International Journal of Education, Social Science & Humanities.
Finland Academic Research Science Publishers
ISSN: 2945-4492 (online) | (SJIF) = 8.09 Impact factor
Volume-14| Issue-11| 2026 Published: |22-11-2026|

ENGLISH TEACHERS, ACADEMIC LYCEUM OF UZBEKISTAN STATE WORLD LANGUAGES UNIVERSITY

Impact of Game-Based Learning on Long-Term Vocabulary Retention among EFL Learners

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Abstract

Background. Game-based learning (GBL), including digital games, educational apps, gamified quiz platforms, and classroom language games, is increasingly used to teach vocabulary to learners of English as a foreign language (EFL). Most studies report immediate gains, but far fewer examine whether words learned through play are retained weeks or months later. **Purpose.** This structured narrative review synthesizes theoretical and empirical research to ask (RQ1) whether game-based learning improves EFL vocabulary retention beyond the immediate post-test; (RQ2) which cognitive and motivational mechanisms explain durable learning in games; and (RQ3) which learner, game, and instructional factors moderate long-term retention. **Method.** Foundational theoretical works, meta-analyses, and empirical studies on digital game-based vocabulary learning, gamification, and memory research were purposively selected, screened against explicit inclusion criteria, and analyzed thematically. **Results.** Four themes emerged: (a) games produce reliable short-term vocabulary gains, but evidence from delayed post-tests is limited and shows partial decay; (b) retention depends on built-in repetition, spaced encounters, and retrieval practice rather than on game play as such; (c) motivation, engagement, and flow sustain the time on task that retention requires, although novelty effects can inflate short-term results; and (d) game type, proficiency, cognitive load, and the presence of teacher-led follow-up moderate outcomes. **Conclusion.** A four-stage framework (prepare, play, retrieve, recycle) is proposed that embeds games in a spaced cycle of review, with implications for teachers and a research agenda centered on delayed testing.

Keywords

game-based learning; gamification; vocabulary retention; long-term memory; EFL; spaced repetition; retrieval practice; motivation.

Аннотация

International Journal of Education, Social Science & Humanities.
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Актуальность. Обучение на основе игр (game-based learning, GBL), включая цифровые игры, образовательные приложения, геймифицированные платформы для викторин и языковые игры на занятиях, всё шире применяется для обучения лексике изучающих английский как иностранный язык (EFL). Большинство исследований фиксируют немедленный прирост знаний, однако значительно меньше работ проверяют, сохраняются ли слова, усвоенные в игре, спустя недели или месяцы. **Цель.** В данном структурированном нарративном обзоре обобщаются теоретические и эмпирические исследования и рассматриваются следующие вопросы: (RQ1) способствует ли обучение на основе игр долговременному сохранению лексики за пределами немедленного посттеста; (RQ2) какие когнитивные и мотивационные механизмы объясняют прочное усвоение в играх; (RQ3) какие факторы, связанные с учащимися, играми и организацией обучения, влияют на долговременное сохранение. **Метод.** Фундаментальные теоретические работы, метаанализы и эмпирические исследования по цифровому игровому обучению лексике, геймификации и психологии памяти были целенаправленно отобраны, проверены на соответствие чётким критериям включения и проанализированы тематически. **Результаты.** Выделены четыре темы: (а) игры дают устойчивый краткосрочный прирост лексики, однако данных отсроченных посттестов немного, и они указывают на частичное забывание; (б) сохранение зависит от встроенного повторения, распределённых во времени встреч со словом и практики извлечения, а не от игры как таковой; (в) мотивация, вовлечённость и состояние потока поддерживают время работы с материалом, необходимое для сохранения, хотя эффект новизны может завышать краткосрочные результаты; (г) тип игры, уровень владения языком, когнитивная нагрузка и наличие последующей работы под руководством преподавателя выступают модераторами результатов. **Выводы.** Предложена четырёхэтапная модель (подготовка, игра, извлечение, повторение), встраивающая игры в распределённый цикл повторения, а также представлены рекомендации для преподавателей и программа исследований с акцентом на отсроченное тестирование.

Ключевые слова

обучение на основе игр; геймификация; сохранение лексики; долговременная память; EFL; интервальное повторение; практика извлечения; мотивация.

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INTRODUCTION

Vocabulary is the foundation of every language skill, yet it is also the component learners most quickly forget. EFL learners often memorize word lists for a test and lose much of that knowledge within weeks, a pattern long described by the forgetting curve (Ebbinghaus, 1885/1913). Researchers estimate that a word must be met many times, in varied contexts, before it becomes part of a learner's lasting lexicon (Nation, 2013; Webb, 2007). Game-based learning, defined here as the use of digital or non-digital games, and of game elements such as points, levels, and challenges, for instructional purposes (Deterding et al., 2011; Reinhardt, 2019), has attracted attention as a way to provide this repeated, engaging exposure.

