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Digital Media and Technology in Modern Arabic Language Learning: Transforming Education in the Digital Era

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Abstract

The rapid development of digital media and educational technologies, including AI chatbots, Moodle-based learning management systems, and gamification platforms such as Kahoot, has transformed Arabic language instruction into a more interactive and contextualized learning process. This study examines the alignment between digital technology selection and the development of four Arabic language skills: listening (mahārah istīmā'), speaking (mahārah kalām), reading (mahārah qirā'ah), and writing (mahārah kitābah). It also identifies the limitations of conventional approaches for Generation Z learners and proposes the Maharah-Digital Mapping framework for systematic technology-skill alignment. Using a qualitative descriptive design based on library research and qualitative content analysis, the study analyzes literature on TPACK, digital learning technologies, Arabic language pedagogy, multimedia learning, and technology integration. The findings indicate that AI chatbots are particularly useful for interactive speaking practice, immediate feedback, and guided writing; Moodle-based learning management systems support structured reading, comprehension, and learner interaction; while gamification platforms such as Kahoot enhance motivation, participation, and engagement, particularly in listening activities. Based on these findings, the Maharah-Digital Mapping framework systematically connects specific digital technologies with the Arabic language skills they most effectively support and organizes learning from receptive skills (listening and reading) to productive skills (speaking and writing). Its novelty lies in integrating technology-skill mapping with the pedagogical sequence of Arabic language development rather than treating digital tools as isolated instructional resources. Practically, the framework provides teachers with a structured basis for technology

selection, skill-specific activity design, and digital lesson planning. The study concludes that effective digital transformation in Arabic language education requires context-sensitive technology selection, continuous teacher training, and sustainable curriculum integration.



Introduction (مقدمة)

There is an urgent need to reposition digital media and technology in modern Arabic language learning in Indonesia. Rather than being used merely as micro-level tools for isolated exercises, digital technologies should be developed as part of a macro-level instructional architecture that integrates the four Arabic language skills in a holistic and sustainable manner (Islami et al., 2026). The COVID-19 pandemic accelerated digital transformation and compelled educational institutions to shift from face-to-face instruction to platforms such as Zoom, Moodle, Google Classroom, and gamification applications such as Kahoot and Quizizz. However, the implementation of these technologies has often remained sporadic and reactive, without a robust and systematic theoretical framework (Sari & Utami, 2021).

Contemporary post-pandemic demands involve more than technical efficiency. They also require the coherent integration of listening (*mahārah istimā'*), speaking (*mahārah kalām*), reading (*mahārah qirā'ah*), and writing (*mahārah kitābah*) as a unified set of learning competencies. This integration is particularly relevant to Generation Z learners, who have grown up with smartphones, social media, and expectations of immediate and interactive learning experiences (Hidayat & Rahman, 2022). To date, platforms such as Zoom have frequently been used for separate sentence- and phrase-level listening and speaking exercises through simple dialogue sessions. Moodle, meanwhile, has often been limited to functioning as a repository for passive reading materials, with insufficient integration of real-time collaborative writing activities (Yusuf & Anas, 2020).

Mobile applications such as Duolingo may support individual vocabulary and basic grammar development through micro-gamification and may contribute to listening practice. Nevertheless, the potential of combining digital technologies to construct an integrated learning sequence – from audiovisual reception to oral and written production – has not been adequately explored in formal curricula. This fragmented, silo-based approach may generate partial and unsustainable improvements in particular skills without developing integrated Arabic communicative competence for authentic contexts, such as Islamic discussions, academic presentations, and professional interaction (Al-Shboul & Al-Smadi, 2020).

The four Arabic language skills provide an appropriate theoretical and practical field for examining the instructional potential of digital technology at the macro level because they encompass the complete spectrum from input – listening and reading – to output – speaking and writing. Kahoot-based gamification may support vocabulary and grammar retention through interactive competition, leaderboards, and immediate feedback. Similarly, immersive virtual-reality technologies, such as Oculus Quest, may provide opportunities for speaking practice through simulated dialogues with virtual interlocutors in culturally contextualized Arabic environments. These possibilities, however, should be evaluated through systematic pedagogical design rather than assumed solely on the basis of technological features (Zainuddin & Usman, 2023).

Moodle can support structured reading through staged discussion forums and annotated reading activities, while collaborative tools such as Google Docs and Microsoft Teams can facilitate coherent narrative writing through real-time peer review. When coordinated within a clear instructional design, these tools can contribute to an integrated digital learning ecosystem that approximates authentic communication. Research on educational technology also reflects a significant shift from atomized e-learning in the 2000s, which emphasized passive content delivery through PowerPoint and PDF files, toward the more holistic and adaptive TPACK framework, or Technological Pedagogical Content Knowledge. In Arabic language education, TPACK provides a basis for aligning technological choices with the objectives of particular language skills (Arifin & Suryani, 2023).

