The Role of Mobile Gaming Apps in Improving Vocabulary Retention among Malaysian Public Univerity ESL Learners

*[1]Azrin Raimi Bin Ahmad, [2]Nur Adibah Binti Zamri, [3]Linggi Lazarus Ak Bilong

[1,2,3]Universiti Teknologi Mara (UiTM),

*Corresponding Author

DOI: https://dx.doi.org/10.47772/IJRISS.2025.924ILEIID0040

Received: 23 September 2025; Accepted: 30 September 2025; Published: 30 October 2025

ABSTRACT

This study explores the role of mobile gaming applications in improving vocabulary retention among a Malaysian public university ESL learners, aiming to coordinate usage patterns, perceptions, and effective design features. Anchored in Mobile-Assisted Language Learning (MALL) and Game-based learning views, the framework connects types of applications, perceptions, and design that helps retention. The study addressed a few problems including the limited retention of vocabulary acquisitions under traditional drill-based practices, confidence barriers in academic assignments, and limited evidence in the local context on mobile gaming. A quantitative survey involving 150 undergraduates, chosen through stratified random sampling, combined with snowballing. Data were collected via online Likert scale questionnaire over three months and statistically analysed using IBM SPSS adopting descriptives, ANOVA, chi-square, cross-tabs, and Cronbach's Alpha. Results show the dominant in accessibility of smartphones, and mixed genres are typical, resulting repeated contextual exposure; perceived effectiveness showed positive trends for current gamers but are not statistically significant in the difference. Motivation and vocabulary self-regulation are predicted higher in a longer gameplay duration, while a positive trend is observed in enjoyment; dialogue and well-articulated objectives are deemed important, and older learners exhibit better academic transfer. In sum, through repeated, meaningful engagement, mobile gaming offers practical, realistic environment for strengthening vocabulary retention. The study suggests specific, story-driven combination and also suggests longitudinal, feature-level; trial across Malaysian tertiary learners.

Keywords: Mobile-Assisted Language Learning (MALL); Game-Based Learning (GBLL); vocabulary retention; ESL learners; mobile gaming applications.

INTRODUCTION

Game-based language learning (GBLL) has evolved abreast of the flourishing integration of mobile gadgets in ESL classrooms. Studies show that mobile-assisted vocabulary learning has become a salient area of research, with the wide utilisation of gamification to improve engagement and results in ESL classrooms (Okumuş Dağdeler, 2023). According to The Malaysian Communications and Multimedia Commission (MCMC)(2023), learning and playing through mobile gadgets are more favourable due to the advancement of the internet coverage and speed, and also the easy access of mobile gadgets. GBLL turns recreation (learners playing games with their phones) to learning as the games themselves involves a lot of repeated encounters with vocabularies, in specific context, for the learners to pick up and also practice on the go.

Regardless of policy support, many Malaysian ESL learners still find it challenging when it comes to vocabulary retention. A case study depicts that narrow vocabulary range and depending on multimedia such as game to expand lexical knowledge in meaningful situations have become the struggles for the learners (Nasaruddin & Kamalludeen, 2020). New vocabularies acquired will fade after assessments due to the classroom's time constraints, mechanical repetition and fragmented exposure. Students also struggle to manage multiple courses and their part-time job resulting in difficulties to maintain spaced practice. This has created a gap between learning and memorising, which educators are trying to find the remedies.

Overall, game-based learning approaches seem to be viable and applicable because of the strong support of technology and the growth of research base on mobile-assisted vocabulary acquisition. Thus, the study is relevant to examine how specific game features impacted retention gaps in accordance with the learners' mobile usage behaviours and learning routines.

Problem Statement

Regardless of curricular efforts, rote learning and fragmented practice are still utilised by many public university ESL learners to learn vocabulary. The learned vocabularies tend to fade after assessments, because rote learning and fragmented practice only emphasize short-term memorisation rather than sustained and meaningful encounters. This also shows limited transfer to authentic applications. Mobile-assisted learning promotes learners' better attitudes and self-control based on the accumulated evidence and this suggests that the orthodox methods underutilised motivation and time (Lei, Fathi, Noorbakhsh & Rahimi, 2022). In real world context, learners learn vocabularies in isolation, which makes them struggle to apply the words into practical language use. As a result, drill-and-test method continues, which restricts the scope of practice conditions and impairs learners' long-term retention in their daily learning routine.

Students are also uncertain to use the vocabularies in their study on-going assessments which includes assignments and also presentations, even when they knew many word forms. Thus, the gaps deteriorate grades and confidence. High-speed and wide coverage of the internet and also the easy access for smartphones open the doors for learners to practice across out-of-school settings, however, the utilisation of targeted vocabulary development is still fragmented (MCMC, 2023; DataReportal, 2023). Study loads, work loads and time to commute diminish the role of spaced practice, and accurate use of the vocabulary seldomly elicits peer feedback. Even though learners are digitally equipped, they still learn vocabularies passively, which impedes smooth recall and hinders risk-taking in academic context.

Despite the expanse of studies on mobile-game approaches to vocabulary learning are growing globally, evidence from Malaysian higher-education remains low, especially for the features of the gameplay and actual retention across time. A study by Okumuş Dağdeler (2023) investigates mobile-assisted vocabulary learning and points out gamification trends, however, the study only synthesizes international studies and not Malaysian local university context. Most of the studies in Malaysia focus on the accessibility of technology rather than the specific language learning outcomes. Consequently, learners are at risk of utilising tools without consideration of context, failing to account university timetables, language policies, and the narrative formats they prefer in games whether during daily commuting and downtime.

Overall, a retention problem that has not been solved by typical coursework are due to the sustained drill-based practices, confidence-related obstacles in learning, and limited evidence locally on mobile gaming. Therefore, to test how mobile gaming and their features impacts vocabulary retention and application to academic discourse a study on local public university students need to be conducted.