1.1 Theoretical background

Several perspectives explain why games might support durable vocabulary learning. Memory research shows that spacing encounters over time (Cepeda et al., 2006) and actively retrieving information rather than re-reading it (Roediger & Karpicke, 2006; Karpicke & Roediger, 2008) produce markedly better long-term retention. Many games build in exactly these features: repeated rounds, levels that recycle earlier content, and questions that require recall. The involvement load hypothesis adds that words are retained better when tasks create need, search, and evaluation (Laufer & Hulstijn, 2001), conditions that game challenges can supply.

Motivational theories form the second strand. Self-determination theory holds that learning is sustained when it satisfies needs for autonomy, competence, and relatedness (Ryan & Deci, 2000), and flow theory describes the deep absorption that arises when challenge matches skill (Csikszentmihalyi, 1990). Gee (2003) argued that well-designed games embody sound learning principles, such as immediate feedback and graduated difficulty. Finally, cognitive load theory cautions that game mechanics can compete with language for limited working memory (Sweller, 1988).

1.2 Previous research and gap

Empirical research on game-based vocabulary learning has grown rapidly. Meta-analyses report moderate to large positive effects of digital games on L2 vocabulary (Chen et al., 2018; Tsai & Tsai, 2018), and reviews map a widening range of games, platforms, and learner groups (Hung et al., 2018; Zou et al., 2021). Studies of commercial games played outside school also link gaming to larger English vocabularies (Sundqvist & Wikström, 2015; Sundqvist, 2019). However, most experimental studies measure learning immediately after the intervention. Delayed post-tests, which show whether words are actually retained, are used far less often, and reviews have repeatedly called for them (Hung et al., 2018; Zou et

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al., 2021). As a result, teachers know that games can raise immediate scores but have little guidance on how to make that learning last.

1.3 Purpose and research questions

This article synthesizes the literature to address three research questions:

RQ1. Does game-based learning improve EFL learners' vocabulary retention beyond the immediate post-test?

RQ2. Which cognitive and motivational mechanisms explain durable vocabulary learning in games?

RQ3. Which learner, game, and instructional factors moderate long-term retention?

METHODOLOGY

2.1 Design

This study is a structured narrative review with a thematic synthesis. It does not report new primary data. A narrative design was chosen because the research questions span memory, motivation, and instructional design, which are studied with heterogeneous methods (experimental, quasi-experimental, meta-analytic, survey, and conceptual) that cannot be pooled statistically. Reporting was informed by the transparency principles of the PRISMA 2020 statement (Page et al., 2021), although the review is not a formal systematic review.

2.2 Sources and search strategy

Sources were purposively selected from the established literature rather than retrieved through an exhaustive database search. Selection targeted foundational theory, meta-analyses, and influential empirical studies published in journals such as *Computers & Education*, *Computer Assisted Language Learning*, *Language Learning & Technology*, *System*, *British Journal of Educational Technology*, and *Applied Linguistics*, and in major academic books. Topics guiding selection were *game-based learning*, *digital game-based language learning*, *gamification*, *vocabulary acquisition*, *delayed post-test*, *spaced repetition*, and *retrieval practice*. Because selection was purposive, the review may under-represent recent or non-English-language studies (see Limitations).

2.3 Inclusion and exclusion criteria

Criterion	Included	Excluded
Intervention	Digital or non-digital games, game-based apps, and gamified platforms used for vocabulary learning	Instruction with no game or game elements
Learners	Second or foreign language learners of English (adolescent and adult); general memory	First-language vocabulary development; very young

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Criterion	Included	Excluded
	research with adult participants	children
Focus	Vocabulary outcomes, especially delayed retention; mechanisms of learning; design and moderating factors	Studies reporting only attitudes with no link to learning
Type	Peer-reviewed articles, meta-analyses, systematic and scoping reviews, theoretical books	Non-scholarly opinion pieces, commercial product descriptions

2.4 Analysis

Included works were read in full and coded for (a) the type of game or gamified activity, (b) vocabulary outcome measures and test timing (immediate or delayed), (c) features related to repetition, spacing, and retrieval, (d) learner characteristics, and (e) reported outcomes. Codes were grouped into themes following the six-phase approach to thematic analysis (Braun & Clarke, 2006): familiarization, initial coding, theme search, theme review, theme definition, and reporting. Themes were then mapped onto the three research questions.

RESULTS

Thematic analysis produced four themes, summarized in Table 1 and elaborated below.