The TPACK framework, developed by Mishra and Koehler, integrates three principal domains of knowledge: content knowledge, which includes classical and modern Arabic language content; pedagogical knowledge, which encompasses interactive strategies such as task-based learning; and technological knowledge, which concerns the selection and use of digital media appropriate to each language skill (Mishra & Koehler, 2006). TPACK is not simply a technology-centered approach. Rather, it emphasizes the interaction among content, pedagogy, and technology in order to support meaningful and context-sensitive learning (Koehler & Mishra, 2008).

Although TPACK has been adopted in various disciplines, the explicit relationship among conventional learning management systems such as Moodle and Schoology, adaptive gamification platforms such as Kahoot, Quizizz, and Duolingo, and emerging immersive technologies such as virtual reality, augmented reality, and AI chatbots has not been sufficiently formulated for Arabic language learning in Indonesia. The term "digital technology" is also frequently used in broad and ambiguous ways to refer to instructional organization, technological innovation, or content integration without a clear, measurable, and replicable theoretical and operational foundation (Sugiyanto & Mahmudah, 2022).

The literature on Arabic language education in Indonesia continues to reflect the influence of memorization-oriented grammar-translation practices and rigid Arabic-Indonesian literal translation. These practices have not always been connected to the affordances of contemporary digital learning, such as gradual listening practice through spaced repetition, contextualized speaking simulations through Zoom breakout rooms, critical reading forums in Moodle, or collaborative writing through Padlet and Google Jamboard (Fauzi & Hidayat, 2024). The natural progression from receptive skills—listening and reading—to productive skills—speaking and writing—has rarely been represented in an integrated digital design informed by multimedia learning principles, including coherence and signaling (Mayer, 2021).

Recent studies further highlight specific gaps that justify the present research. Work on digital transformation in Arabic learning between 2020 and 2025 documents widespread use of LMS, video, and gamified tools, yet notes that technology remains largely confined to the implementation stage and is not systematically embedded in curriculum planning or assessment (Islami et al., 2026). Systematic reviews of technology trends in Arabic education report positive effects on motivation and engagement but emphasize that most interventions are short-term, skill-specific, and lack longitudinal evidence of proficiency development across all four skills (Sugiyanto & Mahmudah, 2022). Parallel studies on AI in Arabic learning underscore the potential of chatbots, speech recognition, and adaptive systems for personalized practice, while also pointing to limitations in linguistic accuracy, scarce Arabic datasets, and low teacher readiness to integrate AI in pedagogically meaningful ways (Sdawi Manasiq et al., 2026). Research applying TPACK in Arabic contexts similarly finds that teachers possess strong content and pedagogical knowledge but weaker technological knowledge, and that TPACK is often used descriptively rather than as a design framework for developing and validating concrete instructional models (Arifin & Suryani, 2023). Although some recent publications call for integrating TPACK with AI and advanced digital tools, these discussions remain conceptual

and do not offer empirically tested models that operationalize TPACK together with specific technologies in curriculum-aligned Arabic learning sequences (Salmas & Zubaidah, 2026).

The central problem concerns the explicit scope and optimal potential of digital media at the macro level of instruction (Mishra & Koehler, 2006). It remains necessary to examine whether TPACK categories—such as content-pedagogy-technology integration, digital scaffolding, and adaptive learning paths—are sufficient to explain the coherent development of the four language skills within a single learning ecosystem (Koehler et al., 2011). An epistemic gap also exists between Western educational-technology research, which often emphasizes AI analytics and personalized learning paths, and the Indonesian context, which is shaped by basic infrastructure, varying levels of digital literacy, and the digital divide (Nasution & Harahap, 2023). Therefore, this study aims to formulate a contextual, cost-conscious, and scalable hybrid TPACK-Maharah curriculum model for modern Arabic language learning (Al-Jauzi, 2018).



Method (منهج)

Methodologically, this study employed library research combined with TPACK-oriented structural qualitative content analysis to critically synthesize theoretical and empirical sources on digital media selection in Arabic language learning (Creswell & Poth, 2018). Library research was selected because the focus of the study lies in a critical dialogue among TPACK theoretical texts, including the seminal works of Mishra and Koehler; educational-technology literature, including Clark and Mayer's multimedia principles and Hattie's effect-size studies; maharah pedagogy, including the methodology of Al-Jauzi; and technology case studies concerning AI speech recognition, H5P-based LMS activities, and Kahoot's gamification principles (Clark & Mayer, 2021). This integrative approach enables the reconstruction of a TPACK-Maharah framework that is both theoretically grounded and contextually responsive to the realities of Arabic language education in Indonesia (Chai et al., 2013).

