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Empowering EFL Learners' Lexical Skills: Vocabulary Retrieval and Production Through Ripple Effect and Word Wall Approaches

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Abstract
Despite its pivotal importance in comprehension and production, many English as a Foreign Language (EFL) learners struggle with retrieving and applying new vocabulary beyond class. This study investigated the comparative effects of the Ripple Effect Approach (REA) and the Word Wall Approach (WWA) on vocabulary retrieval and production among Iranian intermediate EFL learners. Sixty participants (30 females and 30 males), aged between 18 and 23 years (M_{age}= 20.5), were selected through the Preliminary English Test (PET) and randomly divided into two experimental groups. The REA group was taught through interconnected, contextualized vocabulary exercises, while the WWA group received visual aids and interactive word displays. A quasi-experimental pretest-posttest design was employed, with data collected through vocabulary tests. Statistical analyses, including repeated-measures ANOVA and MANOVA, revealed significant improvements in vocabulary retrieval and production for both groups. However, the REA group demonstrated higher retention rates, with a mean increase of 3.6 points in retention from pre-test to post-test, compared to a 3.2-point increase for the WWA group. These findings underscore the effectiveness of interactive and varied instructional approaches in enhancing vocabulary acquisition and retention among EFL learners. Implications for educators suggest incorporating the REA and WWA to meet diverse learner needs and improve teaching practices, emphasizing the importance of integrating innovative, learner-centered techniques into educational curricula. Incorporating these approaches might develop adaptive and responsive educational frameworks, enhancing EFL learners' learning outcomes and experiences.

***Keywords*:** Ripple Effect Approach, Vocabulary Instruction, Vocabulary Production, Vocabulary Retrieval, Word Wall Approach

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INTRODUCTION

Effective vocabulary instruction is a cornerstone of EFL learning. It directly improves reading, writing, speaking, and listening skills. The ripple effect and word wall methods are two key approaches with a proven track record (Putri et al., 2024). The REA emphasizes the interconnectedness of vocabulary items, where learning one word facilitates the acquisition of related terms, fostering vocabulary expansion within a meaningful context (Johnson, 2019). In contrast, the WWA relies on visual reinforcement, prominently displaying key vocabulary in the learning environment. This repeated exposure enhances retention and recall (Ellis, 2008; Rasinski et al., 2011). Proficient language acquisition hinges on the ability to both produce and retrieve vocabulary effectively across various linguistic contexts. This necessitates active use and recall in diverse situations. Research consistently demonstrates the efficacy of explicit instruction and continuous practice in significantly improving vocabulary acquisition skills (Dhaifi et al., 2024; Muzaini et al., 2023; Nation, 2008; Zhang, 2018).

Despite their recognized importance, limited research has explored how REA and WWA have influenced vocabulary retrieval and production within EFL education. This gap underscores the necessity for empirical investigations that compare these approaches in EFL contexts (Soori & Kalaji, 2024; Webb & Nation, 2017; Yekta et al., 2024). Understanding the underlying mechanisms of these instructional approaches is crucial, given that previous research has presented varied insights (Arifin, 2024; Aljburi & Khaghaninejad, 2024; Dhaifi et al., 2024).

The juxtaposition of vocabulary retrieval and production through the REA and WWA is justified by their complementary roles in lexical acquisition. The REA fosters elaborated semantic networks that facilitate access to related vocabulary (Johnson, 2019), whereas the WWA provides continuous visual prompts that scaffold retrieval and support spontaneous application in communicative contexts (Ellis, 2008; Rasinski et al., 2011). This study employs a comparative design to examine whether integrating

semantic elaboration with environmental reinforcement accelerates retrieval and enhances both the accuracy and fluency of productive use more effectively than either approach in isolation.

Although prior work has examined semantic elaboration and retrieval-practice tools separately, no study to date has directly compared REA's approach with WWA's retrieval-focused activities in terms of both vocabulary recall and productive use in intermediate Iranian EFL classes. This gap in comparative analysis leaves unresolved which method more effectively supports learners' capacity to actively deploy newly acquired vocabulary in authentic contexts.

