



DEVELOPMENT OF MULTIMODAL ANIMATION-BASED DIGITAL ARABIC VOCABULARY TEACHING MATERIALS

Ahmad Afandi^{*1}, Very Aulia Rahman², Luthfi Anisatin³, Maghfiratul⁴

¹STAI As-Sunnah Deli Serdang, Indonesia

²Universitas Islam Negeri Raden Mas Said Surakarta, Indonesia

³Universitas Islam Negeri Maulana Malik Ibrahim Malang, Indonesia

⁴Universiti Malaya, Malaysia

Article Information

Article History:

Received : 3-January-2025
Revised : 16-December-2025
Accepted : 21-December-2025
Published : 31-December-2025

Keywords:

Animaker;
Animation-based digital;
Arabic vocabulary learning;
Multimodal learning;
Teaching materials.

Articles Available Online:



ABSTRACT

This study addresses the lack of structured, curriculum-aligned multimodal animation-based instructional media for Arabic vocabulary learning in Islamic higher education language programs. This study aimed to design animation-based Arabic vocabulary learning media using a multimodal learning approach. The research employed a research and development (R&D) method based on the ADDIE model. It was conducted up to the Analysis and Design stages at the Program Pengembangan Bahasa Arab (PPBA), Universitas Muhammadiyah Malang (UMM). Data were collected through classroom observations, student interviews, and the analysis of instructional materials to identify learners' needs, material limitations, and media-related challenges in vocabulary learning. The results of the analysis indicated that vocabulary instruction was dominated by conventional, text-based methods, resulting in low learner engagement, limited vocabulary retention, and difficulties in contextual vocabulary use. Learning materials lacked multimodal support and a structured progression of difficulty, while instructional media showed minimal integration of visual and auditory elements. Based on these findings, an animation-based instructional design was developed, integrating visual illustrations, audio pronunciation, contextual example sentences, and formative assessment components. The study contributes theoretically by strengthening MALL (Mobile-Assisted Language Learning) design epistemology through multimodal animation alignment, and practically by offering a replicable, context-appropriate design model for Arabic vocabulary instruction in Islamic educational environments. The proposed framework establishes clear directions for development-stage validation, learner-agency balance, and interface signaling of skill-material alignment, ensuring accessibility for diverse learner profiles.



Copyright:

© 2025 by the author(s).

This open-access article is distributed under the terms and conditions of the Creative Commons Attribution-ShareAlike (CC BY-SA) license (<https://creativecommons.org/licenses/by-sa/4.0/>).

CORRESPONDING AUTHOR:

Luthfi Anisatin,

Department of Arabic Language Education,

Universitas Islam Negeri Maulana Malik Ibrahim Malang, Indonesia

Jl. Gajayana No. 50, Kelurahan Jatimulyo, Kecamatan Lowokwaru, Kota Malang, Jawa Timur- Indonesia

Email: 230104320013@student.uin-malang.ac.id

How to Cite:

Afandi, A., Rahman, V. A., Anisatin, L., & Maghfiratul, M. (2025). Development of Multimodal Animation-Based Digital Arabic Vocabulary Teaching Materials. *Ta'lim al-'Arabiyyah: Jurnal Pendidikan Bahasa Arab & Kebahasaaraban*, 9(2), 288–300. <https://doi.org/10.15575/jpba.v9i2.43474>

INTRODUCTION

The development of digital technology has brought significant changes to the world of education, particularly in the use of learning media, which are increasingly oriented towards interactivity and visual appeal. The digitalization of learning provides opportunities for educators to create more varied learning experiences that align with the characteristics of the current generation, which is highly familiar with technology (Pradana & Pratama, 2022). Firmadani (2020) emphasized that digital media functions not only as a tool but also as a means to clarify messages, increase learning interest, and facilitate understanding of complex material. Thus, technology integration has become a necessity in developing adaptive and relevant learning.

One emerging approach in the digital context is multimodal learning, which combines various information channels such as visual, auditory, verbal, and kinesthetic modes to achieve optimal learning effectiveness (Lim et al., 2022). This approach aligns with the human cognitive process, which processes information simultaneously through various modes (Ge & Lai, 2021). In Arabic language learning, particularly *mufradāt* (vocabulary), a multimodal approach is particularly crucial because it can help students understand the meaning of vocabulary and the context in which it is used (Yi et al., 2020; Jannah et al., 2023). Vocabulary is a fundamental component that underpins all Arabic language skills (Jaafar et al., 2023); however, several studies have revealed that *mufradāt* learning still faces problems such as monotonous methods (Kesuma et al., 2021), reliance on memorization, and a lack of engaging digital media (Maghfirah, 2024).

