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Digitization of Audio-Visual Based Arabic Language Teaching Materials at MI Nurul Islam Wonokerto Lumajang

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Abstract

Arabic language learning in Islamic Elementary Schools (MI) still faces monotonous methods and limited media, while the digitalization of teaching materials at the institutional level has not been well documented. This study aims to (1) describe the forms of digitalization of audio-visual-based Arabic teaching materials, (2) analyze the implementation process in learning activities, and (3) identify the challenges faced by teachers and students at MI Nurul Islam Wonokerto Lumajang. This study uses a qualitative approach with a descriptive design. Data were collected through observation, in-depth interviews, and documentation involving 1 Arabic teacher, 25 sixth grade students, and the Principal of MI Nurul Islam Wonokerto Lumajang. Data were analyzed using the Miles and Huberman model of data reduction, data presentation, and conclusion drawing. Validation was carried out through source triangulation, technical triangulation, and cross-checking with informants. The results showed three forms of digitalization: learning videos from YouTube, multimedia presentations (PowerPoint and Canva), and teacher-made audio recordings. The use of audio-visual media had a positive impact on student motivation and understanding. However, four challenges remain: limited technological infrastructure, unequal distribution of teachers' digital competencies, limited Arabic-language digital content aligned with the elementary madrasah curriculum, and the absence of curriculum guidelines governing the use of digital media. This study recommends the development of an adaptive curriculum that integrates audio-visual technology systematically and sustainably.

Keywords: *digitalization, Arabic language teaching materials, audio-visual, adaptive curriculum*

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Introduction

The development of information and communication technology has brought fundamental changes to various aspects of life, including education (Pratama et al., 2024). The learning process, which was previously conventional, has now shifted towards digital-based learning that is more interactive, flexible, and adaptive. In the context of Arabic language education in Indonesia, this change presents both opportunities and challenges for Islamic educational institutions, particularly Madrasah Ibtidaiyah (MI) (Akmir et al., 2026). Arabic holds a strategic position in Islamic education because it is the language of the Qur'an, Hadith, and classical Islamic sources (Firdaus et al., 2025).

However, Arabic language learning at the elementary school level often faces various problems, ranging from monotonous teaching methods, a lack of engaging learning media, to low student motivation (Haq, 2023). At MI Nurul Islam Wonokerto, these problems are evident in the results of initial observations of student involvement are, low learning outcomes and passive involvement of 6th grade students in the learning process. Based on the recapitulation data of Mid-Semester Assessment (PTS) scores for Arabic language subjects in 6th grade, totaling 25 students, the average score was 58.5, still below the Learning Objective Achievement Criteria (KKTP) set by the school, which is 70. Of the total 25 students, only 7 students (28%) managed to achieve completeness, while the remaining 18 students (72%) had not yet completed.

Digitizing teaching materials is relevant for improving the quality of Arabic language learning (Haq, 2023), especially in situations where (a) teachers require learning resources that authentically present Arabic sounds, (b) abstract material, such as vocabulary, needs to be visualized, and (c) face-to-face time is limited, requiring students to review the material. However, digitalization has limitations. Its benefits depend on the availability of devices and networks, the teacher's ability to manage media, the content's suitability to the curriculum, and the risks of using media that focuses on entertainment rather than learning objectives.

Audio-visual media is a form of digital technology that has the potential to support language learning. The combination of audio (sound, music, narration) and visual elements (images, animation, video) has been reported to increase student learning (Hanik, Nashihah, & Salam, 2025). In Arabic language learning, this media can be used to introduce vocabulary (mufradat), practice listening skills (istima'), and strengthen grammatical understanding (qawa'id) in a more contextual and enjoyable manner (Hikmah, Petoukhoff, & Papaioannou, 2022).

MI Nurul Islam Wonokerto Lumajang is striving to integrate technology into Arabic language learning. The initial conditions of the madrasah prior to this research were as follows: Although MI Nurul Islam Wonokerto Lumajang has supporting facilities such as LCD projectors, laptops, active speakers, and Wi-Fi networks, the integration of technology into Arabic language learning has not been optimal. In their learning, teachers still predominantly use conventional media in the form of printed textbooks, student worksheets, and whiteboards with a one-way lecture method (thariqah al-muhadharah),

due to teachers' limited time in designing interactive digital media despite having attended basic ICT training. The implementation of digitalization in madrasas has not been scientifically documented, so an in-depth study is needed to understand the real conditions in the field (Ilmiani, Ahmadi, Rahman, & Rahmah, 2020).