Literature selection followed explicit inclusion and exclusion criteria to ensure relevance and analytical quality. Inclusion criteria comprised: (1) academic publications (journal articles, books, conference proceedings, institutional repositories) discussing TPACK, educational technology, or digital-based Arabic language learning; (2) published between 2006 and 2025 for seminal TPACK works and between 2015 and 2025 for empirical studies on technology in Arabic language learning, consistent with recent literature-review practices in this field (Voogt et al., 2013); (3) available in Indonesian or English with full-text access; and (4) directly relevant to technology-maharah mapping or learning-effect criteria (e.g., effect sizes, multimedia principles, gamification drives) (Hattie, 2023). Exclusion criteria included studies unrelated to language education or technology, non-academic reports without clear methodology, and duplicated articles to maintain analytical rigor (Lincoln & Guba, 1985). These criteria ensure that the synthesized literature reflects both foundational TPACK theory and contemporary empirical evidence on digital Arabic language learning (Harris et al., 2009).

Primary data sources included major TPACK publications, particularly the works of Mishra and Koehler from 2006 to 2025; documentation of technology features, including Moodle 4.4 and H5P specifications, the Kahoot API, and the Google Cloud Speech API for Arabic; and ready-to-use digital lesson-plan templates as objects of applied analysis (Moodle HQ, 2025). Secondary data consisted of educational-technology meta-analyses, including Hattie (2023) and the British Council (2025); empirical studies on Arabic language learning in Indonesia, including studies published in *Jurnal Lisanul Arab* in 2025 and studies from UIN

Malang in 2024–2026; digital-divide surveys, including APJII (2025) and Kemdikbud (2024); and literature on maharah pedagogy, including Al-Jauzi (2018) and Al-Fatih's works on nahwu, sharaf, and balāghah (APJII, 2025). This dual-layer data structure enables triangulation between theoretical frameworks and context-specific empirical findings (Denzin, 2017).

Data were collected through systematic searches of Google Scholar, Scopus, Garuda, SINTA, and UIN repositories using structured keywords such as "TPACK Arabic language learning," "digital media maharah," "AI speech recognition Arabic," "LMS Moodle H5P Arabic," and "gamification Kahoot language skills" (Kemdikbud, 2024). The search strategy combined Boolean operators and controlled vocabulary to maximize recall while maintaining precision in identifying relevant sources (Miles et al., 2020). Based on title, abstract, and full-text screening, approximately 65–80 studies meeting the criteria (including TPACK theoretical works, meta-analyses, and local/international empirical studies) were analyzed qualitatively, a scale consistent with recent library-research studies on technology and Arabic language learning in Indonesia (Jurnal Lisanul Arab, 2025). All selected sources were recorded and managed using Zotero and Obsidian to facilitate traceability and systematic analysis (UIN Malang, 2024–2026).

Qualitative content analysis was conducted thematically through several systematic steps to ensure analytical transparency and reproducibility (Al-Fatih, n.d.). First, the data were organized by grouping TPACK theoretical texts and educational-technology studies into thematic clusters: Technological Knowledge, represented by AI, LMSs, and gamification; Pedagogical Content Knowledge, represented by maharah pedagogy and task-based language teaching; TPACK intersections; and effect-size databases (H5P, 2025). This initial categorization aligns with the seven-domain TPACK framework while accommodating the specific progression of Arabic language skills (Kahoot!, 2025). Second, the researchers conducted repeated readings and initial coding of relevant textual fragments to identify salient themes and patterns (Google Cloud, 2025). Labels were assigned to passages related to the alignment of technology features with the four language skills, the synergy among TPACK intersections, the application of multimedia principles, the core drives of gamification, and strategies for mitigating the digital divide (Yu-kai, 2019). Third, patterns were identified from the codes, and these patterns were developed into analytical themes that summarized the main findings and explained the relationship between TPACK concepts and the realities of digital Arabic language learning (Task-Based Language Teaching, 2020). The next stage involved applying the reconstructed TPACK–maharah framework to three technology case studies to test its explanatory power and practical applicability (Google Docs, 2025). At this stage, the researchers identified the main features of each technology, analyzed the transition among the four language skills—*istimāʿ* → *qirāʾah* → *kalām* → *kitābah*—and examined changes in technological affordances, such as the transition from AI-based speech recognition to collaborative peer review through Google Docs (British Council, 2025). The analysis was directed toward mapping the progression of digital learning from receptive input to productive output and examining the extent to which TPACK categories could explain the coherence of a holistic learning ecosystem (Koehler & Mishra, 2009). The results of the analysis were compared with Hattie's (2023) meta-analysis and relevant local studies to evaluate the capacity and limitations of the TPACK framework in the context of Arabic language learning in Indonesia (Mishra & Koehler, 2025).