Based on the literature review, there is a clear research gap. Previous studies have utilized digital media or animation in language learning, but generally only assessed the media's impact on learning outcomes without developing *mufradāt* teaching materials that systematically integrate multimodal learning concepts (Tini & Sidiq, 2023). Furthermore, the use of the Animaker application as an educational animation medium that presents vocabulary along with real-life sentence examples remains underexplored. This gap highlights the need for research focused on developing animation-based teaching materials that are not only visually engaging but also grounded in strong pedagogical principles (Sino, 2024).

The selection of the PPBA UMM students as a research context was based on the institution's need to improve their vocabulary competency as a foundation for Arabic language learning. PPBA UMM students have diverse backgrounds and require learning media that can bridge the gap between their learning needs and their characteristics as digital-native learners. Therefore, this institution is the right place to develop animation-based vocabulary teaching materials as an innovative and applicable solution (Mayer, 2024).

Considering the problems, research gaps, and the urgency of the context, this research aims to develop animation-based vocabulary teaching materials using the Animaker application integrated with a multimodal approach. This research aims to produce teaching materials that not only present vocabulary visually and auditorily but also provide examples of vocabulary use in sentence contexts, making it easier for students to understand. Academically, this research contributes to strengthening the study of technology-based Arabic language learning media development and offers a model of teaching materials that can be replicated in other educational contexts facing similar challenges.

METHOD

This study employed a research and development (R&D) approach using the ADDIE instructional design model (Kainulainen, 2024). However, the research was deliberately limited to the Analysis and Design stages in accordance with the research objectives. The focus of this study was not to measure product effectiveness, but to produce a needs-based and theoretically grounded instructional design of animation-based Arabic vocabulary (*mufradāt*) teaching materials using a multimodal learning approach. Further details of the research procedure are presented in Figure 1 (Candrayani & Sujana, 2023).

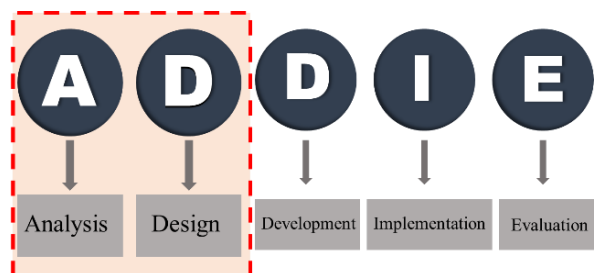


Figure 1. Product Development Stages

This study employed the ADDIE model but was limited to the Analysis and Design stages, as the research aimed to produce a needs-based instructional media design rather than a fully developed or tested product (Anisatin et al., 2021). The Development, Implementation, and Evaluation stages were excluded because they require expert validation and effectiveness testing beyond the scope of this study (Rabiman et al., 2024).

The research was conducted at the Arabic Language Development Program (PPBA), Faculty of Islamic Studies, Universitas Muhammadiyah Malang. The participants were PPBA students enrolled in first- and second-semester Arabic courses, selected through purposive sampling based on their active participation in Arabic classes and their experience with conventional vocabulary learning.

Data were collected through classroom observations, semi-structured interviews, and documentation analysis of syllabi, textbooks, and existing learning materials. Observation instruments focused on learning practices and media use, while interviews explored students' learning difficulties and expectations regarding digital media. Instrument validity was ensured through expert judgment, and reliability was maintained by using consistent indicators and standardized interview protocols.

Data analysis was conducted using a qualitative descriptive technique involving data reduction, categorization, and thematic interpretation. The results of the analysis stage served as the basis for the design stage, which included determining learning objectives and vocabulary themes, designing storyboards, integrating visual and audio elements, selecting Animaker features, and planning formative assessment components.

RESULT AND DISCUSSION

Result

The results of this study are based on the application of the ADDIE instructional design model, which was implemented up to the Analysis and Design stages. The findings were obtained through classroom observations, student interviews, and the analysis of instructional documents related to Arabic vocabulary (*mufradāt*) learning.

Analysis Stage and Learner Analysis

The analysis stage focused on identifying the empirical conditions of *mufradāt* learning and was conducted through three main analyses: learner analysis, material analysis, and media analysis. The findings are presented as recurring patterns that indicate instructional problems and learning needs. The learner analysis revealed that *mufradāt* learning was predominantly conducted using conventional methods, such as direct explanations by lecturers and rewriting vocabulary on the board. Although this approach helped students recognize new words, it was less effective in sustaining learning interest and supporting long-term vocabulary retention.