This study aims to: (1) describe the forms of digitalization of audio-visual-based Arabic language teaching materials implemented at MI Nurul Islam Wonokerto Lumajang; (2) analyze the implementation process in learning activities; and (3) identify the challenges faced by teachers and students in the digitalization process. The results of the study are expected to contribute to the development of an Arabic language curriculum that is more adaptive and responsive to the needs of the digital era.

1. Previous Research

Several studies in the last five years that are relevant to this research serve as a basis for comparison.

The first study was conducted by Syarofi and Syuhadak (2023) entitled "Audio-Visual-Based Arabic Language Learning through Social Media: YouTube, TikTok, Instagram, and Facebook," published in the Kitaba journal. This study examined the use of audio-visual-based social media platforms as Arabic language learning media. The results showed that platforms such as YouTube and TikTok effectively improve vocabulary mastery and listening skills (istima') because they present Arabic content in authentic and engaging contexts. This study focused on social media, while the author's research encompasses the entire ecosystem of digitalization of teaching materials in MI environments.

The second study was conducted by Susiawati, Zulkarnain, Safitri, and Mardani (2022) entitled "Arabic Language Learning in Elementary Madrasahs (A Review of Teacher Competence and Learning Models)" published in El-Tsaqafah: Jurnal Jurusan PBA. This study concluded that teacher competence and choice of learning model are two key determinants of the success of Arabic language learning in elementary madrasahs. This finding strengthens the argument that teachers' digital competence is a critical barrier to the digitalization of Arabic language learning. The study did not specifically address aspects of digitalization and audio-visual technology, so this study fills this gap.

The third study was conducted by Novita and Munawir (2022) entitled "Arabic Language Learning Media Based on Information and Communication Technology in Online Learning in Elementary Schools" and published in EDUKATIF: Jurnal Ilmu Pendidikan. This study was conducted during the online learning period and found that ICT-based media increased student effectiveness and engagement in distance learning in Arabic. Their contribution to this research is empirical evidence that technology integration in Arabic language learning in elementary schools and madrasas has a positive impact. However, that study focused on the online context, while this study examines its implementation in face-to-face learning in madrasas.

The three studies above show that (a) audio-visual media and ICT are beneficial for Arabic language learning, and (b) teacher competence determines learning success. What has not been studied is how Arabic language teaching materials are digitized in face-to-

face learning at MI, how these media relate to the madrasah curriculum documents, and what challenges accompany this. The novelty of this study lies in its context, namely MI Nurul Islam Wonokerto Lumajang, an elementary-level madrasah in the region. Rural area of Wonokerto Village, Tekung District, Lumajang Regency, with teacher-centered digitalization initiatives. Another novelty is the attention to the relationship between digitalization practices and the need for adaptive curriculum development. A summary of the comparison is presented in Table 1.

Table 1. Summary of previous research and the position of this research

Study	Focus	Method	Results	Gap and position of this research
Syarofi & Syuhadak (2023)	Audio-visual social media (YouTube, TikTok, Instagram, Facebook)	Qualitative / Library Research	Improve vocabulary and istima'	Focusing on social media, this study examines the digitalization of teaching materials in MI environments.
Susiawati et al. (2022)	Teacher competencies and learning models in MI	Descriptive qualitative / Field study	Teacher competence and learning models determine success	Not addressing digitalization and audio-visual; this research fills that gap.
Novita & Munawir (2022)	ICT-based Arabic language media in online learning in elementary schools	Quasi-experimental / Qualitative	Increase student effectiveness and engagement	Online context; this research is on face-to-face learning in MI
This research	Digitization of audio-visual teaching materials at MI Nurul Islam	Descriptive qualitative	Three forms of digitalization and four challenges	Filling the gap in the face-to-face context in MI and its relationship to the adaptive curriculum

2. Digitalization in Language Learning

Digitalization of learning refers to the process of transforming conventional teaching content and methods into digital formats that can be accessed through technological devices.(Ghazy, Ghozali, & Wibowo, 2025). In language learning, digitalization includes the use of software, applications, multimedia content, and online platforms to facilitate more effective and efficient language competency acquisition (Panda & Satpathy, 2023).

Several studies have shown that digitizing language learning can increase students' intrinsic motivation, expand access to authentic materials, and enable personalized learning tailored to each student's needs and pace (Agma, 2025). The success of digitalization depends heavily on infrastructure readiness, educator competence, and institutional policy support (Ramadona, Fitria, & Irwandi, 2023). In the context of Society 5.0, teacher digital literacy is a crucial prerequisite for optimal and sustainable learning transformation (Hilmi & Hasaniyah, 2023).

