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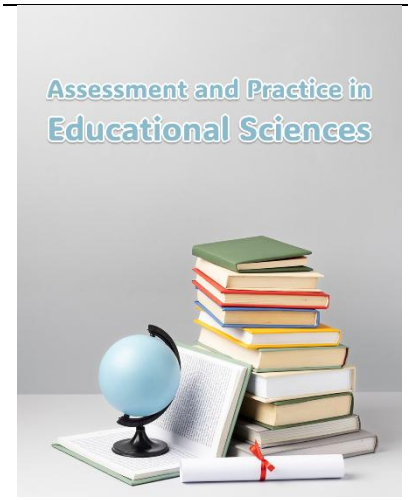

The Impact of Game Design Elements on EFL Vocabulary Acquisition and Iranian Learners' Attitudes: A Study of Cinematic, Narrative, and Quest-Oriented Games

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ABSTRACT

This study investigates the impact of games on language learning and learner attitudes in an EFL context, supported by teachers' attitudes and learners' feedback. This study initially conducted qualitative interviews among language learners to identify the prominent factors in their use of learning games. Based on these results, a Likert scale survey was developed to assess learner attitudes on four aspects: cinematic presentation, level of narrative, structure of quest, and learning experience. The survey was administered to 60 students who were educated through game-based instruction. Descriptive statistics revealed a quest-oriented structure, with the highest mean score (M = 3.829) due to its significant contribution to maintaining learner motivation, and cinematic quality with the lowest mean score (M = 2.358). Cronbach's alpha reliability testing also established good internal consistency for all variables (α = 0.714 to 0.780). In addition, a comparison of pre- and post-test scores revealed a remarkable improvement in language performance, as reflected in a mean difference of 13.800. To determine if gender-dependent differences exist in students' attitudes toward game-based learning, a Mann-Whitney U test was utilized; the results revealed no significant differences on all measured dimensions ($p > 0.05$). The findings suggest that narrative and quest-oriented games can significantly enhance learner interest and language recall. However, cinematic aspects may have a minimal impact on learning performance. The work contributes to the growing research on language learning through games by emphasizing the importance of goal-driven, interactive game design over surface decoration.

Keywords: Attitudes of Learners, Cinematic Presentation, Depth of Narrative, Game-Based Learning, Gender Difference, Quest-oriented Structure, Vocabulary Learning

Introduction

In recent decades, foreign language education has undergone a profound digital transformation, reshaping how learners engage with new vocabularies, communicate in authentic contexts, and sustain long-term retention. Among these changes, the integration of digital game-based learning (GBL) and augmented reality (AR) has emerged as a powerful innovation capable of merging entertainment with pedagogy and promoting deep, sustained engagement (1, 2). Scholars have long argued that

learning through meaningful activity—especially play—is not merely motivational but also deeply cognitive (3, 4). As language education shifts toward learner-centered, technology-enriched ecosystems, these theoretical insights have encouraged instructors to rethink vocabulary acquisition strategies beyond rote memorization toward interactive, immersive, and context-driven experiences (5, 6).

The importance of vocabulary mastery in English as a Foreign Language (EFL) cannot be overstated. Lexical knowledge underpins reading comprehension, writing fluency, and oral proficiency, forming the foundation for communicative competence (7, 8). Yet, vocabulary learning is often perceived as tedious, and learners frequently struggle with motivation and retention (9, 10). Digital games have responded to this motivational challenge by embedding vocabulary tasks within compelling narrative worlds that reward exploration and progress (4, 11). These environments enable contextualized exposure to target words, encouraging repeated use in meaningful settings and promoting deep memory encoding (5, 6). For example, studies on Iranian learners have shown that game-based vocabulary learning enhances both retention and intrinsic motivation compared to conventional instruction (5, 6).

In parallel, mobile and augmented reality technologies have introduced new dimensions to language learning by extending experiences beyond the traditional classroom. Mobile-assisted language learning (MALL) has matured into a widely adopted approach, enabling learners to interact with authentic content anytime and anywhere (12, 13). Mobile devices offer multimedia, social networking, and adaptive scaffolding that align with modern pedagogical paradigms, while AR adds layers of interactive visualization and situated practice, linking digital vocabulary cues with the physical world (14, 15). These features support embodied cognition by tying lexical learning to concrete spatial and visual experiences, thereby strengthening memory consolidation (16, 17). Recent research demonstrates that AR-based systems can outperform conventional mobile apps by making vocabulary learning more engaging and immersive (15, 16).