Observational and interview data showed that many students experienced difficulty remembering vocabulary and applying it in simple sentences or everyday contexts. This condition indicates insufficient repetition and a lack of contextualized practice. In addition, students demonstrated low enthusiasm during learning sessions, particularly when instruction was delivered without visual aids or supporting media. These findings suggest that learners require instructional media that are engaging, repetitive, and context-oriented.

Material and Media Analysis

The material analysis showed that *mufradāt* instruction mainly focused on basic vocabulary related to general themes, such as classroom objects, family members, and daily activities. Vocabulary was commonly presented in the form of word lists to be memorized, with limited opportunities for contextual practice in sentences or communicative situations. Furthermore, the materials were largely text-based, with minimal use of audio pronunciation or illustrative visuals that could support meaning construction. The analysis also revealed the absence of a clear progression of difficulty levels, as students were often introduced to many new vocabulary items simultaneously without differentiation among basic, intermediate, and advanced levels. This increased cognitive load and made it difficult for students to follow the development of the material effectively.

The media analysis indicated that *mufradāt* learning relied heavily on traditional instructional media, including blackboards, printed textbooks, and student notes. Vocabulary learning activities were generally limited to copying and memorizing words without involving interactive or visual elements. While such media were adequate for basic information delivery, they were less effective in promoting student engagement and vocabulary retention.

Overall, the analysis stage highlights a gap between students' learning needs and the instructional practices currently applied in *mufradāt* learning, particularly in terms of multimodal and digital media integration. A summary of the analysis findings is presented in the following table.

Table 1. Needs-Based Design Criteria for Multimodal Animated Arabic Vocabulary Media

Analysis Aspect	Key Findings	Learning Implications
Learners	Low retention, limited contextual use, low engagement	Need for repeated, contextual, and engaging instruction
Materials	Text-based, no audio, unsequenced difficulty	Need for multimodal and scaffolded vocabulary presentation
Media	Conventional, non-interactive	Need for animation-based digital learning media

Design Stage

Based on the findings from the analysis stage, the design stage focused on developing a structured instructional media design that directly responds to the identified learning needs. This stage aimed to create animation-based *mufradāt* learning media using the Animaker application to provide an effective and engaging learning experience.

1. Media Flow Planning

The media flow was designed to ensure a logical and structured sequence of vocabulary presentation. Each *mufradāt* item was introduced through visual animation, followed by audio pronunciation and examples of use in simple sentences. This flow allowed students to follow the learning process smoothly and understand vocabulary within its usage context.

2. Content Design and Learning Scenarios

Vocabulary selection was organized thematically, following topics presented in the first-semester textbook, such as classroom objects, family, and daily activities. Each vocabulary item was displayed visually and accompanied by audio pronunciation to support correct articulation. Example sentences were embedded in the animation to facilitate contextual understanding and everyday language use.

3. Selection of Visual and Auditory Elements

Visual elements consisted of illustrations and animations that represented vocabulary meanings, helping students associate words with images and strengthen long-term memory. Auditory elements included clear pronunciation of vocabulary items and example sentences, supporting learners who rely on auditory input and enhancing overall comprehension.

4. Preparation of Audio Scripts

Audio scripts were prepared for each vocabulary item and example sentence to ensure clarity and accuracy of pronunciation. The scripts were synchronized with the animation tempo, allowing sufficient time for students to listen, repeat, and comprehend the vocabulary. Brief instructional cues were also included to guide students in using the media.

5. Formative Test Design

Formative assessment components were designed in the form of short quizzes and simple comprehension questions. These assessments focused on vocabulary recognition

and usage in sentences, enabling students to measure their understanding while also supporting the learning process.

Media-based learning for *mufradāt* animation using the Animaker application was designed with the aim of creating media that suits the needs of PPBA UMM students and adapts to current technological advances. Several development steps were undertaken: 1) Determining the themes to be developed, in this case, selecting topics presented in the first-semester textbook; 2) Creating multiple slides consisting of an introduction, main menu, submenus, and quizzes or games; 3) Including audio recordings to support the material, questions, or practice sentences; 4) Performing editing by adding supporting effects such as animations, backgrounds, sounds, and other effects; 5) Conducting thorough media testing and finalizing development to ensure ease of use. The following sections present several views on the development of *mufradāt* learning media based on the Animaker application.