The theoretical study in this research is limited to four variables that appear in the field: (1) audio-visual media, (2) teachers' digital competence, (3) technological infrastructure, and (4) curriculum policy.

3. Audio-Visual Media in Arabic Language Learning

Audio-visual media combines sound and visual components in one integrated presentation (Putra & Pratama, 2023). In learning Arabic, this media includes learning videos, vocabulary animations, recorded conversations, Arabic songs, and educational content on digital platforms (Syarofi & Syuhadak, 2023). The use of audio-visual media has several advantages, including: (1) helping students understand the correct pronunciation (makhraj) of Arabic letters through audio reinforcement, (2) strengthening understanding of meaning through concrete and relevant visual context, (2) creating a pleasant learning atmosphere and reducing student boredom, and (4) stimulating listening skills (istima') which is the basis for language mastery (Rohmat & Qosim, 2025).

The main theoretical framework of this research is the Dual Coding Theory proposed by Paivio (1986, 1991). This theory states that humans process information through two interconnected systems: the verbal system and the imagery (imaginary) system. Information presented through these two systems simultaneously forms two memory traces, making it easier to remember. The Cognitive Theory of Multimedia Learning (Mayer & Fiorella, 2022) is used as an operational derivative theory because it develops the dual channel concept into media design principles, for example, the simultaneous presentation of words and images. The relationship between the two is that Paivio's theory serves as a conceptual foundation, while Mayer's theory serves as a reference for assessing whether the media used by teachers is designed according to multimedia learning principles.

In the analysis, both theories were used to interpret the findings for the second objective. For example, the playback of vocabulary videos that combined images and sound was analyzed as a dual-channel presentation, and students' increased vocabulary memorization was interpreted as an indication of better retention. In the MI context, Adhim's (2025) research showed that audio-based media designed according to the level and curriculum material produced better results than general, uncurated content.

4. Development of Technology-Based Adaptive Curriculum

An adaptive curriculum is a curriculum designed to dynamically adapt content, methods, and assessments to students' needs, characteristics, and abilities (Syafi & Rosyidah, 2022). In the digital era, adaptive curriculum development is increasingly possible through technology that can respond to individual differences (Fitri & Hasibuan, 2024). Uzza and Kurniawan (2023) demonstrated that the transition from the 2013 Curriculum to the Independent Curriculum opens greater opportunities for the integration of digital technology in Arabic language learning in madrasas because the Independent Curriculum provides educational units with greater flexibility in developing their curriculum components.

In this study, a curriculum is considered adaptive if it meets four indicators, namely: (1) learning objectives and materials explicitly include the use of digital audio-visual media; (2) media are selected or designed according to the cognitive level of students and the theme of the material; (3) madrasah guidelines or policies are available that serve as a reference for all teachers; and (4) there is support for facilities and continuous improvement of teacher competencies. These four indicators were compiled by researchers based onindicators derived from the definition of Syafi and Rosyidah (2022) and the requirements discussed above (Muhammad, 2024).

In elementary madrasas, developing an adaptive audio-visual-based curriculum faces unique challenges because the curriculum must accommodate Islamic values, national competency standards, and the institution's technological readiness. Muhammad (2024) at MI Manarul Islam Malang showed that the implementation of ICT in Arabic language learning requires synergy between the madrasah principal's policies, infrastructure readiness, and teachers' pedagogical-technological competencies, known as the TPACK (Technological Pedagogical Content Knowledge) framework.

Method

This research employed a qualitative approach with a descriptive design. This approach was chosen because the three research objectives required an in-depth understanding of the forms, processes, and challenges of digitalization as they occur naturally in the classroom, thus not requiring measurement or statistical testing of relationships between variables. A descriptive design is appropriate for describing the actual conditions, while diverse data collection allows for a comprehensive understanding.

The research location was MI Nurul Islam Wonokerto, which was selected purposively based on the following criteria: (1) the madrasah had used digital media in Arabic language learning; (2) the madrasah was willing and provided access to data, including classroom observations and documents; and (3) readiness and commitment of madrasas in rural areas in developing an ICT-based adaptive curriculum to address Arabic language learning problems.

