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Research Article

Boosting Vocabulary Learning and Retention in EFL Learners: The Impact of Visual Hints in Educational Games

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ABSTRACT

This study explores the effectiveness of visual hints in educational games on vocabulary learning and retention among intermediate EFL learners. Participants included 50 male and female students, aged 15 to 19, from the Ava Language Institute in Urmia, Iran. These native Turkish speakers with Persian as their standard language were selected based on their performance on the Oxford Quick Placement Test (OQPT). The study employed a pretest-posttest design, utilizing the Vocabulary Knowledge Scale (VKS) for assessment. Participants were divided into two groups: a visual hints group and a control group, each comprising 25 students. Both groups engaged with the Spaceteam ESL game, an interactive mobile application designed for language learning. The visual hints group received additional visual aids before answering questions, whereas the control group did not. After 10 sessions, a vocabulary posttest was administered immediately and again one month later to measure retention. Results indicated that visual hints significantly enhanced both vocabulary acquisition and long-term retention compared to the control group. These findings suggest that integrating visual aids embedded in the educational games into language learning games can be a highly effective strategy for improving vocabulary knowledge among intermediate EFL learners. Future research should explore the long-term impacts and applicability across diverse learner populations.

Keywords: Educational Games, Visual Hints, Vocabulary Learning, Vocabulary Retention

1. INTRODUCTION

Vocabulary serves as the cornerstone of language learning, acting as the fundamental building blocks for effective communication. According to Vnucko and Klimova (2023), the acquisition of lexical items forms the bedrock upon which learners build their knowledge of the target language. Recognizing the paramount importance of vocabulary in second language (L2) acquisition is essential, as highlighted by Meara (1980), who emphasized that learners often struggle significantly with vocabulary even as they progress to more advanced stages of language learning. Similarly, Cuenca-Calva et al., (2024) pointed out that secondary language teachers often identify vocabulary as a key area needing extensive research to enhance teaching and learning processes in classrooms.

Numerous reasons underscore the importance of vocabulary in language learning. Without a robust vocabulary, meaningful communication is nearly impossible, as communication competence relies heavily on knowing the right words. Vocabulary is also crucial for reading comprehension; a good stock of vocabulary is a strong predictor of reading comprehension success (Lanfer, 2003; Nation, 2001). Learners with limited vocabulary development often struggle to comprehend text at grade level, impacting their overall academic performance (August et al., 1999). Consequently, there is a pressing need for effective vocabulary teaching strategies that can improve both comprehension and communication skills. One of the strategies seems to play a role in both vocabulary learning and retention is game-based instruction.

In recent years, educational games have emerged as a powerful tool in the domain of vocabulary learning. Defined as games created to teach a subject in an engaging format, often incorporating software that runs on various devices (Balci, 2015), educational games harness the intrinsic motivation of gameplay to enhance learning outcomes. According to Franklin (2011) and Hill (2011), game-based applications increase student engagement and extend exposure to content, making them particularly effective for vocabulary acquisition.

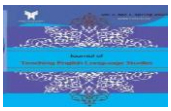
Visual hints within educational games play a significant role in aiding vocabulary retention. Visual aids, such as images, symbols, and animations, help create strong mental associations between words and their meanings, thereby enhancing memory and recall. This concept is supported by dual-coding theory, which posits that both visual and verbal information can enhance learning and memory (Paivio, 1991). When learners encounter new vocabulary accompanied by visual hints, their ability to recall and use these words improves significantly (Fotovatnia & Khaki, 2012).

Research has consistently shown the benefits of educational games with visual hints for vocabulary learning. Hwang, Shadiev, and Huang (2011) demonstrated that such games not only improve vocabulary retention but also boost learners' motivation and engagement. Similarly, Zou et al., (2024) found that visual aids in multimedia environments significantly enhance the learning of new words by providing contextual clues that aid in comprehension and memorization.