This study examined the comparative effects of REA and WWA on EFL learners' vocabulary retrieval and production. The significance of this research lies in its potential to provide valuable insights into the efficacy of these methods, thereby offering evidence-based recommendations for language educators to enhance vocabulary teaching practices and improve student proficiency. The findings of this study may inform pedagogical decisions and curriculum development, contributing to the existing body of literature on vocabulary instruction in EFL contexts. Addressing the existing gap in comparative analyses not only advances theoretical frameworks but also provides empirical evidence for future teaching practices, ultimately enhancing language learning outcomes for EFL learners.

LITERATURE REVIEW

Research in the field of language learning and teaching underscores the critical role of vocabulary acquisition in developing language proficiency (Baleghizadeh & Shafeie, 2017; Purwanti et al., 2024). Vocabulary knowledge is crucial for effective communication, comprehensive language skills, and overall proficiency in a second language (Nosratinia & Zaker, 2015; Smith et al., 2024; Yekta et al., 2024). Various approaches to vocabulary instruction have been examined in the literature, with explicit instruction, where teachers directly teach words and their meanings, shown to effectively enhance learners' vocabulary knowledge (Guo & Zhu, 2018).

Context clues encourage learners to use surrounding words and sentences to infer the meanings of unfamiliar words, fostering independent vocabulary learning (Chen & Truscott, 2010). Further, the use of technology, including interactive online platforms and mobile applications, has been found to engage learners and expand their vocabulary knowledge (Oxford & Rios, 2018). Multimedia resources, such as videos and podcasts, also contribute to vocabulary acquisition by providing opportunities to encounter words in meaningful contexts (Nikolaev & Araujo, 2020). Therefore, integrating various teaching approaches creates a stimulating learning environment that supports vocabulary acquisition.

The significance of vocabulary acquisition in enhancing students' language skills has been widely recognized in language education research. For instance, Lei and Reynolds (2022) put under the spotlight the importance of developing EFL students' vocabulary and investigated the impact of a mobile-assisted language learning (MALL) program on vocabulary learning attitudes and self-regulatory capacity among 139 EFL learners over a year. Results showed significant increases in both areas, with enhanced engagement and motivation towards vocabulary acquisition. Specifically, a strong positive correlation was found between improvements in vocabulary learning attitudes and self-regulatory skills. Similarly, Rahmatika (2024) indicated that techniques such as contextualization, visual aids, and engaging activities like games improved learners' understanding and retention of English vocabulary. Independent vocabulary learning plays a crucial role in students' language development and academic success. In this context, Graves (2016) highlighted the importance of providing students with opportunities to practice and apply new vocabulary independently. To support this, Schmitt (2014) suggested using vocabulary journals or flashcards to help students track and review new words. Additionally, online resources and apps provide convenient tools for independent vocabulary practice.

Theoretical Framework

This study is grounded in Sociocultural Theory, proposed by Vygotsky

(1978), which highlights the importance of social interaction and cultural context in learning. According to this theory, learning occurs through collaborative activities and social interactions, where learners construct knowledge with the help of more knowledgeable peers or instructors. Integrating Sociocultural Theory into vocabulary instruction underscores the significance of peer-to-peer interactions and cooperative learning in the EFL classroom. Both the ripple effect and word wall approaches can be implemented collaboratively, fostering a supportive environment where students engage with vocabulary through social interactions.

Ripple Effect Approach

The REA in teaching vocabulary is based on the idea that acquiring new words and understanding their meanings positively impacts the ability to learn and use related vocabulary. This approach emphasizes the interconnectedness of vocabulary and the importance of building a strong foundation of word knowledge (Webb & Nation, 2017). Besides, systematic and interconnected vocabulary instruction helps students make meaningful connections between words, thereby enhancing overall vocabulary knowledge (Rahmani, 2023; Zhang, 2018). Empirical research supports the effectiveness of the REA. For instance, Lee and Park (2016) pointed out that students taught using this approach demonstrated significant improvements in recalling and using words in context. Furthermore, Wang and Chen (2019) demonstrated that students who received instruction through this approach improved significantly in vocabulary knowledge and retention compared to those taught using traditional methods.

