

Customized Moodle-Based LMS for Arabic Grammar: Transforming Al-Qawa'id Al-Nahwiyah Pedagogy in Higher Education

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Ainun Syarifah¹, Muchammad Nur Huda², Muhamad Fuad Hasim³

^{1,3}UIN Sunan Ampel Surabaya, ²Institut Agama Islam Al-Khoziny
ainunsyarifah@uinsa.ac.id*¹, muhwahbah2010@gmail.com²,
hasimfuadmuhamad@gmail.com³

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Abstract

This study aims to develop and examine the effectiveness of a customized Moodle-based Learning Management System (LMS), namely “Moodlenesia”, for teaching Al-Qawā'id Al-Nahwiyah in higher education. The study employed a research and development approach using the ADDIE model, combined with a quasi-experimental design, to evaluate the impact of the LMS on students' learning outcomes. The participants consisted of 80 students divided into experimental and control groups. Data were collected through learning achievement tests, student response questionnaires, and expert validation of instructional media and content. The findings indicate that Moodlenesia demonstrates high feasibility based on expert evaluations and significantly improves students' learning outcomes compared with conventional instruction. The integration of interactive features, instant feedback, and flexible access to learning contributed substantially to students' understanding of Arabic grammatical concepts. This study highlights the potential of customized LMS platforms to transform Arabic grammar pedagogy into a more interactive and adaptive learning environment in higher education.

Keywords: Moodlenesia; Learning Management System; Arabic Grammar

INTRODUCTION

The development of digital technology has brought about significant changes in the global education system, particularly in how educational institutions design, manage, and deliver learning processes. This transformation is encouraging universities to integrate information technology into the learning process to create a more flexible, interactive, and student-centered learning experience (Hasim, Muflihah, et al., 2025). One of the most widely used forms of technology integration is the Learning Management System (LMS), a digital platform that enables the management of learning materials, academic activities, learning evaluations, and communication between lecturers and students in one integrated system. The LMS functions not only as a means of distributing learning materials but also as a digital learning environment that can support collaborative learning, independent learning, and systematic monitoring of student learning progress (Huda et al., 2023).

In the field of language learning, the use of digital technology has developed through the Computer-Assisted Language Learning (CALL) approach, which emphasizes the use of computer technology to enhance the effectiveness of language learning. This approach has been widely applied in the teaching of various foreign languages because it has been proven to increase learning motivation, provide broader access to materials, and

enable learners to practice independently through various interactive activities (Enayati & Gilakjani, 2020). However, most research in the field of CALL still focuses on developing communication skills such as speaking, listening, and vocabulary mastery. Meanwhile, the more analytical and theoretical aspects of grammar, particularly in Arabic language learning, have received relatively little attention in the development of technology-based learning media.

Learning Arabic grammar in the field of *Al-Qawā'id Al-Nahwiyyah* has a high level of complexity because it requires in-depth syntactic analysis skills regarding Arabic sentence structure (Hasim, Thohir, et al., 2025). Concepts such as *i'rab*, the syntactic function of words, and the grammatical relationships between sentence elements require intensive practice so that students can systematically understand language structure patterns. In practice, Nahwu learning in many universities still uses a conventional approach that focuses on lectures and the use of classical texts as the primary learning source (Hasim, Baihaqi, et al., 2025). This method often makes the learning process less interactive and doesn't provide sufficient opportunities for students to practice repeated analysis. As a result, many students struggle to deeply internalize Arabic grammatical concepts.

Several previous studies have attempted to integrate technology into Arabic language learning to improve the quality of learning. Research conducted by (Kerras & Essayahi, 2022) shows that the use of e-learning platforms in Arabic language learning can increase students' learning motivation and provide flexibility in accessing learning materials. Other research by (Ullah & Anwar, 2020) also shows that the use of digital technology in language learning can increase student engagement through more interactive learning activities. (Bahari et al., 2025) In his study on CALL, he emphasized that the integration of technology in language learning can enrich the learning experience through more dynamic digital interactions.

Research conducted by (Ismail et al., 2023) shows that the use of LMS in Arabic language learning can increase student participation in the learning process and expand access to learning materials. Other research by (Huda et al., 2023) A study on the use of Moodle in Arabic language learning at Indonesian universities showed that the LMS can help students access learning materials flexibly and increase the effectiveness of learning evaluation. Furthermore, the study (Mustofa et al., 2025) regarding the digitalization of Nahwu learning shows that the use of digital media can help students understand Arabic grammatical concepts through visualization and interactive exercises.

