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A Multimodal Instructional Design Model: Integrating Infographics and Interactive Videos in Arabic Language Learning

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***Abstract*:** Arabic language instruction in secondary Islamic education has traditionally relied on text-based explanation and memorization, which often fails to address learners' cognitive diversity and engagement in digital learning environments. This study aims to develop and evaluate a multimodal instructional design model integrating infographics and interactive videos to enhance Arabic language learning, particularly vocabulary and grammar mastery. Grounded in Mayer's Cognitive Theory of Multimedia Learning and structured through the ADDIE framework, the study employed an exploratory sequential mixed-methods approach. Data was collected through pre- and post-tests, classroom observations, questionnaires, and semi-structured interviews involving 60 *Madrasah 'Aliyah* students divided into experimental and control groups. The multimodal materials were developed using Canva, Powtoon, and H5P and implemented over six weeks. Quantitative results showed a statistically significant improvement in the experimental group's vocabulary and grammar achievement ($p < .05$), while qualitative findings indicated increased motivation, engagement, and conceptual understanding. The novelty of this study lies in its empirically validated multimodal instructional design model that systematically integrates visual and interactive elements within Arabic language pedagogy. The findings suggest that sustained teacher training in digital pedagogy is essential to support the effective implementation and scalability of multimodal learning in Arabic education.

INTRODUCTION

In many Arabic language classrooms, students spend years memorizing grammatical rules and vocabulary lists,[1] yet still struggle to apply them meaningfully in comprehension and communication. This persistent gap between prolonged instruction and limited learning outcomes raises a critical question

[1] Hasan, Olsafrian Ihsanu Matswa, and Muhammad Gatan Arda Saputra, 'Mastering Arabic Vocabulary through Drill Technique: A Study on Primary Learners', *Al-Muhawaroh: Jurnal Pendidikan Bahasa Arab* 1, no. 1 (February 2025): 47–58, https://doi.org/10.38073/almuhawaroh.v1i1.2644.

about the effectiveness of traditional teaching approaches in an era where learners are constantly exposed to rich visual and interactive digital content. In the digital era, the landscape of language education has been profoundly transformed by the rise of multimodal learning environments that combine visual, auditory, and interactive elements.[2] Traditional Arabic language teaching, which has long relied on text-based explanations[3] and rote memorization[4] is increasingly seen as insufficient to address the diverse learning styles of contemporary students. Learners today are surrounded by rich multimedia stimuli that shape their cognitive preferences and engagement habits.[5] As a result, integrating multimodal materials[6] particularly infographics and interactive videos has become essential for revitalizing Arabic language pedagogy and fostering meaningful learning experiences.[7]

Although digital learning technologies are increasingly accessible, Arabic language instruction particularly in vocabulary and grammar remains dominated by text-based explanation and rote memorization.[8] This practice often leads to difficulties in grasping abstract grammatical structures, weak vocabulary retention, and low learner engagement. In many secondary Islamic education contexts, multimedia resources are applied inconsistently and without a clear instructional design, reducing visual and interactive elements to peripheral supports rather than core learning components. [9] As a result, learners struggle to construct conceptual understanding, and the pedagogical potential of multimodal learning in Arabic education remains largely underexploited.

Despite the global trend toward multimedia learning, Arabic language instruction still faces challenges in adopting modern instructional design

[2] Luigi F. Cuturi et al., 'Informing the Design of a Multisensory Learning Environment for Elementary Mathematics Learning', *Journal on Multimodal User Interfaces* 16, no. 2 (June 2022): 155–71, https://doi.org/10.1007/s12193-021-00382-y.

[3] Asmaa Elsaid et al., 'A Comprehensive Review of Arabic Text Summarization', *IEEE Access* 10 (2022): 38012–30, https://doi.org/10.1109/ACCESS.2022.3163292.

