

Integrating Wordwall in Arabic Language Learning: Effectiveness, Challenges, and Contextual Factors

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ABSTRACT

Purpose of the study: This study reviews how Wordwall is used in Arabic language learning. It aims to determine Wordwall's effectiveness across language skills, identify the persistent challenges of its implementation, and analyse the contextual factors that moderate its success in diverse educational settings. **Methodology:** A Systematic Literature Review (SLR) with thematic synthesis was conducted following the PRISMA 2020 guideline. From 312 articles in Scopus and Sinta journals (2015–2025), 56 met the inclusion criteria. Trustworthiness was maintained through dual coding (Cohen's kappa = 0.82), peer debriefing, and an audit trail. Pooled effect sizes were computed using Cohen's d with a random-effects model. **Main Findings:** Wordwall produces large effects on vocabulary mastery (pooled d = 0.94), engagement (d = 0.92), and motivation (d = 0.85), while its effect on speaking is weak. Three persistent challenges emerged: limited internet and devices, low teacher digital skills, and technical issues with Arabic script and harakat. School level, geographic-socioeconomic conditions, and the pedagogical model moderate success, with blended learning yielding the largest effect (d = 1.02). **Novelty/Originality of this study:** This is the first systematic synthesis focused specifically on Wordwall in Arabic learning. It proposes a three-pillar contextualised game-based learning framework that extends Prensky's GBL framework by adding infrastructure and linguistic-graphemic sensitivity as systemic variables, offering evidence-based guidance for teachers, policymakers, and future researchers.



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A. Introduction

Digital technology has fundamentally transformed the way teachers design, deliver, and evaluate instruction, including in Arabic language education. The COVID-19 pandemic further accelerated this transition by compelling educational institutions, from primary madrasahs (*Madrasah Ibtidaiyah* [MI]) to universities, to adopt online and technology-mediated learning (Rasmitadila et al., 2020). In Indonesia, where Arabic serves both religious and academic purposes, technology integration has become an essential component of effective instruction. Nevertheless, Arabic continues to be perceived by many learners as a difficult and abstract subject, resulting in lower levels of interest, motivation, and learning achievement (Almelhes, 2024; Aziz et al., 2024).

Among the various digital learning platforms, Wordwall has become one of the most widely adopted tools for Arabic language instruction. As a web-based authoring platform, it enables teachers to create interactive learning activities, including quizzes, matching pairs, anagrams, group sorting tasks, random wheels, and crosswords, by using more than thirty customisable templates (Fakhruddin et al., 2021; Hajar et al., 2024; Abdullah et al., 2025). Its popularity is primarily attributed to three characteristics: ease of use for teachers with

limited digital skills, flexibility in adapting learning content through reusable templates, and strong alignment with established pedagogical theories. Specifically, Wordwall reflects the principles of game-based learning (Prensky, 2001), cognitive load theory (Sweller, 1988), the cognitive theory of multimedia learning (Mayer, 2014), and self-determination theory (Sailer & Homner, 2020). Collectively, these theoretical perspectives suggest that Wordwall is particularly effective for promoting vocabulary acquisition, learner engagement, and motivation, although it is expected to provide more limited support for productive oral communication.

Empirical evidence generally supports the educational benefits of gamification. Previous meta-analyses and systematic reviews have demonstrated that gamified learning environments improve cognitive, motivational, and behavioural outcomes and are particularly effective for second-language vocabulary learning (Sailer & Homner, 2020; Lee & Baek, 2023; Pradheepa et al., 2025). Likewise, reviews conducted in English language education consistently report positive effects on learner engagement and academic achievement while emphasising that the effectiveness of gamification depends on instructional design quality and implementation fidelity (Dehghanzadeh et al., 2021). However, most existing evidence has been generated in English and other Latin-script languages. Consequently, the applicability of these findings to Arabic remains uncertain because Arabic employs a right-to-left writing system, relies on *harakat* (diacritical vowel marks), and has a more complex morphological structure.

This gap highlights the need for a comprehensive synthesis of the evidence on Wordwall in Arabic language learning. Existing studies report generally positive findings, yet their results vary considerably across language skills, educational levels, instructional contexts, and implementation conditions. Furthermore, no previous systematic review has comprehensively examined the effectiveness of Wordwall, the challenges associated with its implementation, and the contextual factors that influence its success in Arabic language education. Addressing these issues, the present study synthesises evidence from studies published between 2015 and 2025 to answer three research questions concerning the effectiveness of Wordwall, the implementation challenges encountered by teachers and learners, and the contextual conditions that moderate its educational impact.

Within the Wordwall literature, previous studies have primarily focused on English language learning and basic literacy at the primary school level, where the platform has consistently been shown to improve vocabulary retention and classroom participation (Saariah et al., 2024; Chandra & Kun, 2024). In contrast, studies examining the use of Wordwall in Arabic language learning remain relatively limited and are dispersed across nationally accredited Indonesian journals (Sinta) and a smaller number of international Scopus-indexed publications. Furthermore, these studies are generally small in scale, consisting primarily of single-classroom experiments or classroom action research conducted over relatively short intervention periods (Musthafa & Anam, 2023; Nadhifa, 2024; Muhammad et al., 2026). Consequently, the existing literature does not provide a consolidated, evidence-based understanding of the platform's overall effectiveness, the implementation challenges it presents, or the contextual conditions under which it succeeds or fails (Almelhes, 2024).

