

The Effectiveness of Spiderweb Learning Media in Enhancing Hijaiyah Letter Recognition Among Early Childhood Learners

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Abstract: This study investigates the effectiveness of Spiderweb Learning media in improving the ability of early childhood learners to recognize and read Hijaiyah letters. Employing a quasi-experimental design with a non-equivalent control group, this research involved 40 students from Class B at Kindergarten Pertiwi 26-13 Bogares Kidul, who were selected through purposive sampling. The sample was divided into two groups: an experimental group receiving instruction through web Spiderweb Learning media and a control group taught using conventional methods. The research procedure included pre-tests, instructional interventions, and post-tests to assess learning outcomes. Data collection was conducted through direct observation, interviews, and standardized testing, with analysis performed using SPSS version 28. The Mann-Whitney U test results indicated a statistically significant improvement in the experimental group's performance compared to the control group, confirming the effectiveness of Spiderweb Learning media as an instructional tool. The findings suggest that interactive learning media can enhance early literacy development by providing engaging and structured stimuli. However, limitations such as the short duration of the intervention and the absence of qualitative engagement measures necessitate further research. Future studies should incorporate longitudinal methodologies and mixed-method approaches to evaluate the long-term impact and broader applicability of web-based learning tools in Arabic literacy education. The study contributes to the growing body of research on digital learning interventions and provides valuable insights for educators and policymakers seeking to enhance early childhood Arabic literacy instruction.

Abstrak: Penelitian ini mengkaji efektivitas media pembelajaran Spiderweb dalam meningkatkan kemampuan anak usia dini dalam mengenali dan membaca huruf Hijaiyah. Dengan menggunakan desain kuasi-eksperimental dengan kelompok kontrol non-ekuivalen, penelitian ini melibatkan 40 siswa Kelas B di TK Pertiwi 26-13 Bogares Kidul yang dipilih melalui teknik purposive sampling. Sampel dibagi menjadi dua kelompok: kelompok eksperimen yang menerima pembelajaran menggunakan media pembelajaran Spiderweb dan kelompok kontrol yang diajar dengan metode konvensional. Prosedur penelitian mencakup pre-test, intervensi pembelajaran, dan post-test untuk menilai hasil belajar. Pengumpulan data dilakukan melalui observasi langsung, wawancara, dan tes standar, dengan analisis data menggunakan SPSS versi 28. Hasil uji Mann-Whitney U menunjukkan peningkatan yang signifikan secara statistik pada kinerja kelompok eksperimen dibandingkan dengan kelompok kontrol, yang mengonfirmasi efektivitas media pembelajaran Spiderweb. Temuan ini menunjukkan bahwa media pembelajaran interaktif dapat meningkatkan perkembangan literasi dini dengan menyediakan stimulus yang menarik dan terstruktur. Namun, keterbatasan seperti durasi intervensi yang singkat dan tidak adanya pengukuran keterlibatan kualitatif memerlukan penelitian lebih lanjut. Studi mendatang disarankan untuk mengadopsi metodologi longitudinal dan pendekatan campuran guna mengevaluasi dampak jangka panjang serta penerapan lebih luas dari media pembelajaran berbasis web dalam pendidikan literasi bahasa Arab. Penelitian ini berkontribusi pada pengembangan kajian tentang intervensi pembelajaran digital serta memberikan wawasan berharga bagi pendidik dan pembuat kebijakan dalam meningkatkan pengajaran literasi bahasa Arab bagi anak usia dini.

1. Introduction

The ability to read the Qur'an is fundamental in Islamic education, as it serves as the primary source of knowledge guiding various aspects of human life.¹ Early childhood is considered the optimal period for acquiring foundational literacy skills, including the recognition of *Hijaiyah* letters, which form the basis of Qur'anic reading.² However, in contemporary educational settings, there is a growing concern that religious education, particularly Qur'anic literacy, is being overshadowed by conventional academic subjects such as mathematics and general literacy.³ This shift has led to a lack of structured and engaging methodologies for introducing children to *Hijaiyah* letters,⁴ resulting in diminished motivation and proficiency in reading the Qur'an.⁵ Therefore, the development of innovative and interactive learning media is essential to foster early literacy in Qur'anic education effectively.