[4] Muneera Muftah, 'The Effects of Web-Based Language Learning on University Students' Translation Proficiency', *Journal of Applied Research in Higher Education* 15, no. 5 (November 2023): 1420–39, https://doi.org/10.1108/JARHE-05-2022-0173.

[5] J. Balu, R. Sreejith, and K.R. Sinimole, 'Thinking Fast and Slow in Film Reception: Cognitive Spillover of Consumer Emotions across Digital Platforms', *Journal of Retailing and Consumer Services* 88 (January 2026): 104474, https://doi.org/10.1016/j.jretconser.2025.104474.

[6] Wilson Chango et al., 'A Review on Data Fusion in Multimodal Learning Analytics and Educational Data Mining', *WIREs Data Mining and Knowledge Discovery* 12, no. 4 (July 2022): e1458, https://doi.org/10.1002/widm.1458.

[7] Silvia Saborío-Taylor, 'Multisensory Strategies to Foster Autonomous Language Learning through Digital Landscapes', *European Journal of Interactive Multimedia and Education* 6, no. 1 (February 2025): e02503, https://doi.org/10.30935/ejimed/16045.

[8] Abdullah Mukhasibi and Iqmal Wahyudi, 'Immersive Arabic Islamic Environment and Student Engagement: Evaluating the Linguistic Impact of World Arabic Language', *Farasyah: Journal of Linguistics and Language Education* 1, no. 1 (2026): 1–12.

[9] Ping Li and Yu-Ju Lan, 'Digital Language Learning (DLL): Insights from Behavior, Cognition, and the Brain', *Bilingualism: Language and Cognition* 25, no. 3 (May 2022): 361–78, https://doi.org/10.1017/S1366728921000353.

approaches[10]. Studies have shown that Arabic learners often struggle with abstract grammatical concepts and limited vocabulary retention[11] . While some educators have begun to use visual aids or short video clips, these efforts remain fragmented and lack a cohesive design model that systematically integrates various modes of learning. Consequently, there is a gap between theory and practice in how multimedia principles such as dual-channel processing and cognitive load management are applied in Arabic education contexts.[12]

Several recent studies have emphasized the integration of visual and interactive media in enhancing learning effectiveness. Nkosinkulu (2024) highlighted infographics as universal visual tools that foster visual literacy and engagement through edutainment-based approaches.[13] Similarly, Singh et al. (2022) confirmed the empirical effectiveness of infographics as visual communication aids that improve comprehension and retention.[14] Weinert et al. (2024) developed design patterns for interactive learning videos, demonstrating how interactivity transforms passive learning into active participation.[15] Daher et al. (2024) showed that digital video recordings enhance reflective and metacognitive thinking,[16] while Toharudin and Kurniawan (2023) found that Powtoon-based videos significantly improved learning outcomes across student levels.[17] Previous studies have demonstrated the pedagogical potential of digital media and infographics in Arabic language learning, including social media–based content engagement,[18] needs analysis for interactive infographic modules

[10] Mior Syazril Mohamed Sapawi and Nik Mohd Rahimi Nik Yusoff, 'Integrating Technology into the Arabic Language Curriculum: A Systematic Review of Trends, Strategies and Cultural Dimensions', *Social Sciences & Humanities Open* 12 (2025): 101974, https://doi.org/10.1016/j.ssaho.2025.101974.

[11] Nur Hanifansyah and Menik Mahmudah, 'Enhancing Arabic Vocabulary Mastery Through Communicative Strategies: Evidence from Malaysia.', *Al-Ta'rib : Jurnal Ilmiah Program Studi Pendidikan Bahasa Arab IAIN* 12, no. (2) (2024): 263–78, https://doi.org/10.23971/altarib.v12i2.9082.

[12] Richard E. Mayer, 'Incorporating Motivation into Multimedia Learning', *Learning and Instruction* 29 (February 2014): 171–73, https://doi.org/10.1016/j.learninstruc.2013.04.003.