Figure 2. Example of a *mufradāt* dish

Figure 2 shows the main display, which presents the learning theme to be studied and features the main character. The character includes audio recordings and delivers the material from the beginning to the end of the lesson.



Figure 3. Example of *mufradāt* practice in a sentence

Figure 3 shows an example of sentence practice. In this activity, students are not only required to memorize the *mufradāt* but also to practice using the learned vocabulary in constructing sentences. Animations presented in each theme can be designed to be kinetic, allowing dynamic visual movement to capture the user's attention. In addition, these animations are equipped with audio elements that provide additional narration or explanation, making it easier to understand the material comprehensively.

The theoretical discussion in this research relies on various expert views that support the importance of using multimodal learning approaches in learning media to improve and facilitate students' understanding of *mufradāt* and its application in sentences. The

simultaneous use of visual and verbal elements is essential in language learning to enhance student comprehension. The learning process is more effective when information is conveyed through two different channels, namely visual (pictorial channel) and auditory/verbal (verbal channel). These two channels allow students to process information in an integrated manner, making it easier to understand and remember the material (Mayer, 2024).

Table2. Problem–Solution Alignment in Multimodal Animated Arabic Vocabulary Media Design

Identified Problems	Design Response	Media Features
Difficulty retaining vocabulary	Repeated multimodal exposure	Visual animation + audio repetition
Limited contextual usage	Contextualized learning	Example sentences in animation
Low student engagement	Interactive presentation	Animated visuals and narration
Text-based materials	Multimodal support	Images and audio pronunciation

The following is a summary of the development output, which can be seen in the following table.

Table 3. ADDIE Stage Outputs for Multimodal Animated Arabic Material Development

ADDIE Stage	Output
Analysis	Empirical identification of learner, material, and media needs
Design	Multimodal animation-based <i>mufradāt</i> instructional design framework

Based on the ADDIE-based output summary, this study was completed at the Analysis and Design stages. The subsequent stages, Development, Implementation, and Evaluation, are planned for future research to transform the proposed design into a fully developed instructional product and to examine its validity, practicality, and effectiveness empirically.

Discussion

The findings of this study demonstrate that the main challenges in Arabic vocabulary (*mufradāt*) learning are low learner engagement, limited vocabulary retention, and difficulties in applying vocabulary in meaningful contexts. These problems are closely related to the dominance of conventional, text-based instructional practices and the lack of systematically designed digital learning media. The analysis results indicate that vocabulary learning that relies heavily on memorization without sufficient visual, auditory, and contextual support is less effective in sustaining students' motivation and long-term understanding (Al-Muttairi & Al-Alusi, 2025).

These findings are consistent with previous studies, which report that monotonous teaching methods and limited integration of digital media contribute to students' difficulties in vocabulary acquisition and application (Kesuma et al., 2021; Maghfirah, 2024; Jaafar et al.,

2023). Similarly, these studies argue that Arabic learners often struggle to use vocabulary communicatively due to the absence of contextualized learning experiences. The learner-related findings in this study reinforce the view that effective *mufradāt* instruction should go beyond word recognition and actively support contextual usage and engagement (Zhang et al., 2025).

From a theoretical perspective, the instructional design proposed in this study aligns with Cognitive Load Theory (Sweller, 2020), which emphasizes that learning becomes more effective when instructional materials are designed to reduce unnecessary cognitive load. By distributing information across visual, verbal, and auditory elements that complement each other, multimodal learning allows students to process vocabulary more efficiently without feeling overwhelmed by complex information (Ummah et al., 2025; Fahmi et al., 2025). The analysis findings show that students require learning media that facilitate repeated exposure and structured information processing, which is addressed through the proposed multimodal design.

In addition, the design is grounded in Mayer's Cognitive Theory of Multimedia Learning, particularly the dual-channel and contiguity principles (Mayer, 2024). The dual-channel principle explains that learners process information through separate visual and verbal channels, and learning is enhanced when both channels are activated simultaneously (Lim et al., 2022). In the proposed Animaker-based design, vocabulary is presented through animated images, written text, and audio pronunciation at the same time, enabling integrated information processing (Amedia et al., 2023). The contiguity principle is applied by placing images, text, and pronunciation close together in time and space, allowing learners to easily associate word forms, meanings, and usage (Anisa et al., 2023). The following is an illustration of Mayer's theory.