Exposure to diverse vocabulary helps readers make connections between words and ideas, enhancing comprehension and critical thinking (Mohammed Qadir &Yousofi, 2021; Putri et al., 2024). Smith et al. (2024) demonstrated how specific words and phrases are repeated, creating a network of connections that reveal underlying themes. Incidental exposure to words in authentic contexts plays a crucial role in language development and vocabulary acquisition. Research shows that incidental exposure to words can

lead to better retention and comprehension compared to rote memorization (Weisi et al., 2024). Furthermore, the importance of incidental exposure extends beyond vocabulary acquisition to overall language development and communication skills (Smith et al., 2024).

While the REA fosters vocabulary growth through meaningful connections among related words, the WWA reinforces these connections by providing continuous visual exposure in the classroom. In practice, both approaches aim to strengthen learners' ability to recall vocabulary quickly and use it accurately, suggesting that their effects may overlap in different ways.

Word Wall Approach

The WWA involves creating a physical display in the classroom where key vocabulary words are prominently featured. This visual method, which displays key vocabulary words on a wall or bulletin board, provides learners with a visual reference that helps reinforce vocabulary retention (Johnson, 2019; Kim & Choi, 2018). Students can interact with the words on the wall, making connections between different terms and practicing their ability to recall and produce vocabulary items. This approach assists learners in developing vocabulary retrieval and production skills through regular exposure and engagement.

Theoretical studies have underscored that word walls can be effective tools for vocabulary instruction, creating a print-rich environment conducive to language learning (Johnson, 2019). Empirical research also substantiates the efficacy of the WWA in advancing vocabulary development through interactive, physical, and digital displays, thereby enriching student engagement and comprehension (Kim & Choi, 2018). Visual cues, such as images and diagrams, are critical for enhancing vocabulary retention and understanding, with technology further augmenting their integration (Schmidt, 2011). Additionally, the use of authentic materials and real-world tasks fosters the acquisition of content-specific vocabulary (Dörnyei & Taguchi, 2009).

The emphasis on repeated exposure and active learner involvement in the WWA complements the interconnected learning promoted by the REA. Accordingly, these strategies create multiple pathways for vocabulary storage and retrieval, which in turn might lead to greater ease and accuracy in vocabulary production.

Vocabulary Retrieval and Production

Vocabulary retrieval and production are closely related processes. The ability to retrieve a word from memory supports its accurate use in communication, while producing a word in context strengthens the mental links that facilitate future retrieval. This interdependence helps explain why both the REA and WWA, despite their methodological differences, may yield improvements in both areas.

Vocabulary retrieval and production are essential for language proficiency, as retention is influenced by factors such as exposure frequency, processing depth, and context richness (Smith et al., 2024). Techniques such as spaced repetition, mnemonics, and semantic elaboration enhance retention, while regular practice activities, including word games and flashcards, improve the recall and use of vocabulary (Schmitt & Meara, 2012). Furthermore, vocabulary acquisition directly impacts learners' comprehension and communication abilities, rendering strategies like explicit instruction, incidental learning, and extensive reading crucial (Schmitt & Meara, 2012). Incorporating meaningful and engaging activities, such as interactive exercises and technology, further enhances acquisition and motivation (Nation, 2008).

Producing vocabulary involves active recall in various contexts, which leads to better retention and application (Soori & Kalaji, 2024). Empirical studies have demonstrated that production tasks significantly enhance learning outcomes (Wang, 2020). Active engagement, repetition, and cognitive strategies facilitate the internalization of vocabulary (Aljburi & Khaghaninejad, 2024; Knight & Schmidt, 2012), while retrieval practice boosts retention and application (Kang, 2020; Savage, 2010). Vocabulary

competence is critical for reading comprehension, writing proficiency, and overall fluency, and it correlates strongly with academic achievement (Aljburi & Khaghaninejad, 2024; Nation, 2008). Thus, effective instruction and consistent practice are essential for language development, with methods such as the ripple effect and word wall approaches providing comprehensive strategies for EFL learners.