General Research Objective

The main purpose of this study is to test the role of mobile gaming applications in improving vocabulary retention among local public university ESL learners. The study aims to discover usage patterns, learners' perceptions and the impact of game design features on vocabulary learning outcomes.

Research Questions

1. What types of mobile gaming apps are typically played by learners?

2. How do learners perceive the effectiveness of these gaming apps in vocabulary retention?

3. How do game design features (interactivity, feedback, rewards) affect vocabulary retention?

LITERATURE REVIEW

Game-Based Language Learning (GBLL)

The initial idea that mobile gaming apps could provide more than just entertainment for its users, but it also opens up opportunities for it to be used as language learning tools, has resulted the introduction of Gam-Based Language Learning (GBLL) in 2019. It describes that if learners engage in interactive components, problem-solving activities, and rewards that boost their motivation to keep playing, it will strengthen the learning process. The key elements for GBLL consist of interactivity, commentary and narrative format that offer substantive language input. In the recent study, GBLL principles such as the utilisation of storylines, interactive tasks, and feedback are used by the mobile gaming apps to create an authentic context that improves vocabulary retention. Studies have exhibited that through GBLL, learners build their motivation and independence (Putri Wulantari, Rachman, Sari, & Uktolseja, 2024), improves focus during vocabulary acquisition (Chowdhury et al., 2024), and apply it in a meaningful context (Chan & Lo, 2024). These stances signal that GBLL successfully connects motivation and practice, making ESL learners to be able to gain from engaging and structured learning context.

Cognitive Load Theory (CLT)

A theory called Cognitive Load Theory (CLT), was developed in 1988 by Sweller, to illustrate how human, within the limited capacity in information processing, operates their working memory. The theory claims that by having a good working instructional design can help to lower unsignificant mental effort and maximises learning. There are three components from the theory which are intrinsic load (the complexity of the task), extraneous load (irrelevant distractions), and germane load (mental effort that supports understanding). In the recent study, the use of progressive difficulty and flash feedback to ease mental effort and improve vocabulary retention are the evidence that CLT is utilised in mobile gaming apps. Various research indicates that tasks that utilised CLT show improvement in students' performance by managing mental capacity (Chen, Liu & Huang, 2019), promote sustained vocabulary acquisition by minimising overload (Rabi'ah & Fatima, 2022), and improve focus by aligning assignments with learners' abilities (Chan & Lo, 2024). Collectively, by managing both the obstacles and availability of learning tasks have become the evidence that CLT can help mobile gaming apps to assist vocabulary learning.

Cognitive Load Theory (CLT)

A theory called Cognitive Load Theory (CLT), was developed in 1988 by Sweller, to illustrate how human, within the limited capacity in information processing, operates their working memory. The theory claims that by having a good working instructional design can help to lower unsignificant mental effort and maximises learning. There are three components from the theory which are intrinsic load (the complexity of the task), extraneous load (irrelevant distractions), and germane load (mental effort that supports understanding). In the recent study, the use of progressive difficulty and flash feedback to ease mental effort and improve vocabulary retention are the evidence that CLT is utilised in mobile gaming apps. Various research indicates that tasks that utilised CLT show improvement in students' performance by managing mental capacity (Chen, Liu & Huang, 2019), promote sustained vocabulary acquisition by minimising overload (Rabi'ah & Fatima, 2022), and improve focus by aligning assignments with learners' abilities (Chan & Lo, 2024). Collectively, by managing both the obstacles and availability of learning tasks have become the evidence that CLT can help mobile gaming apps to assist vocabulary learning.

Connection of Theories with Past Studies

A lot of past researchers combined GBLL and CLT in their studies to examine the synergy between motivational and cognitive perspectives especially in digital language learning. According to Chowdury et al. (2024), learners will interact with language meaningfully in the environments created by the GBLL, meanwhile, they are also ensured not to be overwhelmed, in utilising cognitive capacity, by the CLT. Studies also confirmed that when the three key components which are the tasks that is interactive, the feature that is story-based, and the rewards system when balanced with reduced cognitive load, can improve vocabulary retention (Rabi'ah & Fatima, 2022; Chan & Lo, 2024). The theories explain for themselves why the learners in this study exhibited enhanced

motivation, heightened self-monitoring, and more effective vocabulary retention when they are engaged in interactive and progressively designed games, especially in the context of the role of mobile gaming apps in boosting vocabulary retention among Malaysian public university students. Thus, both theories complement each other by demonstrating that mobile gaming can improve learning outcomes by balancing the engagement and cognitive efficiency.

In conclusion, the exploration of GBLL and CLT highlights how they complement each other in explaining vocabulary acquisition through mobile gaming. GBLL highlights interaction and motivation, while CLT describes how cognitive resources are managed, and synergically providing a balanced framework for comprehending how learners gain from digital tasks. A primary pattern is the consistent role of interactivity, feedback, dynamic design in reinforcing vocabulary retention. However, challenges remain in managing learner differences such as age, proficiency, and gaming experience, which may influence outcomes. Although prior studies confirm positive effects, there is still limited research in Malaysian context. This gap could be addressed in future studies by examining diverse learner groups and combining qualitative with experimental methods for clearer perspectives.

Mobile Gaming Applications in Vocabulary Learning

Mobile game-based activities can improve vocabulary learning over traditional way drills as suggested by recent studies. In a study conducted by Alhebshi and Gamlo (2023), where a mixed-methods quasi-experiment was employed with 56 Saudi students in their first year where Quizizz was utilised with pre/post-tests and interviews, reports that the students score higher in the post-test and better perceptions, including minimised cognitive load. Similarly, Suh and Ryu (2023) claim that traditional conditions are often outperformed by the game-based vocabulary learning because it promotes uplifting emotions linked to retention. Yet, persistence and delayed retention remain open questions for learning transfer because many interventions remain short-term and limited in scope.