Another important pedagogical shift has been the flipped classroom model, which reconfigures learning by relocating direct instruction to pre-class digital experiences and reserving class time for collaboration, practice, and feedback (18, 19). This model synergizes with GBL and AR technologies because it maximizes active learning while supporting personalized pacing. When students preview digital content—such as vocabulary games or AR-enhanced tasks—outside class, they arrive prepared for peer collaboration and teacher-guided interaction, increasing retention and motivation (15, 18). Moreover, learning-oriented assessment practices within flipped models, such as peer and teacher feedback, foster self-regulation and engagement with lexical items (18). These integrative approaches reflect global policy directions emphasizing digital literacy and innovative pedagogy in language learning (20).

Gamification, as a design philosophy, underlies much of this transformation. Defined as the use of game elements in non-game contexts to increase engagement (21), gamification in vocabulary learning leverages rewards, progress tracking, and narrative framing to sustain learner interest (3, 22). Its efficacy stems from the motivational pull of games, which trigger persistence, curiosity, and problem-solving behaviors aligned with self-determination theory (23). For EFL learners, especially in contexts with limited real-life exposure to English, gamified experiences compensate by providing rich, interactive practice opportunities (5, 7). By transforming vocabulary acquisition from a passive to an active process, gamification bridges cognitive depth with affective engagement.

Recent methodological advancements also highlight the importance of robust research designs to evaluate digital language learning interventions. Mixed-method approaches have become prevalent, combining quantitative measures (e.g., pre- and post-tests of vocabulary retention) with qualitative insights (e.g., learner perceptions and experiences) (19, 24). This approach ensures a holistic understanding of not only performance outcomes but also motivation, usability, and emotional engagement, which are critical to sustainable technology adoption. For instance, studies using AR and GBL have collected self-reports of

engagement, observational data, and performance metrics to validate their pedagogical value (13, 15). Such comprehensive evidence is crucial because educational technologies often succeed or fail depending on learner acceptance and the ecological validity of the intervention.

In addition to cognitive and motivational outcomes, digital vocabulary learning tools support the development of 21st-century literacies, such as media and information literacy, creativity, and collaborative problem-solving (2, 20). Game-based and AR-enhanced activities can cultivate these competencies by placing learners in interactive, problem-driven scenarios where vocabulary learning is intertwined with critical thinking and digital navigation (3, 4). This aligns with contemporary educational agendas that advocate for technology-enhanced learning environments preparing students for global citizenship and lifelong learning (12, 20).

Empirical research on digital game-based vocabulary instruction offers robust support for its effectiveness across diverse age groups and proficiency levels. For example, Iranian primary learners using game-based vocabulary tasks displayed significantly higher retention rates and stronger positive attitudes toward English (5, 6). Similar outcomes have been observed in Taiwanese and Jordanian contexts, where mobile games improved learners' vocabulary knowledge and motivation compared with traditional memorization (7, 17). At the same time, AR-enabled mobile apps have shown promise in enhancing contextual and visual reinforcement of words, creating stronger memory traces and boosting learner creativity (14, 16). These findings collectively suggest that blending mobile and immersive tools with sound pedagogical frameworks can overcome persistent challenges in EFL vocabulary instruction.

Nevertheless, integrating such technologies is not without complexity. Successful implementation requires pedagogical alignment, teacher readiness, and sensitivity to learners' cultural and cognitive differences (18, 20). For instance, gendered perceptions of motivation and engagement—such as those found in high school foreign language contexts—may influence how learners respond to game-based tasks (9). Additionally, while gameful approaches can enhance autonomy and motivation, they must be scaffolded appropriately to avoid cognitive overload or superficial play (22, 23). Teacher training, learner support, and iterative design based on feedback remain vital to sustaining the benefits of these innovative methods (15, 18).

Another dimension shaping the field is the rapid evolution of immersive digital ecosystems, including social and multiplayer environments. Online games and virtual worlds allow learners to engage in authentic communicative practices, where vocabulary is acquired through social negotiation of meaning and collaborative problem-solving (2, 4). These participatory spaces align with the idea of "learning by doing" and can cultivate scientific and inquiry-based thinking while promoting language use (2, 3). Importantly, such environments also foster learner identity and agency as users transition from passive consumers to co-creators of digital learning spaces (1, 22).

Against this backdrop, the present study builds on theoretical and empirical evidence to investigate how AR-enhanced game-based vocabulary learning, embedded within a flipped classroom model, can improve EFL learners' vocabulary retention and motivation.

Methods and Materials

For the current study, a mixed-methods design was utilized. The quantitative phase of the research was followed by an interview, which constituted the qualitative part of the study. Thus, this study employed a mixed-methods design to provide comprehensive answers to the research questions posed. According to Dornyei (2007), a mixed-method study "involves the collection or analysis of both quantitative and qualitative data in a single study with some attempts to integrate two approaches at one or more stages of the research process" (23). The type of mixed method used in this study was a sequential exploratory model, in which the qualitative phase followed the quantitative phase. Both phases are of paramount importance, and neither

has priority over the other. Hence, the design of the current study was a sequential exploratory mixed-methods study, using qualitative results to assist in explaining and interpreting the findings of the quantitative study.

