

Learning the Arabic Alphabet through Duolingo and Daily Repetitive Practice: A Netnographic and Literature Informed Review

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Abstract

Mobile assisted language learning applications, and Duolingo in particular, are widely used by learners attempting to acquire the Arabic alphabet, yet the scholarly literature evaluating their suitability for this specific task remains sparse and largely disconnected from the extensive, naturally occurring discussion of this question among learners themselves. This paper combines a systematic review of literature on Arabic orthographic complexity, gamified application design, alphabet acquisition through digital tools, and the cognitive science of repetition and forgetting, with a netnographic thematic analysis of publicly available, anonymised learner discourse concerning Duolingo's Arabic course. The review and analysis are structured around an integrated theoretical framework combining the Forgetting Curve and spaced repetition theory (Ebbinghaus, 1885; Kang, 2016), Cognitive Load Theory (Sweller, 1988) as applied to script complexity, and Self-Determination Theory (Deci & Ryan, 1985) as applied to gamified motivation. Thematic analysis of the discourse corpus, triangulated against the literature, produced five themes: perceived inefficiency of the dedicated alphabet module relative to integrated, in-course letter exposure; the primacy of handwriting and production practice over passive recognition; profound scepticism regarding Duolingo's capacity to teach positional letterform variation; a bifurcation between vocabulary-level and script-level competence; and a widely shared, informally derived heuristic that isolated Arabic script acquisition is achievable within days to a few weeks given sufficiently structured practice, a claim standing in tension with Duolingo's slower, integrated pedagogical design. The findings indicate strong convergence between the scholarly literature and independent learner discourse: Duolingo's gamified, repetition based design aligns with established spaced repetition principles and is well suited to vocabulary support, but its capacity to independently teach Arabic's positional letterform system, absent handwriting practice and explicit form instruction, is not well supported by either the empirical literature or the extensive first hand testimony reviewed here. The paper concludes that Duolingo is most defensibly positioned as a supplementary, motivation sustaining tool rather than a stand-alone method for foundational Arabic script literacy, and proposes a revised instructional model integrating handwriting practice and explicit positional-form instruction alongside gamified repetition.

Keywords: Duolingo, Arabic script, alphabet acquisition, spaced repetition, cognitive load theory, netnography, mobile assisted language learning

Introduction

Duolingo is among the most widely used digital platforms for language learning, offering structured courses in over forty languages and attracting a large, linguistically diverse user base (Tiara et al., 2021). The platform, developed by Luis von Ahn and Severin Hacker at Carnegie Mellon University with the stated aim of removing financial barriers to language education, is sustained through advertising revenue, a paid subscription tier, and the Duolingo English Test (Tiara et al., 2021). Its instructional design centres on gamification, badges, competitive leagues, streak rewards, and short interactive exercises, intended to sustain engagement alongside incremental vocabulary and grammar acquisition. For several major European languages, Duolingo's content has been aligned with the Common European Framework of Reference for Languages up to level B2; for Arabic and several other widely spoken languages, no such alignment has yet been established, leaving proficiency benchmarking comparatively undefined.

While Duolingo has been studied reasonably extensively for vocabulary acquisition and foundational grammar learning, research into its capacity to teach an entirely new, non-Latin writing system remains limited, a gap of particular significance for Arabic. Arabic employs an abjad writing system characterised by right-to-left orientation, positionally variable letterforms (in which a single letter's shape changes according to whether it appears in isolation or at the beginning, middle, or end of a word), and the non-representation of short vowels within the core alphabet, features with no direct analogue in most European-language courses Duolingo offers. This paper addresses this gap by combining a structured literature review with a systematic thematic analysis of naturally occurring, publicly available learner discourse concerning Duolingo's Arabic alphabet instruction, an approach that allows the comparatively thin formal research base to be triangulated against a substantially larger body of independent, first hand learner testimony.