Although these studies demonstrate the significant potential of digital technology in improving the quality of Arabic language learning, most research still focuses on the general use of LMSs without customizing the systems to the specific needs of Arabic linguistics learning. The LMS platforms used in previous studies were generally designed as general learning systems for various subject areas, thus not fully accommodating the pedagogical needs of Arabic grammar learning, which has very specific linguistic characteristics. Furthermore, most studies also emphasize the use of technology as a medium for delivering material, while the development of digital learning systems specifically designed to support Arabic grammatical analysis has rarely been studied in depth.

Based on a review of previous studies, a research gap can be identified in the development of digital learning media for Arabic grammar. First, there is still limited research specifically developing a customized LMS for learning *Al-Qawā'id Al-*

Nahwiyah. Second, previous research has emphasized the use of technology as a learning tool, while studies on digital pedagogical design integrated with Arabic linguistic needs are still relatively limited. Third, there is still little research that empirically tests the effectiveness of LMS specifically designed to support syntactic analysis exercises in Nahwu learning.

To address this gap, this study developed a Learning Management System platform specifically customized for Arabic grammar learning, named "Moodlenesia." This platform was developed by modifying the open-source Moodle architecture so that it can be tailored to the pedagogical needs of learning Al-Qawā'id Al-Nahwiyah. Moodlenesia is designed to provide various interactive learning features such as digital modules, explanatory videos, academic discussion forums, and interactive quizzes with instant feedback that support i'rab analysis exercises. With this approach, the learning platform not only functions as a medium for distributing learning materials but also as a digital learning environment that supports active learning processes.

The development of Moodlenesia in this study is based on the Technological Pedagogical Content Knowledge (TPACK) theoretical framework which emphasizes the importance of integration between technology, pedagogy, and learning content in the design of digital learning systems. (Abid & Sain, 2025). Within the TPACK framework, the success of technology integration in learning is not only determined by the sophistication of the technology used, but also by its suitability to the pedagogical strategy and the characteristics of the learning material (Anggraini et al., 2025). Therefore, the development of Moodlenesia focuses not only on the technical aspects of the LMS system, but also on how the technology can be used to support the Arabic grammar learning process more effectively.

Based on this background, this study aims to develop the LMS Moodlenesia platform as a digital learning medium for the Al-Qawā'id Al-Nahwiyah course and test the effectiveness of its use in improving student learning outcomes. Specifically, this study seeks to (1) develop an LMS-based digital learning system that is appropriate to the characteristics of Arabic grammar learning, (2) analyze the feasibility of the developed system through an expert validation process, and (3) evaluate the effectiveness of using Moodlenesia in improving students' understanding of Nahwu concepts. Thus, this study is expected to provide theoretical and practical contributions to the development of technology-based Arabic language pedagogy in higher education environments.

METHOD

This research method uses a research and development (R&D) approach combined with a quasi-experimental design to develop and test the effectiveness of the Learning Management System (LMS) "Moodlenesia" in learning Al-Qawā'id Al-Nahwiyah in higher education. The ADDIE (Analysis, Design, Development, Implementation, and Evaluation) development model is widely used in modern instructional design because it is able to integrate learning needs analysis, pedagogical system design, and product evaluation comprehensively (Holt et al., 2021). In the analysis stage, the researcher conducted a learning needs analysis of third-semester students of the Arabic Language Education Study Program at UIN Sunan Ampel Surabaya who were taking the Ilmu al-Nahwi al-Naḍary Wa al-Taṭbiqy course. The needs analysis was conducted through observation of the learning process, distribution of student learning needs questionnaires, and analysis of curriculum documents related to the Semester

Learning Plan (RPS). The design stage was carried out by designing a digital learning structure integrated with the course curriculum. The development stage was carried out by customizing the open-source Moodle platform into a special LMS called "Moodlenesia", which is equipped with various learning features such as digital modules, learning videos, academic discussion forums, and interactive quizzes that were first developed through a validation stage by Arabic language material experts and digital learning media experts to ensure the pedagogical and technical feasibility of the developed system. The validated aspects included the feasibility of the material content, instructional design, technical quality of the media, and ease of system navigation. The implementation stage was carried out through a trial of the use of Moodlenesia in the learning process using a quasi-experimental design of the nonequivalent control group design type, which involved two groups of students: an experimental group using the Moodlenesia platform and a control group following learning using conventional methods. The research sample consisted of 80 students divided into two groups, namely 40 students in the experimental group and 40 students in the control group. Data collection was carried out through several research instruments including learning outcome tests (pre-test and post-test), student response questionnaires regarding the use of LMS, and learning activity observation sheets. The learning outcome test was used to measure students' understanding of the concept of Al-Qawā'id Al-Naḥwīyah, especially in the ability to analyze i'rab and the syntactic structure of Arabic sentences. Meanwhile, the questionnaire was used to measure students' perceptions of the effectiveness and ease of use of the digital learning system. Data analysis in this study was carried out using normality tests, homogeneity tests, and average difference tests using the Independent Sample T-Test to determine whether there were significant differences between the learning outcomes of the experimental group and the control group. In addition, this study also uses Normalized Gain Score (N-Gain) analysis to measure the level of improvement in student learning outcomes between before and after treatment.