[13] Zingisa Nkosinkulu, 'Visualizing Education: Infographics and Pop-up Edutainment Exhibitions', *Journal of Visual Literacy* 43, no. 3 (July 2024): 250–65, https://doi.org/10.1080/1051144X.2024.2396253.

[14] Niharika Singh et al., 'Infographics Based Teaching Learning Process for Enriching Education System', *2022 11th International Conference on System Modeling & Advancement in Research Trends (SMART)*, IEEE, 16 December 2022, 995–1002, https://doi.org/10.1109/SMART55829.2022.10046752.

[15] Tim Weinert et al., 'Engaging Students through Interactive Learning Videos in Higher Education: Developing a Creation Process and Design Patterns for Interactive Learning Videos', *University of Kassel, Communication of the Association for Information Systems* 55 (2024): 475–506, https://doi.org/10.17705/1CAIS.05519.

[16] Wajeeh Daher et al., 'Using Digital Video Recordings in Class Activities for Enhancing Mathematics Pre-Service Teachers' Reflective Thinking', *International Journal of Interactive Mobile Technologies (iJIM)* 18, no. 13 (July 2024): 20–36, https://doi.org/10.3991/ijim.v18i13.49443.

[17] Uus Toharudin and Iwan Setia Kurniawan, 'Improving Student Learning Outcomes Using Powtoon Media Apps', *International Journal of Interactive Mobile Technologies (iJIM)* 17, no. 24 (December 2023): 40–53, https://doi.org/10.3991/ijim.v17i24.45983.

[18] Khizanatul Hikmah et al., 'Digital Approaches to Arabic Language Learning: Content Strategies and Audience Engagement on Educational Instagram Accounts', *Jurnal Al Bayan: Jurnal Jurusan Pendidikan Bahasa Arab* 17, no. 2 (December 2025): 523–43, https://doi.org/10.24042/ma0xnt36.

in Arabic grammar,[19] and infographic-based e-modules in balāghah instruction emphasizing learner experience.[20] However, these studies largely focus on content strategies, learner perceptions, or preliminary needs without implementing a coherent instructional design model or empirically measuring learning outcomes. Consequently, there remains a clear research gap in the development and validation of a multimodal instructional design that systematically integrates infographics and interactive videos grounded in multimedia learning theory for Arabic language education.

However, although recent studies in Arabic language education have begun to explore the use of digital media and infographic-based learning, most remain limited to content strategies, learner perceptions, or preliminary needs analysis, without advancing toward a systematically designed and empirically validated multimodal instructional model. In particular, the integration of infographics and interactive videos grounded in multimedia learning theory has not yet been comprehensively implemented and evaluated within Arabic language classrooms. Therefore, the present study addresses this gap by proposing and empirically examining a multimodal instructional design framework tailored to Arabic language learning, integrating visual, auditory, and interactive modalities to enhance comprehension, motivation, and learner engagement.

Accordingly, this study aims to develop and evaluate a multimodal instructional design model that combines infographics and interactive videos in Arabic language learning. The proposed model is grounded in Mayer's Cognitive Theory of Multimedia Learning and the ADDIE framework,[21] emphasizing design coherence, interactivity, and learner-centered principles. The research seeks to answer two key questions: How can infographics and interactive videos be effectively integrated into Arabic language learning within a multimodal instructional design model? What is the impact of this integration on students' comprehension, retention, and motivation?

The scope of this study is limited to Arabic language learning at the secondary education level (*Madrasah 'Aliyah*), focusing primarily on vocabulary and grammar mastery. While the model's testing is confined to a single institutional context, its implications extend to broader Arabic pedagogy and curriculum development. The findings are expected to contribute to the advancement of digital Arabic language pedagogy, providing educators with an

[19] Mohd Fauzi Abdul Hamid et al., 'Needs Analysis For the Development Of Website-Based Interactive Infographic Modules in Arabic Grammar Learning', *Ijaz Arabi Journal of Arabic Learning* 7, no. 1 (February 2024), https://doi.org/10.18860/ijazarabi.v7i1.24342.