The decision to focus on educational games with visual hints in this study is driven by their complementary strengths in enhancing vocabulary learning among EFL learners. Educational games, with their interactive elements and immediate feedback, are particularly effective in maintaining learner engagement and motivation. The use of visual hints caters to visual learners and aids in the retention of new vocabulary by creating vivid mental images. Furthermore, the gamified environment reduces the monotony associated with traditional vocabulary learning methods, thereby increasing learners' willingness to engage in repeated practice. Combining educational games with visual hints and role play offers a multifaceted approach to vocabulary learning. Educational games make the initial learning of new words engaging and memorable. This holistic approach addresses both the cognitive and affective dimensions of vocabulary acquisition, making it a robust strategy for EFL learners. Vocabulary learning in Iranian EFL (English as a Foreign Language) contexts faces numerous challenges. New vocabularies are often taught out of context, making it difficult for learners to acquire them meaningfully. Most vocabulary instruction relies heavily on translation, which hinders the learners' ability to grasp the concept of each word. Consequently, learners' strategies for learning new vocabularies are not adequately considered, resulting in ineffective acquisition. As a result, most learners struggle to use new vocabularies in their speaking and writing, rendering many of the words passive in their minds. In EFL classes, the primary focus is often on memorizing the meanings of words. However, mere memorization does not ensure that students can recall and use these words in different contexts.

Effective vocabulary learning requires appropriate techniques and strategies. According to Oxford (1990), employing general learning strategies, and more specifically, vocabulary learning strategies as highlighted by Lai (2005), is crucial for both teachers and language learners, especially in the context of Iranian EFL learners. To motivate learners to acquire new words meaningfully, some scholars advocate for the use of special methods and strategies such as educational games. These approaches can help overcome the difficulties associated with vocabulary learning, stimulate the learners' minds to generate new ideas, and ultimately facilitate the learning process (Ghaedsharafi & Bagheri, 2012).

Educational games, particularly those incorporating visual hints, have shown potential in enhancing vocabulary learning. Visual hints are a key component of game-based learning, which aims to increase student engagement and exposure to content. Games are intrinsically fun and engaging, making them a compelling medium for educational purposes (Joiner et al., 2011). Educational games, defined as "a game created to teach a subject in the form of software that runs on a computer such as desktop, laptop, handheld, or game console" (Balci, 2015), leverage the popularity of game-based apps to enhance student motivation and learning



outcomes (Franklin, 2011; Hill, 2011).

In the 21st-century classroom, technology integration is increasingly embraced for its potential to facilitate learning for students of all abilities. Technology can align classroom instruction with how students conduct their day-to-day lives, offering numerous benefits including improved student achievement and motivation (Campigotto, McEwen, & Demmans Epp, 2013; Heafner, 2004). The flexibility of technology enables teachers to differentiate instruction in ways that were not possible with traditional media (Meyer & Rose, 2005).

Visual hints in educational games are particularly valuable in vocabulary learning. Visuals help convey meaning and aid memory retention (Fotovatnia & Khaki, 2012). The dual-coding theory proposed by Paivio (1991) supports the idea that both visual and verbal information can be used to represent information, enhancing recall and recognition if information is presented in both formats. According to Paivio (1986), human cognition is unique in its ability to handle verbal and non-verbal information simultaneously, making visual hints a powerful tool for making input more comprehensible for learners.

Despite the evident benefits, the role of educational games with visual hints in vocabulary learning remains under-researched, especially in the context of Iranian EFL learners. Most of the existing studies have been conducted in ESL (English as a Second Language) contexts, such as the study by Zeglen and Rosendale (2018) in the United States. This gap highlights the need for new research to investigate the impact of visual hints in educational games on vocabulary learning among Iranian EFL learners. The study aims to address the following research questions:

RQ**1:** How do visual hints in educational games impact the vocabulary acquisition of Iranian EFL learners compared to traditional vocabulary learning methods?

RQ**2:** To what extent do visual hints in educational games enhance the long-term retention of new vocabulary items among Iranian EFL learners?