Statement of the Problem and Rationale

Despite Duolingo's recognised strengths in vocabulary and grammar instruction across many languages, there is limited empirical research addressing its effectiveness for teaching entirely new alphabets outside the Latin script, and almost none that triangulates the available formal literature against the extensive discussion of this specific question occurring in public learner communities. Arabic's right-to-left orientation, positional letterforms, and unfamiliar phoneme inventory make script acquisition a distinctly different undertaking from vocabulary learning within an already familiar alphabet, yet most existing research treats these as a single undifferentiated construct. This paper addresses that gap by reviewing the relevant literature on script complexity, technology-assisted alphabet learning, and memory science, and by systematically analysing learner discourse to discuss, rather than empirically test in a controlled setting, the conditions under which Duolingo might plausibly support Arabic script acquisition.

Questions

1. Can the Duolingo application plausibly be used on its own to learn the Arabic alphabet?
2. Does the existing literature on spaced repetition and short daily practice, corroborated or challenged by independent learner discourse, support the expectation

that Duolingo-style sessions aid durable retention of Arabic letterforms and their associated sounds?

Objectives

- To review and synthesise existing literature on Duolingo's effectiveness for script and alphabet acquisition, with particular attention to non-Latin writing systems.
- To conduct a systematic thematic analysis of publicly available learner discourse concerning Duolingo's Arabic alphabet instruction, triangulated against the literature.
- To examine, through the combined lens of memory and forgetting-curve research, Cognitive Load Theory, and Self-Determination Theory, whether short daily practice sessions of the kind Duolingo encourages are theoretically well suited to retaining the Arabic alphabet.

Significance

This paper contributes original value in two respects. First, it brings together two strands of literature not often considered jointly: research on Duolingo and comparable gamified applications, and research on the orthographic and phonemic complexity of Arabic script specifically. Second, and more substantially than prior reviews of this topic, it systematically analyses a large corpus of independent, naturally occurring learner discourse using an established qualitative methodology, providing an evidential base considerably broader than the comparatively small number of published empirical studies addressing Duolingo and Arabic directly. The resulting synthesis is intended to be useful to English-speaking learners weighing whether a popular, low-cost application can realistically support their transition into Arabic literacy, and to educators and curriculum designers assessing Duolingo's suitability as a supplementary resource in formal and informal Arabic instruction.

Theoretical Framework

This review is structured around three complementary theoretical perspectives, each corresponding to a distinct dimension of the research questions.

The Forgetting Curve and Spaced Repetition Theory

Ebbinghaus's (1885) classic work on the forgetting curve demonstrates that memory retention decays predictably over time in the absence of further exposure, and that spaced repetition and overlearning meaningfully slow this decay. Woźniak (1999) extends this into practical instructional design, arguing for breaking content into simple, visually supported question-and-answer units to optimise consolidation, a description mapping closely onto Duolingo's own exercise format. Kang (2016) and Metsämuuronen (2013) further demonstrate that spaced intervals and repeated testing produce more durable learning outcomes than massed practice. Applied to Arabic alphabet acquisition, this framework predicts that Duolingo's short, frequent, repetition based sessions should, in principle, support comparatively durable retention of letterforms and sounds, at least for as long as practice continues; it offers no direct guarantee, however, about retention following an extended interruption in practice.

Cognitive Load Theory and Script Complexity

Cognitive Load Theory (Sweller, 1988, 2011) proposes that working memory has limited capacity and that instructional design should minimise extraneous cognitive load so that capacity remains available for building durable schema. Applied to Arabic, the script's positional letterform variation (whereby a single letter may take up to four distinct visual

forms depending on its position within a word), combined with an unfamiliar right-to-left directional convention and the non-representation of short vowels, constitutes a substantially heavier extraneous load than that imposed by vocabulary acquisition within an already-known alphabet. This framework predicts that an instructional approach failing to isolate and explicitly teach positional letterform variation, rather than allowing it to be inferred incidentally through whole-word exposure, risks overloading working memory capacity that would otherwise be available for building genuine, independent decoding schema.

Self-Determination Theory and Gamified Motivation

Self-Determination Theory (Deci & Ryan, 1985, 2000) proposes that sustained motivation depends on the satisfaction of three basic psychological needs: autonomy, competence, and relatedness. Duolingo's gamified design, streaks, badges, competitive leagues, and immediate feedback, can be understood as targeting the competence and relatedness needs directly, providing frequent, low-stakes markers of progress that sustain engagement over time (Tiara et al., 2021). This framework offers a plausible account of why Duolingo sustains daily practice more effectively than many alternative resources, independent of the separate question of whether that sustained practice is pedagogically well-targeted at the specific demands of Arabic script acquisition identified in Section 2.2.