In addition to learning gains, research highlights motivational advantages that are important to maintain vocabulary practice. A study that combined various mobile apps for one year with 139 EFL learners discovered an outcome that allow better engagement with vocabulary learning across time where the learners demonstrated improved attitudes and self-regulatory capacity (Lei et al., 2022). Further reviews demonstrate that gamified approaches help organise repetition and feedback, thereby enhancing learners' ability to recall (Okumuş Dağdeler, 2023). However, several studies rely on single platforms or instructor-selected content, which may compromise ecological validity and fail to reflect the varied narrative environments of typical commercial mobile games that the students already play.

Mobile-Based ESL Learning in the Malaysian Context

According to MCMC (2023) and DataReportal (2023), it is highly feasible for students in Malaysia to engaged in mobile-based learning beyond classrooms due to its easy access to both internet and smartphones. On the other hand, A case study was done with three Kuala Lumpur primary school students demonstrated vocabulary development via multimedia which includes video games, progresses in stages from initial contact to retention, though practice can be irregular without proper instructional support (Nasaruddin & Kamalludeen, 2020). This suggests that being able to access the technology alone will never guarantee vocabulary retention without tying the design back to learning goals, and any incidental knowledge gains may stay unclear and hard to be observed through real language assessments.

Kandasamy et al. (2021), in a quasi-experimental study with 33 Year-4 students, found that a brain-based approach produces better outcomes than the traditional approaches where it enhanced vocabulary learning and delayed retention. Another local research was conducted, utilising image-based induction activities benefits lexical range, eventhough the features were simple and limited to topics, which restricts generalisation to exam-driven secondary and tertiary contexts (Ishak & Mohd Yasin, 2022). Plus, a study by Pang et al. (2023) found that teachers have various vocabulary strategies, however, the utilisation and combination of mobile tools is uneven in their lesson plan. As a result, university contexts demand pragmatic approaches that accommodate both students' class schedules and their mobile habits.

Game Design Features and Learning Outcomes

Feedback, challenge-skill balance, and immersion are the design elements that shape how learners deal with and recall words while playing. A study that compares apps reported that different styles of feedback and task alignment resulted different profiles of vocabulary retention and focus, implying that increased gamification will never be a guarantee for better results (Chen & Cao, 2021). Similar studies found that reward systems, rankings and story-based game design can improve engagement but at the same time, it also occasionally disturbs the focus on the targeted practice when the challenges are not aligned (SAGE Open Review, 2021; Okumuş Dağdeler, 2023). Hence, a well-planned design offers repeated practice by leveraging game loops and meaningful learning context and not just when they are entertaining and novel.

Motivation and self-control are also affected by the interactivity and rewards, which are the early indicators to vocabulary retention. During the Quizizz implementation, higher post-test score and positive learner response regarding cognitive load are corresponding to the instructional design that offer fast feedback and strategic rewards system (Alhebshi & Gamlo, 2022). Another study using Mobile Assisted Language Learning (MALL) programme for one year depicted development in students' self-regulation which allows regular practice and progress tracking (Leiet al., 2022). Additionally, a study relates enhanced retention trajectories with positive emotional and interactive experiences in play (Suh & Ryu, 2023). In sum, this design elements function optimally when they facilitate memory retrieval, make goals explicit, and channel cognitive effort productively.

Overall, it is observable that there is a consistent pattern from the past studies which is mobile gaming and gamified tools enhance vocabulary retention via motivation, feedback, and contextual practice, but the results depend on the quality of the design features and also the context. Regardless these findings, studies on this in Malaysia remains scarce and predominantly short-term, hence the emergence of questions about the long-term impact and academic transfer. Many studies depend on limited samples or single-platform interventions, which limits our understanding of the interplay between game designs, learner autonomy, and curricular requirements. Thus, a study in a Malaysian tertiary setting is important to close these gaps between theories and methodologies and to suggest efficient integration strategies.

CONCEPTUAL FRAMEWORK

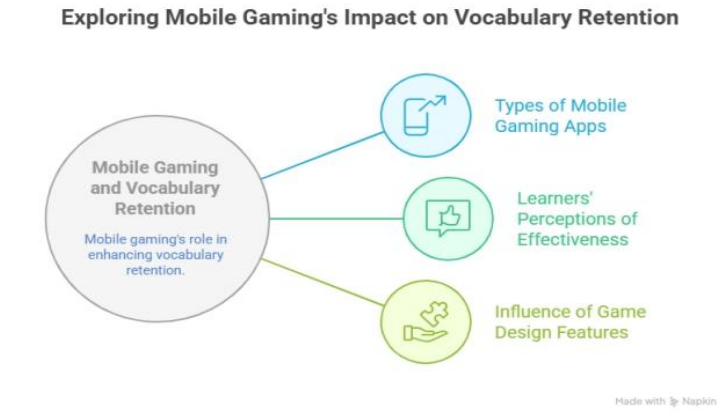

Figure 1: Conceptual Framework: Mobile Gaming Role in Enhancing Vocabulary Retention.

Figure 1 depicts the relationships among key components deduced from the research questions and past studies. Types of Mobile Gaming Apps, Learners' Perceptions and Game Design Features are put as the independent variables that influence the dependable variable which is Vocabulary Retention. The framework mirrors assumptions from MALL and GBLL models, highlighting interaction, motivation and contextual exposure central to vocabulary acquisition.

Types of Mobile Gaming Apps, which is the number one component, represents the platforms and genres learners commonly use, which dictate the linguistic input and opportunities for interaction. The second component, Learners' Perceptions, records attitudes towards the effectiveness of these apps, influencing engagement and long-term use. The third component which is Game Design Features affect motivation and cognitive processing

while playing. The features include interactivity, feedback, and rewards. All the arrows signal the directional influence towards the learning outcome which is Vocabulary Retention. Findings from past studies that connect mobile gaming to incidental vocabulary acquisition are integrated in this framework while underscoring the influence of design and perception.