2. REVIEW OF LITERATURE

Numerous empirical studies have explored the impact of game-based instruction on English language learning, particularly through technology-enhanced methods. Despite the plethora of available applications, educational apps are not as prevalent as other categories (Walker, 2011). Teachers often struggle to find suitable apps for specific student needs. However, Yerushalmy and Botzer (2011) emphasized the importance of mobile learning in future educational curricula, indicating that apps could be critical in providing differentiated instruction. Increasing exposure to English vocabulary through game-based apps can significantly benefit students.

Perera et al. (2014) researched game-based learning for special education in Sri Lanka, demonstrating that ICT-based education could enhance learning effectiveness for students with special needs. The study involved designing games focused on basic concepts in various subjects and measuring performance improvements through pre- and post-tests. Derakhshan and Khatir (2015) reviewed the effects of using games on English vocabulary learning, finding that games enhance word memorization, student interaction, communicative skills, and motivation. Ragatz (2015) similarly found that game-based learning increased motivation and vocabulary retention among students. Yeh and Lan (2018) integrated VR into EFL classes in Taiwan, showing that students who created their own virtual worlds were more motivated and focused, leading to better learning outcomes. Gamlo (2019) investigated mobile game-based language learning apps' impact on Saudi female EFL students, finding that these apps enhanced learning motivation and perceived pedagogical value.

Alfadil (2020) explored the use of the VR game House of Languages for EFL vocabulary acquisition among intermediate students, finding significant performance improvements compared to traditional methods. Stancin, Hoic-Bozic, and Skocic Mihic (2020) conducted a systematic review on digital game-based learning for students with intellectual disabilities, noting that serious games and PC-based technologies were common and beneficial for cognitive development. Furthermore, research has shown that visual aids can significantly enhance language learning by increasing learners' attention and retention. Boers et al. (2008) examined the mnemonic effects of pictorial representations on idiomatic phrases. Their study involved teaching 100 English idioms to 34 Dutch learners using an online program. The results indicated that pictures, combined with verbal explanations, positively impacted the retention of idiom meanings. However, pictorial support had limited effects on the retention of idiom form, particularly for visual learners predisposed to imagery processing. A follow-up study by Boers, Piquer-Píriz, Stengers, and Eyckmans (2009) confirmed these findings, showing that pictorial support contributed little to the retention of linguistic form and could slow down learning for idioms with difficult or unfamiliar words.

Baker (2011) evaluated the effects of visual images and self-generated imagery on learning idioms among second language learners. The study found that both methods improved immediate and delayed recall of idiomatic meanings. Saffarian, Gorjian, and Bavizadeh (2013) investigated the impact of visual images on the retention of body idiomatic expressions in EFL learners.

They found that the experimental group taught with visual aids outperformed the control group taught with verbal definitions alone. Vasiljevic (2015) compared two imagery-based techniques: pictorial support depicting the literal meanings of idioms and etymological notes explaining their origins. Etymological notes were more effective for retaining idiom meanings, while pictorial support facilitated recall of linguistic form. Aydin (2019) examined cognitive processes in L2 idiom comprehension using pictorial representations of literal and figurative meanings. Results indicated that comprehension varied by learning setting, instructional technique, and idiom type, though proficiency level had no significant effect. Overall, these studies underscore the importance of game-based learning and visual aids in enhancing language learning, particularly for vocabulary and idiom retention. Visual supports, whether static or animated, can facilitate cognitive mapping, improve retention, and motivate learners. The existing research on the effectiveness of visual aids in language learning offers valuable insights, yet several gaps remain. Addressing these gaps will provide a more comprehensive understanding of visual learning in language education and inform the development of tailored instructional approaches.

3. METHODOLOGY

3.1. Design

The design of this study is quasi-experimental in nature. It used a pretest posttest design with a control group. Furthermore, the participants were selected based on the convenient sampling.