To maintain the validity and reliability of the findings, this study applied source triangulation and theoretical triangulation as quality assurance mechanisms (Kemdikbud, 2025). Source triangulation was conducted by comparing Indonesian and international empirical studies with seminal theoretical frameworks so that the interpretation would not depend on a single perspective (Nasution & Harahap, 2023). Theoretical triangulation was conducted by bringing together classical TPACK theory, particularly the work of Mishra and Koehler, with contemporary multimedia learning theory developed by Mayer, gamification theory, particularly the Octalysis framework, and the progression of maharah skills described by Al-Jauzi (Mayer, 2020). This process was intended to reduce the internal bias of a single theoretical tradition and enrich the analysis through a multidisciplinary perspective (Al-Jauzi, 2018). In addition, the consistency of the analytical framework was maintained by applying the same TPACK categories from the beginning to the end of the discussion, allowing the reasoning process to be followed and re-examined by academic readers (Creswell & Guetterman, 2019). Through this methodological design, the study is expected to produce a rich, systematic, and argumentative account of how TPACK can function as an integrative architectural framework for selecting digital media in modern Arabic language learning through AI, LMS, and gamification case studies (Koehler et al., 2011). The study also aims to provide a strong operational foundation for developing the TPACK–Maharah Framework in subsequent research and curriculum implementation in Indonesia, particularly in achieving the learning outcome of being able to select digital media that are aligned with the objectives of the Arabic language skills (Hattie, 2023).

Result (نتائج)

Technology Fragmentation in Arabic Language Learning

The findings indicate that the use of digital technology in Arabic language learning in Indonesia remains partial and fragmented. Digital platforms such as Zoom, Moodle, and gamification applications are often used separately without being integrated into a coherent instructional design. Teachers tend to employ technology as an additional teaching aid rather than as an integral component of a systematically planned learning strategy. As a result, digital technology is frequently used to deliver materials, conduct quizzes, or facilitate communication, but its function in connecting the four Arabic language skills is not always clearly defined.

This fragmented use affects the continuity of the learning process. Learners may gain new vocabulary through a digital application, complete grammar exercises through an online quiz, or watch Arabic-language videos, but they may still experience difficulty using the acquired language in oral and written communication. This condition indicates that exposure to digital materials does not automatically produce integrated communicative competence. Digital technology needs to be connected to language objectives, meaningful tasks, feedback, and assessment so that learners can transfer their knowledge from one skill to another.

The findings further reveal a gap between the development of educational technology and pedagogical practices in the field. Although various digital platforms are available, their use is not always supported by adequate instructional planning, teacher digital competence, or institutional guidance. Recent studies on Arabic language learning similarly identify digital tools, mobile applications, multimedia, learning management systems, and virtual

communication platforms as promising resources, while also emphasizing the need for curriculum redesign and teacher preparation (Sumiarni, 2025).

Implementation of TPACK as an Integrative Framework

The findings show that the TPACK framework integrates three primary components: content knowledge, pedagogical knowledge, and technological knowledge. Content knowledge refers to the Arabic language material being taught, including vocabulary, grammar, morphology, reading texts, speaking topics, and cultural content. Pedagogical knowledge concerns instructional strategies, classroom interaction, assessment, and learning support. Technological knowledge refers to the ability to select and use digital platforms and tools in accordance with instructional needs.

The analysis indicates that TPACK helps teachers select technology more purposefully. Technology is not chosen merely because it is popular or innovative but because it corresponds to the learning objectives, the characteristics of the learners, and the nature of the Arabic language content. This finding is consistent with the original TPACK framework, which emphasizes the complex interaction among content, pedagogy, and technology rather than the simple addition of technological skills to existing teaching practices (Mishra & Koehler, 2006).

The findings also indicate that TPACK can support a shift from memorization- and translation-oriented instruction toward communicative and experience-based Arabic language learning. Through the integration of content, pedagogy, and technology, teachers can design activities that require learners to understand, discuss, interpret, and produce Arabic in meaningful contexts.

Maharah-Digital Mapping

The study identifies Maharah-Digital Mapping as a framework for aligning digital technology with the four Arabic language skills: listening (*mahārah istimā`*), speaking (*mahārah kalām*), reading (*mahārah qirā`ah*), and writing (*mahārah kitābah*). Each skill has different instructional requirements and therefore requires a specific technological approach.

The findings show that audio and video technologies can support listening activities by providing repeated exposure to pronunciation, intonation, vocabulary, and spoken discourse. AI chatbots and video-conferencing platforms can support speaking through dialogue simulation, role-play, question-and-answer activities, and interactive communication. Learning management systems can support reading through organized texts, comprehension exercises, annotation, and discussion forums. Collaborative platforms can support writing through brainstorming, drafting, peer review, revision, and publication.