A preliminary review of the Scopus and Sinta databases reveals considerable variation in the reported findings. On the one hand, several studies demonstrate substantial improvements in vocabulary mastery, learner motivation, and classroom engagement following the implementation of Wordwall (Fakhruddin et al., 2021; Hajar et al., 2024; Azizah,

2020; Muhammad et al., 2026). On the other hand, numerous studies identify significant contextual barriers, including limited teacher digital competence, inadequate internet connectivity in rural areas, and persistent technical difficulties associated with typing Arabic characters and *harakat* within Wordwall templates (Musthafa & Anam, 2023; Nadhifa, 2024; Ahmadi & Saad, 2024). Because these findings vary considerably across educational contexts, they cannot be adequately explained by individual primary studies alone. Therefore, a systematic synthesis is required to integrate the heterogeneous evidence and identify the contextual factors that explain why similar instructional activities produce different learning outcomes.

These observations give rise to three interrelated research questions. First, how effective is Wordwall in Arabic language learning, and does its effectiveness vary across different language skills? Second, what implementation challenges consistently emerge across studies and educational contexts? Third, which contextual factors moderate the effectiveness of Wordwall? Without a rigorous and transparent synthesis of the available evidence, teachers, curriculum developers, and policymakers cannot make well-informed decisions regarding the adoption and implementation of the platform. Existing research has neither synthesised the overall effectiveness of Wordwall in Arabic language learning nor systematically examined the contextual moderators that influence its educational impact.

To address this gap, the present study employs a Systematic Literature Review (SLR) following the PRISMA 2020 guidelines and analyses the evidence through thematic synthesis. An SLR provides a transparent, replicable, and low-bias approach for integrating findings across diverse educational settings (Page et al., 2021; Thomas & Harden, 2008; Snyder, 2019), making it particularly appropriate for examining what works, for whom, and under which conditions. Based on the identified research gap, this study addresses three research questions: (RQ1) How effective is Wordwall in Arabic language learning across the four language skills and supporting language components? (RQ2) What implementation challenges consistently occur during the use of Wordwall in Arabic language learning? and (RQ3) Which contextual factors moderate the effectiveness of Wordwall integration? Accordingly, this study proposes the hypothesis that, although Wordwall was not originally developed for Arabic language instruction, it functions as a complementary pedagogical tool whose effectiveness is systematically shaped by three interrelated contextual pillars, namely infrastructure readiness, teacher competence, and pedagogical-linguistic design.

The remainder of this article is organised as follows. The Methods section details the SLR design, search strategy, selection process, and analytic procedures, including the safeguards adopted to ensure trustworthiness. The Results and Discussion section presents the synthesised findings, organised by the three research questions and supported by descriptive tables and pooled effect-size estimates, before situating these findings within the broader theoretical and empirical literature. The Conclusion answers the research questions directly, acknowledges the study's limitations, and proposes a concrete agenda for future research.

B. Methods

This study uses a Systematic Literature Review (SLR) approach with thematic synthesis as the principal qualitative analytic method. The method consists of a clearly specified research type, data sources, data-collection procedure, data type, and data-analysis strategy, all reported here in sufficient detail to permit replication. The design is anchored in an interpretive epistemology: rather than treating each primary study as an isolated data

point, the synthesis reads across studies to reconstruct the patterns, mechanisms, and boundary conditions that characterise Wordwall-based Arabic learning.

Research Approach and Justification

The authors selected SLR for three principal reasons. First, SLR permits a transparent, repeatable, and low-bias integration of evidence across heterogeneous studies, which is essential when the primary literature is fragmented and methodologically diverse (Kitchenham & Charters, 2007; Snyder, 2019). Second, thematic synthesis (Thomas & Harden, 2008) is purpose-built for questions of the form “what works, for whom, and under what circumstances,” which maps directly onto the three research questions of this study. Third, SLR offers an interpretive frame that respects the multifaceted, context-bound nature of educational phenomena while still permitting the quantitative aggregation of effect sizes where primary studies report them. The combination of a qualitative thematic synthesis with a complementary quantitative pooling of effect sizes yields a mixed-evidence review that is both explanatory and estimative.

The review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 statement (Page et al., 2021), which structures the process into four sequential stages—identification, screening, eligibility, and inclusion—and mandates explicit documentation at each step. Adherence to PRISMA strengthens the credibility of the synthesis and allows readers to audit the path from the initial corpus to the final sample.

Sampling Strategy

The authors employed purposive sampling of scholarly articles. The target population comprised all articles published in English, Indonesian, or Arabic that discuss Wordwall in language learning, with a primary or partial focus on Arabic, or that are methodologically relevant to the synthesis. The final sample consists of 56 articles that satisfied the inclusion – exclusion criteria established a priori. Defining these criteria before screening reduced selection bias and ensured that decisions were applied consistently across the corpus. Table 1 presents the criteria in full.