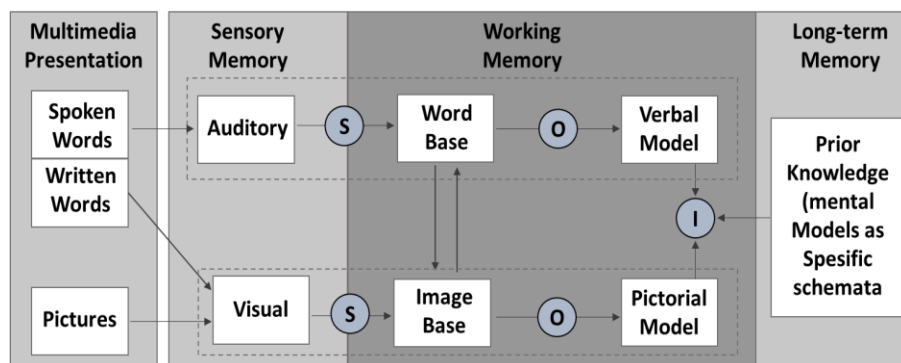


Figure 4. Mayer's Cognitive Theory of Multimedia Learning

The use of the Animaker application facilitates the implementation of these principles by enabling the presentation of *mufradāt* through dynamic visual illustrations, synchronized audio pronunciation, and simple contextual sentences (Pramudiani & Dolk, 2025). This combination not only attracts students' attention but also strengthens memory retention and comprehension (Fajrianti & Meilana, 2022). By presenting vocabulary in a realistic and contextualized manner, the designed media supports students in understanding both the meaning and practical use of *mufradāt*, which is essential in Arabic language learning (Mayer, 2022).

In terms of research contribution, this study differs from prior research that mainly focuses on measuring the effectiveness of digital learning media (Nurmalisa et al., 2023). Instead, it adopts a design-oriented development approach, emphasizing empirical needs analysis as the basis for instructional design decisions (Supianto et al., 2021). By explicitly linking learner, material, and media analysis findings to multimodal design features, this study contributes a structured framework for developing animation-based Arabic vocabulary learning media (Talitha et al., 2025). This framework clarifies the position of the study as an initial development phase. It provides a foundation for future research to proceed to the Development, Implementation, and Evaluation stages of the ADDIE model (Arnab et al., 2022).

This study aligns with recent multimodal learning research in higher education (Wang et al., 2025), which conceptualizes learning as a hybrid and immersive space where meaning is constructed through the integration of visual, verbal, and auditory modes (Rahmanu & Molnár, 2024). Previous studies on multimodal learning, including research on bilingual teacher education, multimodal immersion in language learning, and media-based learning activities, consistently emphasize that well-designed multimodal environments enhance engagement, comprehension, and retention (Martínez-Álvarez et al., 2024). Systematic reviews and learning analytics research further highlight the importance of grounding multimodal design in learner needs and instructional structure rather than technological complexity alone (Ouhaichi et al., 2023). In this context, the present study contributes by offering a pedagogically grounded (Xu et al., 2025), analysis-driven multimodal instructional design for Arabic vocabulary learning, providing a foundational framework that can be extended in future research toward adaptive (Schofield & Carvajal, 2022), analytics-based, or advanced multimodal learning systems (Yi et al., 2020).

CONCLUSION

This study aimed to design animation-based Arabic vocabulary (*mufradāt*) learning media using the Animaker application through a multimodal learning approach. The findings from the Analysis and Design stages of the ADDIE model revealed key instructional problems, including low student engagement, limited vocabulary retention, lack of contextual usage, text-dominated materials, and minimal integration of digital learning media. These empirical findings formed the basis for developing a needs-based instructional media design rather than testing product effectiveness.

The main contribution of this study is a systematic multimodal instructional design framework for *mufradāt* learning that integrates visual animation, audio pronunciation, contextual example sentences, and formative assessment components. The design is theoretically grounded in Cognitive Load Theory and Mayer's Cognitive Theory of Multimedia Learning, ensuring that instructional decisions are pedagogically justified. Scientifically, this study contributes to Arabic language education by emphasizing the importance of early-stage, design-oriented research in instructional media development.

This study is limited to the Analysis and Design stages of the ADDIE model and does not include product development, validation, or classroom implementation. Therefore, future research is recommended to continue with the Development, Implementation, and Evaluation stages to produce the media prototype, conduct expert validation, and empirically examine its practicality and effectiveness in real learning contexts. Practically, the proposed

design can serve as a reference for educators and instructional designers in developing innovative, multimodal Arabic vocabulary learning media.