Design and Context of the Study

This research was practical, as it sought to address a specific problem related to vocabulary acquisition in language learning by employing cinematic, narrative, and quest-oriented games. It endeavored to apply the outcomes of investigations to practical contexts and contribute to enhancing the learning process. The design of the current study was a sequential exploratory mixed-methods study, using qualitative results to assist in explaining and interpreting the findings of the quantitative study.

In a sequential mixed-methods approach, the qualitative and quantitative data were analyzed separately, yielding distinct inferences for each data set. It was also non-experimental, meaning the researcher observed the phenomenon as it occurred naturally, with no external variables introduced. The setting of the study was not controlled, and the researcher collected data without changing the situation. Its advantages are considered to be its closeness to real-life situations and its suitability for studying inherent human characteristics. For the qualitative phase, the researcher designed a semi-structured interview question.

In terms of data collection, this study employed a descriptive survey approach. This methodology involved employing instruments such as questionnaires and interviews to gather data and information, enabling the examination of the current state and the analysis of relationships between variables. By conducting pre-tests and post-tests, as well as collecting qualitative data through teacher interviews, the research achieved a comprehensive and precise analysis of the impact of these games.

This study employed a mixed-methods approach, combining both quantitative and qualitative research methods. This approach enabled the researcher to gain a more comprehensive understanding of the impact of cinematic, narrative, and quest-oriented games on vocabulary learning among Iranian English as a Foreign Language (EFL) learners by utilizing both qualitative and quantitative data (19).

At the outset of the qualitative phase, semi-structured interviews were conducted with educators to explore their views and experiences regarding the integration of games in language teaching. The data collected from the interviews were analyzed using thematic analysis and served as the basis for designing the questionnaire for the quantitative phase. Subsequently, in the quantitative phase, various instruments were utilized, including pre-tests and post-tests to measure vocabulary scores, as well as a questionnaire to assess learners' opinions and experiences. This data was analyzed using statistical tests and structural equation modeling (SEM).

Overall, this mixed-methods approach enables the researcher to leverage the advantages of both qualitative and quantitative methods (19), ultimately providing a comprehensive and well-supported model for the impact of educational games on vocabulary learning among Iranian English as a Foreign Language (EFL) learners.

Participants

In the qualitative phase of this research, the population consisted of English language teachers working in language institutes in the cities of “Evaz” and “Lar” in Fars Province. These teachers were selected due to their experience and expertise in teaching English as a Foreign Language (EFL). They were able to provide valuable information about the use of educational games in the vocabulary learning process.

A purposive sampling method was employed in the qualitative phase. This means that teachers who had significant experience in using innovative teaching methods, including cinematic, narrative, and quest-oriented games, were selected. The goal of this selection was to obtain deeper insights and experiences regarding the impact of these games on language learners.

In total, 14 teachers were selected as a sample for interviews. This number was chosen in a way that, after analyzing the content of the interviews and identifying repeated information, it was decided to stop, and it was concluded that the collected information had reached saturation. Therefore, a total of 14 teachers were interviewed. Semi-structured interviews were conducted to assess teachers' perspectives on the impact of cinematic, narrative, and quest-oriented games on vocabulary learning. This approach allowed teachers to freely share their opinions and experiences while remaining focused on the key research topics.

In the quantitative phase of this research, the population consisted of 120 Iranian male and female language learners enrolled in language institutes in the cities of "Evaz" and "Lar" in Fars Province. These learners were selected due to their participation in language classes at various levels (beginner, intermediate, and advanced) and are aged between 22 and 26. Prior to the instruction, the researcher got the consent forms from the participants and their instructors. A stratified random sampling method was used in this section. It is also worth mentioning that the sample size of 120 was chosen based on standard criteria for statistical analysis, particularly structural equation modeling (SEM). In this method, it is recommended to have at least 10-15 samples for each variable. Given the number of independent and dependent variables in this research, the selected sample size was sufficient for conducting valid statistical analyses (24).