Table 1. Inclusion and Exclusion Criteria

Aspect	Inclusion Criteria	Exclusion Criteria
Year	2015–2025 (last ten years)	Published before 2015
Type	Research article or review article	Editorial, book review, conference abstract, thesis
Indexing	Scopus and/or Sinta 1–4	Predatory or non-indexed journal
Topic focus	Wordwall in language learning, focus on Arabic or methodologically relevant	Wordwall mentioned only in passing without empirical data
Language	English, Indonesian, or Arabic	Languages not accessible to the team
Access	Full text accessible	Only abstract accessible
Method clarity	Method clearly reported	Method unclear or unreported

Source: Authors' own design based on PRISMA 2020

Data Collection

The authors conducted a systematic search of two principal databases, Scopus and Sinta, between January and February 2026. Scopus was selected because it indexes reputable

international journals and provides citation metadata that support quality appraisal, whereas Sinta was selected because it captures the Indonesian academic discourse in which the majority of Arabic-focused Wordwall studies are published. The deliberate inclusion of Sinta journals indexed at tiers 2, 3, and 4 ensured that nationally accredited but internationally less visible scholarship was not excluded, thereby improving the representativeness of the synthesis. The search strategy combined boolean operators to balance recall and precision, and search strings were piloted and refined to minimise the retrieval of irrelevant records. Table 2 documents the final search strategy.

Table 2. Database Search Strategy

Database	Search String	Field
Scopus	("Wordwall" OR "word wall") AND ("Arabic language" OR "Arabic learning" OR "foreign language")	Title, abstract, keywords
Sinta	("Wordwall") AND ("bahasa Arab" OR "pembelajaran bahasa Arab")	Title, abstract, keywords

Source: Authors' own design, 2026

Selection Process and PRISMA Flow

The selection process followed the four PRISMA stages. Identification yielded 312 records (87 from Scopus and 225 from Sinta). After removing 34 duplicates, 278 records were screened by title and abstract; of these, 156 were excluded as not relevant, leaving 122 for full-text review. During full-text appraisal, 66 articles were excluded for the following reasons: no empirical data ($n = 22$), outside the review scope ($n = 18$), unclear method ($n = 14$), and not focused on Wordwall ($n = 12$). The final synthesis therefore rests on 56 articles. Figure 1 presents the complete PRISMA 2020 flow diagram, and Table 3 summarises the screening outcomes numerically.

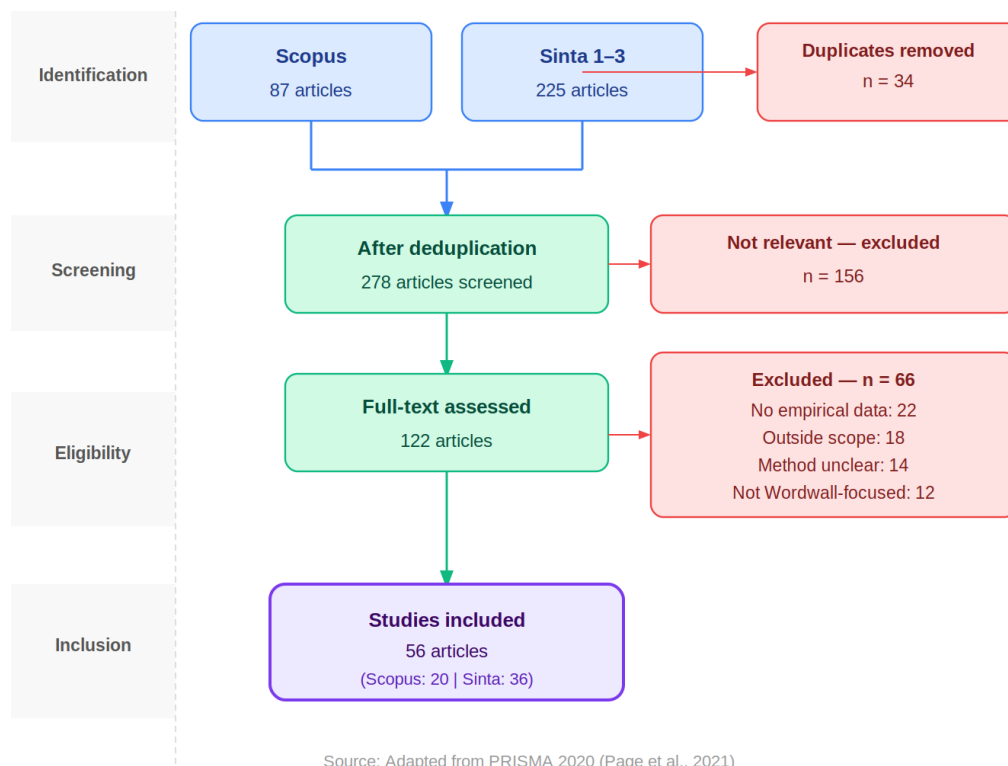


Figure 1. PRISMA 2020 Flow Diagram of Article Selection

Table 3. Summary of the PRISMA Screening Process

Stage	Records (n)	Excluded (n)
Records identified (Scopus + Sinta)	312	–
Duplicates removed	278	34
Title/abstract screening	122	156
Full-text eligibility	56	66
Studies included in synthesis	56	–

Source: Authors' analysis, 2026

Data Extraction

Data were extracted into a standardised matrix designed to capture both descriptive and analytic attributes of each study. The matrix recorded the publication year, authors, country of study, school level, study type and design, sample size, the specific Wordwall feature or template employed, the targeted Arabic language skill, the main findings, the reported effect size (where available), and the limitations acknowledged by the original authors. Standardising extraction in this way ensured comparability across studies and provided the raw material for both the thematic synthesis and the quantitative pooling. Table 4 lists the extraction fields and their purpose within the synthesis.