ACKNOWLEDGMENT

This article was funded by the Competitive Research Grant from the Center for Research and Community Service (P3M), Sekolah Tinggi Agama Islam (STAI) As-Sunnah, Deli Serdang, Indonesia.

AUTHOR CONTRIBUTIONS STATEMENT

All Atuhors is designed the study and formulated core development needs; A.A. led the instructional design and material structuring; V.A.R. developed and produced the multimodal animation-based digital vocabulary teaching materials; L.A. ensured linguistic accuracy and curriculum alignment of Arabic vocabulary content; M. coordinated validation instruments and synthesized empirical development data; all authors contributed to analysis, manuscript revision, final approval, and share responsibility for the study's academic integrity.

REFERENCES

- Adira, W. R., Setiyawan, A., Ramadhan, A. R., Amaliah, F., & Azzahra, A. F. (2024). Arabic Language Acquisition through Instagram Content Lughoty: Psycholinguistic Studies. *Ta'lim al-'Arabiyyah: Jurnal Pendidikan Bahasa Arab & Kebahasaaraban*, 8(2), 200–215. <https://doi.org/10.15575/jpba.v8i2.38164>
- Al-Muttairi, F. Z. S., & Al-Alusi, A. H. S. H. (2025). Multimodal Communication in ESL Learning: Examining the Integration of Visual, Auditory, and Textual Elements in Digital Media with a Focus On Quality Education (SDG 4). *Journal of Lifestyle and SDGs Review*, 5(3), e04773. <https://doi.org/10.47172/2965-730X.SDGsReview.v5.n03.pe04773>
- Amedia, F., Zakaria, R., Subali, B., Linuwih, S., & Ellianawati, E. (2023). Development of Animaker-Based Animated Video and Team Quiz Activities to Improve Mastery of Static Fluid Concepts. *Jurnal Penelitian & Pengembangan Pendidikan Fisika*, 9(1), 139–152. <https://doi.org/10.21009/1.09113>
- Anggraeni, A., Alfani, M., & Rani, N. (2023). The Impact of Utilizing Uno Stacko on Arabic Learning Vocabulary Acquisition. *Ta'lim al-'Arabiyyah: Jurnal Pendidikan Bahasa Arab & Kebahasaaraban*, 7(2), 261–277. <https://doi.org/10.15575/jpba.v7i2.29740>
- Anisa, Y., Malik, M., Putri, T. O. D. S., Hafiz, M., & Novita, N. (2023). Animaker Animation Video Design as a Digital-Based Learning Media with the Theme of Comparison and Scale in Elementary School. *Edunesia: Jurnal Ilmiah Pendidikan*, 4(1), 184–196. <https://doi.org/10.51276/EDU.V4I1.328>
- Anisatin, L., Sunarto, S., & Fauzi, M. F. (2021). Development of E-Book based practical Arabic syntax. *LISANIA: Journal of Arabic Education and Literature*, 5(2), 187–203. <https://doi.org/10.18326/LISANIA.V5I2.187-203>
- Ardiansyah, A. A., Kosim, N., & Harahap, M. F. (2024). The Effectiveness of Project-Based Learning in Improving Students' Performance in Arabic Vocabulary. *El-Mahara*, 2(2), 65–79. <https://doi.org/10.62086/ej.v2i2.691>