RESULTS AND DISCUSSION

The Development Of 'Moodlenesia' LMS For Al-Qawā'id Al-Naḥwīyah

The development of the "Moodlenesia" Learning Management System (LMS) for Al-Qawā'id Al-Naḥwīyah learning was carried out using the ADDIE (Analysis, Design, Development, Implementation, and Evaluation) model, which is an instructional design framework widely used in the development of learning technologies. This model allows for the systematic integration of learner needs analysis, pedagogical design, and technology implementation (Holt et al., 2021). This approach is important because learning Nahwu requires complex syntactic analysis skills (Yusup et al., 2024). Therefore, LMS development is not only oriented towards technological innovation but also towards increasing pedagogical effectiveness in understanding Arabic grammatical structures. Through the ADDIE model, Moodlenesia is designed as a digital learning platform capable of simultaneously integrating pedagogical, cognitive, and technological aspects.

The first stage in this development is a needs analysis aimed at identifying the learning problems faced by students in Nahwu. The analysis was conducted on third-semester students of UIN Sunan Ampel Surabaya who were taking the Ilmu al-Naḥwi al-Naḍary Wa al-Taṭbiqy course. The results of the analysis showed that most students experienced difficulties in understanding the basic concepts of Nahwu, especially in i'rab

analysis, the syntactic function of words, and grammatical relationships in sentences. Approximately 78% of students stated that limited classroom learning time and conventional methods were the main factors hindering their understanding. This condition indicates that learning Nahwu requires media that allows students to do repeated analysis exercises. Therefore, the development of a digital learning system is a solution to provide a more flexible and intensive learning space (Müller & Mildenerger, 2021).

Furthermore, the analysis also shows a gap between the characteristics of learning materials and the learning styles of digital generation students. Most Nahwu materials are still presented in static text format, which lacks an interactive learning experience. Yet, today's students tend to be more responsive to visual and technology-based learning media. The alignment between learning methods and student characteristics significantly impacts the effectiveness of modern learning (Carroll et al., 2021). Therefore, the development of Moodlenesia is aimed at creating a more interactive digital learning environment while maintaining the depth of linguistic analysis in Nahwu studies.

The design phase was carried out by integrating the Semester Learning Plan (RPS) for the Ilmu al-Nahwi al-Nadary Wa al-Taṭbiqy course as the basis for developing learning content. The material structure in Moodlenesia is arranged in stages, starting from basic concepts such as the introduction of sentences, then continuing with a discussion of i'rab, up to an analysis of more complex sentence structures such as marfu'at, manshubat, and majrurat. This progressive material arrangement is based on the scaffolding principle in constructivism theory, which emphasizes gradual learning from simple concepts to more complex concepts (Darmawansah et al., 2024). With this approach, students can build grammatical understanding systematically and sustainably.

The learning design in Moodlenesia also adopts the principle of Self-Regulated Learning, which emphasizes the importance of student independence in managing the learning process. Through the LMS system, students can access materials anytime and anywhere, giving them the flexibility to review material or delve deeper into specific topics according to their individual learning needs. This approach allows students to play a more active role in the learning process and not solely rely on lecturers' explanations in class. Thus, the integration of Self-Regulated Learning principles is expected to increase learning engagement and strengthen conceptual understanding of the rules of Nahwu (Shafiee Rad, 2025).

The development phase involved customizing the open-source Moodle platform into a dedicated LMS system called "Moodlenesia." Moodle was chosen for its flexibility in supporting various learning activities and its ability to be modified to meet pedagogical needs. Through this customization process, Moodlenesia was designed to support Arabic linguistics learning more specifically than a generic LMS. This system allows for the integration of various learning features such as digital modules, discussion forums, and interactive quizzes designed to facilitate syntactic analysis exercises in Nahwu. Thus, Moodlenesia functions not only as a repository of learning materials but also as an interactive digital learning environment.