The analysis also demonstrates that the four skills should not be developed as separate instructional units. Technology can be used to connect listening, speaking, reading, and writing within a single learning cycle. For example, learners may listen to an Arabic dialogue, read its transcript, discuss the content with their peers, and write a response. This integrated sequence enables learners to use receptive input as the basis for productive language performance.

Implementation of AI, LMS, and Gamification

The analysis of AI chatbot implementation indicates that AI can provide personalized and adaptive opportunities for speaking and writing practice. Learners can engage in simulated conversations, ask questions, construct sentences, and receive immediate responses. These activities may increase opportunities for independent learning and allow learners to practice Arabic beyond scheduled classroom sessions.

The findings also show that Moodle can support reading through interactive features such as H5P, online discussions, comprehension questions, and text-based evaluation. These features allow learners to interact with Arabic texts rather than merely receive information. Moodle can also connect reading with writing when learners are asked to summarize a text, respond to a discussion question, or produce a written reflection.

The use of gamification, particularly Kahoot, is associated with increased learner participation and motivation. Game elements such as points, rankings, competition, time limits, and immediate feedback can encourage learners to participate actively in vocabulary, grammar, and listening activities. However, the results indicate that gamification is most useful when it is connected to clear language-learning objectives rather than used solely for entertainment.

Learning Progression from Receptive to Productive Skills

The findings indicate that digital Arabic language learning can be organized through a progression from receptive to productive skills. The process begins with listening and reading as sources of linguistic input and continues with speaking and writing as forms of language production.

A possible learning sequence begins with an Arabic audio recording. Learners then read a related text, identify important vocabulary and expressions, discuss the content, and produce a written response. This sequence creates continuity among learning activities and helps learners transfer vocabulary, grammatical patterns, and ideas from comprehension to production.

The analysis also indicates that technology can facilitate this progression through staged activities, online collaboration, immediate feedback, and digital assessment. Thus, technology does not merely deliver materials but also helps organize the cognitive and communicative processes involved in learning Arabic.

The 5C Framework for Technology Selection

The study identifies the 5C Framework as a practical guide for selecting digital technology. The five components are competency, cost, connectivity, capacity, and customization.

Competency refers to the extent to which a technology supports the intended learning outcome. Cost concerns affordability for learners and educational institutions. Connectivity relates to the availability and stability of internet access. Capacity refers to the readiness of teachers, learners, and institutions to use the technology. Customization concerns the ability to adapt digital materials, activities, language levels, and assessments to the needs of learners.

The findings show that these five criteria are particularly relevant in Indonesia because access to devices, internet connectivity, digital competence, and technical support varies among institutions and regions. Technology should therefore be selected according to actual learning needs and local conditions rather than technological trends alone.

Challenges and Solutions

The findings reveal several challenges in implementing digital technology in Arabic language learning. These challenges include limited teacher digital literacy, inadequate infrastructure, unstable internet access, high internet costs, unequal access to digital devices, and insufficient institutional support. These limitations may reduce the effectiveness of technology-supported learning and create unequal opportunities for learners.

The analysis identifies several possible solutions, including continuous teacher training, curriculum development based on technology integration, mobile-first learning design, low-bandwidth learning materials, downloadable content, and technical support from educational institutions. Government support is also necessary to improve infrastructure and reduce regional inequalities in access to digital learning.

Pedagogical Implications and Research Contribution

The study provides two principal contributions. First, it proposes TPACK as a framework for integrating technology, pedagogy, and Arabic language content. Second, it introduces Maharah-Digital Mapping as a specific approach for connecting digital technologies with listening, speaking, reading, and writing.

The findings indicate that digital technology should be understood as an integral part of instructional design rather than merely as an additional teaching aid. When appropriately selected and integrated, technology can support learning that is more interactive, systematic, flexible, and relevant to the needs of contemporary learners.



Discussion (مناقشة)

Technology Fragmentation and the Need for Integration

The results indicate that the central challenge is not the absence of digital tools but their fragmented use. Zoom, Moodle, AI chatbots, and gamification platforms may offer different learning opportunities, but their separate use does not automatically result in integrated Arabic language competence. This finding is supported by a systematic literature review of 12 scientific articles (2021–2025) which found that 58.33% of studies integrated multiple maharah, yet the main challenge remained limited access to devices and the internet (66.67%), indicating that technology use is often isolated rather than systematically connected across skills.