This framework is in-line with the aim of this research to study how mobile gaming applications facilitate vocabulary retention among Malaysian public university ESL learners. It also becomes the guidance to analyse the factors that influence retention and also offers insights on how to effectively integrate mobile gaming in language learning.

METHODOLOGY

Research Design

This study employs a quantitative research design to study the relationship between mobile gaming applications and vocabulary retention among Malaysian public university ESL learners. This design is popularly used in ESL research because it enables researchers to objectively measure the variables and statistically analyse the patterns (Yang, 2021). In the context of this study, quantitative research design allows researchers to record numerical data on learners' gaming habits, perceptions and retention outcomes. This approach guarantees dependable outcomes that can be compared among participants, and this is crucial to identify patterns and testing hypothesis in a bigger sample size. Thus, this design supports the aim of this study which is to generate broadly applicable findings on the impact of mobile gaming on vocabulary learning.

Research Approach

A survey technique is employed for the research approach in order to collect data from a wide group of Malaysian public university students. In the area of vocabulary studies, surveys are frequently utilised as they can easily record data in a structured format on the learners' attitudes, behaviours, and self-reported experiences (Dhanyamol, 2022). Items on types of mobile games, perceived effectiveness, and design features influencing retention are included in the survey of this study. In order to reach a large population and to statistically analyse the relationship among variables, it is crucial for this study to employ this approach. As a result, it provides a clear perspective of learner practices and perceptions, shaping the interpretation of vocabulary retention results.

Sample Size and Population

This study involved 150 undergraduate ESL learners from a public university in Malaysia. The number is enough to conduct quantitative analysis and it was also similar to other studies that also examined vocabulary learning. For example, Husin, Rahim, Ali, Alzeebaree, and Bakar, (2022) conducted a study on vocabulary learning strategies and has surveyed 320 Malaysian ESL students to investigate. Meanwhile, Zhao (2021) surveyed 150 students in a study which is also on vocabulary learning strategies. Both studies advocate the medium-to-large sample sizes as a means of ensuring both representativeness and statistical validity. In the same way, this study used 150 respondents to record diverse data on gaming habits and also perceptions among faculties. The size of the sample balanced the feasibility and the generalisability, therefore enhancing the findings' validity for the target population.

Sampling Method

A stratified random sampling technique which later complemented by snowball sampling technique was applied for this research to boost responses. Stratified sampling ensured a balanced distribution across faculties, while snowballing assisted in reaching out students who share the same criteria. Such approach was also used the past. For example, Husin et al. (2022) used t to reflect population diversity and another researcher, Ting, Memon, Thurasamy, and Cheah, (2025) remarked that snowball technique as effective for groups that is difficult to reach. In this study, faculty clusters served as the basis for the strata, while initial respondents referring peers that fulfill the requirements. The integration of these methods reduced biasness and increased participation, which is crucial for analysing trends among various groups.

Instrumentation

Like many other research in language learning that measure attitudes and perceptions, this study utilised an online survey with a 5-point Likert scale. The data collected through this instrument is more structured and making it easy for statistical analysis. For instance, a study by Hassan and Hashim (2021) applied this scale to study students' motivation in vocabulary acquisition through digital tools. Yongi Gu (2021), in turn, verified an online questionnaire for vocabulary strategies with the same type of scaling. The questionnaire employed in this study consists of sections on gaming habits, perceived effectiveness, and design features. This instrument is effective for big sample sizes, and maintain consistency. That makes it appropriate to analyse patterns among the respondents.

Data Collection Procedure

For the data collection in this study, Google Forms (Gforms) were utilised and it was distributed via WhatsApp, Telegram, and email over a period of two to three months. This is common among ESL research due to its cost effectiveness and the accessibility; for example, Lau et al., (2023) utilised Gforms to collect undergraduates' responses on digital learning, while Manggaberani and Darlis (2024) verified its validity for conducting mass-online tests. All the data collected in this study were kept in Google Sheets which then will be transferred to IBM SPSS for statistical analysis. However, before the data analysis was done, all the raw data were cleaned up to remove any incomplete responses or missing information. This was to ensure accuracy as this process guarantees the integrity of the data and strengthen the credibility of the statistical findings.

Data Analysis Procedure

The data collected from the survey were analysed using IBM SPSS, a statistical programme that is globally used in ESL research for handling both descriptive and inferential statistics. SPSS allows multiple tests, such as descriptive statistics, Chi-Square, cross-tabulation, one-way ANOVA, and reliability analysis via Cronbach's Alpha. For example, ANOVA and Chi-Square tests were used by Hassan and Hashim (2021) in study on ESL vocabulary, while Cronbach's Alpha was used by Yonggi Gu (2021) to validate Likert-scale instruments for vocabulary strategies. In this study, demographic data and usage patterns were analysed using descriptive statistics, The differences in perceptions were tested using ANOVA, and Chi-Square analysed the relationship, and to ensure internal consistency, Cronbach's Alpha was used. These analyses offer strong understanding into inter-variable relationships and bolster the robustness of the results.

Validity And Reliability Tool: Cronbach's Alpha

Cronbach's Alpha is a well-established indicator in evaluating the degree to which items within a scale are correlated. In many ESL research, Cronbach's Alpha was used in making sure that the questionnaires reliably analyse components such as attitudes or perceptions. For example, a theme-based vocabulary module was validated by using Cronbach's Alpha in a study by Ishak et al. (2023), while in another study conducted by Luo et al. (2021) that utilised vocabulary-related instruments in comprehension studies, Cronbach's Alpha was used to verify the instrument's reliability. In this study, it was implemented to verify the consistency among items analysing learners' perceptions and gaming behaviours. This step guarantees that the instrument produces stable outcomes, thereby supports the validity of the findings.