Moodlenesia customization encompasses three main components: user interface design, learning content management, and a student learning activity tracking system. The interface is designed to be user-friendly, allowing students to access materials intuitively. Content management allows lecturers to systematically organize learning materials according to the curriculum structure. Meanwhile, the learning activity tracking

system provides information on student participation levels and learning progress. The integration of these three components aligns with the Technological Pedagogical Content Knowledge (TPACK) concept, which emphasizes the importance of synergy between technology, pedagogy, and learning content (Akram et al., 2021). Through this approach, Moodlenesia is expected to become a learning platform that is not only technologically innovative but also effective in improving the quality of Arabic grammar pedagogy in higher education.

1. User Interface (UI/UX): The design is responsive for optimal accessibility on both mobile and desktop devices. The use of clear Arabic iconography and typography is prioritized to facilitate the reading of classical texts.
2. Content Management: Moodlenesia integrates various media formats, including interactive video tutorials, downloadable PDF modules, and synchronous and asynchronous discussion forums. A key feature developed is the Quiz Activity, specifically designed for independent I'rab practice with instant feedback.
3. Tracking System: This system allows lecturers to monitor students' learning progress in real-time, including the duration of access to materials and the evaluation results of each sub-chapter.

The user interface development in Moodlenesia was designed with visual comfort, ease of navigation, and user accessibility in mind within a digital learning environment. A responsive interface allows the system to be accessed across a variety of devices, including desktop computers and mobile devices. This is crucial because students in the digital age are more likely to access learning materials via mobile devices, providing flexibility in their learning process (McKnight et al., 2016). Furthermore, the use of clear Arabic typography and a systematic content layout are designed to facilitate students' reading of Arabic texts, which have their own visual complexity, particularly in analyzing sentence structure. From the perspective of User Experience theory in educational technology, an intuitive interface design can enhance user experience and minimize technical barriers in the digital learning process (Akram et al., 2021). Therefore, good visual design not only functions as an aesthetic element, but also as a pedagogical factor that supports student learning engagement.

In addition to considering visual aesthetics, Moodlenesia's interface design also integrates Human-Computer Interaction (HCI) principles, which emphasize the importance of efficient interaction between users and digital systems. These principles guide the system's development, allowing users to access materials, navigate menus, and engage in learning activities easily and intuitively (Alkatheiri, 2022). The menu structure in Moodlenesia is designed hierarchically to help students understand the learning flow more clearly. This systematic navigation design helps students move from one topic to another without experiencing confusion. This results in a more effective digital learning experience and supports user engagement in the Arabic language learning process.

Content management in Moodlenesia is designed to integrate various forms of learning media to create a richer and more varied learning experience. Learning materials are presented not only in text form but also combined with explanatory videos, downloadable digital modules, and discussion forums that enable academic interaction between students and lecturers. The integration of various media formats aims to enrich the representation of information so that students can understand the concept of Nahwu through various learning approaches. In digital pedagogy, a variety of learning media

plays a crucial role in increasing students' cognitive engagement and strengthening the internalization of linguistic concepts (Gameil & Al-Abdullatif, 2023).

The integration of various learning media in Moodlenesia is based on Richard Mayer's Multimedia Learning theory. This theory explains that the learning process will be more effective when information is presented through a combination of visual and verbal cognitive channels (Mayer, 2024). In the Moodlenesia system, Nahwu concepts are not only explained through text but also visualized through explanatory videos, sentence structure diagrams, and interactive exercises. This approach allows students to process information through more than one cognitive pathway, thereby improving memory retention and conceptual understanding. By utilizing multimedia learning principles, this digital learning system is able to provide a more comprehensive learning experience compared to conventional learning methods, which tend to be text-based.

In addition to increasing the variety of learning media, multimedia integration in Moodlenesia also serves to reduce students' cognitive load when learning complex linguistic concepts. Cognitive Load, learning that is too cognitively heavy can hinder the process of understanding concepts (Evans et al., 2024). Therefore, presenting material through various visual and interactive representations can help students understand the relationships between grammatical elements more clearly. Visualization of sentence structure and interactive exercises in learning nahwu can help students grasp Arabic syntactic patterns more systematically. Thus, this approach significantly contributes to improving students' understanding of grammatical rules.

The interactive quiz feature developed in Moodlenesia plays a crucial role in supporting independent i'rab analysis practice. In Nahwu learning, the ability to determine the grammatical function of a word in a sentence requires intensive, repeated practice. Therefore, the interactive quiz system is designed to provide students with the opportunity to practice independent analysis through various grammatical problems. These exercises allow students to test their understanding of previously learned Nahwu concepts. With this feature, the learning process focuses not only on delivering material but also on practice activities that encourage active student engagement.