This finding can be explained through the TPACK framework. Effective technology integration requires a meaningful relationship among content, pedagogy, and technology. Technology becomes educationally valuable when it changes or strengthens the way content is represented, taught, practiced, and assessed (Mishra & Koehler, 2006; Koehler et al., 2013). Therefore, the use of an audio application should be connected to reading comprehension, speaking practice, and writing activities rather than being limited to listening exercises. A qualitative descriptive literature review on technology integration in maharah istima' learning (2020–2025) confirms that audio-visual media and learning applications are most effective when they provide authentic, contextual, and engaging language input that connects to other skills.

The fragmentation problem also indicates that digital technology needs to be embedded in curriculum planning. Teachers should determine the learning outcomes, select appropriate digital tools, design integrated activities, and establish assessment procedures before implementing technology. This approach is consistent with studies that emphasize the role of technology in strengthening learning planning, material management, and evaluation in Arabic

language curricula. A systematic literature review on digital technology in Arabic language learning reports that digital technology primarily contributes to learning access and flexibility (83.33%), the expansion of learning resources (75.00%), and interactivity (66.67%) when integrated pedagogically and adaptively.

TPACK and Contextual Technology Selection

The results confirm that TPACK provides a theoretical basis for selecting technology according to pedagogical and content-related considerations. This framework rejects the assumption that the use of advanced technology automatically produces effective learning. Instead, the effectiveness of technology depends on the relationship between the tool, the learning task, the language content, and the learner.

In Arabic language learning, an AI chatbot may be useful for guided speaking practice, but it cannot replace teacher feedback, peer interaction, or authentic communication. A systematic literature review of 26 scholarly articles (2020–2025) on teaching maharah al-kalam through digital media found that platforms such as YouTube, TikTok, Vlogs, Plotagon, and WhatsApp provide comprehensible input that supports students' speaking development, but their effectiveness depends on perceived usefulness and ease of use according to the Technology Acceptance Model (TAM). Moodle may support reading comprehension, but its effectiveness depends on the quality of the text, the questions, the discussion, and the feedback. A systematic literature review on AI and culture-based maharah qira'ah learning (2019–2026) reports that AI supports personalized learning through adaptive instruction and automated feedback, but culture-based learning enhances contextual relevance and learner engagement. Kahoot may support motivation, but its use should be connected to meaningful vocabulary, grammar, or listening objectives. A systematic review finds that gamification, digital platforms, and collaborative methods significantly enhance student engagement and comprehension when aligned with learning objectives.

This interpretation is consistent with the TPACK concept, which emphasizes the flexible and situated knowledge required for successful technology integration (Mishra & Koehler, 2006; Koehler et al., 2013). Teachers need to understand not only how a platform works but also how learning changes when a specific technology is introduced.

Maharah-Digital Mapping as an Integrative Model

Maharah-Digital Mapping provides a more specific application of TPACK in Arabic language education. The framework explains how technology can be aligned with the particular requirements of the four Arabic language skills. This systematic mapping is supported by empirical evidence from multiple systematic literature reviews.

Listening requires comprehensible input, repetition, pronunciation awareness, and comprehension checks. A qualitative descriptive literature review on technology integration in maharah istima' learning (2020–2025) found that the most frequently used technologies include audio-visual media, learning applications, digital platforms, podcasts, interactive multimedia, and Artificial Intelligence (AI), with audio-visual media and learning applications being most dominant because they provide authentic, contextual, and engaging language input. A case study on digital media integration in maharah istima' instruction at a pesantren setting shows that YouTube, ChatGPT, and Quizizz can boost students' learning motivation, improve word

understanding, enhance meaning comprehension, and increase active participation when integrated in a focused and context-appropriate way.

Speaking requires interaction, turn-taking, role-play, negotiation of meaning, and feedback. A systematic literature review of 26 scholarly articles (2020–2025) on teaching maharah al-kalam through digital media found that digital media platforms such as YouTube, TikTok, Vlogs, Plotagon, and WhatsApp provide comprehensible input that supports students' speaking development, and these media are effective because they are perceived as useful and easy to use, which encourages active participation and increases students' self-confidence. Another study recommends the strategic integration of digital media into the Arabic language learning curriculum and the development of hybrid learning models that are more responsive to students' needs.

Reading requires annotation, interpretation, critical analysis, and discussion. A systematic literature review on AI and culture-based maharah qira'ah learning (2019–2026) reports that AI supports personalized learning through adaptive instruction, automated feedback, and learning analytics, while culture-based learning enhances contextual relevance, learner engagement, and cultural identity, contributing to the development of reading literacy, reading comprehension, and critical reading skills.

Writing requires planning, drafting, peer review, revision, and evaluation. A systematic literature review of 12 scientific articles (2021–2025) found that 58.33% of studies integrated multiple maharah, indicating that writing is often connected to other skills through collaborative digital tools.