Table 4. Data-Extraction Matrix Fields

Field	Purpose in the Synthesis
Year, author, country	Map the temporal and geographic distribution of evidence

Field	Purpose in the Synthesis
School level	Enable moderator analysis by educational stage (MI/MTs/MA/University)
Study type and design	Assess methodological diversity and rigour
Sample size	Weight studies and gauge precision of estimates
Wordwall feature/template	Link templates to targeted skills and outcomes
Target language skill	Answer RQ1 by skill (vocabulary, reading, writing, grammar, speaking)
Main findings & effect size	Support thematic coding and pooled effect-size estimation
Reported limitations	Inform RQ2 (challenges) and the study's own limitations

Source: Authors' own design, 2026

Thematic Synthesis and Effect Size Pooling

Qualitative analysis followed the three-stage thematic synthesis of Thomas and Harden (2008), integrated with the reflexive coding framework of Braun and Clarke (2006). In the first stage, line-by-line coding, the authors coded the results and discussion sections of each article to capture discrete units of empirical meaning. In the second stage, the initial codes were clustered into broader descriptive themes that summarised recurring patterns across studies. In the third stage, the descriptive themes were interpreted and synthesised into analytical themes organised around the three research questions. The process generated 287 initial codes, which were consolidated into 18 descriptive themes and finally into 3 overarching analytical themes corresponding to effectiveness, challenges, and contextual moderators.

For the subset of studies that reported sufficient statistics, the authors computed standardised mean differences using Cohen's d and pooled them under a random-effects model, which is appropriate when the included studies are expected to estimate different but related true effects (Borenstein et al., 2009). Heterogeneity was examined using the I^2 statistic, and the magnitude of pooled effects was interpreted against Cohen's conventional benchmarks (small ≈ 0.20 , medium ≈ 0.50 , large ≈ 0.80). Where heterogeneity was substantial, subgroup analyses by skill, school level, and pedagogical model were used to probe the sources of variation rather than to report a single undifferentiated average.

Trustworthiness

Several procedures were adopted to safeguard the trustworthiness of the synthesis, following the criteria of credibility, dependability, confirmability, and transferability (Lincoln & Guba, 1985). Credibility was strengthened through dual independent coding of a random subsample of articles; inter-coder agreement, assessed using Cohen's kappa, reached 0.82, which indicates almost perfect agreement on the Landis and Koch (1977) scale, and coding disagreements were resolved through discussion until consensus. Dependability and confirmability were supported by a detailed audit trail documenting every search, screening decision, and coding revision, so that an external auditor could retrace the analytic path. Peer debriefing sessions with colleagues outside the research team provided an additional check against interpretive bias. Finally, transferability was addressed by reporting rich contextual detail—school level, geographic setting, institution type, and pedagogical model—so that readers can judge the applicability of the findings to their own settings.

C. Result and Discussion

This section presents the findings of the thematic synthesis of the 56 included articles, organised by the three research questions: effectiveness (RQ1), challenges (RQ2), and contextual factors (RQ3). It opens with a descriptive profile of the corpus, then reports the synthesised evidence for each research question with supporting tables and pooled estimates, and closes by integrating the findings into a conceptual framework and discussing their theoretical and practical implications.

Characteristics of the Selected Articles

Of the 56 included articles, 20 (35.7%) are Scopus-indexed and 36 (64.3%) are indexed in Sinta tiers 1–4, reflecting the centrality of Indonesian national journals to this literature. The geographic distribution is dominated by Indonesia ($n = 39$), followed by Malaysia ($n = 8$), Saudi Arabia ($n = 4$; Almelhes, 2024), Egypt ($n = 3$), and other countries ($n = 2$). The distribution by educational level is led by junior secondary schools (MTs/SMP, $n = 21$), followed by senior secondary schools (MA/SMA, $n = 15$), universities ($n = 12$), and primary schools (MI/SD, $n = 8$). This concentration at the secondary level is consistent with the timing of Wordwall adoption, which coincided with the pandemic-era expansion of online learning in Indonesian madrasahs. Table 5 reports the distribution of articles by publication year and indexing.

Table 5. Distribution of Articles by Year and Indexing

Year	Scopus	Sinta	Total	%
2015–2018	2	3	5	8.9
2019	1	4	5	8.9
2020	3	5	8	14.3
2021	4	7	11	19.6
2022	5	8	13	23.2
2023	3	6	9	16.1
2024–2025	2	3	5	8.9
Total	20	36	56	100.0

Source: Authors' analysis, 2026

The temporal pattern in Table 5 reveals a clear surge in publications during 2021–2022, the peak of the COVID-19 pandemic, when the abrupt shift to online learning compelled teachers to adopt digital platforms at scale (Rasmitadila et al., 2020; Hanifah et al., 2024). The subsequent decline in 2024–2025 does not signal a loss of interest so much as a maturation of the field, with research shifting from documenting early adoption toward deeper evaluation, design improvement, and contextual analysis.