One of the main advantages of the interactive quiz feature in Moodlenesia is its ability to provide instant feedback on student answers. When students make mistakes in determining the i'rab of a word, the system automatically provides corrections and explanations that help students understand the error. This immediate feedback has crucial pedagogical value because it allows students to improve their understanding immediately without having to wait for evaluation from the lecturer. From the perspective of Formative Assessment theory, rapid feedback can increase the effectiveness of the learning process by helping students identify errors and correct them independently (Morris et al., 2021). Thus, this feature contributes to strengthening the reflective learning process in the study of Arabic grammar.

In addition to interactive features, Moodlenesia also features a learning activity tracking system that allows lecturers to monitor student learning progress in real time. This system records various learning activity indicators, such as frequency of material access, study duration, and evaluation results for each topic. This learning activity data provides a more comprehensive picture of student participation levels in the digital learning process. In a technology-based learning environment, this type of data has strategic value in understanding student learning dynamics more objectively.

The existence of this learning activity tracking system also allows lecturers to analyze student learning patterns. Through the data generated by the system, lecturers can identify learning topics that are still difficult for students to grasp. This information can be used as a basis for designing more adaptive learning strategies and providing appropriate academic interventions. From a learning analytics perspective, utilizing learning activity data can improve the quality of decision-making in the learning process (Morris et al., 2021). Therefore, integrating learning activity tracking features is one of the main advantages of LMS-based learning.

Before the MoodleLnesia platform was implemented in the learning process, the system prototype first underwent a validation phase by experts to ensure its pedagogical and technical quality. This validation was carried out by Arabic language subject matter experts and digital learning media experts with expertise in educational technology development. The validation process aimed to evaluate the extent to which the developed system met the standards for suitability as a learning medium in higher education. The experts' assessment covered various important aspects such as the appropriateness of the content, instructional design, technical quality of the media, and ease of system navigation. This evaluation process was a crucial step in ensuring that the developed system had adequate academic quality before being used by students.

The expert validation stage is a crucial procedure to ensure that the resulting product possesses pedagogical and technological qualities suitable for use in the learning process. Through this evaluation process, experts provide constructive feedback that is used to refine the system before the implementation phase. The revision process, based on expert recommendations, allows the MoodleLnesia system to evolve into a more optimal learning platform. Thus, the validation stage serves not only as an evaluation process but also as a quality improvement mechanism in the development of technology-based learning media.

Before implementation, the MoodleLnesia prototype underwent a series of validation tests by experts. The validation results are summarized in the following table:

Table 1. Results of Media and Material Expert Validation

Validation Aspects	Average Score	Category
Content/Material Suitability	92%	Very Worthy
Instructional Design	88%	Very Worthy
Media Technical Quality	90%	Very Worthy
Ease of Navigation	85%	Worthy

The data in the table shows that the MoodleLnesia platform received excellent reviews from experts. The content appropriateness aspect received the highest score of 92%, indicating that the material presented aligns with Nahwu scientific principles and is relevant to the university curriculum. Instructional design received a score of 88%, indicating that the learning structure within the system has been systematically designed. The technical quality of the media received a score of 90%, indicating that the system has stable technical performance. Meanwhile, the ease of navigation aspect received a score of 85%, indicating that the system is quite easy to use for users, although there is still room for improvement.

Expert input contributed significantly to the system's refinement process prior to implementation. Subject matter experts suggested ADDING contextual examples from contemporary texts in addition to classical Arabic texts to help students understand the application of Nahwu principles in various types of Arabic texts. Media experts also

suggested strengthening the notification feature to allow students to receive information about new assignments or learning activities more quickly. Based on this input, developers revised the system, including ADDING a glossary of Nahwu terms that students can access directly. This glossary feature helps students understand technical terms in Nahwu without having to search for additional references outside the system. This feature makes the learning process more efficient and integrated within a single digital platform.

The findings from this development phase indicate that technology integration in Arabic grammar learning goes beyond simply transferring printed materials to digital format. Digital pedagogical transformation requires learning designs that consider the interaction between technology, learning content, and user characteristics (Vääätäjä & Ruokamo, 2021). Moodlenesia is designed to facilitate interaction between students and complex linguistic materials through interactive features that support independent exploration of concepts. This approach demonstrates the potential of technology to improve language learning when pedagogically sound. By providing a dynamic digital learning environment, Moodlenesia creates a more flexible and interactive learning experience for students.

The development of Moodlenesia also reinforces the concept of Computer-Assisted Language Learning (CALL), which emphasizes the role of technology in supporting language learning through interactive activities and automated feedback. Within the CALL framework, technology serves not only as a medium for conveying information but also as a tool that facilitates active language exploration by learners (Shadiev & Yang, 2020). Through interactive quizzes, discussion forums, and flexible access to materials, Moodlenesia provides students with opportunities to engage more actively in the language analysis process. This approach demonstrates that technology integration can enrich students' learning experiences, enabling them to gain a deeper understanding of Arabic language structure.