Integrated Model

These three frameworks address complementary questions: spaced repetition theory addresses whether frequent short sessions support retention in principle; Cognitive Load Theory addresses whether Duolingo's specific instructional design manages the extraneous load Arabic script imposes; and Self-Determination Theory addresses why learners persist with the application at all. A plausible account of Duolingo's suitability for Arabic script acquisition therefore requires all three questions to be answered favourably, sustained motivation alone does not guarantee well-targeted cognitive load management, and well-managed cognitive load in principle does not guarantee sustained motivation in practice. This tripartite structure is used in Sections 5 and 6 to interpret both the literature review and the discourse corpus.

Literature Review

The Structure and Complexity of Arabic Script

Arabic script is used not only for Arabic itself but also for several other languages, including Farsi, Pashto, Sorani, and Urdu. It is written in a cursive format from right to left and makes no distinction between upper and lower case. The script comprises twenty-eight consonantal letters, three of which, alif, wāw, and yā, also function as long vowels in particular contexts, while short vowels are not represented within the core alphabet at all. Many letters are grouped by shared base shapes, distinguished only by the placement of dots above or below that shape, and additional orthographic elements, vowel markers, variant spellings, phonetic markers, and the consonant hamza, add further complexity, even though some of these features are optional and infrequently used in everyday writing. At the same time, Arabic is considered a highly phonemic script, in that its letters closely and consistently represent the sounds they convey (Lebanese Arabic Institute, n.d.; Ryding, 2014). This combination, a comparatively transparent sound-symbol relationship paired with positional letterforms and an unfamiliar directional convention, frames much of what follows: Arabic may be more learnable than its reputation suggests in terms of phonemic consistency, but the visual and structural demands of the script remain substantial for a first-time learner, precisely the demands identified in Section 2.2 as constituting extraneous cognitive load.

Technology-Assisted Literacy Education More Broadly

The growth of smartphones and tablets has reshaped how learners engage with literacy education both inside and outside the classroom, with numerous literacy-focused applications now available through Android and Apple app stores. Research from Australia indicates that such applications can produce positive outcomes in early education, including improved reading skills and heightened engagement, provided the tools are designed around sound educational theory and game-based principles, with careful attention paid to learner interaction, content delivery, and structured guidance (McKenzie et al., 2018). This sets a general standard against which more script-specific applications, including those for Arabic, might reasonably be judged.

Duolingo and Gamified Language Applications

Mobile-assisted language learning applications have substantially reshaped self-directed study, with both free and paid tools offering immediate access to structured lessons. Duolingo has emerged as one of the most popular of these tools, and prior research indicates that it enhances vocabulary acquisition while fostering learner motivation, in part by reducing anxiety and making study sessions more enjoyable (Tiara et al., 2021), a finding directly consistent with the Self-Determination Theory account outlined in Section 2.3.

Alphabet Acquisition through Digital Tools

Research into alphabet acquisition through digital applications more generally shows encouraging outcomes. Bose (2019) examined a touch-based application designed to help dyslexic children learn Hindi script, finding that the intervention reduced the time needed to master each letter from several weeks to approximately one week. Rahayu et al. (2021) similarly found that an augmented reality application improved first-grade students' engagement and comprehension when learning the alphabet, underscoring the value of visual and interactive elements in early literacy instruction. Safar et al. (2016) found comparable benefits for English alphabet acquisition among preschoolers, with an augmented-reality experimental group significantly outperforming a traditionally instructed control group on letter-mastery outcomes. Notably, Hindi's abugida structure and English's Latin alphabet both lack Arabic's positional letterform variation, a distinction returned to in Section 6.

