

Contextual-adaptive model of Arabic language learning management in the era of Artificial Intelligence: A multisite study on Islamic educational institutions in Yogyakarta

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ABSTRACT

The development of artificial intelligence (AI) encourages changes in the management of Arabic language learning, but the adoption rate in Islamic educational institutions is not uniform and is not always in line with the readiness of students, teachers, infrastructure, and institutional governance. This study aims to analyze the management pattern of Arabic language learning in the context of different AI and digital learning adoption and formulate a contextual-adaptive model that is appropriate for Islamic educational institutions. The research uses a qualitative approach with a multisite study design in six educational institutions in Yogyakarta, namely MI Annidzomiyah, Salafiyah Ula Islamic Centre Bin Baz, SDIT Al-Ukhuwah Al-Islamiyyah, MTsN 1 Yogyakarta, Aisyiyah Flagship Junior High School, and MA Bin Baz Putri. Primary data came from field observations, interviews with Arabic teachers, and learning documentation in the even semester 2025/2026. The analysis was carried out through per-site data condensation, cross-case matrix preparation, thematic comparison, and conceptual pattern formulation. The results of the study showed five findings. First, technology adoption is on the continuum from book-based learning to managed digital integration. Second, AI functions more as a teacher's work assistant for planning, material search, pronunciation, and evaluation preparation than as a tool used directly by students. Third, verification of AI outputs for Arabic books, modules, dictionaries, and references is an important control mechanism. Fourth, hybrid practices that combine digital media with manual exercises and authentic assessments are still needed, especially for oral, listening, and writing skills. Fifth, the sustainability of AI use is influenced by gadget policies, the availability of facilities, time allocation, and teacher competency development. Based on these findings, the study formulated a Contextual-Adaptive Model consisting of context diagnosis, adaptive planning, hybrid-controlled implementation, authentic verification and assessment, as well as institutional support and teacher development. This model places AI as a support tool for pedagogical decisions, not a substitute for teachers' academic authority.

Introduction

Digital transformation has changed the way teachers plan, implement, and evaluate learning. The presence of artificial intelligence (AI) expands these changes because teachers no longer only use technology as a medium of presentation, but also as a tool to find ideas, compile materials, produce examples, examine language, and design assessments. In Islamic education, this change

needs to be read as a matter of learning management: technology must be placed in educational goals, student readiness, teacher competence, and institutional governance. Studies of contemporary learning show that technology, e-learning, and learning systems are important directions in educational research, but innovation does not automatically produce quality learning without contextual design (Robbaniyah, 2025). At the same time, a study on the development of the Independent Curriculum in Islamic schools in Yogyakarta shows that curriculum flexibility requires local adaptation strategies, character strengthening, and teacher development so that its implementation does not stop at administrative changes (Robbaniyah & Baharumi, 2025). This perspective is relevant to reading the use of AI in Arabic language learning.

Arabic learning has characteristics that make the integration of AI cannot be equated with other subjects. The accuracy of meaning, the structure of nahwu-sharaf, pronunciation, the context of religious texts, and the four language skills demand strong pedagogical validation (Tampubolon, 2022). At Turots' study shows that ChatGPT can be used as a medium to support Arabic language learning (Mustofa et al., 2024), while the development of AI-based Arabic media models emphasizes the importance of user needs, lecturer readiness, infrastructure, policies, and linguistic accuracy (Iqbal et al., 2026). Other research shows that Arabic teachers at the secondary level have a positive perception of AI, but their integration practices are still influenced by training, access to facilities, and structural barriers (Qomari et al., 2026). From the user side, students use AI to support Arabic learning, although these benefits go hand in hand with the need to maintain academic independence and accuracy (Akmal et al., 2026; Ilmiyah et al., 2026).

Although the literature is rapidly evolving, most research still focuses on media effectiveness, user perception, product development, or one institutional context (Maulifah et al., 2026). Research comparing how learning management functions—planning, implementation, evaluation, and control—are changing in Islamic educational institutions with different levels of digital readiness are still limited. This gap is important because field findings show that AI is not always used directly by students. In one institution, AI functions as a teacher's assistant; in another, its use has not yet entered the classroom; whereas in institutions that are more prepared, the use of digital devices is regulated through gadget policies and authentic assessments. This means that the relevant question is not just "whether AI is used", but "how AI is managed to fit the learning context".