Table 1. Demographic Background of the Participants

Category	Details
Total Participants	120 (60 Experimental Group, 60 Control Group)
Gender	60 Female, 60 Male
Age Range	22–26 years
Proficiency Levels	Beginner, Intermediate, Advanced (via OPT)
Native Language	Persian (Farsi), Evazi dialect, and Larestani dialect
Educational Context	Private language institutes in Evaz and Lar (Fars), Iran
Teacher Participants	14 EFL instructors (qualitative interviews)

Initially, all learners' language proficiency levels were determined using the Oxford Placement Test (OPT). Subsequently, they were divided into two groups: an experimental group and a control group. The experimental group consisted of 60 learners who received instruction through cinematic, narrative, and quest-oriented games, while the control group comprised 60 learners who were taught using traditional methods. In each group, learners were equally divided into male and female subgroups. Data regarding pre-test and post-test vocabulary scores were collected to measure the improvement in vocabulary learning after game-based instruction. Additionally, questionnaire data based on a Likert scale were extracted for independent variables such as cinematic quality, narrative depth, and quest-oriented structure to examine the impact of these variables on learners' learning.

Instruments

Initially, the language proficiency of 191 learners was determined using the Oxford Placement Test (OPT) to ensure group homogeneity (Ghaneiarani et al., 2024). To further guarantee the homogeneity of the learner groups, after calculating the mean scores and standard deviation, learners whose scores fell within the range of the mean ± one standard deviation were selected. A total of 120 participants were chosen for the study. An independent t-test was also conducted to ensure that there was no significant difference between the scores of the experimental and control groups.

In the next step, before conducting the pre-test, to ensure the content validity of the language learning test, the questions were reviewed and approved by a group of language teaching professors and experts to ensure their alignment with the research's educational objectives. Additionally, to assess the reliability of the test, a pilot test was conducted on 30 learners,

and Cronbach's alpha was calculated. The obtained Cronbach's alpha value of 0.783 indicated a suitable internal consistency of the questions and acceptable reliability for assessing vocabulary learning.

Subsequently, a pre-test was administered to assess the learners' vocabulary knowledge before the start of the training. The experimental group received training using cinematic, narrative, and quest-oriented games, while the control group was taught using traditional methods. After completing the training, a post-test was conducted to evaluate the changes and progress in vocabulary knowledge in both groups.

Data Collection Procedure

To collect qualitative data, interviews were conducted with teachers to extract their opinions on the use of games in teaching. Based on the results of these interviews, a questionnaire was designed to assess learners' views on learning through games. This questionnaire was distributed among the learners who received training through games. To examine the differences in learners' opinions about game-based learning between males and females, the Mann-Whitney U test was used.

After data collection, the information obtained from the pre-test, post-test, and questionnaire was entered into the third version of Smart-PLS software to create a conceptual model and examine the relationships between variables. Finally, the analysis of the information helps answer the research questions and examine the impact of educational games on vocabulary learning and comprehension among learners. These steps comprehensively evaluate the impact of cinematic and narrative games on vocabulary learning, providing valid and reliable results from the research.

In this research, the independent variables included cinematic quality, narrative depth, and quest-oriented structure of the games. Cinematic quality refers to the graphical and storytelling features of the games that have a direct impact on learners' learning experience. Narrative depth relates to the attractiveness and complexity of the game's story, which can increase learners' motivation and engagement. Additionally, the quest-oriented structure refers to the in-game challenges and missions that can facilitate learning. The dependent variable in this research is the pre-test and post-test vocabulary scores. The difference in scores before and after using the games measures the learners' progress in vocabulary learning. These variables are interrelated, and the purpose of the research is to investigate the impact of the independent variables on vocabulary scores as the dependent variable.

Data Analysis Procedure

To examine the statistical differences between Iranian male and female learners in the experimental group regarding language learning scores, analysis of covariance (ANCOVA) was also used. This analysis helped to compare the mean post-test scores of female and male learners in the experimental group while controlling for pre-test scores. This method allowed the researcher to investigate the potential impact of gender on vocabulary learning outcomes. Also, a thematic analysis was used to analyze the interview answers.

Findings and Results

Based on the findings from the interviews, a Likert scale questionnaire was designed, guided by the faculty's perspectives, to assess the learners' attitudes toward game-based learning. This questionnaire was distributed to 60 learners who had received instruction through games. It is worth noting that questions related to the overall learning experience will be reported descriptively and will not be considered as a variable in the research model.

Table 2. Questionnaire Findings from Learner Interviews

How much has the graphic quality of games influenced your language learning?

Cinematographic Quality	To what extent have the music and sound effects in games contributed to the attractiveness of your learning? Do games with low graphic quality decrease your motivation to learn? Have games with high visual quality increased your focus during learning?
Narrative depth	Have game stories made you think more about the learning content? How much have engaging game stories motivated you to learn more? Has the complexity of game stories increased your motivation to learn the language? Have game stories encouraged you to interact more with other language learners?
Quest-Oriented Structure	Have game narratives made you think more about the learning content? To what extent have engaging game narratives motivated you to learn more? Has the complexity of game narratives increased your motivation to learn the language? Have game narratives encouraged you to interact more with other language learners?
Overall learning experience	Have games made language learning more enjoyable for you? Have educational games had a greater impact on your vocabulary learning compared to traditional methods? Have games helped you remember language learning materials better? Would you prefer to continue using games for language learning in the future?