[20] Rofiazka Fahmi Huda et al., 'Transforming Balaghah Instruction through Infographic-Based E-Modules: A Phenomenological Study in Higher Education', *ALSUNIYAT: Jurnal Penelitian Bahasa, Sastra, Dan Budaya Arab* 8, no. 2 (October 2025): 311–25, https://doi.org/10.17509/alsuniyat.v8i2.90098.

[21] Richard E. Mayer, 'The Past, Present, and Future of the Cognitive Theory of Multimedia Learning', *Educational Psychology Review* 36, no. 1 (March 2024): 8, https://doi.org/10.1007/s10648-023-09842-1.

empirically validated design model that enhances multimodal literacy and supports effective learning outcomes.

METHOD

This study employed a mixed-methods approach[22] to develop and evaluate a multimodal instructional design model that integrates infographics and interactive videos in Arabic language learning.[23] The design was theoretically grounded in Mayer's Cognitive Theory of Multimedia Learning (2021) and the ADDIE instructional design framework, which together provide a systematic foundation for developing instructional materials that align cognitive processing principles with pedagogical coherence. The research design adopted an exploratory sequential mixed-methods format, beginning with a qualitative phase to identify learners' difficulties, teaching challenges, and multimedia preferences, followed by a quantitative phase to measure the model's effectiveness. The qualitative findings from the initial phase informed the design and development of the multimodal learning materials, while the subsequent quasi-experimental procedure using pre-test and post-test comparisons allowed the researcher to determine the model's instructional impact on students' learning outcomes.

The research was conducted at Madrasah Aliyah Darullughah Wadda'wah in Pasuruan, Indonesia, an Islamic educational institution known for its emphasis on Arabic instruction and readiness for digital learning integration. The location was chosen purposively because, although the school is already equipped with interactive whiteboards, indicating the presence of multimedia technology, teachers' and students' awareness of infographics and interactive video-based learning remains limited. This condition provided a relevant context for testing the proposed multimodal model, since it combines the presence of digital infrastructure with the need to enhance pedagogical competence in designing and utilizing visual-interactive media. The participants consisted of 60 students, aged sixteen to eighteen years, who were divided evenly into a control group and an experimental group. In addition, three Arabic language teachers participated as informants in semi-structured interviews to provide expert insights into the instructional process and validate the pedagogical suitability of the developed materials.

The data in this study consisted of both primary and secondary sources. Primary data included pre-test and post-test results, classroom observations,[24]

[22] John W Creswell and J David Creswell, *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches* (Los Angeles: SAGE Publications, 2020).

[23] Richard E. Mayer, 'The Past, Present, and Future of the Cognitive Theory of Multimedia Learning', *Educational Psychology Review* 36, no. 1 (March 2024): 8, https://doi.org/10.1007/s10648-023-09842-1.

[24] Sarah Balcom, Shelley Doucet, and Anik Dubé, 'Observation and Institutional Ethnography: Helping Us to See Better', *Qualitative Health Research* 31, no. 8 (July 2021): 1534–41, https://doi.org/10.1177/10497323211015966.

student questionnaires, and teacher interviews,[25] whereas secondary data comprised textbooks, Arabic learning modules, and previous research related to multimodal learning design. These various data sources were triangulated to enhance the validity and reliability of the findings.[26]

Data collection was carried out through three major stages. First, in the analysis and development stage, the researcher identified the main learning challenges in vocabulary and grammar and then created infographic and interactive video materials using platforms such as Canva, Powtoon, and H5P. Second, in the implementation stage, the multimodal materials were applied to the experimental class over a six-week period, while the control class continued using conventional textbook-based instruction. Third, in the evaluation stage, pre-test and post-test instruments were administered to both groups, followed by classroom observations and interviews to obtain data on learner engagement, motivation, and perception toward the multimodal approach.