This study aims to analyze the management patterns of Arabic language learning in six Islamic educational institutions in Yogyakarta that have diverse characteristics of students, institutional culture, infrastructure, and technology adoption levels. The novelty of the research lies in the formulation of the Contextual-Adaptive Model of Arabic Language Learning Management in the AI Era. This model develops the idea of contextual-adaptive integration that was previously used to explain the integration of the national curriculum and Islamic boarding schools (Robbaniyah, 2026) to the realm of Arabic learning management. Its contribution is not to offer a single application or one universal method, but rather a decision-making framework that places context diagnosis, adaptive planning, hybrid-controlled implementation, AI output verification, authentic assessment, and institutional support as a single managerial cycle.

Teacher-centric contextual-adaptive learning management and AI

Learning management is the process of directing learning resources so that learning goals are achieved through planned, organized, implemented, and controlled decisions. In the context of AI, these functions are increasingly complex because teachers must choose technology, assess its compatibility with competencies, regulate student access, verify system outputs, and determine parts of learning that still require human interaction. The literature on AI in education confirms that the benefits of AI can appear in learning, teaching, assessment, and administration, but at the same time there are challenges of accuracy, ethics, user readiness, and governance (Tan et al., 2025). (UNESCO, 2023) placing human-centered approaches, user protection, age appropriateness, and strengthening educator capacity as important principles of the use of generative AI in education.

The contextual-adaptive concept in this study refers to the ability of learning managers to adjust the intensity and form of technology use to real conditions. The context includes the age of students, language readiness, curriculum objectives, the character of Islamic institutions, the availability of devices, the policy on the use of gadgets, and the digital competence of teachers. Adaptive means that technology decisions can change from just a tool for teachers, presentation media, audiovisual resources, evaluation platforms, to the controlled use of AI by students. This framework is in line with the finding that teachers' AI literacy is not enough in the form of technical knowledge; it requires practical knowledge and professional consideration in determining when, for what, and with what limits technology is used (Sperling et al., 2024).

In Arabic learning, adaptive principles are also related to linguistic validity. Generative AI and automated translators can generate shapes that appear superficially correct but are less precise in meaning, structure, or context. Therefore, the teacher's position shifts from the conveyor of information to the designer, curator, and validator. Qualitative research on Arabic teachers and students shows that AI increases flexibility and interactivity, but cultural-contextual understanding remains highly dependent on interaction with the teacher; the success of implementation is also determined by training and digital readiness (Ridho et al., 2025). This framework supports the use of AI as a pedagogical augmentation tool, rather than a substitute for teachers' professional assessments.

Method

This research uses a qualitative approach with a multi-site study design. The design was chosen to obtain a comparative understanding of Arabic learning management in Islamic educational institutions at different levels, institutional character, and technological readiness. The six research sites are MI Annidzomiyah, Salafiyah Ula Islamic Centre Bin Baz (ICBB) Yogyakarta, SDIT Al-Ukhuwah Al-Islamiyyah Yogyakarta, MTsN 1 Yogyakarta, SMP Unggulan Aisyiyah, and MA Bin Baz Putri. The selection of sites is purposive by considering variations at the elementary-secondary level, the form of schools/madrasas/pesantren, and variations in the use of AI and digital learning.

The primary data of the research was collected in the even semester of the 2025/2026 school year through field observations, interviews with Arabic teachers on each site, and learning support documentation. The focus of data collection included learning planning, implementation strategies, media and applications used, forms of AI utilization, evaluation methods, technology output validation mechanisms, constraints, and institutional support. At one site, direct learning observation could not be carried out because it coincided with the implementation of the exam so that classroom practice information was deepened through teacher interviews and observation of learning facilities (Yusuf et al., 2024). Documentation is positioned as supporting data, not as the main object of the research.