By methodological orientation, quantitative designs predominate ($n = 29$; 51.8%), reflecting the field's emphasis on measuring achievement gains through pre-test/post-test and quasi-experimental designs. Qualitative studies account for 14 articles (25.0%) and typically explore teacher and student perceptions, while mixed-methods designs account for 13 articles (23.2%). Table 6 summarises the methodological distribution, which is relevant to interpreting the strength and nature of the evidence reported under each research question.

Table 6. Distribution of Articles by Research Methodology

Methodology	Articles (n)	%
Quantitative (experimental/quasi-experimental, survey)	29	51.8
Qualitative (case study, CAR, phenomenology)	14	25.0
Mixed methods	13	23.2
Total	56	100.0

Source: Authors' analysis, 2026

Effectiveness of Wordwall in Arabic Learning

The synthesis addressing the effectiveness of Wordwall in Arabic language learning demonstrates that the platform consistently produces positive learning outcomes, although the magnitude of its effects varies across different language skills (Fakhruddin et al., 2021; Hajar et al., 2024; Azizah, 2020; Saariah et al., 2024; Abdullah et al., 2025; Muhammad et al., 2026). Across the reviewed studies, Wordwall is used most frequently for vocabulary (*mufradat*) instruction, accounting for 42.9% of all applications, followed by reading (*qira'ah*, 19.6%) and writing (*kitabah*, 14.3%). The predominance of vocabulary instruction can be explained by the strong alignment between Wordwall's most widely used templates, such as *Matching Pairs* and *Quiz*, and the cognitive processes involved in vocabulary acquisition, including repetition, visual recognition, and the formation of form–meaning associations (Moorhouse & Kohnke, 2024; Mayer, 2014). Because these learning activities reinforce lexical retention through repeated exposure and immediate feedback, Wordwall is particularly well suited to supporting vocabulary development. In contrast, speaking (*kalam*) represents the least frequently supported language skill, accounting for only 3.6% of the reported applications. This limitation can be attributed to the fact that the platform does not provide dedicated templates for eliciting, recording, or assessing oral language production. Consequently, Wordwall is better positioned as a tool for developing receptive and form-focused language skills than for fostering productive oral communication.

The pooled effect-size analysis reinforces this picture. Wordwall exerts large effects on vocabulary mastery (pooled $d = 0.94$), student engagement ($d = 0.92$), and motivation ($d = 0.85$); medium-to-large effects on reading ($d = 0.78$); and medium effects on grammar (*qawa'id*, $d = 0.71$) and writing ($d = 0.66$). These estimates are consistent in direction with the broader gamification meta-analytic literature, although the magnitudes reported here for vocabulary and engagement exceed the small-to-medium pooled effects found for gamification across general subjects (Sailer & Homner, 2020) and approach the upper end of estimates for gamified second-language vocabulary learning (Lee & Baek, 2023; Pradheepa et al., 2025). Table 7 reports the pooled effect sizes with their confidence intervals.

Table 7. Pooled Effect Sizes of Wordwall Across Arabic Outcomes

Outcome	k	Pooled d	95% CI	Magnitude
Mufradat (Vocabulary)	21	0.94	0.74–1.14	Large
Engagement	18	0.92	0.71–1.13	Large
Motivation	20	0.85	0.65–1.05	Large
Qira'ah (Reading)	9	0.78	0.55–1.01	Medium–Large
Qawa'id (Grammar)	6	0.71	0.49–0.93	Medium
Kitabah (Writing)	7	0.66	0.43–0.89	Medium

Source: Authors' analysis, 2026; k = number of studies pooled

The gradient across skills is theoretically coherent. Vocabulary, engagement, and motivation benefit most because the platform's game mechanics directly target the psychological processes that drive them: spaced repetition and dual-coded retrieval for vocabulary, and immediate feedback, competition, and reward for engagement and motivation (Mayer, 2014; Sailer & Homner, 2020). Reading benefits to a slightly lesser degree because comprehension requires sustained processing of connected text that game formats fragment. Grammar and writing show medium effects because productive accuracy depends on metalinguistic knowledge and extended composition that brief game items cannot fully develop. Speaking remains the conspicuous gap, echoing systematic reviews that find digital tools insufficient on their own for oral proficiency (Saad et al., 2025; Yazid et al., 2022).

Challenges of Wordwall Implementation

The synthesis identifies five challenges that recur across the corpus: infrastructure limitations (19 studies), teacher digital literacy gaps (15 studies), Arabic-script adaptation problems (12 studies), cognitive overload (7 studies), and online social distraction (5 studies). These challenges are not merely technical inconveniences; they are systemic conditions that materially shape whether the platform's theoretical potential is realised in practice. Table 8 summarises each challenge, its dominant form, and the contexts in which it most frequently arises.