- Arnab, S., Petridis, P., Spatioti, A. G., Kazanidis, I., & Pange, J. (2022). A Comparative Study of the ADDIE Instructional Design Model in Distance Education. *Information* 2022, Vol. 13, Page 402, 13(9), 402. <https://doi.org/10.3390/INFO13090402>
- Ayumi, N. M., Yul, W., & Andrian, R. (2025). Constructivist-Based Arabic Reading Pedagogy in a Heterogeneous Student Context: Insights from Ma'had IAIN Kerinci. *Ta'lim al-'Arabiyyah: Jurnal Pendidikan Bahasa Arab & Kebahasaaraban*, 9(1), 91–108. <https://doi.org/10.15575/jpba.v9i1.45285>
- Candrayani, N. M. W., & Sujana, I. W. (2023). Digital Comics: Character Value-Based Learning Media in the Ramayana Puppet Story Content, Social Studies, Elementary School. *Indonesian Values and Character Education Journal*, 6(1), 63–72. <https://doi.org/10.23887/IVCEJ.V6I1.54657>
- Fahmi, N., Latuf, L. H., & Fatchiatuzahro, F. (2025). Using Multimodal Learning in Arabic Vocabulary Instruction at Islamic Elementary School. *Aphorisme: Journal of Arabic Language, Literature, and Education*, 6(1). <https://doi.org/10.37680/aphorisme.v6i1.6870>
- Fajrianti, R., & Meilana, S. F. (2022). Pengaruh Penggunaan Media Animaker terhadap Hasil Belajar Peserta Didik pada Mata Pelajaran IPS Sekolah Dasar. *Jurnal Basicedu*, 6(4), 6630–6637. <https://doi.org/10.31004/basicedu.v6i4.3325>
- Firmadani, F. (2020). *Media Pembelajaran Berbasis Teknologi Sebagai Inovasi Pembelajaran Era Revolusi Industri 4.0*. Prosiding Konferensi Pendidikan Nasional, 2(1), 93–97. http://ejurnal.mercubuana-yogya.ac.id/index.php/Prosiding_KoPeN/article/view/1084/660
- Ge, S., & Lai, X. (2021). Strategies for Information Design and Processing of Multimedia Instructional Software-Based on Richard E. Mayer's Multimedia Instructional Design Principles. *International Journal of Educational Technology and Learning*, 10(1), 40–46. <https://doi.org/10.20448/2003.101.40.46>
- Jaafar, A., Deni, E. P., Febriani, A., Lestari, R., Yelliza, M., & Sari, W. W. (2023). Problems of Learning Arabic in Islamic Boarding Schools. *International Journal of Multidisciplinary Research of Higher Education*, 6(3), 147–154. <https://doi.org/10.24036/ijmurhica.v6i3.141>
- Jannah, M., Rabbani, M. A., & Aziz, A. (2023). Pengembangan Media dan Teknologi Dalam Pembelajaran. *BLAZE: Jurnal Bahasa Dan Sastra Dalam Pendidikan Linguistik Dan Pengembangan*, 1(4), 156–168. <https://doi.org/10.59841/blaze.v1i4.683>
- Kainulainen, S. (2024). Research and Development (R&D). *Encyclopedia of Quality of Life and Well*. https://doi.org/10.1007/978-3-031-17299-1_2482
- Kesuma, M. el-K., Kesuma, G. C., & Saputra, D. (2021). Rancangan Media Pembelajaran Kosa Kata (Mufrodat) Bahasa Arab Berbasis Game Android. *SIENNA: Jurnal Sistem Dan Teknologi Informasi*, 2(1). <https://doi.org/https://doi.org/10.47637/sienna.v2i1.389>
- Kudsiyah, K., Mauludiyah, L., & Murdiono, M. (2021). Arabic Video Lyric Untuk Meningkatkan Pemahaman Kosakata Bahasa Arab Siswa. *Ta'lim al-'Arabiyyah: Jurnal Pendidikan Bahasa Arab & Kebahasaaraban*, 5(1), 52–60. <https://doi.org/10.15575/jpba.v5i1.11351>