The analysis was conducted in two stages. The first stage was an in-site analysis through the condensation of data into the categories of planning, implementation, evaluation, AI/digital utilization, validity control, barriers, and institutional support. The second stage was a cross-site analysis with a comparative matrix to find similarities, differences, and patterns of adoption rates. From these patterns, conceptual themes and interthematic relationships were compiled which were then formulated into models. The credibility of the findings was maintained through the comparison of interview information, observations, and documentation at each site as well as the consistency of intersite patterns. The study did not use experimental measurements, so the terms effectiveness in this article are limited to reported or observed benefits and changes, not causal relationships.

Results

Cross-site analysis shows that the integration of AI and digital learning in Arabic language learning does not form a single pattern. Technology is used in stages according to teacher readiness, learning goals, student age, infrastructure, and institutional policies. Table 1 summarizes these variations.

Table 1. Arabic language learning management patterns at six sites

Website	Utilization of AI/digital	Managerial strengths	Main obstacles
MI Annidzomiyyah	Gemini is used by teachers to search for material and pronunciation examples; the use of students is not yet direct.	AI is positioned as a teacher assistant; outputs are matched with modules/books; gradual introduction plans.	The lesson time is short; the projector/facilities are not evenly distributed; the evaluation is still manual.
Salafiyah Ula ICBB	Books are becoming the primary source; internet/YouTube and LCD are used occasionally; AI is not yet a routine practice.	Conventional planning, implementation, and evaluation are carried out systematically; four maharabs are still assessed.	Lack of AI experience and training; technology is still complementary.
SDIT Al-Ukhuwah Al-Islamiyyah	Authentic video, PPT/LCD, Google Forms, and interactive device experiments; digital tasks are also done from home.	Direct methods, audiovisual exposure, and digital media are combined with manual exercises.	The readiness of istima' and especially imla' is not evenly distributed; interactive devices are limited; the digital literacy of parents varies.
Holiday rentals in Yogyakarta (Yogyakarta)	YouTube and educational games support learning; AI is seen as needing to be controlled.	Teachers emphasize responsible use and mentoring; facility/training support is available.	Potential abuse of AI on homework/exams and risks to academic honesty.
Aisyyah Flagship Junior High School	Wordwall for formative evaluation, CBT for exams, Al-Maany for lexicography; machine translation results are criticized in class.	The curriculum is contextualized to worship reading; devices are decentralized; authentic oral assessments are maintained.	There are no specific written AI guidelines yet; the quality of machine translation and the risk of student dependence.
MA Bin Baz Putri	PPT, YouTube, Educaplay, internet, ChatGPT, and Google Translate are used as supports.	ChatGPT helps with teaching materials/questions; AI outputs are double-checked with Arabic references; individual evaluations are still used.	AI accuracy is not always appropriate; access to technology in the pesantren environment is limited; training is not routine.

Technology adoption shapes the managerial continuum

The first finding is the existence of an adoption continuum, not the dichotomy between "using" and "not using" AI. At Salafiyah Ula ICBB, learning is still centered on books with the use of digital media situationally. MI Annidzomiyyah is in the teacher-side adoption phase: Gemini is used through teachers' personal devices to prepare materials and pronunciation models, while students have not yet accessed AI directly. MA Bin Baz Putri shows a more diverse use because teachers utilize ChatGPT, Google Translate, PPT, YouTube, internet, and Educaplay. At Aisyyah Flagship Junior High School, the level of integration is more visible in governance because technology is linked to gadget policies, Wordwall, CBT, digital dictionaries, and oral assessments. Thus, digital maturity is not solely determined by the number of applications, but by the extent to which the use of technology is connected to goals, rules, validation, and evaluation.

AI is more dominant as a teacher's work assistant

On most sites, AI is used more by teachers than by students. At MI Annidzomiyyah, Gemini helps with material search and pronunciation. At MA Bin Baz Putri, ChatGPT is used to compile teaching materials and questions, while Google Translate helps vocabulary or text with re-verification. This pattern shows that the current function of AI mainly increases teachers' work capacity at the planning and preparation stages. The use of students directly tends to be more cautious, especially at the elementary level and in environments that limit access to gadgets. The findings confirm that the level of AI integration needs to be differentiated between AI for teacher productivity, AI as a learning medium, and AI that students use independently.