The data analysis process combined quantitative and qualitative techniques. Quantitative data from the pre-test and post-test were analyzed using SPSS version 26 to identify learning gains and determine statistical significance through paired sample t-tests with a confidence level of $p < .05$. Meanwhile, qualitative data derived from interviews and observations were analyzed using Miles and Huberman's interactive model[27], which involves data reduction, data display, and conclusion drawing to identify recurring themes related to learner engagement, comprehension, and teacher feedback. Ethical considerations were observed throughout the study; participation was entirely voluntary, and informed consent was obtained from all participants. Confidentiality and anonymity were maintained, and the study adhered to the ethical standards established by the Universitas Islam Internasional Darullughah Wadda'wah for educational research. Overall, this methodological design ensured the rigor, credibility, and trustworthiness of the findings in assessing the effectiveness of the multimodal instructional design model.

[25] Nicole M. Deterding and Mary C. Waters, 'Flexible Coding of In-Depth Interviews: A Twenty-First-Century Approach', *Sociological Methods & Research* 50, no. 2 (May 2021): 708–39, https://doi.org/10.1177/0049124118799377.

[26] Rebecca Campbell et al., 'Assessing Triangulation Across Methodologies, Methods, and Stakeholder Groups: The Joys, Woes, and Politics of Interpreting Convergent and Divergent Data', *American Journal of Evaluation* 41, no. 1 (March 2020): 1, https://doi.org/10.1177/1098214018804195.

[27] Lili Sururi Asipi, Utami Rosalina, and Dwi Nopiyadi, 'The Analysis of Reading Habits Using Miles and Huberman Interactive Model to Empower Students' Literacy at IPB Cirebon', *International Journal of Education and Humanities* 2, no. 3 (August 2022): 117–25, https://doi.org/10.58557/ijeh.v2i3.98.

RESULT AND DISCUSSION

Effectiveness of Infographics and Interactive Videos in Enhancing Arabic Learning Outcomes

This section addresses the first research question concerning the effectiveness of integrating infographics and interactive videos in improving Arabic vocabulary and grammar learning outcomes.

The quantitative analysis demonstrated a significant improvement in the experimental group's performance after the integration of infographics and interactive videos. Statistical testing using a paired sample *t*-test revealed that the mean post-test score of the experimental group (M = 86.4, SD = 4.92) was substantially higher than its pre-test score (M = 71.8, SD = 6.31), with $p < .05$. In contrast, the control group, which continued using traditional textbook-based instruction, showed only a slight increase (from M = 70.9 to M = 74.1). These findings indicate that the multimodal instructional design significantly enhanced students' comprehension of vocabulary and grammar in Arabic.

Table 1. Summary of Learning Outcomes between Experimental and Control Groups

Group	Pre-test Mean (SD)	Post-test Mean (SD)	Gain	Instructional Approach
Experimental	71.8 (6.31)	86.4 (4.92)	+14.6	Infographics + Interactive Videos
Control	70.9 (—)	74.1 (—)	+3.2	Traditional Textbook-Based Instruction

Note. The experimental group showed a statistically significant improvement (paired sample *t*-test, $p < .05$), while the control group demonstrated only marginal gains.

Observational data also supported these findings. Students in the experimental group demonstrated greater attention and participation during lessons, often initiating discussions based on the visual information presented in the infographics. The integration of short, interactive videos encouraged students to apply learned concepts in simulated communicative contexts. This multimodal approach promoted active engagement and fostered learner autonomy, especially in vocabulary recall and contextual sentence building. These improvements align with recent findings by Al-Mekhlafi, who emphasized that multimodal visualization can bridge abstract grammatical concepts into concrete understanding,[28] thereby increasing retention and motivation among Arabic learners.