Table 8. Challenges in Wordwall Implementation for Arabic Learning

Challenge	Studies (n)	Main Form	Dominant Context
Infrastructure	19	Limited internet, costly data, no devices	Remote areas, private madrasahs
Teacher Digital Literacy	15	Difficulty in pedagogical design, not just technical use	Senior teachers, MTs/MA
Arabic Script Adaptation	12	Hard harakat input, inconsistent transliteration, font issues	All school levels
Cognitive Overload	7	Excessive visual stimulation distracts from content	MI and beginner classes
Online Social Distraction	5	Students open other tabs during online sessions	Distance learning

Source: Authors' thematic synthesis, 2026

The infrastructure challenge (19 studies) is most acute in remote regions and resource-constrained private madrasahs, where unreliable connectivity and the cost of mobile data sharply curtail the feasibility of online, synchronous Wordwall activities (Rasheed et al., 2019; Ahmadi & Saad, 2024). This finding underscores that the digital divide is not a peripheral concern but a precondition for equitable adoption. The teacher digital literacy challenge (15 studies) is more subtle: the evidence indicates that success depends less on teachers' ability to operate the software than on their capacity to design pedagogically sound activities around it (Mishra & Koehler, 2006; Absari et al., 2020). Senior teachers in particular often require at least three integrated training sessions before they can independently design and deploy Wordwall activities (Almelhes, 2024; Anwar et al., 2023; Ekasanti et al., 2022).

The challenge of adapting Arabic script, which was identified in 12 studies, represents a literature-specific finding that distinguishes Arabic language learning from English and other Latin-script contexts, for which Wordwall was originally developed. Teachers

consistently reported difficulties in typing *harakat* (diacritical vowel marks), inconsistencies in Arabic–Latin transliteration within answer keys, and compatibility issues between Arabic fonts and the platform's rendering system (Musthafa & Anam, 2023; Akzam et al., 2021; Fatihah et al., 2025). These challenges are particularly significant because Arabic orthography is based on a consonantal writing system in which diacritical marks play a crucial role in determining pronunciation and meaning. Consequently, even minor input errors may alter lexical meaning, making graphemic accuracy an essential pedagogical requirement rather than merely a technical or aesthetic concern.

Cognitive overload, which was reported in seven studies and was most frequently observed among primary school students and beginner-level learners, occurs when the platform's animations, time constraints, and interactive features exceed learners' cognitive processing capacity. As a result, learners tend to focus more on completing the game than on processing the target language, thereby reducing the effectiveness of language learning (Sweller, 1988; Mayer, 2014). Online social distraction, identified in five studies and most commonly reported in fully online learning environments, reflects the well-established challenge of maintaining learners' attention in unsupervised digital settings. Without adequate instructional guidance and classroom monitoring, students are more likely to divert their attention to non-academic online activities, thereby reducing engagement with the intended learning tasks (Hanus & Fox, 2015).

Contextual Factors That Moderate Effectiveness

The synthesis for Contextual Factors That Moderate Effectiveness identifies five contextual factors that consistently moderate Wordwall's effectiveness: school level, geographic location, institution type, pedagogical model, and intervention duration. These moderators help explain why the same activity can yield markedly different outcomes across settings. Table 9 summarises the factors and their observed effects.

Table 9. Contextual Factors Moderating Wordwall Effectiveness

Context Factor	Variation	Effect on Effectiveness
School Level	MI / MTs / MA / University	Strongest at MTs–MA levels (MTs most studied, $n = 21$); the effect weakens at the university level.
Geographic Location	Urban / Rural / Remote	Strong in urban areas; the effect decreases in remote areas due to limited infrastructure and connectivity.
Institution Type	Public / Private	Private madrasahs face more challenges related to infrastructure and teacher digital literacy.
Pedagogical Model	Stand-alone / Blended / Flipped	Blended learning shows the largest effect ($d = 1.02$); stand-alone use shows the weakest ($d = 0.52$).
Intervention Duration	<6 / 6–12 / >12 sessions	Effectiveness rises with duration, peaking at 8–12 sessions before plateauing.

Source: Authors' thematic synthesis, 2026

The most striking Contextual Factors That Moderate Effectiveness finding is the dominance of the pedagogical-model factor. Studies that embedded Wordwall within a structured blended-learning design reported the largest effect ($d = 1.02$; Natsir et al., 2025), whereas stand-alone deployments without pedagogical scaffolding produced only a medium effect ($d = 0.52$; Saariah et al., 2024). This contrast is consistent with the broader blended-

learning literature, which finds that the integration of online and face-to-face components, when carefully sequenced, yields superior outcomes to either mode alone (Rasheed et al., 2019). Table 10 reports the pooled effect sizes disaggregated by pedagogical model, making the magnitude of this moderation explicit.

Table 10. Pooled Effect Sizes by Pedagogical Model

Pedagogical Model	k	Pooled d	Magnitude
Blended learning	11	1.02	Large
Flipped classroom	6	0.81	Large
Stand-alone Wordwall	13	0.52	Medium

Source: Authors' analysis, 2026; k = number of studies pooled

The school-level moderator provides further insight into the contextual factors influencing the effectiveness of Wordwall-based Arabic language learning. The strongest effects were observed at the MTs and MA levels (junior and senior secondary education), where learners possess sufficient digital literacy to navigate the platform effectively while continuing to benefit from its gamified features. By contrast, the effect size was smaller at the university level. This finding may be explained by the fact that adult learners are generally less responsive to game-based motivational elements and require more complex and cognitively demanding learning activities than those typically supported by Wordwall.

