities experienced more significant improvements than those with initially high abilities. These findings suggest that AI plays an effective role as a tool for reinforcing basic concepts and providing step-by-step explanations for students who still have difficulty understanding the grammatical structures of Arabic. The analysis results per indicator show that the most significant improvement occurred in understanding the rules and applying Sharaf, while the *l'rab* aspect showed more moderate improvement. This indicates that procedural and example-based material is easier to understand with the help of AI than material that requires deep syntactic analysis and advanced linguistic reasoning.

The results of the student perception survey indicated that the majority of respondents found AI easy to use and useful as a tool for reinforcing material. Students stated that AI helped them obtain alternative explanations in simpler language, provided additional examples, and facilitated independent practice outside of class hours. Flexibility of access is one of the main factors supporting the use of AI in learning Nahwu Sharaf. Nevertheless, some students still experience difficulties when studying abstract and complex material. In such conditions, students need clarification and reinforcement from lecturers to ensure that they accurately

understand the principles. These findings indicate that AI cannot fully replace the role of lecturers but rather serves as a companion that complements the face-to-face learning process.

The qualitative findings obtained through interviews and observations support the quantitative results. Students showed increased learning independence, activeness in asking questions, and courage to attempt solving problems before seeking help from lecturers. The use of AI also encouraged students to be more reflective about mistakes made during the learning process. Overall, the integration of quantitative and qualitative results confirms that the effectiveness of using AI as a supplementary tutor is greatly influenced by the instructional design and pedagogical guidance provided by the lecturers. AI functions optimally when used in a targeted manner, integrated with learning objectives, and supported by lecturers acting as facilitators who ensure the accuracy of concepts and depth of student understanding.

Table 1. Summary of Research Findings

Research Aspects	Key Findings
Learning Outcomes (Pretest–Posttest)	There was an increase in the average student scores after AI was used as a supplementary tutor.
Gain Score	The improvement was in the moderate–high category, predominantly among students with low and medium initial abilities.
Student Perceptions (Questionnaire)	AI was considered easy to use, helpful for understanding, and supportive of independent learning by the students.
Results of Student Interviews	AI helped with material repetition and increased confidence but was not yet optimal for abstract material.
Learning Observation Results	Students became more active and independent, and lecturers acted as facilitators.
The Role of AI in Learning	AI serves as a supplementary tutor and material enhancer, not as a replacement for lecturers.

4.2. Discussion

The use of AI as a supplementary tutor in learning Nahwu Sharaf has been proven to significantly improve students' learning outcomes. This finding aligns with the theory of computer-assisted language learning (CALL), which emphasizes the role of technology as a tool for reinforcing language understanding through repeated practice and instant feedback. The most notable improvement in learning outcomes was observed in students with low initial proficiency, indicating that AI functions as a form of scaffolding, as proposed by Vygotsky. AI helps students move from their actual ability zone to the zone of proximal development through step-by-step explanations and contextualized examples. (McCarthy, 2007).

The results of the student perception survey support the framework of the Technology Acceptance Model (TAM), which states that the ease of use and usefulness of technology influence user acceptance of the technology. Students' positive perceptions of AI reinforce its effectiveness in learning Nahwu Sharaf. However, the limitations of AI in explaining abstract concepts indicate that learning Arabic, particularly Nahwu Sharaf, still requires the lecturer's role as an academic authority. This aligns with the Blended Learning perspective, which emphasizes a balance between technology and human interaction (Musthofa, 2010).

Qualitative findings indicate a shift in students' learning patterns towards more independent and active learning. This aligns with the theory of self-regulated learning, in which technology acts as a trigger for self-directed learning management. Learning observations showed a shift in the role of lecturers from being a source of information to becoming facilitators. These findings support a student-centered learning approach that positions students as active participants in the learning process.

The results of this study are consistent with previous research, which stated that AI in language learning can enhance motivation and conceptual understanding, as long as it is used in an integrated and pedagogically controlled manner. However, full reliance on AI has the potential to create misconceptions if not accompanied by instructor guidance. Therefore, students' digital and academic literacy is an important factor in AI implementation. (Gao et al., 2021) The integration of quantitative and qualitative results reinforces the finding that AI is effective not only in cognitive aspects but also in affective and learning processes of language acquisition. This indicates that AI acts as a catalyst for learning rather than an end goal. Thus, the use of AI as a supplementary tutor in Nahwu Sharaf learning can be seen as a pedagogical innovation relevant to the demands of higher education, as long as lecturers remain the primary guides of the learning process.

V. Conclusion

Based on the research results, it can be concluded that the implementation of Artificial Intelligence (AI) as a tutoring assistant in Nahwu Sharaf learning has a positive impact on improving the learning outcomes of students in the Arabic Language Education Study Program (PBA) in the third semester at IAIN Ternate. The increase in post-test scores and gain values indicates that the AI was effective in helping students understand Nahwu rules, perform i'rab, and apply Sharaf in sentence contexts more systematically and purposefully. In addition to improving learning outcomes, AI also contributes to strengthening students' independence and active learning. Qualitative findings show that students use AI as a flexible learning resource that can be accessed outside of class hours, thus supporting self-directed and reflective learning. Nevertheless, this study emphasizes that AI functions as a supplementary tutor rather than a replacement for instructors. Instructors play a crucial role in providing conceptual clarification, guiding abstract grammatical reasoning, and ensuring that AI use aligns with pedagogical goals. Therefore, the effectiveness of AI implementation largely depends on its integration into a well-planned learning design and continuous support from instructors.

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