RESULTS AND DISCUSSION

RQ1: Identify The Types Of Mobile Gaming Apps Commonly Used By Learners

Device Used	Frequency	Percentage (%)
Mobile Phone only	27	18.0
Mobile Phone + Tablet	24	16.0
PC + Mobile Phone	12	8.0
Other combinations	87	58.0
Total	150	100%

Table 1: Devices Used to Play Mobile Games

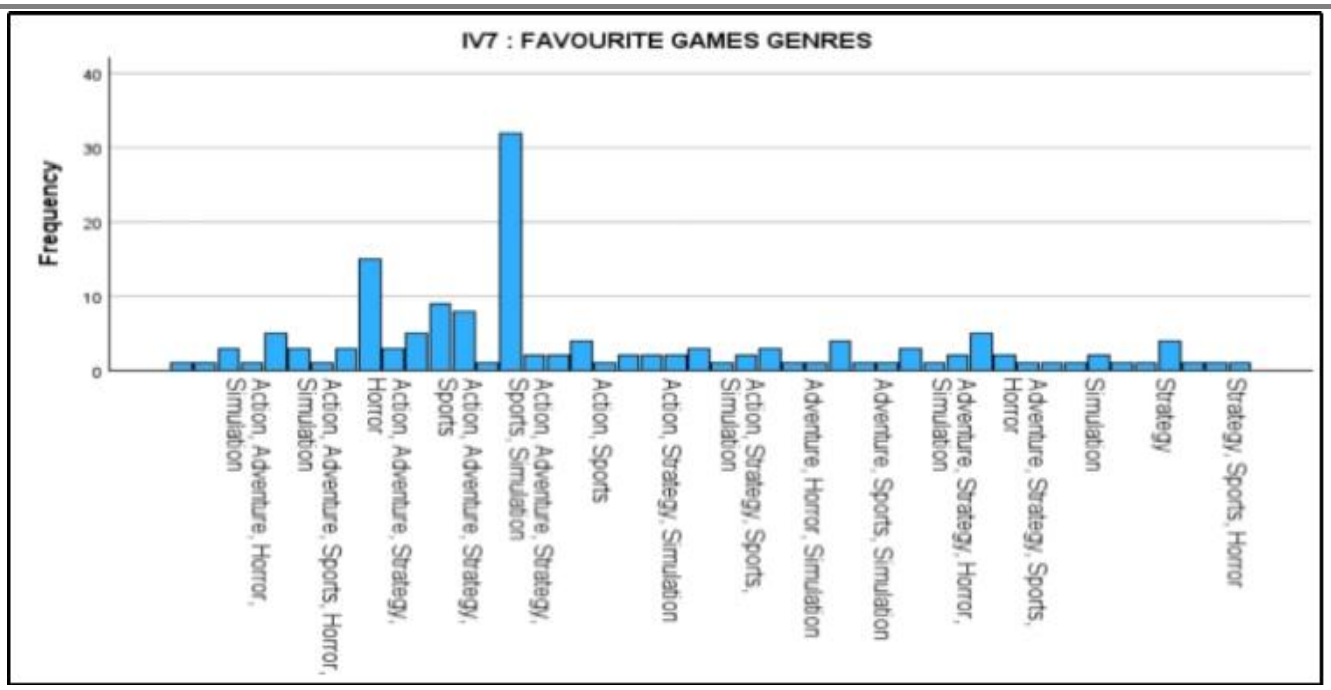

FIGURE 2: Games Genres that commonly used

Table 1 depicts the patterns in the use of the device for gaming, signalling that most of them either played on their mobile phone alone or in combination with other devices. Figure 2 further shows the distribution of commonly played genres, representing diverse and blended-genre play. The data showed mobile-only (18%) and mixed device patterns (particularly "other combinations." 58%) points to smartphones as widely accessible and complemented by other devices. For the genre, it is reported that no single genre is dominant, suggesting that language contact happening diversely throughout interfaces and activities. Hence, the contact the learners made with instructions, dialogues, and on-screen text in various formats increases the chance for incidental vocabulary encounters. In sum, the pattern signifies that playing games every day provides repeated, meaningful input throughout genres; therefore, the environments in the mobile gaming apps are an effective channel for vocabulary encounter that can be coordinated with coursework.

Table 2. Contextual examples of device and genre use (illustrative, anonymized paraphrases)

Category	Example text
Mobile only	"I play on my phone during commutes; short puzzle and word games are easy to fit in."
Phone + tablet	"I read quest text on my tablet at home, but I grind levels on my phone."
Phone + PC	"Cutscenes and longer raids are on PC, yet I review terms and items on the phone app."
Story/Narrative	"Dialogues in story missions help me notice new words and how they fit in sentences."

RQ2: Evaluate learners' perceptions of the effectiveness of these apps in vocabulary retention

Table 3 : ANOVA Statistic for Vocabulary Retention by Experience

ANOVA

DV1 : VOCABULARY RETENTION

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.538	1	1.538	2.635	.107
Within Groups	71.204	122	.584		
Total	72.742	123			

Table 4: Descriptive Statistics for Vocabulary Retention by Experience

Descriptives

DV1 : VOCABULARY RETENTION

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum
					Lower Bound	Upper Bound	
2.00	28	4.04	.576	.109	3.81	4.26	3
4.00	96	4.30	.809	.083	4.14	4.47	1
Total	124	4.24	.769	.069	4.11	4.38	1

Descriptives

DV1 : VOCABULARY RETENTION

	Maximum
2.00	5
4.00	5
Total	5

Table 3 displays a one-way ANOVA testing the differences in perceptions by current gaming experience and Table 4 presents the group descriptives. The results showed a higher means for learners still playing mobile games, but it did not reach statistical significance $F(1, 122) = 2.64$, $p = .107$. Descriptively, learners who are still active in gaming indicated stronger agreement that games help retain words, than the less active group of learners, suggesting advantages tied to ongoing exposure. However, it is suggested to be careful in making generalisation on the effect beyond this sample as the p-value is non-significant. Practically speaking, students modestly believe in the usefulness of gaming because it all depends on the frequency of playing and the types of tasks. Overall, we can see that current gamers appeared to be more positive in their perceptions, which means a bigger and broader samples are needed to verify a reliable perceptions gap.