The research subjects consist of 1 person Arabic teacher,25 sixth grade students, and1 head of the madrasah. Semi-structured interviews were conducted with as many as

10 teachers and 10 students. 3 sessions with a duration of approximately30-45 minutes. The focus of teacher interview questions included the media used, reasons for content selection, technical constraints, and digital skills, while questions to students focused on learning experiences and difficulties encountered. Observations were conducted on 4 times Arabic language learning meetings, and the documents reviewed include syllabi, lesson implementation plans (RPP/teaching modules), and digital teaching materials for teachers (Sugiyono, 2022).

Data analysis used the Miles and Huberman model (Qomaruddin & Sa'diyah, 2024) with the following operational steps: (1) data condensation, namely selecting, focusing, and simplifying observation notes, interview transcripts, and documents; (2) coding, namely assigning codes to units of meaning, for example "YouTube videos", "device constraints", and "teacher initiatives"; (3) categorization, namely grouping codes into categories according to research objectives (digitalization forms, implementation processes, and challenges); (4) data presentation in narrative and tabular form; and (5) drawing conclusions and verification. Data validity was maintained through source triangulation, technical triangulation, and confirmation with informants (member check). The research was carried out through the stages of preparation, data collection, analysis, and report preparation.

Results And Discussion

1. Forms of Digitalization of Arabic Language Teaching Materials at MI Nurul Islam Wonokerto Lumajang

The results of observations and interviews show that the digitalization of Arabic language teaching materials at MI Nurul Islam Wonokerto Lumajang is realized in three main forms.

First, the use of Arabic language learning videos downloaded from YouTube and adapted to the curriculum material. These videos generally include explanations of new vocabulary accompanied by contextual images and audio. Teachers independently select content based on five suitability indicators:namely suitability with the lesson theme, the level of cognitive development of grade VI students, clarity of pronunciation of vocabulary (mufradat), suitability with the material in the Ministry of Religion textbook, and video duration of no more than 5-10 minutes so that students' focus is maintained. This was expressed by Mrs. Ilmiatun Nuriyah, S.Pd: "*I don't just grab videos from YouTube. I usually select ones that align with the theme of the 6th-grade textbook, have clear pronunciation, engaging visuals, and aren't too long, around 5 to 7 minutes. If the videos are too long, 6th-grade students often get bored quickly and lose focus on the vocabulary being taught.*" (interview,February 25, 2026). This pattern of using YouTube as a source of audio-visual content is in line with Ilyasa's (2024) findings that the

structured use of YouTube media has a positive effect on MI students' vocabulary mastery. Figure 1 and Figure 2 show examples of this form in classroom use.



Figure 1. Students watch a video learning Arabic letters through a projector.



Figure 2. Learning video projected onto the classroom whiteboard

Second, teachers utilize multimedia presentation applications, namely Microsoft PowerPoint and Canva, to present material visually and interactively. Slides are complemented by images, colors, and typography that engage students. Teachers find Canva relatively easy to learn and produces a professional appearance, even without in-depth graphic design skills. This is as conveyed by Mrs. Ilmiatun Nuriyah, S.Pd.: "*For material that requires visual variation, I usually create slides using Canva or PowerPoint. Canva is very helpful because the templates are already beautiful and attractive for children, so I just change the Arabic text and insert appropriate images. The appearance looks professional and the sixth graders are more interested in paying attention to the material rather than just looking at the blackboard*." (interview, February 24, 2026).

Third, some teachers have begun developing audio content in the form of recordings of vocabulary readings and conversations (muhadatsah) that are played back over the classroom loudspeaker. The recordings are made by the teachers themselves using the voice recorder feature on their mobile phones. While still simple, this initiative

demonstrates teachers' awareness of the importance of authentic audio components in Arabic language learning.This was confirmed by Mrs. Ilmiatun Nuriyah, S.Pd.: "*Besides videos and slide presentations, I also often record my own voice while reading mufradat or short conversations using my cell phone. Later, the voice recording is played in class through an active speaker so that the 6th graders can hear the clear pronunciation and imitate it together. Even though it's just a makeshift cell phone recording, this is quite helpful for the children to learn how to pronounce words correctly*." (interview, February 24, 2026).

These three forms of digitalization demonstrate madrasahs' efforts to adapt to the demands of 21st-century learning. These findings align with Novita and Munawir (2022), who emphasized the use of ICT-based media in Arabic language learning in elementary schools and madrasahs. The study also showed that digitalization initiatives in Arabic language education generally began with individual teacher creativity before being institutionalized in curriculum policies.