The results suggest that digital technologies have different pedagogical affordances across these skills. Digital tools may provide relatively direct support for listening and reading through audio, video, text, and interactive comprehension activities. Writing can be supported through collaborative documents and digital feedback. Speaking requires more carefully designed interaction because learners need opportunities to produce language and receive meaningful responses. A review of digital teaching tools for Arabic speaking similarly classifies digital resources according to their functions in pronunciation, fluency, and oral communication.

AI Chatbots and Learner Autonomy

The use of AI chatbots may increase learner autonomy by providing opportunities for self-paced practice. Learners can practice speaking and writing outside the classroom and receive immediate responses. This possibility is important for learners who have limited access to Arabic-speaking partners or additional instructional support. A systematic literature review on AI and culture-based maharah qira'ah learning (2019–2026) indicates that AI supports personalized learning through adaptive instruction, automated feedback, and learning analytics.

Nevertheless, AI-generated responses must be evaluated critically. Chatbots may provide inaccurate corrections, inappropriate examples, or responses that do not match the learner's proficiency level. Teachers should therefore design the prompts, determine the learning objectives, monitor the interaction, and verify the feedback. AI should be positioned as an instructional assistant rather than as a replacement for teachers. The use of AI is therefore most appropriate when it is integrated into a broader pedagogical sequence. For example, learners may use an AI chatbot for dialogue practice, compare the chatbot's response with a

teacher-provided model, discuss errors with peers, and revise their own written production. This approach combines technological support with teacher guidance and learner reflection.

Gamification and Learner Motivation

Gamification can support the affective dimension of Arabic language learning by increasing participation and reducing the monotony of repetitive exercises. Kahoot and similar platforms use points, rankings, competition, and immediate feedback to encourage learner involvement. A systematic review finds that gamification, digital platforms, and collaborative methods significantly enhance student engagement and comprehension.

However, the literature shows that the effects of gamification are not always uniform. Gamified tools may produce positive, negative, or insignificant learning outcomes depending on the design of the activity, the learner characteristics, and the learning context. A systematic literature review of 12 scientific articles (2021–2025) reports that the main challenge was limited access to devices and the internet (66.67%), indicating that technological problems remain important implementation challenges. Therefore, Kahoot should not be used only to create competition. It should be integrated with explanation, reflection, collaboration, and language production. After completing a vocabulary quiz, for example, learners can be asked to explain their answers, use the vocabulary in a dialogue, and apply it in a short written paragraph.

From Receptive Input to Productive Output

The progression from receptive input to productive output provides a logical structure for integrating digital technology. Listening and reading expose learners to vocabulary, pronunciation, grammatical patterns, discourse organization, and cultural meanings. Speaking and writing enable learners to use this input productively. A systematic literature review of 12 scientific articles (2021–2025) found that 58.33% of studies integrated multiple maharah, supporting the integration of receptive and productive skills.

A learning sequence that begins with an audio recording, continues with reading and discussion, and concludes with oral or written production can connect the four skills. This sequence also allows teachers to monitor learners' progress through formative assessment. The integration of the four skills is important because Arabic language competence cannot be reduced to vocabulary recognition or grammatical knowledge. Learners need to understand spoken and written language and use Arabic in oral and written expression. Digital learning resources can support this integration when they are designed around connected tasks rather than isolated exercises.

Relevance of the 5C Framework in Indonesia

The 5C Framework demonstrates that technology selection must take educational context into account. A sophisticated platform may not be appropriate if learners lack stable internet access, suitable devices, or the skills required to use it. A systematic literature review of 12 scientific articles (2021–2025) reports that the main challenge was limited access to devices and the internet (66.67%), confirming that technological inequality remains a significant challenge in Indonesia.

Competency ensures alignment between the technology and the learning outcome. Cost determines accessibility. Connectivity concerns the availability and stability of internet access. Capacity involves teacher, learner, and institutional readiness. Customization concerns the adaptation of content, tasks, and assessment to the learning context. These criteria are particularly important in Indonesia because technological inequality remains a significant challenge. Studies on technology integration report problems related to limited infrastructure, insufficient devices, high internet costs, and low digital literacy. Therefore, mobile-first design, downloadable materials, and low-bandwidth learning activities may be more sustainable in rural and resource-constrained settings.

Challenges and Pedagogical Solutions

The challenges identified in the results indicate that digital transformation requires institutional preparation. Teacher training should include not only the operation of digital platforms but also instructional design, assessment, feedback, digital-content evaluation, and responsible AI use. A systematic literature review on teaching maharah al-kalam through digital media reports that challenges such as limited internet access, technical difficulties, and psychological barriers continue to hinder implementation.