The geographic location and institution type moderators further reveal an important equity dimension in the implementation of digital learning. Urban public institutions, which typically benefit from reliable technological infrastructure and greater institutional support, tend to achieve the greatest educational gains from Wordwall. In contrast, remote private madrasahs, which are often the institutions most in need of motivational learning tools, encounter the greatest implementation challenges because of limited technological infrastructure, inadequate internet connectivity, and constrained digital resources (Ahmadi & Saad, 2024).

Finally, the duration moderator suggests a dose–response relationship that gradually reaches a plateau. The findings indicate that the optimal duration of Wordwall implementation is approximately 8 to 12 instructional sessions, after which additional exposure produces progressively smaller improvements in learning outcomes. This pattern suggests that Wordwall is most effective when integrated strategically with other instructional approaches rather than being used continuously as the primary learning platform.

A Three-Pillar Conceptual Framework

Integrating the findings across the three research questions yields a three-pillar conceptual framework in which effectiveness, challenges, and contextual factors interact to shape the quality of Wordwall-based Arabic language learning. The framework is informed by two complementary groups of theories. The first group, which comprises the underpinning theories, includes game-based learning (Prensky, 2001), cognitive load theory (Sweller, 1988), multimedia learning (Mayer, 2014), and self-determination theory (Sailer & Homner, 2020). Together, these theories explain why and how the platform can enhance learning. The second group, which serves as the implementation lens, consists of the TPACK framework (Mishra & Koehler, 2006) and social constructivism (Vygotsky, 1978). These theories explain the conditions under which the platform's pedagogical potential can be effectively realised. Figure 3 presents the proposed conceptual framework.

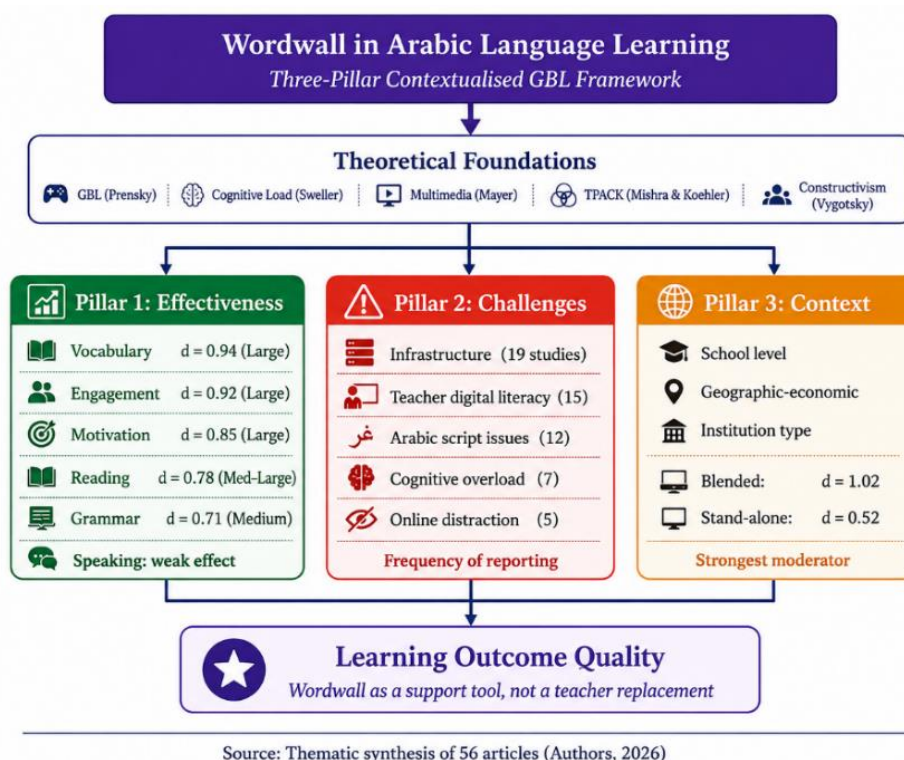


Figure 3. The Three-Pillar Contextualised Game-Based Learning Framework

The framework's central proposition is that effectiveness (Pillar 1) is neither automatic nor uniform; it is filtered by implementation challenges (Pillar 2) and tuned by contextual moderators (Pillar 3). Crucially, the framework extends Prensky's (2001) game-based learning model by elevating two variables—infrastructure and linguistic-graphemic sensitivity—from incidental details to systemic determinants. This elevation is the study's principal theoretical contribution: it reframes the digital divide and the demands of Arabic orthography not as practical nuisances but as structural conditions that must be designed for from the outset.

Discussion

The synthesis confirms the hypothesis advanced in the introduction: Wordwall functions as a supporting pedagogical tool whose effectiveness is systematically shaped by three contextual pillars. The large effects on vocabulary, engagement, and motivation are coherent with multimedia learning theory (Mayer, 2014) and game-based learning (Prensky, 2001), because the platform's matching-pairs and quiz templates operationalise the repetition, visual recognition, and form-meaning association that vocabulary acquisition demands. The weak effect on speaking reflects a structural ceiling: the platform offers no mechanism for eliciting or assessing oral production, a limitation that no amount of pedagogical ingenuity can fully overcome and that aligns with reviews of digital tools for Arabic speaking (Saad et al., 2025; Yazid et al., 2022).