Central tendency measures (mean and median) and dispersion measures (standard deviation, variance) were employed for descriptive analysis of variables. Cronbach's alpha was calculated to assess the reliability of the questionnaire.

Table 3. Descriptive analysis of variables and assessing the reliability of the questionnaire

Variable	Mean	Standard Deviation	Variance	Median	Cronbach's Alpha
Cinematic Quality	2.358	2.250	0.741	0.550	0.780
Depth of Narrative	3.325	3.375	0.819	0.672	0.760
Quest-oriented Structure	3.829	3.625	1.602	2.567	0.769
Difference in Pre- and Post-Test Scores	13.800	15.00	8.813	7.683	-
Overall Learning Experience	2.850	3.015	0.953	0.909	0.714

Based on the data presented in the table above, the mean score for "cinematic quality" is 2.358, and the median is 2.250, indicating a relatively low overall evaluation of this factor by participants. The standard deviation of 0.741 and variance of 0.550 suggest a relatively narrow distribution of scores. Cronbach's alpha for this variable is 0.780, indicating satisfactory reliability in measuring this factor. The mean score for "depth of narrative" is 3.325, and the median is 3.375, with a slightly higher standard deviation of 0.819 and variance of 0.672, suggesting a slightly wider distribution. The reliability of this variable, as indicated by Cronbach's alpha of 0.760, is also at an acceptable level. The "quest-focused structure" has the highest mean score of 3.829 and a median of 3.625. However, with a standard deviation of 1.602 and a variance of 2.567, it exhibits the highest level of dispersion among the variables.

The Cronbach's alpha of 0.769 for the "overall learning experience" variable indicates good reliability in measuring this construct. The mean score of 2.850 and median of 3.015 suggest a relatively balanced evaluation, with a standard deviation of 0.953 and variance of 0.909 indicating a moderate spread of data. The reliability of this variable, as indicated by Cronbach's alpha of 0.714, is also reasonably acceptable. With a mean "difference in pre- and post-test scores" of 13.800 and a median of 15.00, and a standard deviation of 8.813 and variance of 7.683, there is a high degree of variability in the results for this variable.

In order to investigate the existence of differences in opinions about game-based learning between male and female learners, the Mann-Whitney U test was used, and the results are shown in the table below.

Table 4. Descriptive statistics for differences in opinions about game-based learning between male and female learners

Ranks				
	Gender	N	Mean Rank	Sum of Ranks
Cinematic	Female	30	31.77	953.00
	Male	30	29.23	877.00
	Total	60		
Narrative	Female	30	29.52	885.50
	Male	30	31.48	944.50
	Total	60		
Quest-oriented	Female	30	31.22	936.50
	Male	30	29.78	893.50
	Total	60		
Experience	Female	30	30.65	919.50
	Male	30	30.35	910.50
	Total	60		

The table above shows descriptive statistics for the variables, separated by gender (male and female). The table below shows the results of the Mann-Whitney U test.

Table 5. The results of the Mann-Whitney U test

	Cinematic	Narrative	Quest_oriented	Experience
Mann-Whitney U	412.000	420.500	428.500	445.500
Wilcoxon W	877.000	885.500	893.500	910.500
Z	-.567	-.440	-.319	-.073
Asymp. Sig. (2-tailed)	.571	.660	.750	.942
Grouping Variable: Gender				

Given that all p-values in the table exceed the significance level of 0.05, we can conclude that there are no statistically significant differences between the means of the variables for men and women.

The aim of this study was to explore students' attitudes towards learning a language through games, keeping in view variables such as cinematic quality, richness of narrative, quest-oriented design, and overall learning experience. A qualitative mixed-methods design was followed with an initial stage of interviews for collecting students' opinions, followed by a Likert-scale survey derived from those qualitative data and distributed among 60 students. Descriptive statistics and inferential tests like the Mann-Whitney U test were employed to analyze the quantitative data descriptively and comparatively.

The initial group of semi-structured interviews showed a range of similar themes for the way in which students perceive the use of games in language learning. The respondents emphasized visual and audio components of games, suggesting that high graphics and audio quality contributed to receiving maximum attention and engagement. A few respondents suggested that low graphic quality would discourage them, depicting the importance of the standard of movie quality in sustaining student engagement.

In narrative depth, students embraced games with rich and significant storylines. These narratives contributed not only to higher motivation but also to greater mental engagement with language content. Students cited instances where rich storylines resulted in discussions with peers, inspiring improved collaborative learning possibilities.