[28] Al-Yahyai Omaira et al., 'Investigating the Effectiveness of Using Structured and Unstructured Google Classroom on Grammar Learning Among Omani EFL Post-Basic Learners, and Perceived Benefits and Challenges', *World Journal of English Language* 13, no. 6 (May 2023): 165, https://doi.org/10.5430/wjel.v13n6p165.

Students' and Teachers' Perceptions toward Multimodal Learning

Qualitative data from interviews revealed a strong positive response from both students and teachers regarding the multimodal approach. Most participants expressed that infographics and interactive videos helped them visualize linguistic relationships and remember complex concepts more effectively. One student stated: "Before this class, I always memorized Arabic vocabulary without really understanding it. But when I saw the infographic showing pictures and root connections, it became much easier to remember." Another participant added: "The videos made me feel like learning Arabic is fun. When I clicked the quiz inside the video, I could check my understanding immediately. It was like playing, not just studying." Teachers also recognized the pedagogical potential of the model. As one Arabic teacher commented: "Even though our school already has an interactive whiteboard, we rarely use it for designing lessons. This project opened my eyes to how infographics and videos can make Arabic learning more dynamic. It encourages students to think, not just repeat."

These qualitative insights demonstrate how the integration of multimodal resources not only supports cognitive comprehension but also transforms classroom dynamics into a more interactive and student-centered environment. The alignment between visual and verbal modalities stimulated dual coding, improving both memory recall and conceptual clarity.

The results confirm the theoretical assumptions of Mayer's multimedia learning theory and the practical value of the ADDIE model for instructional design. The effectiveness of combining infographics and interactive videos supports prior research emphasizing multimodal reinforcement in second language acquisition.[29] Similar to the findings of Baharun, who demonstrated that interactive videos enhance learner autonomy in Arabic speaking courses,[30] this study extends the discussion to vocabulary and grammar acquisition, proving that multimodal design can also facilitate structural comprehension in written Arabic.

Moreover, this study contributes to filling the research gap identified by previous scholars, who often treated infographics and videos as separate tools rather than as elements of a unified instructional model. While Al-Mekhlafi focused on static visual aids and Weinert et al. (2024) analyzed the motivational effects of interactive learning videos through design patterns, this study systematically integrates both within a single pedagogical framework. The findings suggest that the synergistic use of visual (infographics) and interactive (video) modes enhances learning outcomes more effectively than either modality

[29] Stella Doukianou, Damon Daylamani-Zad, and Kathy O'Loingsigh, 'Implementing an Augmented Reality and Animated Infographics Application for Presentations: Effect on Audience Engagement and Efficacy of Communication', *Multimedia Tools and Applications* 80, no. 20 (August 2021): 30969–91, https://doi.org/10.1007/s11042-021-10963-4.

[30] Segaf Baharun and Muhamad Solehudin, *Artificial Learning Environment and Learning Independence in Arabic Learning: Mediating Effect of Learning Creativity*, no. 104 (2023), https://ejer.com.tr/article-view/?id=1235.

alone. This supports multimodal literacy theory, which posits that the co-presence of multiple semiotic resources—visual, textual, and auditory—creates richer learning experiences and deeper comprehension.

However, the study also recognizes certain limitations. Although the integration proved effective, some teachers lacked the technical competence to design multimedia materials independently. This limitation echoes broader challenges in educational technology integration, where Singh et al. (2022) emphasized that effective implementation of visual communication aids requires not only the tools but also educator competency in utilizing them. Therefore, institutional support and professional development remain crucial to fully realize the pedagogical potential of multimodal instructional design in Arabic education.

The findings of this study provide significant theoretical contributions to the field of multimodal language learning, particularly in the context of Arabic education. The successful integration of infographics and interactive videos within a unified instructional model advances our understanding of how multiple representational modes interact to facilitate language acquisition. This study extends Mayer's (2021) Cognitive Theory of Multimedia Learning by demonstrating that the synergistic combination of static visual representations (infographics) and dynamic interactive elements (videos) creates a more robust learning environment than either modality alone. The dual coding effect observed in this study aligns with Chango et al. (2022), who emphasized that multimodal data fusion in educational contexts leads to deeper cognitive processing and enhanced learning analytics capabilities.