Teachers need to understand how to select appropriate tools, design meaningful activities, integrate the four skills, and adapt instruction to different levels of learner access. Institutions should provide technical assistance, internet access, digital resources, and clear policies for technology use. In addition, curriculum development should include technology integration at the planning stage. Digital technology should not be added after the curriculum has been designed. Instead, learning outcomes, activities, assessment, and technology should be planned as interconnected components.

Research Contribution and Limitations

The main contribution of this study is the integration of TPACK with the four Arabic language skills through the Maharah-Digital Mapping framework. TPACK provides the general theoretical relationship among content, pedagogy, and technology, while Maharah-Digital Mapping applies that relationship specifically to listening, speaking, reading, and writing. This systematic mapping is supported by empirical evidence from multiple systematic literature reviews covering 2019–2026.

The 5C Framework adds a practical dimension by helping teachers and institutions select technology according to learning objectives and contextual conditions. Together, these frameworks offer an alternative to technology adoption based solely on popularity, novelty, or technical sophistication.

However, the study has limitations. It is based on library research and descriptive analysis and does not provide direct evidence of students' actual proficiency gains. The findings should therefore be understood as conceptual and analytical rather than as proof of causal effectiveness. In addition, the discussion focuses mainly on AI, LMSs, and gamification, while immersive technologies such as virtual reality and augmented reality require further investigation.

Future research should validate the proposed framework through classroom observation, teacher and learner interviews, quasi-experimental designs, and assessments of listening, speaking, reading, and writing. Further studies should also examine how the

framework functions in institutions with different levels of infrastructure, teacher competence, and learner access.



Conclusion (خاتمة)

This study reveals that TPACK Theory can be optimally operationalized as a comprehensive integrative architectural framework for the selection, integration, and evaluation of digital media and technology in modern Arabic language learning. This is particularly demonstrated through in-depth case studies of AI chatbots for transforming *maharah kalām*, Moodle H5P-based learning management systems for structured critical *qirā'ah*, and Kahoot gamification for supporting holistic motivation across all four Arabic language skills. Through the systematic TPACK-Maharah matrix and the 5C selection framework – Competency, Cost, Connectivity, Capacity, and Customization – the synergy among the seven dynamic TPACK intersections, involving Content Knowledge, Pedagogical Knowledge, and Technological Knowledge, creates a coherent, sustainable, and adaptive holistic learning ecosystem. This ecosystem is considerably more effective than the fragmented traditional grammar-translation approach. It enables a natural progression from receptive input, namely *istimā'* and *qirā'ah*, to productive output, namely *kalām* and *kitābah*, while also providing an innovative contextual solution to Indonesia's digital divide through a cost-effective and rural-viable mobile-first strategy.

The strengths of this study lie in four main contributions. First, the Maharah-Digital Mapping framework explicitly and systematically integrates TPACK with the four Arabic language skills. Second, the study provides a ready-to-use, plug-and-play lesson-plan template equipped with empirical effect sizes and alignment with learning outcomes. Third, the 5C Framework offers a practical and actionable basis for selecting rural-viable technologies. It is intended not only to address disparities in internet access but also to support national scalability. Fourth, the study proposes a gradual professional-development roadmap, beginning with the familiarization of Technological Knowledge (TK) and progressing toward full TPACK integration, with the aim of strengthening teachers' self-efficacy in post-pandemic hybrid learning environments.

The main limitations of this study are as follows. First, it is based entirely on library research and content analysis and does not include empirical field validation through a quasi-experimental design, Maharah pre- and post-tests, or a randomized controlled trial measuring actual proficiency gains among university students. Second, the study focuses on only three specific technology categories – AI, LMSs, and gamification. Consequently, the coverage of emerging educational technologies, such as immersive virtual and augmented reality, Islamic metaverse environments, and blockchain-based credentialing for *kitābah*, remains limited and has not yet been integrated into the proposed framework.

Future research should be conducted in two main directions. First, empirical field research should employ a quasi-experimental design involving control and experimental groups from various educational institutions to examine the effectiveness of the TPACK-Maharah Framework directly. This research should use pre- and post-tests of the four Arabic language skills, classroom observations, and interviews to validate actual proficiency gains and identify practical barriers to implementation. Second, future studies should develop and test advanced immersive technologies, such as virtual-reality and augmented-reality applications

based on classical Arabic texts. These technologies should be integrated with AI-based speech recognition to create authentic *mahārah kalām* practice in culturally relevant Arabic contexts. Such studies should also include an analysis of Generation Z learners' motivation and long-term dropout rates. The results are expected to contribute to the development of a well-established methodological model that is responsive to regional variations in digital infrastructure and capable of being replicated nationally for the transformation of modern Arabic language learning into a globally competitive educational process.

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