Previous research has demonstrated the effectiveness of web-based learning media in enhancing various language skills. For instance, a web-based TOEFL simulation system was developed to improve the effectiveness of online TOEFL learning, providing an interactive experience for learners.⁶ Similarly, a web-based learning medium incorporating speech recognition technology has been implemented to enhance English-speaking skills interactively.⁷ In another study, a validated web-based learning platform was designed for French language education, demonstrating positive outcomes in pedagogical applications.⁸ These studies indicate the potential of digital learning media in improving language acquisition and literacy skills across different linguistic domains.

The development of multimedia-based educational tools has also been explored extensively in the realm of e-learning. A study introduced M3D, an XML-based programming language, to facilitate the visualization and simulation of multimedia e-learning content across platforms.⁹ Moreover, the implementation of WebRTC-based video conferencing for e-learning has been assessed, demonstrating its effectiveness across various networks and browsers.¹⁰ Additionally, artificial intelligence-driven

¹ Pir Noman Ahmad et al., "Semantic web-based propaganda text detection from social media using meta-learning," *Service Oriented Computing and Applications*, 2024, doi:10.1007/s11761-024-00422-x.

² Tazeen M Ali, "Qur'anic Literacy as Women's Empowerment: Cultivating Interpretive Authority at the Women's Mosque of America," *Journal of the American Academy of Religion* 89, no. 4 (1 Desember 2021): 1434–61, doi:10.1093/jaarel/lfab098.

³ Parven Akhter, "A young child's intergenerational practices through the use of visual screen-based multimodal communication to acquire Qur'anic literacy," *Language and Education* 30, no. 6 (1 November 2016): 500–518, doi:10.1080/09500782.2016.1141935.

⁴ M E E Elshareif et al., "Smart Glove with Mobile Application to Detect Static Arabic Hijaiyah Hand Code for Quran Recitation," in *2024 21st Learning and Technology Conference (L&T)*, 2024, 64–69, doi:10.1109/LT60077.2024.10469054.

⁵ Ibrahima Diallo, "Qur'anic and Ajami literacies in pre-colonial West Africa," *Current Issues in Language Planning* 13, no. 2 (1 Mei 2012): 91–104, doi:10.1080/14664208.2012.687498.

⁶ M Nasir et al., "Modeling System Test of English as a Foreign Language as a Web-Based Learning Media," *IOP Conference Series: Materials Science and Engineering* 536, no. 1 (2019): 12130, doi:10.1088/1757-899X/536/1/012130.

⁷ A F Muhammad, D Ekky Pratama, dan A Alimudin, "Development Of Web Based Application With Speech Recognition As English Learning Conversation Training Media," in *2019 International Electronics Symposium (IES)*, 2019, 571–76, doi:10.1109/ELECSYM.2019.8901594.

⁸ I Pramuniati, "Development of web-based French language learning media on Réception Écrite courses," *Zenodo* 17 Agustus (2020), doi:10.5281/zenodo.3987679.

⁹ Sepideh Chakaveh et al., "M3D (Media 3D): a new programming language for web-based virtual reality in e-learning and edutainment," in *Proc. SPIE*, vol. 5018, 2003, 228–35, doi:10.1117/12.476185.

¹⁰ Naktal Edan dan Sanabil A. Mahmood, "Multi-user media streaming service for e-learning based web real-time communication technology," *IJECE: International Journal of Electrical and Computer Engineering*

approaches, such as fuzzy logic and deep learning systems, have been employed to enhance digital learning environments by detecting and classifying web-based content.¹¹ These advancements highlight the significance of integrating technology into educational settings to optimize learning experiences.

Recent studies have also explored the role of web-based media in facilitating special education and domain-specific knowledge. A web-based learning medium was developed to assist children with Autism Spectrum Disorder (ASD) in daily activities using behavior management strategies validated by therapists and parents.¹² Furthermore, a web-based dictionary application was designed to improve digital literacy and enhance students' understanding of herbal plants in vocational education.¹³ Additionally, an interactive tensor learning method was introduced to analyze cross-media information for topic detection in web-based video content.¹⁴ These studies underscore the adaptability of web-based media in diverse educational contexts, including specialized learning needs and knowledge dissemination.