2. Implementation of Audio-Visual Media in the Learning Process

Audio-visual media at MI Nurul Islam Wonokerto is primarily applied in two phases: the presentation phase (ta'aruf al-mufradat) and the reinforcement phase (tadrib wa tamrin). In the first phase, teachers play videos or multimedia presentations at the beginning of the lesson to build students' knowledge schemas and introduce new vocabulary in a lively and relevant context. In the second phase, audio media is used for repeated pronunciation practice (nuthq), while visual media helps students identify and pair meanings.

This implementation increases students' active participation. Based on observations on4 Arabic language learning meetings in grade VI, students appear more enthusiastic and responsive when the material is presented in audio-visual format compared to conventional lecture methods, for exampleFor example, out of 25 sixth-grade students, around 16 to 18 students (64%–72%) actively raised their hands to answer vocabulary questions and read aloud (qira'ah jahriyah) when the media was displayed, a significant increase from the initial figure of only 7 students. This enthusiasm was further reinforced by the statement of a sixth-grade student, Fathir Ahmad Azzami (FAA): "Learning Arabic using videos and images on Canva slides is more fun and doesn't make you sleepy, Sir/Madam. Because there are clear images and sound, so you understand the meaning faster than just writing on the board." (interview, February 28, 2026). This finding is in line with Syarofi and Syuhadak (2023) that digital platform-based audio-visual media increases student engagement and motivation in learning Arabic.

In addition, students who initially had difficulty memorizing vocabulary began to show improvement when the vocabulary was presented with illustrations and clear pronunciation.Field observation notes showed that most sixth-grade students were able to

accurately recall 12 of the 15 new vocabulary words tested at the end of the audio-visual learning session. This improvement was also observed by Ms. Ilmiatun Nuriyah, S.Pd. who stated that students grasped the meaning of vocabulary more quickly when the visual image was paired directly with the audio pronunciation (interview, February 24, 2026).This finding can be explained by Dual Coding Theory (Paivio, 1986, 1991), which states that vocabulary presented as both words and images forms two memory traces. From a media design perspective, this also aligns with the Cognitive Theory of Multimedia Learning (Mayer & Fiorella, 2022), which states that presenting words and images simultaneously supports deeper processing and better retention.

However, the integration of audio-visual media has not been structured in madrasa curriculum documents. The documents reviewed are: The documents reviewed include the syllabus, Arabic Language Learning Implementation Plan (RPP/Teaching Module) for class VI, and the Madrasah Operational Curriculum Document (KOM) MI Nurul Islam Wonokerto. The document does not contain special allocation of the use of ICT media in the formulation of learning objectives, steps in core learning activities, and assessment indicators that explicitly mention the use of digital audio-visual based media. Media use is more of a teacher initiative than a planned curricular policy. This situation creates variations in the quality and intensity of media use between teachers and classes, resulting in inconsistent student learning experiences.

These findings demonstrate the importance of formalizing the use of digital media in madrasah curriculum documents. Fitri and Hasibuan (2024) at SDIT Alam Talago showed that the success of technology-based Arabic language learning transformation is largely determined by the presence or absence of clear curriculum guidelines and institutional support from madrasah leadership.

3. Challenges of Digitalization Implementation

This study identified four main groups of challenges in implementing the digitalization of audio-visual-based Arabic language teaching materials at MI Nurul Islam Wonokerto Lumajang, which are presented in Table 2 along with the main indicators and data sources.

Table 2. Challenges in implementing digitalization of Arabic language teaching materials

o.	Challenge Categories	Information	Key indicators	Data source

	Technology infrastructure	Limited hardware (projectors, speakers, laptops) and unstable internet connections. Not all classrooms have adequate facilities to optimally display audio-visual media.	There is only 1 LCD projector unit and 1 set of active speakers available to serve all classrooms (1:6 classes), and the Wi-Fi coverage in class VI is not yet stable.	\Observation, teacher interviews
	Teacher digital competence	Not all teachers are capable of developing and operating digital media independently. The competency gap between teachers is significant, especially between senior and junior teachers.	Teachers still rely on ready-to-use templates and are not yet able to produce their own interactive audio-visual media from scratch independently.	Teacher interviews, observations
	Content availability	Arabic-language audio-visual content that aligns with the cognitive level of MI students and national curriculum standards remains limited. Most online content is not designed for the Indonesian madrasah context.	Only about 20%–30% of video content on the YouTube platform can be used directly without the need for editing or readjusting the material.	Teacher interviews, teaching material documents
	Curriculum policy	There is no official curriculum guide that integrates digital media in a structured manner into Arabic language learning, so its implementation is ad hoc and depends on teacher initiative.	The absence (0%) of written points or guidelines regarding the allocation of digital media use in RPP/Teaching Modules and Madrasah KOM.	Documents, interviews with teachers and madrasah principals