3.2. Participants

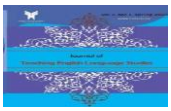
For this study, 60 male and female students from two intermediate classes across two branches of the Ava Language Institute in Urmia, Iran, participated. Their ages ranged from 15 to 19 years old, and all students were native Turkish speakers with Persian as their standard language. Two weeks prior to the study, all participants underwent the Oxford Quick Placement Test (OQPT) to assess their proficiency levels in English as a Foreign Language (EFL). Based on the test results, 50 students were selected as final participants and divided into two groups, each comprising 25 students.

3.3. Instruments and Materials

The first assessment tool utilized in this study was the Oxford Quick Placement Test (OQPT), comprising 60 multiple-choice items designed to rapidly gauge students' overall language proficiency. It assesses grammar and vocabulary knowledge, as well as the ability to comprehend meaning in communication and apply English in real-world situations. The test aimed to ensure the homogeneity of intermediate EFL participants in terms of general English proficiency, with selection criteria based on one standard deviation above and below the mean. Participants were allotted 60 minutes to complete the test.

The second assessment tool was a pretest on vocabulary, consisting of 60 multiple-choice items adapted from Paribakht and Wesche (1993). The Vocabulary Knowledge Scale (VKS) developed by Paribakht and Wesche was employed, focusing on levels I and II to determine which vocabularies would be targeted during the treatment. Levels III, IV, and V were reserved for post-test evaluation. Each item on the VKS scale yielded a score ranging from 1 to 5, indicating progressive degrees of word knowledge. The pretest was expert-judged for validity by a panel of three experts and reported a reliability coefficient of .76.

The third assessment tool was a posttest in vocabulary, comprising 40 multiple-choice items (with total score of 20) aligned with the instructional content. This researcher-made test aimed to measure participants' learning and retention of new words taught during the intervention. Participants were required to complete the test within a 60-minute time limit. The posttest underwent



expert validation by three experienced teachers with PhD degrees in TEFL, resulting in a reported reliability coefficient of .81.

3.4. Data Collection and Analysis Procedures

At the onset of the study, the Oxford Quick Placement Test (OQPT) was used to homogenize the learners' language proficiency levels. The test, consisting of 60 multiple-choice items taken from Fischer's (2001) 'Oxford University Press and University of Cambridge Local Examinations Syndicate,' was administered, and learners scoring within one standard deviation above and below the mean were selected for the study. The allotted time for the test was 60 minutes. From the initial 60 students, 50 were selected and categorized into two groups: the visual hints group and the control group.

After homogenizing the learners, a pretest on vocabulary was administered, using new words selected from the games to be used in the study. Both groups were then exposed to the Spaceteam ESL game. According to Grimshaw and Cardoso (2018), Spaceteam ESL is an interactive gaming application designed for intermediate-level English students, played on mobile devices. Players, in teams of two or more, communicate instructions to keep a spaceship running. Spaceteam ESL operates in two modes. In the first mode, players received a list of frequently-used vocabulary on their mobile screens, which an automated word producer enunciated. Players repeated the vocabulary, made sentences, and interacted with peers in English. In the second phase, the same vocabulary appeared during gameplay, and players repeated and used the words in sentences.

The procedure for the visual hints group was as follows: subjects received elaborate feedback after each game activity, and were provided with visual hints before answering rehearsal questions. This visual reinforcement aimed to aid in vocabulary retention. The control group followed the same game activities but without the visual hints. The treatment lasted for 10 sessions. One month after the conclusion of the treatment, a vocabulary posttest was administered to both groups to estimate the learners' retention of new words. The results were then analyzed using independent samples t-tests.

4. RESULTS AND DISCUSSIONS

The first research question aimed to explore the existence of any significant difference in the effects of visual hints in educational games on vocabulary learning of EFL learners. Table 1 indicates the descriptive statistics of the learners in two groups in the posttest of vocabulary.