Table 1. *Themes derived from the reviewed literature*

Theme	Core finding	Representative sources	Research question
1. Short-term gains, uncertain retention	Games reliably raise immediate vocabulary scores; delayed evidence is scarce and shows partial decay	Chen et al. (2018); Tsai & Tsai (2018); Wouters et al. (2013)	RQ1
2. Repetition, spacing, and retrieval	Durable learning comes from recycled encounters and active recall built into play	Cepeda et al. (2006); Karpicke & Roediger (2008); Laufer & Hulstijn (2001)	RQ1, RQ2
3. Motivation and engagement	Enjoyment and flow sustain time on task, but novelty can inflate early results	Ryan & Deci (2000); Csikszentmihalyi (1990); Hamari et al. (2014)	RQ2
4. Moderating factors	Game type, proficiency, cognitive load, and teacher-led follow-up shape retention	deHaan et al. (2010); Sweller (1988); Clark et al. (2016)	RQ3

3.1 Theme 1: Short-term gains, uncertain retention (RQ1)

The evidence that games improve vocabulary scores in the short term is consistent. Meta-analyses of digital game-based vocabulary learning report

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moderate to large effects compared with non-game instruction (Chen et al., 2018; Tsai & Tsai, 2018). Broader meta-analyses of serious games likewise find advantages for both learning and retention over conventional instruction (Clark et al., 2016; Wouters et al., 2013). Studies of out-of-school gaming add correlational evidence: adolescents who played commercial English-language games frequently scored higher on vocabulary tests than those who played little (Sundqvist & Wikström, 2015; Sundqvist, 2019).

Evidence on long-term retention is much thinner. Reviews of digital game-based language learning note that most interventions are short and that delayed post-tests are uncommon (Hung et al., 2018; Zou et al., 2021). Where delayed tests are used, scores typically fall from the immediate post-test, although game groups often keep an advantage over comparison groups (deHaan et al., 2010; Wouters et al., 2013). The current literature therefore supports a cautious conclusion: games can produce retention, but how much and for how long remains under-researched.

3.2 Theme 2: Repetition, spacing, and retrieval (RQ1, RQ2)

The features that explain lasting learning in games are the same features that explain lasting learning elsewhere. Distributed practice consistently outperforms massed practice on delayed tests (Cepeda et al., 2006), and repeated retrieval strengthens memory far more than repeated study (Karpicke & Roediger, 2008; Roediger & Karpicke, 2006). In vocabulary research, the number of encounters with a word strongly predicts whether it is learned (Webb, 2007; Nation, 2013). Games that recycle words across levels, require learners to recall rather than recognize, and return to items after a delay apply these principles. Games that present each word once, however enjoyably, do not.

The involvement load hypothesis offers a related explanation. Tasks that create a need for a word, require learners to search for its meaning, and ask them to evaluate its use lead to better retention (Laufer & Hulstijn, 2001). Game challenges that make success depend on understanding a word raise involvement; games in which words are decorative to the mechanics do not.

3.3 Theme 3: Motivation and engagement (RQ2)

Motivation matters for retention mainly because it increases exposure. Games that support autonomy, competence, and relatedness (Ryan & Deci, 2000), and that keep challenge matched to skill (Csikszentmihalyi, 1990), encourage learners to play longer and to return voluntarily. That extra time on task brings more encounters and more retrieval. Gamified platforms such as Kahoot! have been reported to improve classroom engagement and attitudes as well as learning (Wang & Tahir, 2020).

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The literature also identifies a risk. Positive effects of gamification depend on context and users, and some benefits may reflect novelty that fades over time (Hamari et al., 2014; Wang & Tahir, 2020). Meta-analytic results for gamification show small but positive effects on cognitive outcomes (Sailer & Homner, 2020). Because novelty influences immediate tests more than delayed ones, studies without delayed testing may overstate the lasting value of games.

3.4 Theme 4: Moderating factors (RQ3)

Four groups of moderators recur. First, **game type and design**: games in which vocabulary is central to play, with feedback and repeated exposure, appear more effective than games in which language is incidental (Chen et al., 2018; Godwin-Jones, 2014). Second, **cognitive load**: highly interactive games can divide attention between mechanics and language. In one study, students who watched a music video game recalled more vocabulary than students who played it (deHaan et al., 2010), consistent with cognitive load theory (Sweller, 1988). Third, **learner proficiency**: commercial games with dense, unscaffolded text may suit advanced learners better than beginners (Sundqvist, 2019). Fourth, **instructional integration**: games are more effective when combined with other instruction, played over multiple sessions, and followed by reflection (Clark et al., 2016; Wouters et al., 2013).