Despite the evident benefits of web-based learning tools, challenges remain in their application to Qur'anic literacy education. Traditional methods of teaching *Hijaiyah* letters often rely on passive instructional approaches, such as writing on blackboards, which fail to engage young learners effectively.¹⁵ While previous studies have validated the efficacy of web-based educational media in various domains, there is limited research on its application in early childhood Qur'anic literacy. Moreover, existing digital learning tools often require significant financial investment, limiting accessibility in resource-constrained educational settings.¹⁶ These gaps highlight the need for cost-effective, engaging, and interactive learning media tailored to early childhood Qur'anic education.

This study aims to examine the effectiveness of Spiderweb Learning media in enhancing the ability of early childhood learners to recognize *Hijaiyah* letters at Kindergarten Pertiwi 26-13 Bogares Kidul. The proposed Spiderweb Learning media is designed using recycled materials, making it an accessible and cost-efficient tool for interactive learning. By integrating game-based elements, the study seeks to foster a more engaging and enjoyable learning environment that aligns with the play-based learning principles essential for young children. The findings of this research will contribute to the growing body of knowledge on digital and interactive learning tools, offering practical insights into their application in early childhood Qur'anic literacy

11, no. 1 (2021): 567–74, doi:10.11591/ijece.v11i1.pp567-574.

¹¹ Tingyu Li, Jing Yu, dan Haiping Zhang, "Web of things based social media fake news classification with feature extraction using pre-trained convoluted recurrent network with deep fuzzy learning," *Theoretical Computer Science* 931 (2022): 65–77, doi:10.1016/j.tcs.2022.07.031.

¹² Napalai Chaimaha et al., "Development of Web-Based Learning Media on Behavior Management to Enhance Activities of Daily Living for Children with Autism Spectrum Disorder," *Occupational Therapy In Health Care*, 2024, 1–18, doi:10.1080/07380577.2024.2415974.

¹³ Medika Risnasari, Laili Cahyani, dan Abd Asis, "Web-based herbal plant dictionary for generation Z student's learning media," in *AIP Conference Proceedings*, vol. 2867, 2024, 30018, doi:10.1063/5.0227737.

¹⁴ Chengde Zhang, Kai Mei, dan Xia Xiao, "Cross-media web video topic detection based on heterogeneous interactive tensor learning," *Knowledge-Based Systems* 283 (2024): 111153, doi:10.1016/j.knosys.2023.111153.

¹⁵ Irfan Hania et al., "The Phonics Method in Aşwat Learning and Its Influence on the Reading Ability of Ibtidaiyyah Madrasah Students," *al Mahāra: Jurnal Pendidikan Bahasa Arab* 8, no. 2 (2022): 231–47, doi:10.14421/almahara.

¹⁶ Annie Singla dan Rajat Agrawal, "DisDSS: a novel Web-based smart disaster management system for determining the nature of a social media message for decision-making using deep learning – case study of COVID-19," *Global Knowledge, Memory and Communication* 73, no. 8/9 (1 Januari 2024): 1044–65, doi:10.1108/GKMC-07-2022-0180.

education. Ultimately, this study aspires to bridge the existing pedagogical gap by introducing an innovative, sustainable, and effective methodology for teaching *Hijaiyah* letters in early childhood education.

2. Method

This study employed an experimental research design with a quantitative approach to examine the effectiveness of Spiderweb Learning media in enhancing early childhood recognition of *Hijaiyah* letters. A quasi-experimental design with a non-equivalent control group type was used to compare learning outcomes between an experimental group and a control group. The population of this study consisted of 40 students from Class B at Kindergarten Pertiwi 26-13 Bogares Kidul, selected through purposive sampling. The sample was divided into two groups: 20 students in the experimental group, who received instruction using Spiderweb Learning media, and 20 students in the control group, who were taught using conventional methods.

The research procedure was conducted in several stages, beginning with a pre-test to assess students' initial recognition of *Hijaiyah* letters. The experimental group was then introduced to Spiderweb Learning media as the primary instructional tool, while the control group continued learning through traditional teaching methods. The intervention lasted for a specified period, after which a post-test was administered to evaluate the students' progress. Additionally, observational data and interviews with teachers were collected to gain qualitative insights into student engagement and motivation. Documentation was used to supplement the data collection process and provide further validation.