Table 1

Descriptive Statistics of Posttest in Vocabulary in Short-run

Group	N	Mean	Std. Deviation	Std. Error Mean
Visual hint	25	17.37	3.05	.578
Control	25	11.98	2.77	.594

Table 1 reveals that the mean scores of the EFL students in posttest of vocabulary in visual hint group is 17.37 with SD of 3.05 and the mean score of the EFL students in posttest of vocabulary in the control group is 11.98 with the SD of 2.77. As it is clear from the above table, the means of two groups were to some extent different. However, the differences between groups needed to be tested statistically, thus, the assumption of parametric test needed to be tested. One is testing the fact that the data should be normally distributed, hence there is a need to run an independent samples t-test to test the null hypothesis. Table 2 shows the results of independent samples t-test in vocabulary learning.

Table 2

Independent Samples T-Test in in Vocabulary Learning

	Levene's Test for Equality Variances		Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	2.576	.130	1.8	48	.000	21.721	10.32	-.5602	43.124
Equal variances not assumed			2.3	48	.000	21.721	9.44	2.615	40.437

According to the table, there is a significant difference between the two groups (t (48) = 1.8, p = .000), implying that the visual hint group had a significantly better performance than the control group in terms of vocabulary learning. In this way, the first null hypothesis is rejected and the results approved the effectiveness of visual hints on vocabulary learning. The second research question looked at the effectiveness of visual hints on vocabulary retention in long run. Table 3 indicates the descriptive statistics of the learners in two groups in the delayed posttest of vocabulary.

Table 3

Descriptive Statistics of Posttest in Vocabulary in Long-run

Group	N	Mean	Std. Deviation	Std. Error Mean
Visual hint	25	18.02	4.21	.665
Control	25	11.27	3.49	.568

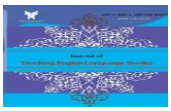
Table 3 reveals that the mean scores of the EFL students in the delayed posttest of vocabulary in visual hint group is 18.02 with SD of 4.21 and the mean score of the EFL students in posttest of vocabulary in the control group after one month of treatment is 11.27 with the SD of 3.49. To explore the existence of any significant difference between two groups in vocabulary retention, an independent samples t-test was run (See Table 4).

Table 4

Independent Samples T-Test in in Vocabulary Retention

	Levene's Test for Equality Variances		Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	3.32	.165	2.5	48	.039	19.786	8.96	-.5145	43.476
Equal variances not assumed			2.5	48	.029	19.786	9.03	2.342	43.411

According to the table, there is a significant difference between the two groups (t (48) = 1.6, p = .039), implying that the visual hint group had a significantly better performance than the control group in terms of vocabulary retention. In this way, the second null hypothesis is rejected and the results approved the effectiveness of visual hints on vocabulary retention.



Discussion

As mentioned, the focus of the current study was on vocabulary learning and improving this essential sub-skill via different strategies, specifically visual hints in educational games. Additionally, the role of the strategy in vocabulary retention was examined. The first research question investigated whether there was any difference between learners in the groups in terms of vocabulary performance. Data analysis showed a significant difference between learners in two groups. Consequently, the first null hypothesis was rejected, indicating that visual hints play a role in the vocabulary performance. Moreover, the second null hypothesis was rejected as results showed that learners in the visual hints group outperformed those in the control group in the vocabulary delayed posttest, suggesting that the effect of visual hints was significant than the role of traditional group.

The study utilized educational games to explore the impact of visual hints on vocabulary learning. Technology has become ingrained in educational institutions, significantly influencing how educators teach and students learn (Wells et al., 2008). Teachers are under pressure to integrate technology into their classrooms, seeking to provide rich learning experiences and create more engaging and stimulating environments (Koehler, Mishra, Hershey, & Peruski, 2004). The findings of this study align with this trend, demonstrating that practically all students were actively engaged, working in groups, supporting each other, and interacting with the researcher during class activities.