Arabic-Specific Technology Research

Arabic learning presents distinctive challenges arising from script complexity and, historically, limited technological integration in instructional contexts. Studies report a widespread perception that Arabic is difficult to master, alongside the view that technology-based teaching methods could enhance both teacher and student motivation; at the same time, research also points to a gap in technological expertise among Arabic language instructors relative to their English-teaching counterparts, which may constrain how readily such tools are adopted in formal settings (Keshav et al., 2022; Mohd et al., 2019). More targeted interventions have nonetheless shown measurable benefits: AlNajdi (2018) found that a blended learning environment combining digital and traditional methods produced measurable improvements in reading, writing, and pronunciation of Arabic letters among primary school learners, while Al Hejaili and Newbury (2021) found that a gamified touchscreen application, featuring a progress meter, badges, and interactive exercises, supported both motivation and comprehension of Arabic characters among young learners. Abusafia (2013) similarly identified persuasive-technology design models as effective in promoting engagement and memorisation of Arabic characters among young learners. Notably, several of these successful interventions (AlNajdi, 2018; Al Hejaili & Newbury,

2021) incorporated explicit writing or production components alongside recognition-based exercises, a design feature returned to in Section 5.

Duolingo and Arabic Specifically

A smaller body of research has examined Duolingo's role in teaching Arabic specifically. Ritonga et al. (2022) noted the platform's potential for introducing vocabulary and script recognition, but emphasised its limitations in fostering spoken fluency, particularly among adult learners, an important caveat given that script recognition and conversational fluency draw on different skills. Other studies report more straightforwardly positive outcomes for vocabulary specifically: Yazid et al. (2023) and Febriani (2022) both found notable gains in Arabic vocabulary acquisition and learner motivation among students using Duolingo in secondary and tertiary education settings. Taken together, this strand of research suggests that Duolingo's strengths for Arabic may lie more in vocabulary support than in the deeper work of script mastery, a distinction that recurs, considerably amplified, in the discourse corpus analysed in Section 5.

Memory, Repetition, and the Forgetting Curve

The theoretical foundations of repetition and spaced study underpin much of the literature on alphabet learning more broadly. Thornbury (2011) highlights memorisation as a central, if often overlooked, aspect of language learning, particularly for alphabet acquisition, where sound-symbol associations must be internalised before they can be applied fluently. As detailed in Section 2.1, Ebbinghaus's (1885) forgetting curve, Woźniak's (1999) instructional principles, and the spaced-testing literature (Kang, 2016; Metsämuuronen, 2013) collectively support the theoretical expectation that an application built around frequent, short, repeated exposure should be comparatively well suited to alphabet retention, at least during the period of active use.

Methodology

Design

This study employed a two-strand qualitative design comprising (a) a systematic review of scholarly literature on Arabic script complexity, technology-assisted alphabet acquisition, and memory science, and (b) a netnographic thematic analysis (Kozinets, 2002, 2015) of publicly available, anonymised discussion threads concerning Duolingo's Arabic alphabet instruction, drawn from language-learning online communities. Netnography was selected because learners discuss the specific, practical question motivating this review, whether Duolingo alone suffices for Arabic script acquisition, candidly and at length in public forums, generating a naturally occurring dataset considerably larger and more varied than the small number of published empirical studies addressing this question directly.

Data Sources and Anonymisation

The discourse corpus comprised publicly accessible threads in which participants discussed their direct experience using Duolingo's Arabic alphabet module, compared it against alternative resources, and offered advice to other learners facing the same question. All usernames have been replaced with non-identifying descriptors, and no verbatim text exceeding conventional fair-use limits is reproduced; all reported content is paraphrased and thematically synthesised rather than quoted directly. Consistent with ethical guidelines for research using publicly available online data (British Psychological Society, 2021; Kozinets, 2015), because the platforms concerned are openly accessible without membership approval and no attempt was made to interact with, survey, or identify individual contributors, the

analysis is treated as analogous to the study of publicly archived text rather than as direct human-subjects research.

Analytic Procedure

The discourse corpus was analysed using Braun and Clarke's (2006) six-phase thematic analysis procedure: familiarisation, initial coding, searching for themes, reviewing themes, defining and naming themes, and producing the final analysis. Coding was conducted deductively against the three theoretical constructs specified in Section 2 (spaced repetition and retention, cognitive load and positional letterform complexity, and gamified motivation), while remaining open to inductively emergent themes not fully anticipated by the framework, most notably those relating to handwriting and production practice.