Verification becomes a control function specific to Arabic

Verification of technology outputs appears consistently on sites that have utilized AI. MA teacher Bin Baz Putri does not use AI results directly, but compares them with Arabic books or references. MI Annidzomiyyah teachers match Gemini results with print modules. At Aisyyah

Superior Junior High School, the inaccuracy of machine translators is actually used as proof material in class, while vocabulary searches are directed to the Al-Maany dictionary. This pattern shows that controlling in learning management in the AI era has shifted from simply controlling student achievement to also controlling the quality of information that enters learning. In Arabic, the control is directly related to meaning, language structure, pronunciation, and context.

Hybrid practice maintains language skills and assessment validity

The use of digital media does not replace manual exercises. SDIT Al-Ukhuwah utilizes authentic videos, LCDs, Google Forms, and interactive devices, but maintains writing exercises because students' imla' readiness is not evenly distributed; field reports even noted that only about five out of twenty-five students in the observed group had adequate imla' readiness. Aisyiyah's Flagship Junior High School uses Wordwall and CBT, but the ability to translate and memorize worship readings is tested orally individually without books. Salafiyah Ula ICBB still evaluates four Arabic skills manually. The pattern shows that hybrid design is needed so that digital efficiency does not reduce motor, oral, and cognitive exercises that require authentic performance.

Policies, facilities, and teacher development determine sustainability

Variation between sites is also determined by organizational factors. MI Annidzomiyah has not been able to integrate technology directly into the classroom due to time constraints and facilities that are still in the procurement process, even though teachers are undergoing AI training from outside. Salafiyah Ula ICBB faces a gap in experience and training. MA Bin Baz Putri has access to a variety of media, but the use of technology is limited by the conditions of the pesantren environment and training has not taken place regularly. On the other hand, SMP Unggulan Aisyiyah shows that clear control of gadgets can allow for targeted use of digital without making devices as learning centers. This means that the sustainability of AI is not only a matter of individual teacher competencies, but also the design of institutional policies, access to facilities, and professional development support.

Figure 1. Contextual-adaptive model of Arabic learning management in the AI era



Prinsip lintas tahap: penilaian profesional guru | nilai pendidikan Islam | kesiapan usia dan bahasa | akurasi data

The model in Figure 1 describes five cyclical stages. Context diagnosis maps curriculum goals, students' language age and ability, institutional culture, facilities, and device policies. Adaptive planning determines the position of the technology: whether AI is only used by teachers, becomes a classroom medium, or can be used by students in a controlled manner. Hybrid-controlled implementations combine face-to-face interactions, books, manual exercises, digital media, gamification, and AI as intended. The verification and authentic assessment stages ensure that AI outputs are checked using authoritative referrals and that students' abilities are continuously tested through real performance. Institutional support and teacher development are mechanisms that allow the cycle to be continuously improved.

Discussion

First, this study reinforces the argument that the integration of AI in Arabic learning should start from contextual needs, not from available technologies. (Iqbal et al., 2026) found that the use of AI in Arabic language learning needs to be supported by adaptive user readiness, policies, infrastructure, and design. The study's multi-site findings expand on this argument: adaptivity is not

only a principle of media design, but a principle of management. At the basic level, the use of teacher-mediated AI is more realistic; at a higher level, students can be involved more directly as long as there are clear boundaries, goals, and evaluation mechanisms. This pattern is consistent with UNESCO's (2023) human-centred approach that places age, human capacity, and institutional control as key considerations.

Second, the position of teachers as validators is an important contribution to research. Generative AI studies show that technology can help with the preparation of learning materials and activities, but the risk of incorrect outputs, pseudo-information, and dependency demands changes in assessment and capacity building of educators (Lo, 2023; Ogunleye et al., 2024). In Arabic, the need for validation is more specific because errors in translation, pronunciation, or structure can change meaning. Findings from MA Bin Baz Putri, MI Annidzomiyyah, and Aisiyyah Superior Junior High School show a verification mechanism using authoritative books, modules, and digital dictionaries. Therefore, the AI literacy of Arabic teachers is not sufficiently measured by the ability to operate applications. The literacy required includes the ability to evaluate, verify, and decide whether AI outputs are worthy of entering the learning process. This is in line with the concepts of AI literacy and competency which emphasizes the relationship between knowledge and the ability to apply it appropriately (Chiu et al., 2024), as well as the findings of Sperling et al. (2024) regarding the importance of professional judgement in teacher AI literacy.