The results of this study are consistent with Ruddick's (2012) findings that students in game-based classes improved their grades compared to those in traditional classrooms. Similarly, Reinders and Wattana (2015) found that digital games in L2 education led to increased English interaction among Thai learners, and Grimshaw and Cardoso (2018) reported that playing games like Spaceteam ESL improved Canadian ESL learners' willingness to communicate. The effectiveness of visual hints in educational games can be attributed to the age and proficiency level of the students, who were young adults and intermediate learners. Visuals or pictures helped them overcome their inadequacies in learning new words, as young adult learners tend to be more visually oriented (Boucheix, 2005). Visual aids are known to be very effective in helping students memorize new vocabulary and structures (Clark & Lyons, 2004).

The importance of visual hints in educational games is supported by cognitive theories related to input, dual-coding, and image schema. These theories emphasize the significance of visual and experiential relationships in language acquisition (Mitchell & Myles, 2004; Paivio, 1991). The dual-coding theory, for instance, posits that combining pictures, mental imagery, and verbal elaboration enhances understanding and learning (Paivio, 1991).

The results of this study are in harmony with previous research indicating the positive effects of visual aids on vocabulary learning (Peeck, 1993; Carney & Levin, 2002; Clark & Lyons, 2004; Jakolva, 2009; Shoari & Farrokhi, 2014; Heidari & Araghi, 2015). For example, Carney and Levin (2002) found that pictures improved the reading-to-learn process, while Herron, Hanley, and Cole (1995) demonstrated that visual support significantly facilitated listening comprehension (as cited in Canning-Wilson, 2000).

In conclusion, the study's findings illustrate that the use of visual hints in educational games significantly impacts vocabulary learning by aiding the transfer of information from working memory to long-term memory. This highlights the importance of designing engaging and motivating learning environments that utilize visual aids to optimize students' learning experiences. Future research should continue exploring specific learning strategies in serious educational games to further enhance their effectiveness.

5. CONCLUSION

The findings of this study indicate that the use of visual hints in educational games significantly enhances both the vocabulary learning and retention of EFL learners. The effectiveness of visual hints suggests that incorporating visual aids into language learning can provide substantial benefits, especially for intermediate learners. This approach not only facilitates the acquisition of new vocabulary but also aids in the long-term retention of these words. The current study has a set of implications. Teachers and educators can leverage visual hints in educational games to create a more engaging and effective vocabulary learning experience. By integrating visual aids, educators can cater to the visual learning preferences of students, thereby improving their overall language acquisition process. Curriculum developers should consider incorporating visual elements into language learning materials. This integration can enhance the learning process, making it more interactive and aligned with modern educational technologies. The use of educational games that include visual hints can be a valuable tool in both traditional and online language classrooms. This approach can help bridge the gap between theoretical knowledge and practical application, providing a more holistic learning experience. Like most of the studies, this study also had a set of limitations. The study was conducted with a limited sample size of 60 intermediate EFL learners from a language institute. The generalizability of the

findings may be restricted to similar demographic and linguistic backgrounds. The study's duration was relatively short, and while it demonstrated the effectiveness of visual hints in the short term, the long-term effects were not thoroughly examined. Although the study compared the visual hints group with a control group, further comparison with other types of instructional strategies could provide more comprehensive insights. Future research should explore the long-term impact of visual hints on vocabulary retention over extended periods. Longitudinal studies could provide deeper insights into the sustained effectiveness of this approach. Research should be conducted with a more diverse population, including learners of different ages, proficiency levels, and cultural backgrounds. This would help determine the broader applicability of visual hints in language learning. Comparative studies involving different instructional strategies, such as auditory aids, kinesthetic activities, and traditional teaching methods, could provide a more comprehensive understanding of the most effective techniques for vocabulary acquisition. Further investigation into various types of technology-enhanced learning tools, beyond visual hints, can offer a broader perspective on how digital innovations can be optimized for language education. Incorporating qualitative methods such as interviews and observations could provide richer data on learners' experiences and perceptions, offering a more nuanced understanding of how visual hints impact language learning. By addressing these areas, future research can build on the findings of this study, contributing to the development of more effective and inclusive language learning strategies.

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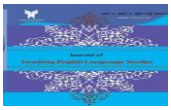

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