DISCUSSION

4.1 Interpretation of findings

The reviewed literature indicates that game-based learning is an effective but incomplete route to long-term vocabulary retention. For RQ1, games reliably improve immediate scores, and the limited delayed-test evidence suggests that part of this advantage persists (Wouters et al., 2013). Yet the scarcity of delayed post-tests means that claims about lasting effects rest on a narrow base (Hung et al., 2018; Zou et al., 2021). For RQ2, durable learning appears to depend less on the game itself than on the memory principles a game happens to embody: repeated encounters, spaced practice, and active retrieval (Cepeda et al., 2006; Karpicke & Roediger, 2008). Motivation acts mainly as an amplifier, increasing the time learners spend on these processes (Ryan & Deci, 2000). For RQ3, game design, cognitive load, proficiency, and teacher-led integration determine whether play leads to lasting learning.

A notable pattern is that games are often treated as single events, such as a review game at the end of a unit. Memory research suggests the opposite approach: a game should be one step in a cycle of repeated, spaced retrieval. When games are

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embedded in such a cycle, their motivational strengths and the evidence on spacing and retrieval work together.

4.2 A four-stage framework for durable game-based vocabulary learning

Building on the themes above, the following framework places games inside a spaced review cycle.

Table 2. *Prepare–Play–Retrieve–Recycle framework for game-based vocabulary teaching*

Stage	Purpose	Example activities	Supporting evidence
1. Prepare	Introduce form and meaning before play to reduce cognitive load	Pre-teach 8–12 target words with images and example sentences; check pronunciation	Sweller (1988); Nation (2013)
2. Play	Create high-involvement, repeated encounters with target words	Word-based digital games, quiz platforms (e.g., Kahoot!, Quizlet), board or card games where success depends on word meaning	Laufer & Hulstijn (2001); Chen et al. (2018)
3. Retrieve	Turn recognition into recall immediately after play	Learners use words in sentences, short dialogues, or written summaries; peer quizzing without prompts	Roediger & Karpicke (2006); Swain (1985)
4. Recycle	Space later encounters to counter forgetting	Replay or new games with the same words after about 1 day, 1 week, and 1 month; delayed mini-tests	Cepeda et al. (2006); Webb (2007)

The framework follows from the evidence: pre-teaching manages cognitive load; high-involvement play provides engaging encounters; retrieval converts recognition into recall; and spaced recycling counters the forgetting curve (Cepeda et al., 2006; Laufer & Hulstijn, 2001; Roediger & Karpicke, 2006).

4.3 Practical implications

Choose games where words matter. Prefer games in which learners cannot succeed without understanding the target words, rather than games where language is decoration (Godwin-Jones, 2014; Laufer & Hulstijn, 2001).

Plan the second and third encounter. Schedule returns to the same vocabulary after a day, a week, and a month, using a different game or task each time to vary context (Cepeda et al., 2006; Webb, 2007).

Require recall, not only recognition. Follow multiple-choice games with tasks in which learners produce the words themselves (Karpicke & Roediger, 2008; Swain, 1985).

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Manage load for lower levels. Pre-teach key words and choose games with simple mechanics for beginners; reserve complex commercial games for advanced learners (deHaan et al., 2010; Sundqvist, 2019).

Test later, not just now. Use short delayed quizzes to check what learners have actually retained and to provide further retrieval practice.

4.4 Limitations

This review has several limitations. Sources were purposively selected rather than retrieved by an exhaustive systematic search, so relevant studies may be missing and selection bias is possible. The included studies vary in game type, learner population, test format, and delay length, which prevents quantitative synthesis. Much of the research involves short interventions with university students, and evidence on adolescents, low-proficiency learners, and retention beyond a few weeks is limited. Finally, the proposed framework is derived from theory and prior findings and has not been tested empirically.

4.5 Directions for future research

Future studies should test the framework in classroom experiments with immediate and multiple delayed post-tests (for example, after one week, one month, and three months); compare games with and without built-in spacing and retrieval; separate novelty effects from lasting effects through longer interventions; examine adolescent and lower-proficiency learners; and measure productive as well as receptive vocabulary knowledge. Mixed methods, such as learner interviews and gameplay logs, could show how engagement relates to the number of encounters with each word.

CONCLUSION

Game-based learning can strengthen EFL learners' long-term vocabulary retention, but only when play is built around the conditions that memory requires: repeated encounters, high involvement with word meaning, active retrieval, and spaced review. Games supply motivation and engagement that keep learners practicing; teachers supply the structure that turns that practice into lasting knowledge. By embedding games in a prepare, play, retrieve, and recycle cycle, teachers can use familiar classroom games to serve durable learning rather than short-term test scores. Classroom studies with multiple delayed post-tests, particularly with adolescent and lower-proficiency learners, are the most pressing next step for researchers.

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