Third, the findings on hybrid practices correct the assumption that digital transformation means less use of manual methods. Wordwall and CBT at Aisiyyah Flagship Junior High School increase evaluation flexibility, while videos, Google Forms, and interactive devices at SDIT Al-Ukhuwah expand the variety of learning experiences. However, writing, memorization, translation, and oral assessment exercises are still needed to capture competencies that are not always visible on digital scores. These findings are in line with Wordwall's research that shows the potential of interactive media in improving engagement and learning outcomes (Hayati & Said, 2025), but this study adds a managerial limit: digital media needs to be placed as part of the assessment portfolio, not as the only source of evidence of achievement. In the context of Arabic, such a combination is important to maintain a balanced balance of *istima'*, *kalam*, *qira'ah*, and *kitabah* skills.

Fourth, institutional factors explain why the same technology can result in different implementation patterns. Studies on AI in Islamic education management affirm the importance of strategy, governance, and resource management in AI-based transformation (Romadany et al., 2026). Research on PAI learning also shows that the integration of AI media in regional schools is influenced by the readiness of technology and teachers' adaptive strategies (Fadli et al., 2026). The findings of this study support this direction. The availability of LCDs, the internet, interactive devices, gadget rules, and teacher training are part of the ecosystem that determines whether AI stops at teachers' personal use or evolves into managed classroom practice. In other words, AI readiness must be understood as organizational readiness, not just individual readiness.

Fifth, the contextual-adaptive model offers a closer relationship with the trajectory of Islamic education research. Robbaniyah's research (2026) shows that the integration of national curriculum and *pesantren* requires an adaptation mechanism to the character and needs of institutions. The same principle appears in Arabic data: SMP Unggulan Aisiyyah changes the context of the material to be close to the reading of students' worship, SDIT Al-Ukhuwah adjusts technology to *istima'* and *imla'* readiness, while *pesantren* institutions limit access to devices according to institutional culture. Thus, adaptation is not a compromise on innovation, but a way to keep innovation pedagogically and institutionally relevant. This model simultaneously connects the expertise of Islamic education management, curriculum, and contemporary learning with the issue of AI in Arabic.

The practical implication is that institutional leaders do not need to set a target of "all teachers must use AI" uniformly. A more appropriate policy would be to set process standards: the purpose

of use must be clear, AI data and outputs must be verified, authentic assessments must be maintained on core competencies, the use of gadgets needs to have rules, and teachers need to receive training that is appropriate to the subject. Research on teacher professional development shows that research and program attention is still more focused on the use of AI in teaching than on the professional development needs of teachers themselves; whereas teacher readiness determines the quality of integration (Tan et al., 2025). The model produced by this research can be used as a simple audit framework for schools and madrasahs to determine the appropriate level of adoption without imposing technological uniformity.

Conclusion

This study concludes that the management of Arabic language learning in the age of AI in Islamic educational institutions in Yogyakarta develops in a diverse pattern, ranging from book-based learning with digital media as a complement to digital integration regulated through policies, verification, and combination assessment. AI at six sites is more powerful in functioning as a teacher's work assistant rather than as a substitute for the in-person learning process. The most consistent findings are the need for verification of AI outputs, maintenance of authentic practice and assessment, and the importance of institutional support. Based on these findings, the Contextual-Adaptive Model is formulated in five components: context diagnosis; adaptive planning; hybrid-controlled implementation; authentic verification and assessment; and institutional support and teacher development. Theoretically, the model extends the contextual-adaptive approach from the level of curriculum integration to the level of learning management. In practical terms, the model provides a framework for schools, madrasahs, and Islamic boarding schools to integrate AI without ignoring pedagogical goals, teachers' academic authority, and the value of Islamic education. The limitations of the study are the coverage of six sites in Yogyakarta, the use of one primary informant of teachers at each site, and qualitative designs that do not test causal influences on learning outcomes. Subsequent research can test the model through mixed methods, involve more teachers and students, and compare the effectiveness of the model at different levels and institutional cultures.

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