Various tools and technologies were utilized in this research to ensure accuracy and efficiency. The Spiderweb Learning media was developed using recycled materials, making it a cost-effective learning aid. Observations were systematically recorded using structured observation sheets, and interviews were conducted following a semi-structured format. Additionally, standardized pre-test and post-test instruments were used to measure students' recognition of *Hijaiyah* letters.

Data were collected through multiple techniques, including direct observation, interviews, testing (pre-test and post-test), and documentation. The collected data were analyzed using SPSS for Windows version 28. The analysis process began with a normality test to assess data distribution, followed by the Mann-Whitney U test to determine significant differences between the experimental and control groups.

To ensure the reliability and validity of the study, the pre-test and post-test instruments underwent validity and reliability testing using SPSS for Windows version 28. The validity test ensured that the instruments measured what they intended to, while the reliability test assessed the consistency of the results over repeated applications. These measures helped confirm the robustness of the research findings and ensured that the study adhered to established scientific standards.

3. Result and Discussion

This study was conducted over six sessions, including one pretest, four treatment sessions, and one posttest. The pretest was administered to both the experimental and control groups, utilizing image-based media featuring the Arabic letters (*hijaiyah*) from *alif* to *ya*'. The pretest was conducted separately for each group at different times. The treatment phase involved the use of a Spiderweb Learning media as an instructional medium, which was applied exclusively to the experimental group across four sessions.

In the first treatment session, students were introduced to the Arabic letters from alif to ya' using the Spiderweb Learning media and the storytelling method to facilitate letter recognition. The second treatment focused on differentiating visually similar letters, such as ط - ظ, س, and ف, by incorporating the Spiderweb Learning media as a learning aid. The third treatment involved randomized letter recognition, where students identified and sequenced *hijaiyah* letters selected through the Spiderweb Learning media. The fourth treatment required students to read Arabic letters sequentially using the Spiderweb Learning media, reinforcing their ability to recognize and pronounce *hijaiyah* letters accurately.

3.1. Research results and hypothesis testing

Following the pretest and posttest assessments, both the experimental and control groups demonstrated improvement in their reading skills. However, the increase in reading proficiency was more pronounced in the experimental group compared to the control group. These findings suggest that the use of Spiderweb Learning media positively influences children's ability to read *hijaiyah* letters. This result aligns with previous research utilizing similar interactive media to enhance student learning outcomes.

Tabel 1. Normality Test Result

	Kolmogorov-Smirnov ^a		
	Statistic	Df	Sig
Pretest Control	0.223	20	0.013
Posttest Control	0.161	20	0.201
Pretest Experiment	0.235	20	0.008
Posttest Experiment	0.247	20	0.004

The normality test results in Table 1 determine whether the data follow a normal distribution based on the significance value (Sig.). If the significance value is less than 0.05, the data are not normally distributed; otherwise, if the significance value exceeds 0.05, the data meet the normality assumption. As indicated in Table 1, the Post-test Experimental Group exhibits a significance value of 0.004, which is below the threshold of 0.05. Consequently, the normality assumption is violated, necessitating the use of non-parametric statistical methods for hypothesis testing. Therefore, the Mann-Whitney U test was applied, as presented in Table 2.

Tabel 2. Post-test Rank Comparison between Experiment and Control Groups

Group	N	Mean Rank	Sum of Ranks
Posttest Experiment	20	25.25	498.00
Posttest Control	20	17.45	331.00

The results in Table 2 indicate that the experimental group achieved a higher mean rank (25.25) compared to the control group (17.45). This suggests a potential improvement in the ability to read *hijaiyah* letters following the intervention. To further confirm the statistical significance of this difference, a Mann-Whitney U test was conducted using SPSS version 28, with results presented in Table 3.

Table 3. Mann-Whitney U Test Results for Post-test Scores

Test Statistic	Value
Mann-Whitney U	120.000
Wilcoxon W	331.000
Z	-2.353
Asymp Sig. (2-tailed)	0.021
Exact Sig. (2-tailed)	0.025

The Mann-Whitney U test results demonstrate a test statistic of $U = 120.000$, with an Asymp. Sig. (2-tailed) value of 0.021. This significance level is below the threshold of 0.05, indicating a statistically significant difference between the post-test scores of the experimental and control groups. Additionally, comparing the calculated U value (120.000) with the critical U table value (116) for $n_1 = 20$ and $n_2 = 20$ at $\alpha = 0.05$ further confirms the rejection of the null hypothesis (H_0). Thus, the intervention had a measurable impact on improving students' ability to read *hijaiyah* letters.