Trustworthiness

Trustworthiness was addressed following Lincoln and Guba's (1985) criteria. Credibility was supported through triangulation between the scholarly literature reviewed in Section 3 and the independently derived discourse corpus. Dependability was supported through systematic, documented application of the Braun and Clarke (2006) coding procedure. Confirmability was supported by explicitly separating deductive, framework-derived codes from inductively emergent codes. Transferability remains limited by the self-selected, non-random nature of forum participation, a limitation discussed further in Section 6.4.

Results and Discussion

Thematic analysis of the discourse corpus produced five themes, each interpreted in relation to the theoretical framework and the literature reviewed in Section 3.

Theme 1: Perceived Inefficiency of the Dedicated Alphabet Module Relative to Integrated, In-Course Letter Exposure

A recurring, structurally specific theme concerned dissatisfaction with the design of Duolingo's separate alphabet module relative to the main course. Several participants described reaching a point at which the dedicated alphabet section offered only repeated exposure to a small subset of already-mastered letters, while the main course had progressed to introduce additional letters not yet covered in the alphabet module, creating a disjointed and duplicative learning experience. Other participants, by contrast, reported that letters and their sounds were reintroduced continuously throughout the main course itself, arguing that the dedicated alphabet module was therefore unnecessary to complete in full and could reasonably be abandoned once basic recognition had been established. This divergence in reported experience, plausibly reflecting differences in when different participants encountered the course, given a described platform update intended to better integrate the two components, indicates persistent structural inconsistency in how letterform instruction is sequenced within the application, a finding not previously documented in the published literature reviewed, which addresses Duolingo's Arabic content only at the level of aggregate vocabulary or fluency outcomes rather than internal course architecture.

Theme 2: The Primacy of Handwriting and Production Practice over Passive Recognition

A theme raised with considerable consistency and force across the corpus was the perceived necessity of handwriting practice, physically producing letterforms by hand, as a complement to, or substitute for, purely recognition-based digital exercises. Multiple participants argued that combining handwriting with spoken repetition produced

considerably faster and more durable mastery than tapping pre-supplied answer options on a screen, and several explicitly recommended supplementing or replacing Duolingo's alphabet module with dedicated handwriting-focused resources that demonstrate stroke order and direction. This theme is directly consistent with the successful interventions reviewed (AlNajdi, 2018; Al Hejaili & Newbury, 2021), several of which incorporated explicit writing or production components, and offers a plausible account, framed in Cognitive Load Theory terms, for why recognition-only digital exercises may be insufficient: producing a letterform by hand requires active reconstruction of its visual structure, a deeper level of processing than selecting a correct option from a multiple-choice array, and may therefore build more robust schema for encoding positional letterform variation.

Theme 3: Scepticism Regarding Positional Letterform Instruction

Closely related to Theme 2, a distinct and frequently voiced theme concerned specific scepticism about whether Duolingo adequately taught the systematic changes Arabic letters undergo depending on their position within a word (isolated, initial, medial, or final form). Participants described the application's approach to this feature as insufficiently explicit, arguing that letters were encountered in their various positional forms within whole words without the underlying pattern being directly taught, leaving learners to infer the system incidentally rather than acquiring it as an explicit, transferable rule. This theme provides direct, independent corroboration of the Cognitive Load Theory prediction outlined: without explicit instruction isolating positional variation as a distinct, learnable pattern, working memory capacity may be consumed reconstructing this pattern independently for each new word encountered, rather than applying an already-internalised general rule, a considerably heavier extraneous load than that imposed by scripts lacking this feature (Bose, 2019; Safar et al., 2016).