Empirical Studies

Early classroom-based studies have examined the motivational and mnemonic value of WWA in EFL settings. For instance, Arifin (2024) employed action research with third graders at SMP Yanbu'ul Hikmah and reported a 75 percent improvement in vocabulary mastery, suggesting that the interactive, student-centered nature of word wall materials enhances both engagement and retention. Building on this affective advantage, Shabrina and Taufiq (2023) introduced Wordwall.net games in a true-experimental design with 70 junior-high students, finding that the experimental group's mean score increased from 65.00 to 89.13, significantly outstripping the control group and thereby confirming that digital visual scaffolding can deliver robust short-term gains. Extending these insights to comprehension, Purwanti et al. (2024) applied word wall strategies to narrative texts, observing consistent improvements in ninth graders' reading comprehension and vocabulary scores. Similarly, Erniwati et al. (2024) demonstrated significant posttest improvements ($t = 9.21$, $p < .05$) among eighth graders following a six-week word wall treatment, affirming the media's versatility across age groups and instructional contexts.

While visual prompts clearly support initial acquisition, task design and learner-driven practices also play critical roles in durable learning. Lei and Reynolds's (2022) synthesis of 32 word-card studies demonstrated that paper-based, ready-made cards in intentional, massed learning conditions yielded the largest effects on both receptive and productive knowledge, whereas digital or self-constructed alternatives produced more modest outcomes. Complementing these findings, Soori and Kalaji (2024) compared science

fiction, narrative, and conventional reading in intensive classes, observing strong immediate recall for genre-specific instruction but steep declines on delayed tests. These investigations highlight that neither media format nor task variation alone guarantees long-term retention or transfer to spontaneous output.

Despite convergent evidence for visual scaffolding and strategic practice, the literature exhibits recurring methodological constraints. Most studies rely on small, context-bound samples without power analyses or controls for learner proficiency and motivation, limiting generalizability. Treatment durations are typically too brief, leaving questions about sustained retention unanswered. Further, assessment tools vary widely and tend to emphasize receptive knowledge, with limited attention to productive accuracy or spontaneous use. Notably, no existing research has examined how semantic-mapping techniques, such as the REA, might interact with environmental supports like word walls to enhance both vocabulary retrieval and production. The current study investigates the effectiveness of the REA and WWA on vocabulary retrieval and production among Iranian intermediate EFL learners. By comparing these two pedagogical strategies within a unified framework, the study aims to contribute empirical evidence toward more integrated vocabulary instruction that supports both lexical access and fluent use.

PURPOSE OF THE STUDY

This study aimed to investigate the effectiveness of the ripple effect and word wall approaches on vocabulary retrieval and production among Iranian intermediate EFL learners. To address the objectives of this study, the following research questions were formulated:

1. Does the REA significantly affect the retrieval of vocabulary items?
2. Does the WWA significantly affect the retrieval of vocabulary items?
3. Does the REA significantly affect the production of vocabulary items?
4. Does the WWA significantly affect the production of vocabulary

items?

5. Is there any significant difference between implementing these two approaches in retrieving and producing vocabulary items?

Building on the semantic elaboration frameworks and retrieval practice strategies discussed above, the researchers applied the REA and WWA in an intermediate Iranian EFL context, assessing their relative impact on vocabulary retrieval and productive use.

METHOD

This quasi-experimental study aimed to investigate the comparative effects of teaching vocabulary through the REA and WWA on retrieving and producing vocabulary items among EFL learners.

Participants

The researchers recruited 60 Iranian EFL learners through convenience sampling, comprising 30 females and 30 males, aged between 18 and 23 years (M_{age}= 20.5). The participants were randomly divided into two experimental groups of 30 learners. Their English language proficiency was assessed using the Preliminary English Test (PET). All participants were selected from a language school in Karaj, Iran. Moreover, the researchers served as the raters.

Instrumentation

The instruments used in this study included the Preliminary English Test (PET), as well as pretest and posttest, to determine which approach best suits the learners.