Based on the calculation of the post-test results of the experimental and control groups using the Mann-Whitney U test with a significance level of 0.05 and $n_1 = 20$, $n_2 = 20$, the U table value is 116. The obtained U value from SPSS 28 is 120.000, which is slightly larger than the U table value. The total post-test score for the experimental group was 281 with an average rank of 25.25, whereas the control group had a total score of 259 with an average rank of 17.45. Since the calculated U value is smaller than the U table value ($120.000 < 116$), the null hypothesis (H_0) is rejected, leading to the conclusion that the spiderweb learning media significantly improves students' ability to read *hijaiyah* letters. This is attributed to the engaging and continuous stimulation provided by the intervention, which effectively supports children's learning processes.

This finding aligns with existing theories that emphasize the role of stimulus-response mechanisms in learning. When children receive consistent and engaging stimuli, they demonstrate noticeable improvements, as reflected in their ability to distinguish *hijaiyah* letters not only by reading but also by understanding phonetic variations and letter connectivity rules. Initially, some children struggled with distinguishing similar letter pairs; however, after the intervention, they showed fluency improvements, although some students with learning delays required additional support.

Furthermore, these results highlight the importance of adaptive learning methods tailored to individual student needs. Future studies should explore additional qualitative insights, such as classroom engagement observations and student feedback, to further validate the effectiveness of this intervention. Additionally, longitudinal studies could be conducted to examine the retention of *hijaiyah* reading skills over extended periods. These findings contribute to the growing body of research on Arabic literacy development and provide valuable guidance for educators seeking to enhance instructional strategies through evidence-based approaches.

3.2. The Influence of Spider Web Learning Media on The Ability to Read *Hijaiyah* Letters in Early Childhood

The present study aimed to examine the effect of spiderweb learning media on the ability to read *hijaiyah* letters in early childhood at Kindergarten Pertiwi 26-13 Bogares Kidul. Previous research has emphasized the importance of interactive and adaptive learning methods in fostering literacy skills among young learners.¹⁷ Web-based learning tools have been successfully developed in various educational contexts, including language acquisition and pronunciation training.¹⁸ However, limited studies have specifically addressed the effectiveness of digital media in supporting early Arabic literacy development. Therefore, this study contributes to the growing body of research by investigating the impact of spiderweb learning media on early childhood Arabic literacy skills.

¹⁷ Pramuniati, "Development of web-based French language learning media on Réception Écrite courses."

¹⁸ Muhammad, Pratama, dan Alimudin, "Development Of Web Based Application With Speech Recognition As English Learning Conversation Training Media."

The findings indicate a statistically significant improvement in the ability to read *hijaiyah* letters among students who used the spiderweb learning media. The Mann-Whitney U test results showed that the experimental group outperformed the control group, with a mean rank of 25.25 compared to 17.45. Additionally, the total post-test score for the experimental group (281) was higher than that of the control group (259), supporting the effectiveness of the intervention. The rejection of the null hypothesis confirms that the use of spiderweb learning media significantly enhances *hijaiyah* reading skills. These results suggest that interactive and engaging learning tools provide better stimulation for young learners, leading to improved literacy outcomes.

Comparing these findings with previous research, the effectiveness of web-based learning media aligns with studies demonstrating the benefits of digital interventions in language acquisition.^{19,20} Similar studies on web-based simulation systems for language learning have reported positive outcomes in enhancing students' engagement and comprehension.²¹ However, while previous studies primarily focused on higher education or second language learning, the present study extends this research to early childhood Arabic literacy. The results also corroborate the stimulus-response learning theory, which suggests that continuous exposure to structured and engaging stimuli fosters cognitive development.

The observed improvements in *hijaiyah* reading ability can be attributed to the interactive nature of the spiderweb learning media. The integration of engaging visual elements and structured repetition likely enhanced children's ability to recognize, differentiate, and articulate *hijaiyah* letters. This finding is consistent with research indicating that digital media with interactive features can improve literacy skills by sustaining learners' attention and reinforcing learning through repetition.²² Additionally, children who initially struggled with letter recognition exhibited notable improvements, suggesting that the intervention effectively addressed early literacy challenges. However, variations in individual learning speeds indicate the necessity of personalized learning pathways within digital media interventions.