Compared to generic LMS platforms commonly used across various fields of study, Moodlenesia offers more in-depth specifications for managing Arabic linguistic learning. System customization allows the integration of features specifically designed to support Arabic grammatical analysis, such as interactive i'rab exercises and a glossary of Nahwu terms. This specification is a major novelty in this study, as most LMS platforms used in higher education are still generic and not specifically designed for Arabic language learning needs. This research demonstrates that customizing open-source platforms like Moodle can be an innovative strategy for developing learning systems that are more relevant to the characteristics of specific disciplines. This approach also provides a practical solution for Islamic higher education institutions in carrying out digital transformation of learning in an economical and sustainable manner.

The material expert noted the need to add contextual examples from contemporary texts in addition to classical texts (Kitab Kuning). Meanwhile, the media expert suggested strengthening the notification feature for each new assignment. Revisions were made based on this feedback, including the addition of a one-click glossary of Nahwu terms.

The findings from this development phase demonstrate that technology integration in Arabic grammar learning is not simply a matter of transferring printed text to a digital screen. The success of "Moodlenesia" lies in its ability to mediate interactions between learners and complex material through interactive features. Theoretically, this development reinforces the concept of Computer-Assisted Language Learning (CALL),

which states that the effectiveness of digital media depends largely on the extent to which it can reduce students' cognitive burden in understanding complex language structures (Bahari et al., 2023).

The Efficacy Of Moodlenesia In Enhancing Student Learning Outcomes

The effectiveness analysis was conducted using a quasi-experimental approach by comparing learning outcomes between the experimental group using the Moodlenesia platform and the control group learning using conventional methods. The quasi-experimental approach was chosen because it allows researchers to evaluate the impact of a pedagogical innovation in real-world learning conditions without having to fully manipulate variables as in a pure experiment. This method is often used to test the effectiveness of learning media because it can provide a fairly accurate picture of the influence of an intervention on students' learning processes. By comparing two groups with relatively equal initial conditions, this study sought to identify the extent to which the integration of LMS-based learning technology significantly impacted students' understanding of Arabic grammatical concepts. Therefore, the analysis focused not only on differences in final scores but also considered the equivalence of initial abilities and the statistical significance of the improvements in learning outcomes.

Before implementing the Moodlenesia platform, this study first measured students' initial abilities through a pre-test administered to both research groups. This pre-test was designed to measure students' understanding of basic concepts in *Al-Qawā'id Al-Nahwiyyah*, including their ability to identify sentence types, determine the grammatical function of words in sentences, and perform simple *i'rab* analysis. Measuring initial abilities is a crucial step in educational experimental research because it serves to ensure that both groups have a relatively equal level of competence before the treatment is administered. This equivalence of initial abilities allows researchers to isolate the effect of the treatment variable more objectively in subsequent analysis stages. In other words, if there are differences in learning outcomes after the learning process has taken place, these differences can be interpreted as the impact of the use of different learning media. This approach provides a strong methodological basis for evaluating the effectiveness of the Moodlenesia platform as a pedagogical innovation in Nahwu learning.

The pre-test results showed that the average score of students in the control group was 55.40, while the average score of the experimental group was 56.12. This very small difference between the two groups indicates that the students' initial abilities were relatively homogeneous before the learning intervention was carried out. Homogeneity of initial abilities is an important indicator in quasi-experimental research because it ensures that both groups are in comparable conditions before the treatment is administered (Schneider & Rohmann, 2021). Thus, the improvement in learning outcomes that occurred after the learning process can be more validly attributed to the use of different learning media. The equivalence of initial abilities provides a strong analytical basis for evaluating the impact of using the Moodlenesia LMS on improving students' understanding of Arabic grammar concepts. Therefore, the pre-test serves as an objective starting point in measuring changes in student competency after the learning intervention (Nuis et al., 2024).

After the pre-test phase was conducted, the learning process continued with the implementation of learning media in accordance with the predetermined experimental design. The experimental group participated in learning using the Moodlenesia platform,

which provides various interactive features such as digital modules, learning videos, discussion forums, and interactive quizzes with instant feedback. Meanwhile, the control group participated in learning using conventional methods dominated by lecturer explanations in class and the use of textbooks as the primary learning source. This implementation process took place over several meetings in accordance with the curriculum structure of the Ilmu al-Nahwi al-Naḍary Wa al-Taṭbiqy course. During the learning process, students in the experimental group had the opportunity to independently access materials through the LMS and repeatedly practice grammatical analysis through the interactive quiz feature. This provided a more flexible and adaptive learning experience compared to traditional learning methods that are more limited to classroom interaction.