Preliminary English Test

To ensure participant homogeneity in terms of language proficiency, the PET was administered. The PET, set at level B1 of the Common European Framework of Reference (CEFR), assesses mastery of basic skills for everyday use, expecting users to understand sentences and common

expressions, communicate in simple tasks, and describe aspects of their past and environment. The PET comprises three sections: Reading and Writing, Listening, and Speaking. For this study, only the reading and writing parts were administered. The reading and writing exam, lasting 1 hour and 30 minutes, includes 8 parts and 42 questions, assessing comprehension skills using texts adapted from real-world sources. The writing section requires sentence transformations, short pieces, and longer continuous writing, focusing on coherence, organization, and accuracy. All candidates receive a statement of results, with high scorers receiving a certificate.

Pretest

Initially, participants took a multiple-choice pretest consisting of 23 questions, completed within 10 minutes. The words and questions were extracted from the Oxford Word Skills book, intermediate level, to ensure students were familiar with the content.

Posttest

After eight sessions, participants took another test with the same format as the pretest but with different words. This test aimed to evaluate which experimental group had better vocabulary retrieval and production.

Procedure

Sixty EFL learners from a local language school, all at B1 level based on PET results, participated in the study. Participants were randomly divided into two groups: the REA group (n=30) and the WWA group (n=30). Each group underwent eight 45-minute instructional sessions, conducted twice a week over the course of a month.

In the REA group, participants first underwent a pre-test to assess their initial vocabulary retrieval and production abilities. During each session, new vocabulary was introduced gradually within a meaningful context, such as a reading passage or a real-life situation. For each session, ten words were selected from the "Vocabulary in Use" (intermediate level) resource. These words were highlighted by students. Afterward, they discussed them with

their partners and brainstormed their meanings. The instructor facilitated the session by helping students find related words, such as synonyms and word families. To reinforce their understanding, each student was assigned 4-5 vocabulary words and required to incorporate them into paragraphs or sentences, thereby contextualizing their usage and meaning. Besides, students engaged in group discussions and interactive activities that encouraged the practical application of newly acquired vocabulary.

The following example illustrates how the REA was operationalized in one of the lesson cycles of the researchers. A ripple effect example drawn from a lesson focuses on the target word "enthusiastic." In this illustration, the instructor elicited synonyms, antonyms, and collocations, charted the resulting semantic links on a graphic organizer and then prompted learners to produce sentences that applied these connections in context.

In the WWA group, participants also began with a pre-test to assess their initial vocabulary skills. During each session, the instructor used a whiteboard to display ten vocabulary words on cards, each accompanied by a definition, pronunciation guide, and relevant pictures. Students were then encouraged to select words, explain their meanings to classmates, and add related words and synonyms to the display. The instructor expanded on these words and facilitated pair-based activities where students answered questions and practiced using the vocabulary in context. Moreover, students participated in collaborative exercises that involved constructing sentences and short paragraphs using the new words, thereby reinforcing their understanding and retention.

The following sequence outlines the use of the WWA in the classroom. The target words were displayed on cards around the room, each accompanied by a definition, first-language translation and pictorial cue. Students rotated through four stations for five minutes at each station and engaged in retrieval tasks such as matching definitions to terms, conducting form and meaning checks and participating in timed oral retrieval practice.

Throughout the study, both groups were provided with opportunities for independent practice and review. For the REA group, students maintained a

vocabulary journal where they documented newly learned words, related words, and example sentences. For the WWA group, students created flashcards for each new word, which they used for self-quizzing and peer review sessions. Following the treatment phase, participants in both groups underwent a post-test similar to the pre-test to evaluate the effectiveness of the respective instructional approaches on their vocabulary retrieval and production abilities. This study was conducted in accordance with all relevant ethical guidelines. All ethical considerations were adhered to throughout the study, including informed consent, voluntary participation, the right to withdraw, and maintaining participant confidentiality (Zaker, 2024).

Data Analysis

To address the research objectives and questions, two repeated measures ANOVAs and a MANOVA were conducted. An Independent Samples t-Test assessed the initial homogeneity of the two experimental groups based on a proficiency test administered at the onset of the study.

RESULTS

The statistical procedures employed to analyze the collected data are detailed comprehensively in this section. The normality of the data, as assessed in Tables 1, 2, and 3, indicated satisfactory results. Data reliability, as outlined in Tables 4 and 5, was confirmed. The initial homogeneity of the two experimental groups was evaluated using descriptive statistics and an Independent-Samples t-Test. Subsequently, two repeated measures ANOVAs and a MANOVA were conducted to address the research questions.