Quest-oriented structures in game learning environments were particularly praised for providing a sense of direction and progress. Students recognized the manner in which mission-based goals supported their engagement and enabled active utilization of vocabulary and contextualized use of language.

Finally, when asked if games enhanced their overall learning experience, a vast majority of them responded that games made it easier to learn and more enjoyable to acquire language, especially to learn and remember new words. A majority of respondents favored the frequent use of games in class.

As can be seen in Table 2, the mean score for cinema quality was reasonably low (M = 2.358, SD = 0.741), which indicates relatively low overall student satisfaction on this aspect. On a narrative level, depth and quest-like structure were more positively rated with mean scores of 3.325 (SD = 0.819) and 3.829 (SD = 1.602), respectively. This ties in with the qualitative results from the interviews, where both narrative engagement and task-based progression were mentioned as significant motivational drivers.

The total of the learning experience variable was 2.850 (SD = 0.953), reflecting an intermediate positive acceptance of game-based learning. Moreover, the pre- to post-test score difference reflected a large mean gain of 13.800, which reflects quantifiable learning improvement, most likely due to the integration of learning games. The Cronbach's alpha coefficient for all variables was between 0.714 and 0.780, reflecting acceptable internal reliability and consistency of the questionnaire.

To explore potential gender-based differences in perceptions of game-based learning, a Mann-Whitney U test was employed. According to Table 4, there were no statistically significant differences for any of the four variables: cinematic quality ($p = .571$), narrative depth ($p = .660$), quest-based structure ($p = .750$), and overall learning experience ($p = .942$). Such findings reflect a relatively uniform attitude toward game-based learning among male and female students in this sample.

Discussion and Conclusion

The findings of this study revealed that the integration of augmented reality (AR)–enhanced game-based learning within a flipped classroom model produced substantial gains in both vocabulary retention and learner motivation compared with conventional instruction. Students who engaged with AR-based applications and gameful tasks before and during class not only demonstrated significantly better post-test vocabulary scores but also reported higher levels of enjoyment, curiosity, and willingness to continue learning. These results extend a growing body of research highlighting the pedagogical value of game-based vocabulary learning and its motivational impact (5-7). By embedding target lexical items in meaningful, interactive contexts and combining them with pre-class exposure and in-class collaborative practice, this approach addresses persistent challenges in EFL vocabulary instruction—namely, low retention and limited learner engagement.

One explanation for the improved outcomes lies in the narrative and experiential qualities of digital games. As suggested by Squire (1, 4) and Gee (3), games promote situated learning by immersing learners in problem-solving scenarios where words are used purposefully. The present study's results align with Erya and Taloko (11), who found that narrative-based video games significantly enriched vocabulary mastery by embedding learning in compelling storylines that foster sustained attention and meaningful repetition. Moreover, the AR components likely enhanced retention by linking digital stimuli to real-world spatial cues, reinforcing embodied cognition (14, 16). This supports findings by Khodabandeh (15) showing that AR-embedded flipped instruction improves long-term vocabulary recall due to its ability to contextualize and visualize lexical information.

A second critical factor explaining the strong results is the flipped classroom structure, which reallocated direct instruction to pre-class AR/game tasks and maximized in-class interaction. This mirrors the learning-oriented assessment strategies highlighted by Ghaneiarani (18), where peer and teacher feedback during collaborative sessions promotes deeper processing and self-regulation. By arriving in class already familiar with the lexical input encountered through mobile and game-based platforms, learners could dedicate in-class time to meaning negotiation, peer correction, and contextual application, processes known to strengthen lexical networks and communicative confidence (19, 20). Furthermore, this sequencing supports Dörnyei's (23) assertion that learning motivation increases when tasks build on prior knowledge and provide immediate, meaningful feedback.

The motivational dimension of the results is also notable. The gamified environment—with progress indicators, challenges, and rewards—appears to have activated intrinsic motivation, which is central to sustained vocabulary study. This aligns with Deterding and colleagues (21), who conceptualized gamification as a means to enhance engagement and self-determination. Similarly, Baierschmidt (22) argued that principled integration of game mechanics can reduce learner anxiety and promote risk-taking in language use. Learners in this study reported that gameful AR tasks were "enjoyable" and "less intimidating," echoing Ashraf's (6) and Aghlara's (5) findings among Iranian EFL contexts where game-based tasks transformed vocabulary learning from mechanical drills into interactive, student-centered experiences.