Table 5. Contextual examples of perceptions (illustrative, anonymized paraphrases)

Category	**Example text**
Current gamers	“I keep the words better when I see them in quests every day.”
Current gamers	“Timers and missions push me to review terms, so they stick.”
Non-current	“I learned some words, but they fade when I stop playing.”
Non-current	“Without regular play, I don’t notice much difference in remembering.”

RQ3: Analyze How Game Design Features (Interactivity, Feedback, Rewards) Influence Vocabulary Retention

Table 6: ANOVA Statistics for Self-Assessment, Motivation, and Enjoyment

ANOVA

		Sum of Squares	df	Mean Square	F
DV3 : MOTIVATION	Between Groups	11.156	1	11.156	7.330
	Within Groups	135.459	89	1.522	
	Total	146.615	90		
DV4 : ENJOYMENT	Between Groups	6.136	1	6.136	3.238
	Within Groups	166.764	88	1.895	
	Total	172.900	89		
DV6 : SELF-ASSESMENT	Between Groups	11.546	1	11.546	6.551
	Within Groups	156.871	89	1.763	
	Total	168.418	90		

ANOVA

		Sig.
DV3 : MOTIVATION	Between Groups	.008
	Within Groups	
	Total	
DV4 : ENJOYMENT	Between Groups	.075
	Within Groups	
	Total	
DV6 : SELF-ASSESMENT	Between Groups	.012
	Within Groups	
	Total	

Table 7: Descriptive Statistics for Self-Assessment, Motivation, and Enjoyment

Descriptives

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound
DV3 : MOTIVATION	1.00	18	2.83	1.150	.271	2.26
	5.00	73	3.71	1.253	.147	3.42
	Total	91	3.54	1.276	.134	3.27
DV4 : ENJOYMENT	1.00	18	3.11	1.231	.290	2.50
	5.00	72	3.76	1.409	.166	3.43
	Total	90	3.63	1.394	.147	3.34
DV6 : SELF-ASSESMENT	1.00	18	2.72	1.274	.300	2.09
	5.00	73	3.62	1.340	.157	3.30
	Total	91	3.44	1.368	.143	3.15

Table 8: Most Effective Aspect of Mobile Learning for Learning English

IV15 : THE MOST EFFECTIVE ASPECT OF MOBILE LEARNING FOR LEARNING ENGLISH

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		1	.7	.7	.7
	Game rewards/challenges	10	6.7	6.7	7.3
	Instructions/objectives	32	21.3	21.3	28.7
	Interaction with other players	15	10.0	10.0	38.7
	Repetition of language	16	10.7	10.7	49.3
	Storyline/dialogue	76	50.7	50.7	100.0
	Total	150	100.0	100.0	

Table 9: Cross Tabulation Statistics for Influence on Vocabulary Use and Confidence

AGE * IV15 : HAVE THEY USED ENGLISH VOCABULARY FROM MOBILE GAMING IN CLASSES AND ETC? Crosstabulation

Count

		IV15 : HAVE THEY USED ENGLISH VOCABULARY FROM MOBILE GAMING IN CLASSES AND ETC?			
			Never	Occasionally	Rarely
AGE	18-20 Years old	1	0	2	3
	21-23 Years old	1	1	41	13
	24-25+ Years old	1	3	18	7
Total		3	4	61	23

Table 10: Chi-Square Tests Statistics for Influence on Vocabulary Use and Confidence

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	23.051[a]	8	.003
Likelihood Ratio	24.128	8	.002
N of Valid Cases	150		

a. 7 cells (46.7%) have expected count less than 5. The minimum expected count is .48.

Table 6 and Table 7 depict ANOVA results by the duration of gameplay for motivation, self-assessment and enjoyment; Table 8 displays feature preferences; Table 9 and 10 depict cross-tabulation and chi-square tests. The results showed that with longer playtime, motivation ($F=7.33$, $p=.008$) and self-assessment ($F=6.55$, $p=.012$) were higher; enjoyment was not significant ($F = 3.24$, $p = .075$), though it trended positive. For the feature, higher ratings were given to storyline/dialogue (50.7%) and clear instructions/objectives (21.3%), whereas rewards and interaction attracted smaller percentages. Furthermore, aged displayed a significant relationship with using game-learned vocabulary in class ($\chi^2(8) = 23.05$, $p = .003$); however, confidence does not relate with years of English study. Jointly, the features of mobile games application that offer narrative context and explicit goals, combined with sustained engagement, seems to be most supportive of vocabulary retention and academic transfer. Thus, specific design choices may change normal game playing into purposeful vocabulary practice.

Table 11. Contextual examples of feature impacts (illustrative, anonymized paraphrases)

Category	Example text
Storyline/Dialogues	"Conversations with NPCs show how the word is used, so I remember it in class."
Instructions/Objectives	"Clear mission steps keep me noticing key terms during tasks."
Feedback/Rewards	"Instant feedback helps, but points alone don't make the word stick."
Transfer to class	"As a senior, I can slot game terms into presentations more confidently now."