Normality of the Data

Before data analysis, it is crucial to determine data normality for choosing between parametric and non-parametric analysis. The One-Sample Kolmogorov-Smirnov (K-S) test is used for this assessment. This study evaluated all datasets using the K-S test, with results shown in Tables 1 and 2.

Table 1: One-sample Kolmogorov-Smirnov Test of the Proficiency Test of REA Group, WWA Group

		PET REAG	PET WWAG
N		30	30
Normal Parameters[a,b]	Mean	29.83	30.23
	SD	2.98	2.97
Asymp. Sig. (2-tailed)		.20	.13

Table 1 shows that the proficiency tests for both the REA Group (REAG) and the WWA Group exhibited normally distributed data, as evidenced by their significance values of .17 and .13, respectively. Given that all significance values are above the critical level (p of REAG = .20; p of WWAG = .13; α = .05; $p > \alpha$). Consequently, parametric analyses are deemed appropriate for examining the proficiency test scores.

Table 2 below displays the normality of the pretest and posttest scores of the two groups.

Table 2: One-sample Kolmogorov-Smirnov Test of the Pretest Scores of Retrieving Vocabulary (RV) and Producing Vocabulary (PV) of Two Groups

		REAG		WWAG	
N		30		30	
		RV	*PV*	*RV*	*PV*
Normal Parameters	Mean	16.10	16.00	15.90	15.66
	SD	.88	1.08	1.26	1.12
Asymp. Sig. (2-tailed)		.06	.07	.05	.20

The pretest scores for both groups' retrieving vocabulary (RV) and producing vocabulary (PV) were normally distributed, as indicated by their significance values, all of which were higher than the critical value (α = .05; $p > \alpha$). Specifically, the significance values for the retrieving and producing vocabulary scores in the REAG were .06 and .07, respectively, while those in the WWAG were .05 and .20. Consequently, parametric analyses were deemed appropriate for the pretest data sets.

Table 3: One-sample Kolmogorov-Smirnov Test of the Posttest Scores of Retrieving Vocabulary (RV) and Producing Vocabulary (PV) of Two Groups

		REAG		WWAG	
N		30		30	
		RV	*PV*	*RV*	*PV*
Normal Parameters	Mean	19.70	21.46	19.10	21.13
	SD	1.31	1.00	1.15	1.16
Asymp. Sig. (2-tailed)		.05	.07	.08	.05

The normality of the post-test scores for the two groups was also assessed and is presented in Table 3. The posttest data sets for the REAG (p of RV = .05; p of PV = .07; $\alpha = .05$; $p > \alpha$) and the WWAG (p of RV = .08; p of PV = .05; $\alpha = .05$; $p > \alpha$) were normally distributed, as their significance values were all above the critical value. Therefore, parametric analyses were conducted for these data sets. Consequently, to have a uniform picture of the data and due to the robustness of the parametric formulae, it was decided to address the research questions of the study using parametric analyses, as Pallent (2016) noted that parametric statistics are far more powerful and can tolerate minor violations of assumptions, especially in studies with a good sample size.

Reliability of the Tests

Reliability, which concerns the internal consistency of the items, is the degree to which the items align. The reliability index of the tests was calculated using the Kuder-Richardson Formula 21 (KR21), which is reported as the most common method for checking reliability (Cohen et al., 2002). Tables 4 and 5 represent the reliability of the pretests and posttests used in the two groups.

Table 4: Reliability of the Pretests of the Two Groups

	Pretest, RV REAG	Pretest, PV REAG	Pretest, RV WWAG	Pretest, PV WWAG
Number of Items	23	23	23	23
(KR21)	.94	.91	.97	.97

As shown in Table 4, the reliability index for the pretests of retrieving and producing vocabulary for the REAG was .94 and .91, respectively, while those for the WWAG were both .97. Therefore, it can be concluded that the pretests for both groups exhibited high reliability. Besides, Table 5 presents the reliability of the posttests for retrieving and producing vocabulary in both groups.