- Lim, F. V., Toh, W., & Nguyen, T. T. H. (2022). Multimodality in the English language classroom: A systematic review of literature. *Linguistics and Education*, 69. <https://doi.org/10.1016/j.linged.2022.101048>
- Maghfirah, D. N. (2024). Menjadikan Pembelajaran Mufradat Menyenangkan : Strategi Inovatif Untuk Meningkatkan Motivasi Belajar Bahasa Arab Di Mi. *Al-Madrasah : Jurnal Ilmiah Pendidikan Madrasah Ibtidaiyah*, 8(4), 1842–1853. <https://doi.org/10.35931/am.v8i4.4081>
- Martínez-Álvarez, P., Cuevas, I., Sáez, N., & Son, M. (2024). Bilingual pre-service teachers' evolving conceptualizations about curriculum as a hybrid space through multimodal learning experiences - ScienceDirect. *Teaching and Teacher Education*, 152. <https://doi.org/10.1016/j.tate.2024.104801>
- Mayer, R. E. (2022). *Cognitive Theory of Multimedia Learning*. Cambridge University Press. <https://doi.org/10.1017/9781108894333.008>
- Mayer, R. E. (2024). The Past, Present, and Future of the Cognitive Theory of Multimedia Learning. *Educational Psychology Review*, 36(8). <https://link.springer.com/article/10.1007/s10648-023-09842-1>
- Nurmalisa, Y., Sunyono, S., Yulianti, D., & Sinaga, R. M. (2023). An Integrative Review: Application of Digital Learning Media to Developing Learning Styles Preference. *International Journal of Information and Education Technology*, 13(1), 187–194. <https://doi.org/10.18178/IJiet.2023.13.1.1795>
- Ouhaichi, H., Spikol, D., & Vogel, B. (2023). Research trends in multimodal learning analytics: A systematic mapping study - ScienceDirect. *Computers and Education: Artificial Intelligence*, 4. <https://doi.org/10.1016/j.caeai.2023.100136>
- Pradana, B. G. V., & Pratama, Y. M. (2022). Peran Digitalisasi Media Pembelajaran Terhadap Kualitas Pembelajaran. *Jurnal Sosial Humaniora*, 13(2), 145–153. <https://ojs.unida.ac.id/JSJ/article/download/4989/3309/22648>
- Pramudiani, P., & Dolk, M. (2025). Engaging Primary School Students in Developing Fraction Sense through Animaker in a Realistic Context. *Mathematics Education Journal*, 19(2), 323–342. <https://doi.org/10.22342/MEJ.V19I2.PP323-342>
- Rabiman, R., Oksandi, F., & Khaharsyah, A. (2024). Learning technology using flipping book in vocational education: ADDIE model. *AIP Conference Proceedings*, 3145(1). <https://doi.org/10.1063/5.0214392>
- Rahmanu, I. W. E. D., & Molnár, G. (2024). Multimodal immersion in English language learning in higher education: A systematic review. *Heliyon*, 10(19). <https://doi.org/10.1016/j.heliyon.2024.e38357>
- Schofield, D., & Carvajal, P. (2022). The Media and Global Imagination: Mediagraphy as a Multimodal Learning Activity in Higher Education. *Video Journal of Education and Pedagogy*, 7(1), 1–21. <https://doi.org/10.1163/23644583-bja10031>
- Sino, R. (2024). The Impact Of Visual Support On Efl Learners' Vocabulary Acquisition When Reading [Malmö University]. <https://urn.kb.se/resolve?urn=urn:nbn:se:mau:diva-67191>
- Supianto, A. A., Prasetya, O., Anam, S., Tibyani, T., Pardede, H. F., Hayashi, Y., & Hirashima, T. (2021). Cluster Analysis of Student Learning Process on Digital Learning Media Based on Visual Intuition Using Adaptive Moving Self-Organizing

- Maps. ACM International Conference Proceeding Series, 118–124. <https://doi.org/10.1145/3479645.3479691>
- Talitha, S., Mulyati, Y., Yulianeta, Y., & Kurniawan, K. (2025). Multimodal Learning Module Based on Augmented Reality Technology to Enhance Students' Information and Digital Literacy. *Jurnal Sosioteknologi*, 24(3). <https://doi.org/10.5614/SOSTEK.ITBJ.2025.24.3.5>
- Tini, C., & Sidiq, H. (2023). Implementasi Media Audio Visual Berbasis Animasi Bahasa Arab Dalam Pembelajaran Mahārah Istimā'. Al Mi'yar: *Jurnal Ilmiah Pembelajaran Bahasa Arab Dan KebahasaAraban*, 6(2), 457–470. <https://doi.org/10.35931/am.v6i2.2603>
- Ummah, S. K., Sugiman, Cholily, Y. M., Retnawati, H., & Santoso, E. (2025). Local learning trajectory with multimodal approach through mathematical transfer: Bibliometric analysis 2015 – 2025. *Jurnal THEOREMS (The Original Research of Mathematics)*, 10(1), 33–47. <https://doi.org/10.31949/TH.V10I1.14737>
- Wang, L., Peng, N., Liu, L., & Wei, S. (2025). Innovation of Multimodal Learning Paths Based on Learning Behavior and Sentiment Analysis in AI Digital Intelligence Platform. *Procedia Computer Science*, 261. <https://doi.org/10.1016/j.procs.2025.04.246>
- Xu, S., Li, G., Cao, M., Zhang, Y., & Cao, Y. (2025). SABA: Scene-aware bidirectional backdoor attack against multimodal learning. *Neurocomputing*. <https://doi.org/10.1016/j.neucom.2025.132366>
- Yi, Y., Shin, D., & Cimasko, T. (2020). Special issue: Multimodal composing in multilingual learning and teaching contexts. *Journal of Second Language Writing*, 47. <https://doi.org/10.1016/j.jslw.2020.100717>
- Zhang, L., Lubna, |, Mohammed, A., Shoukath, |, & Fauziah, D. (2025). Examining the impact of multimodal learning approaches on English language proficiency in higher vocational education in China. *Multidisciplinary Science Journal*, 8(1), 2026003–2026003. <https://doi.org/10.31893/MULTISCIENCE.2026003>