Infrastructure challenges are identified as the most fundamental obstacle based on the most dominant frequency of appearance in the results of interviews with teachers and the Head of Madrasah, as well as its consistency with observation notes at each class

meeting, where the learning process is often hampered due to limited LCD projector units and unstable internet connections,and because of its structural nature and the need for significant financial investment. Without adequate equipment and networks, the potential of audio-visual media cannot be optimally utilized in the classroom. This challenge is similar to Sanjaya's (2024) findings on optimizing technological media in Arabic language learning, which emphasized that the digital infrastructure gap between urban and rural madrasas remains a systemic barrier requiring policy attention.

The challenge of teachers' digital competence is a second-level internal barrier related to teachers' beliefs, attitudes, and professional abilities in integrating technology (Dele-Ajayi et al., 2021). Afiaturrahmah, Saefuloh, and Sumiarnih (2024) found that the problems in implementing the Independent Curriculum in Arabic language subjects were partly caused by uneven teacher preparedness, including technological competence. Therefore, TPACK-based professional development programs need to be designed sustainably and systematically.

The challenge of content availability is a widespread issue. The limited availability of Arabic audio-visual content aligned with the madrasah curriculum in Indonesia forces teachers to rely on home-made content of varying quality. Adhim (2025) emphasized that audio-based media specifically designed to suit the material and student level delivers better learning outcomes than generic, uncurated content.

The absence of a curricular policy is a challenge that connects other challenges. Without clear guidelines, infrastructure spending, teacher training, and content development lack a common direction, leaving implementation dependent on individual initiative. This aligns with Fitri and Hasibuan (2024), who found that clear curricular guidelines and strong leadership support are crucial to the success of technology-based Arabic language learning.

Conclusion

This study concludes that the digitalization of audio-visual Arabic language teaching materials at MI Nurul Islam Wonokerto Lumajang is still in its initial stage. This initial stage is clearly indicated by its individual use by teachers, its lack of formal integration into curriculum documents, and its uneven distribution among teachers and grade levels. To address the first and second objectives, the digitalization methods implemented include curated YouTube videos, PowerPoint/Canva multimedia presentations, and teacher-made audio recordings of vocabulary and conversations (muhadatsah). These implementations are implemented through the stages of material presentation (ta'aruf al-mufradat) and reinforcement (tadrib wa tamrin), which result in increased student participation, motivation, and vocabulary retention.

To address the third objective, four integrated challenges were identified: limited infrastructure, a gap in teachers' digital competency, a lack of appropriate Arabic language content, and the absence of a curricular policy that serves as a key bridge to all these obstacles. Based on these findings, recommendations include the development of

an integrated curriculum document based on the Independent Curriculum, TPACK training for teachers, the development of a digital Arabic language content bank, and improvements to madrasah technology infrastructure.

Before formulating further research directions, it should be noted that this study has limitations in the form of using a qualitative approach in a single location so that the findings cannot be generalized, and the impact on motivation and vocabulary retention was only observed qualitatively without quantitative measurements. Therefore, further research is recommended using a quasi-experimental design to test the effectiveness of audio-visual media on student competency achievement in a measurable manner, while also developing a technology-based adaptive curriculum model that can be replicated in similar madrasas.

Declaration of AI and AI-Assisted Technologies in the Writing Process

In the preparation of this manuscript, the authors utilized ChatGPT to assist with the development of ideas, organization of the manuscript structure, and language improvement, and Grammarly to assist with the translation of the manuscript from Indonesian into English and English language refinement. All AI-assisted outputs were subsequently reviewed, verified, and revised by the authors. The authors remain fully responsible for the accuracy, originality, substance, and final content of the publication.

Author Contribution Statement

The first author contributed to the formulation of the research problem, research design, data collection, and preparation of the initial manuscript. The second author contributed to the literature review, data processing, and analysis of the research findings. The third author contributed to data interpretation, preparation of the discussion, substantive review, and refinement of the manuscript. The fourth author contributed to the final editing of the manuscript, language proofreading, and translation of the manuscript from Indonesian into English. All authors contributed to the revision process and approved the final version of the manuscript for publication.

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Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to research ethics requirements, respondent privacy, and applicable institutional policies.

Declaration of Interests

The authors declare that there are no conflicts of interest, including financial, personal, professional, or other interests that could have influenced the conduct of the research, interpretation of the findings, or preparation of the manuscript.

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