CONCLUSION

Summary of Findings and Discussions

The findings show that learners played multiple game genres by using the most common device for gaming, the smartphones or often combined with other devices such as tablets or PCs. It means that the learners are already familiar and comfortable being in that mobile-rich environments, allowing the opportunities for incidental vocabulary exposure to happen incidentally. These discoveries complement a study done by Okumuş Dağdeler (2023), who reported that accessibility and flexibility of the apps are the factor of the increased in the effectiveness of mobile-aided vocabulary learning. Lei et al. (2022) found something similar, where learner autonomy and motivation were improved due to the mobile tools, and this is aligned with the present study's findings of high engagement through gaming. However, this study only highlights entertainment-driven games, which may not have sufficient pedagogical design, and not structured, educational apps like in the prior research. The difference indicates a challenge: despite high access and engagement, retaining vocabulary relies on receiving purposeful language input in games. Thus, the findings verify the potential of mobile gaming for vocabulary learning, but it also emphasises the need for strategic integration to optimise learning results.

The findings for RQ2 depict that learners tend to perceive the helpfulness of the apps in vocabulary retention if they are still actively gaming, even though the difference was not significant. This points out that formal instruction is not linked to positive attitudes, unlike the on-going exposure that shows positive attitude on mobile gaming for vocabulary retention. Lei et al.'s (2022) study is complemented by the findings of the current research, that mobile-assisted learning promotes motivation and self-regulation, which implicitly aids vocabulary development. Suh and Ryu (2023) reported something similar that game-based learning often improves learner engagement, despite relatively minor measurable outcomes. However, the findings of this study contrast with Alhebshi and Gamlo (2022), who revealed clear enhancements in vocabulary scores after learners undergone structured-based interventions. The differences in game type and instructional integration may be the factor of the discrepancy. Thus, retention is not guaranteed by perception alone, even though the learners believe in the advantages of gaming. This highlights the need to come up with a purposeful design and sustained practice, for the engagement to be translated into measurable outcomes.

The RQ3's findings show that learner's motivation and vocabulary self-assessment are improved significantly after a longer gameplay duration, while enjoyment indicates a positive yet non-significant trend. Moreover, dialogue and storyline appeared as the most valued design features, shadowed by clear objectives, meanwhile interaction and rewards were less important. These findings strongly supplement the findings by Chen and Cao (2021) that feedback and narrative structure improves attention and retention, and this also conforms Suh and Ryu's (2023) findings that highlighted the role of meaningful context in vocabulary learning. In a similar manner,

Lei et al. (2022) stated that uninterrupted engagement through mobile phones promotes self-regulation, which in line with the current study's discovery of higher motivation across frequent players. Nevertheless, the minimal impact of rewards the belief that gamification alone can improve learning. Thus, the findings propose that story-driven and goal-oriented features, integrated with sustained engagement, are crucial for retention, which strengthens the need for meaningful combination of these features in educational settings.

Implications of Findings

The findings of the current research have theoretical contributions and practical implications. In theory, it strengthens the principles of MALL and GBLL, and contextual exposure and engagement are emphasised as key factors of vocabulary retention (Okumuş Dağdeler, 2023). In real world, the study suggests that if educators want to improve motivation and incidental learning for their students, they should consider embedding story-driven mobile games into ESL curricula. In addition, classroom instruction could be complemented by structured gaming as the findings show that there is a positive link between gameplay duration and self-assessment. Teachers should be given the training in order to be able to exploit mobile platforms effectively. Ultimately, it is more than entertainment value that mobile game applications can offer, it can also serve as a teaching and learning aid or tool than can be effectively utilised to improve ESL when they are coordinated and aligned with curriculum goals.

Recommendations for Future Research

Future research should tackle the gaps in the method by adopting longitudinal designs to measure delayed retention and vocabulary academic transfer (Lei et al., 2022). Practically, for deeper learning, studies should consider hybrid models that integrate commercial games with instructor-guided activities. Further research should, theoretically, investigate how learner autonomy and cognitive load interact with certain design features to maximise vocabulary learning (Suh & Ryu, 2023). In order to enhance generalisability, studies should consider conducting expanded research in diverse Malaysian institutions. In conclusion, future studies should prioritize sustainable, context-sensitive strategies to optimise the educational potential of mobile gaming instead of focusing on short-term interventions.

ACKNOWLEDGEMENTS

First and foremost, our deepest gratitude is dedicated to God the Almighty, whose blessings, strength, and guidance have made this research possible. We are also profoundly thankful to our friends and family for their unwavering support, encouragement, and understanding, all of which have been instrumental to the completion and success of this study.

REFERENCES

1. Alhebshi, A. A., & Gamlo, N. (2022). The effects of mobile game-based learning on Saudi EFL foundation year students' vocabulary acquisition. Arab World English Journal, 13(1), 408–425. https://dx.doi.org/10.24093/awej/vol13no1.27
2. Chan, S., & Lo, N. (2024). Enhancing EFL/ESL instruction through gamification: A comprehensive review of empirical evidence. Frontiers in Education. https://doi.org/10.3389/feduc.2024.1395155
3. Chen, C.-M., & Cao, D. (2021). Effects of design factors of a game-based English vocabulary learning app on performance, attention, emotion, and retention. Journal of InfoLib and Archival Studies, 13(98), 1–38. https://doi.org/10.6575/JILA.202106_(98).0001 (PDF: https://jila.lib.nccu.edu.tw/wp-content/uploads/2021/06/98-1.pdf)
4. Chen, C. M., Liu, H., & Huang, H. B. (2019). Effects of a mobile game-based English vocabulary learning app on learners' perceptions and learning performance: A case study of Taiwanese EFL learners. ReCALL, 31(2), 170-188. https://doi.org/10.1017/S0958344018000228
5. Chowdhury, M., Dixon, L. Q., Kuo, L. J., Donaldson, J. P., Eslami, Z., Viruru, R., & Luo, W. (2024). Digital game-based language learning for vocabulary development. Computers and Education Open, 6, 100160. https://doi.org/10.1016/j.caeo.2024.100160
6. DataReportal. (2023). Digital 2023: Malaysia. https://datareportal.com/reports/digital-2023-malaysia