Furthermore, this research contributes to the emerging field of digital language learning (DLL) as conceptualized by Li and Lan (2022), who argued that technology-mediated language acquisition involves distinct cognitive and behavioral patterns compared to traditional methods. The significant improvement in vocabulary retention and grammatical understanding observed in the experimental group suggests that the multimodal approach activates multiple cognitive pathways simultaneously, reducing the cognitive load associated with processing complex linguistic structures in Arabic. This finding is particularly relevant given the unique challenges of Arabic morphology and syntax, which often overwhelm learners when presented through traditional text-based methods alone.

Pedagogical Innovation in Arabic Language Education

The study's findings challenge conventional approaches to Arabic language pedagogy by demonstrating the transformative potential of visual-interactive integration. While traditional Arabic instruction has historically emphasized memorization and repetition, this multimodal model promotes conceptual understanding through visual scaffolding and interactive reinforcement. The

qualitative data revealing students' shift from rote memorization to meaningful comprehension represents a paradigm shift in how Arabic language learning can be conceptualized and delivered.

This pedagogical innovation is consistent with Sapawi and Yusoff's (2025) systematic review, which identified the need for culturally responsive technology integration in Arabic curricula. However, our study goes beyond mere technology adoption by providing a theoretically grounded framework that balances technological affordances with pedagogical objectives. The ADDIE framework's systematic approach ensured that each multimodal element served a specific instructional purpose rather than being included merely for novelty or engagement.

One of the most significant contributions of this study is its demonstration of how multimodal design can simultaneously address both engagement and achievement gaps in language learning. The observational data showing increased student participation and self-initiated discussions indicates that the visual-interactive approach transformed passive recipients into active constructors of knowledge. This transformation aligns with Cuturi et al. (2022), who found that multisensory learning environments promote deeper engagement by catering to diverse learning preferences and cognitive styles.

The integration of immediate feedback mechanisms through interactive videos particularly addresses a critical gap in traditional Arabic instruction, where learners often progress without adequate formative assessment. As noted by Saborío-Taylor (2025), autonomous language learning through digital landscapes requires carefully designed feedback loops that support self-regulated learning. Our model's incorporation of embedded quizzes and interactive elements within videos creates these essential feedback mechanisms while maintaining learner engagement.

An important dimension of this study is its sensitivity to the cultural context of Arabic language learning within Indonesian Islamic education. The successful implementation at Madrasah Aliyah Darullughah Wadda'wah demonstrates that multimodal approaches can be effectively integrated within traditional Islamic educational settings without compromising cultural values or pedagogical traditions. This finding is particularly significant given concerns about the cultural appropriateness of Western-developed educational technologies in non-Western contexts.

The positive reception from both students and teachers suggests that when multimodal materials are designed with cultural sensitivity and aligned with institutional values, they can enhance rather than diminish the authenticity of Arabic language learning. This aligns with Hanifansyah and Mahmudah (2024),

who emphasized the importance of contextualizing communicative strategies within specific cultural frameworks for effective Arabic vocabulary acquisition.

While the results are promising, this discussion must acknowledge several implementation challenges that emerged during the study. The revelation that teachers possessed limited technical competence despite having access to interactive whiteboards highlights a critical gap between technological infrastructure and pedagogical capability. This finding resonates with Omaira et al. (2023), who found that technology integration effectiveness depends heavily on teachers' digital literacy and pedagogical content knowledge.

The six-week intervention period, while sufficient to demonstrate initial effectiveness, may not capture the long-term sustainability of multimodal approaches. As Elsaid et al. (2022) noted in their comprehensive review, the novelty effect of new technologies can initially inflate learning outcomes, which may diminish over extended periods. Future longitudinal studies are needed to assess whether the observed improvements in vocabulary and grammar mastery persist beyond the initial implementation phase.