Theme 4: A Bifurcation between Vocabulary-Level and Script-Level Competence

A fourth theme, corroborating the distinction identified in the scholarly literature (Ritonga et al., 2022; Yazid et al., 2023), was a clear bifurcation in participant testimony between Duolingo's perceived usefulness for vocabulary acquisition and reading practice, generally described favourably, and its perceived usefulness for foundational script mastery specifically, described considerably less favourably and, in several cases, characterised as inefficient to the point of being counterproductive relative to time invested. Several participants who reported extensive prior familiarity with Arabic, including at least one describing prior professional linguistic training, characterised the standalone value of the platform's script instruction as minimal once vocabulary and grammar content were factored out, while other participants with no prior exposure reported that the same course content had, over a period of weeks, supported them in developing functional reading ability. This divergence suggests that Duolingo's alphabet instruction may function adequately as a review or consolidation tool for learners who have already been exposed to basic letterform recognition through another resource, while functioning less adequately as a true first point of entry into an entirely unfamiliar script, precisely the distinction anticipated by the Cognitive Load Theory framework's emphasis on the difference between building new schema and consolidating existing schema.

Theme 5: An Informally Derived Heuristic for Rapid, Structured Script Acquisition

A final, striking theme was the frequent, largely convergent claim that isolated Arabic script recognition, distinct from broader language competence, could be acquired within a remarkably short period, commonly cited as a matter of days to at most a few weeks,

provided the learner engaged in focused, structured practice using dedicated script-learning resources rather than a general-purpose vocabulary application. This claim was accompanied by a broadly shared recommendation strategy: complete dedicated script instruction rapidly and intensively using resources other than Duolingo's alphabet module, then proceed to Duolingo's main course, or a comparable vocabulary resource, for subsequent vocabulary and grammar development. This corpus-derived heuristic stands in some tension with Duolingo's own considerably slower, integrated pedagogical pacing, in which letterform instruction is distributed gradually across the full length of the course rather than front-loaded and completed rapidly, and suggests a potential mismatch between the platform's default pacing and what a substantial proportion of its own user base regards, based on direct experience, as the more efficient sequencing for this specific sub-task.

Summary of Thematic Convergence with the Literature

Table 1 summarises the mapping between identified themes, the theoretical framework, and the supporting literature.

Theme	Theoretical construct	Supporting literature
1. Alphabet module structural inefficiency	Cognitive load (sequencing)	Not previously documented in reviewed literature
2. Primacy of handwriting/production	Cognitive load (depth of processing)	AlNajdi (2018); Al Hejaili & Newbury (2021)
3. Positional letterform scepticism	Cognitive load (extraneous load)	Lebanese Arabic Institute (n.d.); Ryding (2014)
4. Vocabulary/script bifurcation	Cognitive load vs. schema consolidation	Ritonga et al. (2022); Yazid et al. (2023)
5. Rapid structured acquisition heuristic	Spaced repetition, intensity vs. distribution	Ebbinghaus (1885); Kang (2016)

Four of the five themes show clear convergence with, or direct extension of, findings already present in the scholarly literature; Theme 1 represents a structural, course-design observation not previously documented in the published research reviewed here, illustrating the value of triangulating the formal literature against independent learner discourse.

Read together, the literature and the discourse corpus analysed here suggest a considerably more detailed and, in places, more critical answer to the two questions framing this paper than the scholarly literature alone would support.

Spaced Repetition and Gamified Motivation

On the question of whether Duolingo's design is theoretically well matched to alphabet learning in principle, the evidence remains reasonably encouraging. Studies of comparable gamified, repetition-based applications report strong outcomes for alphabet and character acquisition across several scripts (Bose, 2019; Rahayu et al., 2021; Safar et al., 2016), consistent with the broader memory-science literature on spaced repetition and repeated testing (Ebbinghaus, 1885; Kang, 2016; Metsämuuronen, 2013; Woźniak, 1999). The Self-Determination Theory account of gamified motivation (Deci & Ryan, 1985) is likewise corroborated by the discourse corpus: no participant in the corpus disputed that Duolingo was engaging or that its streak and reward system encouraged sustained daily practice, a finding entirely consistent with prior research on learner motivation and Duolingo (Tiara et al., 2021).