7. Dhanyamol, C. T. (2022). Assessing the dimensions of vocabulary knowledge in ESL context: A quantitative study. Journal of Research in Humanities and Social Science, 10(5), 42–52. https://www.questjournals.org/jrhss/papers/vol10-issue5/Ser-4/E10054252.pdf
8. Hassan, F. A., & Hashim, H. (2021). The use of an interactive online tool (Plickers) in learning vocabulary among young learners in ESL setting. Creative Education, 12(4), 780–796. https://doi.org/10.4236/ce.2021.124055
9. Husin, M. Z. M., Rahim, N. F. A. A., Ali, Z., Alzeebaree, Y., & Bakar, N. A. (2022). Preferred vocabulary learning strategies among Malaysian students. Research Journal in Advanced Humanities, 3(4). https://doi.org/10.58256/rjah.v3i4.942
10. Ishak, N., Noordin, N., Ismail, L., & Mustakim, S. (2023). Development, validity, and reliability of a theme-based CBI vocabulary module for ESL post-secondary tourism management students at an English-medium university. Arab World English Journal, 14(3), 351–367. https://doi.org/10.24093/awej/vol14no3.22
11. Ishak, N. H., & Mohd Yasin, M. (2022). The impact of images in enhancing the ESL vocabulary breadth of Malaysian primary pupils using PWIM. Malaysian Journal of Social Sciences and Humanities, 7(6), Article 2526. https://msocialsciences.com/index.php/mjssh/article/view/2526
12. Lau, K. Y. L., Runggol, C. J., & Rijeng, J. S. (2023). Project-based approach incorporating IT component using Google Forms in E-ESL classrooms during Covid-19 pandemic: Undergraduates' perspectives. International Journal of Academic Research in Business and Social Sciences, 13(5), 1–15. https://ir.uitm.edu.my/id/eprint/81228/
13. Lei, X., Fathi, J., Noorbakhsh, S., & Rahimi, M. (2022). The impact of mobile assisted language learning on EFL learners' vocabulary learning attitudes and self-regulatory capacity. Frontiers in Psychology, 13, 872922. https://doi.org/10.3389/fpsyg.2022.872922
14. Luo, Y., Song, H., Wan, L., & Zhang, X. (2021). The effect of vocabulary depth and breadth on English listening comprehension. Frontiers in Psychology, 12, 657573. https://doi.org/10.3389/fpsyg.2021.657573
15. Malaysian Communications and Multimedia Commission (MCMC). (2023). Internet Users Survey 2022 (published Oct 2023). https://www.mcmc.gov.my/skmmgovmy/media/General/IUS-2022.pdf
16. Manggaberani, A. A., & Darlis, A. M. (2024). The effectiveness of Google Forms in assessing and evaluating online learning outcomes: A meta-analysis study. Indonesian Journal of Social Technology, 5(10), 4561–4575. https://pdfs.semanticscholar.org/037e/4146ce98522416c1c483e2d6b097c4bbda86.pdf
17. Nasaruddin, N. S. A., & Kamalludeen, R. (2020). A case study of how Malay ESL learners build vocabulary using multimedia technology. IIUM Journal of Educational Studies, 8(2), 112–130. https://journals.iium.edu.my/ijes/index.php/iejs/article/download/288/144/1351
18. Okumuş Dağdeler, K. (2023). A systematic review of mobile-assisted vocabulary learning research. Smart Learning Environments, 10, 19. https://slejournal.springeropen.com/articles/10.1186/s40561-023-00235-z
19. Pang, B. H., Ismail, N., & Rahim, N. A. (2023). Strategies used by Malaysian ESL primary school teachers in vocabulary instruction: A survey. In European Proceedings of Educational Sciences (Vol. 6). https://doi.org/10.15405/epes.23097.41
20. Putri Wulantari, N., Rachman, A., Sari, M. N., & Uktolseja, L. J. (2024). The role of gamification in English language teaching: A literature review. Journal on Education, 6, 2847–2856. https://doi.org/10.31004/joe.v6i1.9617
21. Rabi'ah, A. A., & Fatima, R. R. (2022). The effect of mobile game apps on second language learners' motivation and vocabulary learning. Journal of Research in Education and Psychology, 37(4), 677–714. https://doi.org/10.21608/mathj.2022.158962.1254
22. SAGE Open Review. (2021). A comparative review of mobile and non-mobile games for language learning. SAGE Open, 11(4), 21582440211067247. https://doi.org/10.1177/21582440211067247
23. Suh, S., & Ryu, J. (2023). Exploring the potential of digital game-based vocabulary learning: A systematic review. Systems, 11(2), 57. https://doi.org/10.3390/systems11020057
24. Ting, H., Memon, M. A., Thurasamy, R., & Cheah, J.-H. (2025). Snowball sampling: A review and guidelines for survey research. Asian Journal of Business Research, 15(1). https://ajbr.co.nz/ajbr/ajbr250186.pdf

25. Yang, J. (2021). Revisiting research methods in language learning psychology from a complexity dynamic system theory perspective. Frontiers in Psychology, 12, 741045. https://doi.org/10.3389/fpsyg.2021.741045
26. Yongqi Gu, P. (2021). Validation of an online questionnaire of vocabulary learning strategies for ESL learners. Studies in Second Language Learning and Teaching, 11(2), 325–350. https://files.eric.ed.gov/fulltext/EJ1183992.pdf
27. Zhao, X. (2021). An experimental study of English vocabulary learning strategies training for college students. Proceedings of the 9th International Conference on Social Science, Education and Humanities Research (SSEHR 2021). https://webofproceedings.org/proceedings_series/ESSP/SSEHR%202021/B2112063.pdf