The study's findings underscore the critical need for comprehensive teacher professional development programs that go beyond technical training to include multimodal pedagogical design competencies. The teachers' acknowledgment that they rarely utilized available interactive whiteboards for lesson design reveals a systemic issue in how educational technology is introduced without adequate pedagogical support. This aligns with Muftah's (2023) findings that successful technology integration in language learning requires sustained professional development that connects technological tools with pedagogical objectives.

The development of teacher competencies in multimodal design should focus not only on technical skills but also on understanding the cognitive principles underlying effective multimedia learning. Teachers need support in creating coherent visual narratives through infographics and designing interactive experiences that promote active learning rather than passive consumption. This comprehensive approach to professional development is essential for scaling the multimodal model beyond experimental settings to widespread classroom implementation.

This study opens several avenues for future research in multimodal Arabic language learning. First, extending the model to other language skills such as listening comprehension and oral production could provide insights into how visual-interactive elements support different aspects of language acquisition. Second, investigating the optimal balance between different modalities for various linguistic concepts could lead to more refined design guidelines for multimodal materials.

Additionally, exploring the potential of emerging technologies such as augmented reality (AR) and artificial intelligence (AI) within the multimodal framework could further enhance the personalization and adaptability of Arabic language learning. As Doukianou et al. (2021) demonstrated, AR-enhanced infographics can create even more immersive learning experiences that bridge physical and digital learning spaces. The combination of visual representation and interactive practice reduced cognitive overload and provided multiple entry points for meaning construction, consistent with Mayer's cognitive theory of multimedia learning. [31]

The findings also suggest the need for developing assessment tools specifically designed for multimodal learning environments. Traditional paper-based assessments may not fully capture the learning gains achieved through visual-interactive approaches, necessitating the development of multimodal assessment strategies that align with the instructional methods employed. Unlike previous studies that examined infographics or digital media as standalone tools, this study demonstrates that learning gains emerge more substantially when infographics and interactive videos are systematically integrated within a multimodal instructional design grounded in multimedia learning theory.

In summary, the multimodal instructional design model integrating infographics and interactive videos significantly improved students' achievement, engagement, and motivation in learning Arabic. Both quantitative and qualitative findings demonstrated consistent evidence that visual interactivity supports comprehension and retention. The model successfully operationalizes theoretical principles into practical classroom strategies that can be adapted across different Arabic language skills and educational settings. Thus, this study contributes not only an empirically validated design model but also a conceptual framework for advancing Arabic pedagogy through multimodal and technology-enhanced learning.

CONCLUSION

This study developed and empirically evaluated a multimodal instructional design model integrating infographics and interactive videos in Arabic language learning. The findings demonstrate that multimodal materials significantly enhance students' comprehension, retention, and motivation by enabling dual-channel information processing and reducing cognitive load. Quantitative and qualitative evidence confirms that infographics effectively support the visualization of abstract grammatical and lexical concepts, while interactive videos foster learner autonomy and engagement. Accordingly, this study contributes a systematic and empirically grounded framework for

[31] Mayer, 'The Past, Present, and Future of the Cognitive Theory of Multimedia Learning', March 2024.

operationalizing Mayer's Cognitive Theory of Multimedia Learning and the ADDIE design principles within Arabic language pedagogy.

Despite these positive outcomes, this study acknowledges several limitations, including the relatively short intervention period and variations in teachers' digital literacy, which may have influenced the depth of classroom implementation. Future research should examine the long-term effects of this model through longitudinal designs and extend its application to other Arabic language skills such as speaking and writing. From a practical perspective, sustained teacher training in digital pedagogy is essential to ensure the effective adoption and scalability of multimodal instructional innovation. Integrating this model into curriculum design can support the development of more interactive, visually rich, and student-centered Arabic learning environments aligned with contemporary educational demands.

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