After the entire learning process was completed, this study measured student learning outcomes through a post-test administered to both groups. This post-test was designed with a level of difficulty equivalent to the pre-test and covered the main material learned during the learning process. The results of the data analysis showed a significant increase in learning outcomes in the experimental group compared to the control group. The average post-test score for students in the experimental group reached 87.45, while the control group only achieved an average score of 72.10. This difference in scores indicates that students who learned using the Moodle platform had a higher level of understanding of Nahwu concepts compared to students who participated in conventional learning. The significant increase in the experimental group indicates that the integration of learning technology can contribute significantly to improving the quality of the student learning process.

The jump in scores in the experimental group not only demonstrated a quantitative improvement in students' academic grades but also indicated a change in how students understood Arabic grammatical concepts. Materials previously considered difficult by students, such as i'rab analysis, identifying sentence tarkib, and understanding syntactic relationships between sentence elements, could be studied more systematically through the interactive features available on the Moodle platform. Students' ability to practice independently and repeatedly enabled them to develop a deeper understanding of Arabic structural patterns. This demonstrates that the use of an LMS serves not only as a medium for delivering material but also as a tool that supports active learning. Thus, Moodle is able to create a more conducive learning environment for students to optimally develop their linguistic analysis skills.

To ensure that the differences in learning outcomes between the two groups did not occur by chance, this study conducted statistical analysis using normality tests and T-tests (Independent Sample T-Tests). The normality test was conducted to ensure that the distribution of student learning outcome data was normal, thus meeting the requirements for parametric statistical analysis (Arredondo Montero, 2026). After the data was declared to meet the assumption of normality, the analysis continued with a test for differences in means using the Independent Sample T-Test. This test aims to determine whether there is a statistically significant difference between the learning outcomes of students in the experimental group and the control group (Arredondo Montero, 2026). This type of statistical analysis is standard procedure in educational experimental research because it provides a strong empirical basis for drawing conclusions. Using this analytical method, research can provide more convincing scientific evidence regarding the effectiveness of using an LMS in Arabic language learning.

The results of the statistical analysis showed that the significance value (Sig. 2-tailed) obtained was 0.000, which means it is smaller than the set significance level of 0.05. This result indicates that there is a statistically significant difference between the learning outcomes of students in the experimental group and the control group. In other words, the improvement in learning outcomes that occurred in the experimental group can be directly attributed to the use of the Moodle platform in the learning process. This finding provides empirical evidence that the integration of LMS-based learning technology has a significant effect on improving students' understanding of Arabic grammar concepts. A very small significance value like this indicates that the probability of a difference occurring by chance is very low. Therefore, it can be concluded that the use of Moodle makes a significant contribution to improving student learning outcomes.

Table 2. Results of the Independent Sample T-Test

Group	N	Mean (Post-test)	Standard Deviation	Sig. (2-tailed)
Experiment (Moodle)	40	87.45	5.24	0.000
Control (Conventional)	40	72.10	6.18	—

In addition to statistical significance analysis, this study also used N-Gain Score analysis to more comprehensively measure the level of improvement in student learning outcomes. N-Gain analysis is a method commonly used in educational research to measure the effectiveness of a learning intervention by comparing the increase in scores between the pre-test and post-test. (Arredondo Montero, 2026). The N-Gain calculation results show that the experimental group had an N-Gain value of 0.72, which is included in the high category, while the control group had an N-Gain value of 0.38, which is in the medium category. This difference in categories indicates that the use of the Moodle platform has a stronger impact on improving student understanding compared to conventional learning methods. In other words, LMS integration in Nahwu learning has been proven to accelerate the process of internalizing Arabic grammatical concepts in students.

Moodle's effectiveness in improving student learning outcomes can also be explained through the perspective of modern learning theory, particularly Richard Mayer's Cognitive Theory of Multimedia Learning. This theory states that learning is more effective when information is presented through a combination of various cognitive channels such as text, visuals, and audio (Mayer, 2024). In the Moodle platform, learning materials are presented not only in text but also through explanatory videos, concept illustrations, and interactive exercises that enable students to process information through multiple cognitive pathways. This integration of various media helps reduce students' cognitive load in understanding complex Arabic grammatical structures. Thus, the use of multimedia in the LMS platform can improve memory retention and strengthen students' conceptual understanding of Nahwu rules.