The role of mobile-assisted language learning (MALL) in extending practice opportunities also emerged strongly. Consistent with Zain and Bowles (12), mobile devices provided ubiquitous, flexible access to game and AR content, supporting just-in-time review and personalization. Chen (17) similarly observed that mobile games enhance learners' perceptions of autonomy and control, which can improve vocabulary retention. The current findings reinforce these conclusions, suggesting that combining mobility, AR visualization, and gamified design can create a highly adaptive vocabulary learning ecosystem that accommodates individual pacing and preferences while maintaining structured pedagogical goals.

Importantly, this study also contributes to global conversations on digital literacies and 21st-century skills. By integrating AR and game-based tools, learners were not only acquiring vocabulary but also practicing critical digital navigation, collaboration, and creative problem-solving—competencies highlighted in UNESCO's curriculum for media and information literacy (20). Steinkuehler and Duncan (2) emphasize that virtual environments cultivate "scientific habits of mind," while Gee (3) links game-based learning to higher-order thinking and adaptive expertise. Thus, the instructional design used here has implications beyond language learning, preparing students for technology-rich academic and professional futures.

While the results are encouraging, the study also underscores the importance of pedagogical alignment and teacher mediation. Games and AR experiences alone are insufficient if not embedded in a coherent instructional framework (22, 23). The flipped model and structured feedback loops provided necessary scaffolding, echoing Ghaneiarani's (18) recommendation that digital tools be coupled with assessment-for-learning strategies. Without guided reflection and purposeful application, there is a risk of superficial engagement or cognitive overload, as cautioned by previous research (9, 22). The present study mitigated these risks by balancing autonomous pre-class play with guided classroom interaction.

Another noteworthy point is the cultural responsiveness of the design. Previous studies in Iranian and regional EFL contexts emphasize that socio-cultural factors—such as gender perceptions of motivation (9) or local attitudes toward technology (5, 6)—shape how learners engage with digital tools. By allowing pre-class self-paced play and in-class support, the model may have accommodated diverse learner profiles and reduced anxiety associated with public performance. These culturally sensitive design choices strengthen the generalizability of the approach across similar educational settings.

Finally, the mixed-methods research design proved essential in uncovering both cognitive outcomes and affective dimensions. Quantitative post-test gains provided objective evidence of improved vocabulary retention, while qualitative

feedback illuminated motivational shifts and user experience—methodological triangulation recommended by Saraswati and Devi (19) and Bhandari (24). Ebadi (13) also highlighted that understanding learners' perceptions is critical for sustaining mobile and extramural vocabulary activities. The present study confirms that combining test data with learner voices yields richer, actionable insights.

Despite its contributions, this research faces several limitations that warrant caution. The sample size was relatively small and drawn from a single institutional context, limiting the generalizability of the findings to other EFL populations with different cultural or technological access profiles. The duration of exposure to AR and game-based activities was moderate; extended longitudinal studies might capture whether motivational gains and retention persist over time or diminish once novelty effects fade. Additionally, the study relied on self-reported motivation and engagement, which, although insightful, may be subject to social desirability or reporting bias. Another limitation lies in the variability of learners' prior digital literacy; some participants may have been more comfortable navigating mobile and AR tools, which could have influenced both learning outcomes and attitudes.

Future investigations should expand the scope and diversity of participant groups, including varied age levels, proficiency bands, and cultural contexts to test the adaptability of the AR-flipped game-based model. Longitudinal designs spanning multiple semesters could examine the durability of vocabulary gains and motivational effects beyond the short term. It would also be valuable to integrate objective engagement analytics (e.g., app usage logs, eye-tracking, or clickstream data) alongside self-reports to triangulate learners' cognitive and emotional involvement. Comparative studies isolating individual components—such as AR alone, gamification alone, or flipped learning without AR—could clarify which design features drive the strongest outcomes. Furthermore, exploring how adaptive algorithms and artificial intelligence can personalize vocabulary difficulty and feedback in AR/game environments may enhance efficiency and learner autonomy.

Educators aiming to adopt similar interventions should focus on alignment between technology and pedagogy rather than technology as a stand-alone solution. Structured pre-class game or AR experiences should feed directly into interactive, communicative in-class activities to ensure deep processing. Teacher preparation is critical; instructors need training in managing digital tools, interpreting learner analytics, and providing timely feedback that builds on autonomous pre-class engagement. Additionally, schools and policymakers should invest in infrastructure and equitable access, ensuring all learners can participate regardless of device ownership or connectivity. Finally, curriculum designers might consider embedding media and information literacy objectives into game-based and AR-enhanced lessons, thus addressing both language development and essential digital competencies for the 21st century.