The Central Complication: Cognitive Load and Positional Letterforms

The more significant complication, substantially amplified by the discourse corpus relative to what the scholarly literature alone indicates, concerns Cognitive Load Theory's prediction regarding positional letterform variation. Themes 2 and 3 provide direct, independently generated corroboration that Arabic's positional letterform system, absent explicit instruction and handwriting practice, imposes an extraneous cognitive load that Duolingo's recognition-only exercise format may not adequately manage. This finding extends, with considerably more specificity and evidential weight, the general caution raised by Ritonga et al. (2022) regarding Duolingo's limitations for Arabic, and helps explain why the successful Arabic-specific interventions reviewed in Section 3.5 (AlNajdi, 2018; Al Hejaili & Newbury, 2021) incorporated explicit writing or production components rather than relying on recognition exercises alone.

Vocabulary Support versus Foundational Script Literacy

Theme 4's bifurcation between vocabulary-level and script-level competence, corroborating Ritonga et al. (2022), Yazid et al. (2023), and Febriani (2022), suggests that Duolingo's genuine strength lies in vocabulary support for learners who already possess basic script recognition, rather than in serving as a true first point of entry into an entirely unfamiliar writing system. Theme 5's corpus-derived heuristic, that rapid, focused, dedicated script instruction should precede rather than run concurrently with general vocabulary study, offers a plausible, empirically grounded resolution to this tension: it suggests that Duolingo's pacing may be genuinely well-suited to its own stated strength (distributed vocabulary and grammar acquisition) while being poorly suited to the discrete, front-loadable task of initial script acquisition, a task better addressed through a distinct, more intensive, and shorter period of dedicated instruction using handwriting-focused resources.

Limitations

Several limitations qualify these findings. The discourse corpus, while extensive, derives from self-selected forum participants and may over-represent particularly engaged, frustrated, or vocal community members, a limitation inherent to netnographic methods generally (Kozinets, 2015). Neither the discourse corpus nor the scholarly literature reviewed here provides objectively measured retention or reading-accuracy data; both remain self-report in nature. Additionally, this review does not constitute a controlled empirical test of the discussion questions posed in Section 1.2, and the conclusions drawn should be understood as a theoretically and evidentially grounded discussion rather than a definitive empirical resolution.

Conclusion

This review brought together research on Arabic script complexity, technology-assisted alphabet learning, and the cognitive science of memory with a systematic thematic analysis of independent, naturally occurring learner discourse, interpreted through an integrated framework combining spaced repetition theory, Cognitive Load Theory, and Self-Determination Theory. The findings indicate that Duolingo's gamified, repetition-based design is well aligned with established principles of spaced learning and motivation, and is associated, both in the published literature and in learner testimony, with strong vocabulary gains. However, both the scholarly literature and, considerably more emphatically, the discourse corpus indicate that Duolingo's capacity to independently teach Arabic's positional letterform system, absent explicit instruction and handwriting practice, is limited. For learners seeking an accessible, motivating introduction to Arabic vocabulary and grammar,

Duolingo offers a genuinely valuable resource; for learners seeking independent script literacy as a foundational first step, the evidence reviewed here supports a hybrid approach: intensive, focused, handwriting-supported script instruction using dedicated resources, followed by, or run alongside, Duolingo's main course for subsequent vocabulary and grammar development.

Future Research Directions

Future research should move beyond discourse analysis and published outcome studies to controlled, empirical comparison of script-acquisition trajectories among learners using Duolingo alone, learners using dedicated handwriting-focused script resources alone, and learners using a hybrid sequence of the kind suggested by Theme 5, measuring both initial recognition accuracy and retention following an extended interruption in practice, directly testing the forgetting-curve-derived prediction discussed in Section 2.1. Further research should also examine whether explicit, isolated instruction in positional letterform variation, delivered as a discrete module prior to whole-word exposure, improves outcomes relative to Duolingo's current incidental, in-context approach, directly testing the Cognitive Load Theory account developed in Section 6.2. Finally, given that this review's discourse corpus was not exhaustively representative, future work might usefully employ a more systematic, platform-diverse sampling strategy, potentially combined with direct survey or interview methods, to validate and extend the five themes identified here.

Declaration

No financial incentives were offered to or received by the author in connection with this study. All forum data have been anonymised, and no identifying information is reported. Publicly available online discourse was analysed in accordance with ethical guidelines for internet-based research (British Psychological Society, 2021; Kozinets, 2015).

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