The success of the Moodle platform can also be explained through the perspective of Computer-Assisted Language Learning (CALL), which emphasizes the role of technology in supporting language learning through interactive and exploratory activities. Within the CALL framework, technology serves not only as a medium for conveying information but also as a tool that enables learners to actively interact with the language being studied (Lim & Aryadoust, 2022). Through interactive quizzes, discussion forums, and sentence analysis exercises available in Moodle, students have the opportunity to explore linguistic concepts in greater depth. This interactive

process helps students build a constructive understanding of the language through a more active learning experience. Thus, the use of an LMS in Arabic language learning not only improves access to materials but also enriches students' overall learning experience.

Overall, the findings of this study provide an important contribution to the development of technology-based second language learning models in Islamic higher education. This study demonstrates that the integration of an LMS specifically designed for linguistic learning needs can significantly enhance the effectiveness of Arabic language pedagogy. The use of Moodle not only improves student learning outcomes but also enriches the learning experience through more dynamic digital interactions. Thus, the digitalization of Nahwu learning through a customized LMS can be seen as an innovative strategy capable of improving the quality of Arabic language learning in higher education. These findings also open up opportunities for further research exploring the integration of other digital technologies in Arabic language learning in the era of technology-based education.

Determinants Of Success In Digitalizing Arabic Grammar Pedagogy

The success of Moodle implementation is determined not only by technology availability, but also by the synergy between instructional design, user readiness, and adaptive technical features. Based on qualitative data analysis and observations during the study, several key determinants ensure the effectiveness of the digitalization of Al-Qawā'id Al-Nahwiyyah pedagogy.

One of the key factors of Moodle's success is its ability to simplify complex Nahwu material through user-oriented technical features.

1. **Unlimited Accessibility:** 24-hour easy access to materials allows students to repeat (review) difficult material without being tied to a physical classroom.
2. **Automatic and Real-Time Evaluation:** Quizzes that provide instant feedback have been proven to boost student confidence. In conventional methods, students often have to wait a long time to discover their mistakes, but Moodle reduces this time, thus preventing ongoing conceptual misunderstandings.
3. **Multimodality of Material:** The combination of digital yellow book text, explanatory videos, and interactive concept maps (mind mapping) helps students with different learning styles (visual, auditory, and kinesthetic) to remain actively engaged in learning.

Digitalization through Moodle has triggered a shift in roles within the learning ecosystem. Findings from user response questionnaires indicate a very high level of satisfaction (averaging 86.5%).

1. **Self-Regulated Learning:** Students feel more in control of their learning process. They can start with the most challenging material and skip ahead to material they've already mastered, which is the essence of differentiated learning.
2. **Managerial Efficiency for Lecturers:** From a teaching perspective, this platform reduces the administrative burden of manual assignment submission and grading. This allows lecturers to play a more facilitative and mentoring role in in-depth discussions (higher-order thinking) related to Arabic text analysis, rather than simply delivering repetitive theoretical lectures.

These determinants of success confirm that digitizing Arabic grammar is not simply a matter of "moving books to screens," but rather creating a new learning ecosystem. These findings support the Technological Pedagogical Content Knowledge

(TPACK) theory, which argues that technological mastery must go hand in hand with a deep understanding of language pedagogy.

Moodlenesia's success demonstrates that when technology is customized to specific linguistic needs (such as the I'rab system and Arabic character typing), resistance to digital learning is reduced. These factors provide a model for other Islamic higher education institutions in designing language learning platforms that are not only technologically advanced but also maintain the substance of classical scholarship through a modern approach.

CONCLUSION

The integration of a customized Moodle-based Learning Management System (LMS) in the form of the "Moodlenesia" platform has proven to be able to transform the pedagogy of Al-Qawā'id Al-Naḥwīyah learning in higher education to be more interactive, flexible, and student-centered. System development through the ADDIE model ensures that the platform is designed systematically and pedagogically relevant. Expert validation results indicate that Moodlenesia has a very high level of feasibility in terms of material aspects, instructional design, technical quality, and ease of navigation. Effectiveness testing through a quasi-experimental design also shows that students who use Moodlenesia obtain significant improvements in learning outcomes compared to conventional methods, which is reinforced by a statistical significance value <0.05 and a high N-Gain category. This success is influenced by interactive features, instant feedback, flexible learning access, and multimodal material presentation. These findings strengthen the relevance of the TPACK, CALL, and Multimedia Learning frameworks in technology integration in language learning. Practically, this study shows that customizing open-source platforms such as Moodle can be an innovative and economical solution for the digital transformation of Arabic language pedagogy in higher education, although further research is still needed with a wider scope of institutions and fields of Arabic language learning.

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