The significance of these findings lies in their implications for Arabic language education in early childhood. The results suggest that incorporating web-based learning tools can facilitate early literacy development, particularly for complex script recognition such as *hijaiyah* letters. This study supports the argument that interactive learning media can bridge the gap between traditional instruction and modern pedagogical approaches.²³ However, it is important to consider the adaptability of digital tools to accommodate diverse learning needs, as some students required additional support to achieve fluency. These findings highlight the need for further exploration into differentiated learning strategies within digital Arabic literacy programs.

Despite the promising results, this study has several limitations that warrant cautious interpretation. First, the short-term nature of the intervention limits conclusions about the long-term retention of *hijaiyah* reading skills. Future research should

¹⁹ *Ibid.*

²⁰ Pramuniati, "Development of web-based French language learning media on Réception Écrite courses."

²¹ Nasir et al., "Modeling System Test of English as a Foreign Language as a Web-Based Learning Media."

²² Atabik et al., "Digitalization of Educational Quality Management in Higher Education," *Revista de Gestão Social e Ambiental* 18, no. 7 SE- (12 Juni 2024): e06776, doi:10.24857/rgsa.v18n7-133.

²³ Garry Falloon, "From digital literacy to digital competence: the teacher digital competency (TDC) framework," *Educational Technology Research and Development* 68, no. 5 (2020): 2449–72, doi:10.1007/s11423-020-09767-4.

implement longitudinal studies to assess the sustained impact of spiderweb learning media. Second, while the statistical analysis confirmed significant improvements, qualitative measures such as student engagement levels and teacher observations were not included. Incorporating these elements in future research could provide deeper insights into the learning process and effectiveness of digital media interventions.

The findings have important implications for educators, curriculum developers, and policymakers seeking to enhance Arabic literacy instruction. The demonstrated effectiveness of spiderweb learning media suggests that integrating digital tools into early childhood education can improve learning outcomes and engagement. Future research should explore additional qualitative insights, such as classroom engagement observations and student feedback, to further validate the effectiveness of this intervention. Additionally, longitudinal studies could examine the retention of *hijaiyah* reading skills over extended periods. By leveraging evidence-based approaches, educators can develop more effective and inclusive Arabic literacy programs for young learners.

4. Conclusion

This study aimed to examine the effect of web-based spiderweb learning media on the ability to read *hijaiyah* letters in early childhood at Kindergarten Pertiwi 26-13 Bogares Kidul. The findings indicate that the use of this digital intervention significantly enhances students' ability to recognize and read *hijaiyah* letters, as evidenced by the statistical analysis of post-test results. The experimental group demonstrated higher scores and an improved average rank compared to the control group, confirming the effectiveness of the intervention in facilitating early literacy development. These results contribute to the growing body of research on Arabic literacy education by demonstrating the role of interactive and adaptive learning tools in enhancing script recognition skills. The study underscores the importance of providing engaging and structured stimuli in early childhood education to strengthen cognitive processing and memory retention. The findings also highlight the potential of web-based learning media to support differentiated instruction, as some students required additional reinforcement to achieve fluency. Despite these promising outcomes, several limitations should be acknowledged.

The study's short-term design does not allow for conclusions regarding the long-term retention of *hijaiyah* reading skills. Future research should incorporate longitudinal methodologies to assess sustained learning effects over time. Additionally, the study relied solely on quantitative statistical measures, without considering qualitative factors such as student engagement, motivation, and teacher observations. A mixed-methods approach incorporating classroom observations and student feedback would provide a more comprehensive understanding of the learning process. Based on these findings, further research should explore the integration of web-based spiderweb learning media into broader Arabic literacy curricula, examining its adaptability for different learner profiles. Studies focusing on the long-term impact of digital learning tools and their effectiveness across diverse educational settings would provide valuable insights for educators and policymakers. By leveraging innovative and evidence-based instructional strategies, Arabic literacy programs can be enhanced to better meet the needs of early childhood learners, ensuring a strong foundation in *hijaiyah* reading proficiency.

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