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Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

All ethical principles were adhered in conducting and writing this article.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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References

1. Squire K, Giovanetto K, Devane B, Durga S. From users to designers: Building a self-organizing game-based learning environment. TechTrends: Linking Research & Practice to Improve Learning. 2005;49(5):34-42. doi: 10.1007/BF02763688.
2. Steinkuehler C, Duncan S. Scientific habits of mind in virtual worlds. Journal of Science Education and Technology. 2008;17(6):530-43. doi: 10.1007/s10956-008-9120-8.
3. Gee JP, Hayes ER. Language and learning in the digital age: Routledge; 2011.
4. Squire K. Video Games and Learning: Teaching and Participatory Culture in the Digital Age. 2011.
5. Aghlara L, Tamjid NH. The effect of digital games on Iranian children's vocabulary retention in foreign language acquisition. Procedia - Social and Behavioral Sciences. 2010;29:552-60. doi: 10.1016/j.sbspro.2011.11.275.
6. Ashraf H, Motlagh FG, Salami M. The impact of online games on Iranian EFL learners' vocabulary retention and motivation. International Journal of Applied Linguistics & English Literature. 2014;3(6):63-9. doi: 10.1016/j.sbspro.2014.03.418.
7. Muhanna W. Using online games for teaching English vocabulary for Jordanian students learning English as a foreign language. Journal of College Teaching & Learning (Online). 2012;9(3):235. doi: 10.19030/tlc.v9i3.7178.
8. Musselman ML. The effect of game-based learning on middle school students' academic achievement. 2014.
9. Kissau SP, Kolano LQ, Wang C. Perceptions of gender differences in high school students' motivation to learn Spanish. Foreign Language Annals. 2010;43(4):703-21. doi: 10.1111/j.1944-9720.2010.01110.x.
10. Liu S. Use of gamification in vocabulary learning: A case study in Macau. 2014:90-7.
11. Erya PD, Taloko JL. THE INFLUENCE OF NARRATIVE-BASED VIDEO GAMES ENGAGEMENT ON ENGLISH VOCABULARY MASTERY: A NARRATIVE INQUIRY. Magister Scientiae. 2024;52(2):134-43. doi: 10.33508/mgs.v52i2.5919.
12. Zain DSM, Bowles FA. Mobile-assisted language learning (MALL) for higher education instructional practices in EFL/ESL contexts: A recent review of literature. Computer-Assisted Language Learning Electronic Journal. 2021;22(1):283-307.
13. Ebadi S, Amini Z, Gheisari N. On the relationship between mobile-based extramural activities and vocabulary development of EFL learners: a mixed-method study. Smart Learning Environments. 2023;10(1):33. doi: 10.1186/s40561-023-00252-y.
14. Wen Y. Augmented reality enhanced cognitive engagement: Designing classroom-based collaborative learning activities for young language learners. Educational Technology Research and Development. 2021;69(2):843-60. doi: 10.1007/s11423-020-09893-z.
15. Khodabandeh F. Enhancing Vocabulary Learning and Retention in EFL Students: A Comparative Study of ARLOOPA Augmented Reality App in Flipped Online and Flipped Face-to-Face Classes. Educational Technology Research and Development. 2025:1-19. doi: 10.1007/s11423-025-10489-8.
16. Hung HT, Yeh HC. Augmented-reality-enhanced game-based learning in flipped English classrooms: Effects on students' creative thinking and vocabulary acquisition. Journal of Computer Assisted Learning. 2023;39(6):1786-800. doi: 10.1111/jcal.12839.

17. Chen CM, Liu H, Huang HB. Effects of a mobile game-based English vocabulary learning app on learners' perceptions and learning performance: A case study of Taiwanese EFL learners. ReCALL. 2019;31(2):170-88. doi: 10.1017/S0958344018000228.

18. Ghaneiarani S, Alavi SM, Kaivanpanah S. Enhancing writing ability of Iranian EFL learners through learning-oriented assessment: peer and teacher feedback implementation. Language Testing in Asia. 2024;14(1):39. doi: 10.1186/s40468-024-00298-w.

19. Saraswati P, Devi A. Mixed methods-research methodology an overview. Mathews Journal of Nursing and Health Care. 2023;5(4):1-3. doi: 10.30654/MJNH.100024.

20. Unesco. Media and Information Literacy: A Curriculum for Teachers: UNESCO Publishing; 2021.

21. Deterding S, Dixon D, Khaled R, Nacke L, editors. From game design elements to gamefulness: Defining "gamification". Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments; 2011.

22. Baierschmidt J. A principled approach to utilizing digital games in the language learning classroom. The JALT CALL Journal. 2013;9(3):307-15. doi: 10.29140/jaltcall.v9n3.j162.

23. Dörnyei Z. Research methods in applied linguistics: Quantitative, qualitative, and mixed methodologies: Oxford University Press; 2007.

24. Bhandari P. Independent vs. dependent variables | Definition & examples. Scribbr. 2023.