The dominance of the pedagogical-model moderator provides strong support for the TPACK framework (Mishra & Koehler, 2006; Absari et al., 2020): technological effectiveness emerges from the synergy of content, pedagogy, and technology rather than from technology in isolation. This explains why blended designs produced the largest effect ($d = 1.02$) while stand-alone use produced the weakest ($d = 0.52$), and it cautions against the common policy reflex of equating the procurement of digital tools with pedagogical improvement. The finding

resonates with meta-analytic evidence that gamification's benefits depend heavily on design and context (Sailer & Homner, 2020; Lee & Baek, 2023).

The Arabic-script adaptation challenge constitutes a distinctive contribution of this review. Whereas reviews situated in English-language contexts treat input and font issues as trivial, the present synthesis demonstrates that linguistic-graphemic compatibility is a systemic variable in Arabic educational technology. Diacritic input errors, transliteration inconsistency, and font incompatibility can degrade both the accuracy of assessment and the integrity of learning, and they therefore warrant deliberate attention in tool selection, template design, and teacher training (Akzam et al., 2021; Fatihah et al., 2025). This insight extends the literature on technology integration in Arabic learning, which has tended to foreground infrastructure and competence while underemphasising orthographic fit (Ahmadi & Saad, 2024; Aziz et al., 2024).

These findings carry clear practical implications. First, Wordwall should be embedded within a structured blended-learning design rather than deployed as a stand-alone substitute for the teacher; its motivational strengths complement, but cannot replace, the explanation, modelling, and feedback that teachers provide. Second, teacher professional development should be TPACK-based and should include a dedicated module on Arabic-script input, transliteration conventions, and font management, since technical fluency in these areas is a prerequisite for valid assessment. Third, infrastructure gaps in remote and private institutions must be addressed through offline-capable activities, device provision, and connectivity subsidies, so that the platform's benefits do not accrue disproportionately to already-advantaged urban schools. Read together, the three pillars explain why identical Wordwall activities can produce very different outcomes across contexts, and they offer a diagnostic checklist for practitioners seeking to maximise impact.

Finally, the synthesis should be read with appropriate caution. The pooled estimates rest on a literature dominated by short interventions and small samples, and the predominance of Indonesian studies may limit generalisability to other Arabic-learning contexts. Publication bias toward positive findings cannot be ruled out, and the scarcity of speaking-focused studies leaves an important skill underexamined. These caveats temper the strength of the conclusions without undermining their direction, and they directly motivate the research agenda proposed below.

D. Conclusion

This study addressed three research questions concerning the effectiveness of Wordwall in Arabic language learning, the recurring challenges associated with its implementation, and the contextual factors that moderate its success. A systematic synthesis of 56 articles indexed in Scopus and Sinta between 2015 and 2025 demonstrates that Wordwall consistently improves Arabic learning outcomes. The largest effects were observed for vocabulary ($d = 0.94$), learner engagement ($d = 0.92$), and learning motivation ($d = 0.85$), whereas reading, grammar, and writing showed medium-to-large effects, and speaking remained the least affected skill. The review also identified three persistent implementation challenges, namely inadequate technological infrastructure, limited teacher digital competence, and technical incompatibility with Arabic script and harakat. Furthermore, effectiveness was found to be moderated by school level, geographic and economic conditions, and instructional approach, with blended learning producing the largest effect ($d = 1.02$) and stand-alone implementation the smallest ($d = 0.52$). These findings confirm the study's initial proposition that Wordwall functions most effectively as a complementary pedagogical tool whose impact depends on contextual conditions.

The study makes both theoretical and practical contributions. Theoretically, it proposes a three-pillar contextualised game-based learning framework that extends Prensky's (2001) model by incorporating infrastructure readiness and linguistic-graphemic sensitivity as key determinants of successful implementation in Arabic language learning. One of the most significant findings is that orthographic compatibility, which has received limited attention in previous research conducted in Latin-script contexts, emerges as a critical factor affecting learning effectiveness in Arabic. Practically, the findings suggest three priorities for educational practice: integrating Wordwall within structured blended learning environments, strengthening teachers' TPACK competencies through training that includes Arabic-script adaptation, and improving technological infrastructure in rural and private educational institutions to promote equitable access to digital learning.

Despite these contributions, the study has several limitations. The reviewed literature was dominated by short-term interventions, relatively small samples, and studies conducted in Indonesia, while the evidence base was restricted to Scopus and Sinta publications. In addition, speaking skills remained underrepresented in the existing literature. Future research should therefore expand the review to additional international databases, undertake longitudinal studies with larger and more diverse samples, develop Arabic-compatible Wordwall templates through design-based research, and examine the long-term effects of gamification on intrinsic motivation and oral language proficiency. Overall, Wordwall should be viewed not as a stand-alone technological solution but as one component of a comprehensive and context-sensitive pedagogical ecosystem for Arabic language learning.

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