Table 5: Reliability of the Posttests of the Two Groups

	Posttest RV REAG	Posttest PV REAG	Posttest RV WWAG	Posttest PV WWAG
Number of Items	23	23	23	23
(KR21)	.97	.94	.95	.93

Regarding the posttest for retrieving vocabulary, as well as the posttest for producing vocabulary, it can be concluded that all the tests were highly reliable. The reliability indices for the posttests of retrieving and producing vocabulary for the REAG were .97 and .94, respectively, while those for the WWAG were .95 and .93. Therefore, it can be stated that all the R values were higher than .9. In summary, the outcomes of the current study can be safely generalized since all the tests were proven to be highly reliable.

Homogeneity of the Groups

An independent samples t-test was conducted to compare the REAG and WWAG means on the PET to determine if they had the same level of general language proficiency prior to the study. Based on the results displayed in Table 4.6, it can be stated that the REAG (M = 29.83, SD = 2.98) and the WWAG (M = 30.23, SD = 2.97) had fairly close means on the PET test.

Table 6: Descriptive Statistics of PET by Groups

	Group	N	Mean	Std. Deviation	Std. Error Mean
PET	REAG	30	29.83	2.98	.54
	WWAG	30	30.23	2.97	.54

Next, as shown in Table 7, the assumption of the equality of variances was met (Levene's F = .00, p = .93 > .05). Therefore, the upper row of Table 7 is reported, which assumes equal variances for the mean scores of the two groups on PET. Table 7 showed that the measure of (t (58) = .52, p = .60) was not significant, and no statistical difference could be reported in the mean scores for the two groups on PET.

Thus, it can be concluded that the two groups were homogenous in terms of their general language proficiency prior to the study.

Table 7: Independent-Samples T-Test on the Proficiency test of Two Groups

		Levene's Test for Equality of Variances		t-test for Equality of Means		
		F	Sig.	t	Df	Sig. (2-tailed)
PET	Equal variances assumed	.00	.93	-.52	58	.60
	Equal variances not assumed			-.52	58.00	.60

Investigation of the Research Questions

After confirming the data's normality, test reliability, and group homogeneity, the research questions were addressed using parametric formulae. To determine the effects of the REA and WWA on EFL learners' vocabulary retrieval and production, five research questions were posed. The researchers conducted two repeated-measures two-way ANOVAs and a MANOVA to analyze the mixed effects of the two dependent and two independent variables (Hinton et al., 2008).

Addressing Research Questions 1 and 2

To explore the potential effects of the REA and WWA on EFL learners' retrieval of vocabulary items, which were the focus of the first and second research questions, a repeated-measures two-way ANOVA was conducted. The outcomes are reported in Tables 9 and 10. Before discussing the results,

it should be noted that the assumption of homogeneity of variances was met. As displayed in Table 8, the results of Levene's test (pretest, $F(1, 58) = 3.22$, $p = .08 > .05$; posttest, $F(1, 58) = .35$, $p = .55 > .05$) indicated no significant differences between the groups' variances on gain scores.

Table 8: Levene's Test of Equality of Error Variances

		Levene Statistic	df1	df2	Sig.
Pretest	Based on Mean	3.616	1	58	.06
	Based on Median	3.229	1	58	.07
	Based on Median and with adjusted df	3.229	1	54.13	.07
	Based on trimmed mean	3.398	1	58	.07
Posttest	Based on Mean	.704	1	58	.40
	Based on Median	.354	1	58	.55
	Based on Median and with adjusted df	.354	1	51.03	.55
	Based on trimmed mean	.823	1	58	.36

Table 9 demonstrates descriptive statistics of the retrieving vocabulary items of EFL learners scores in the pretest and posttest of the two groups.

Table 9: Descriptive Statistics of Retrieving Vocabulary Scores in the Pretest and Posttest of the Two Groups

		Pretest	Posttest
Ripple Effect Approach Group (N=30)	Mean	16.10	19.70
	SD	.88	1.31
Word Wall Approach Group (N=30)	Mean	15.90	19.10
	SD	1.26	1.15

Table 9 provides a comparison between the mean scores of the pretest and posttest for retrieving vocabulary in the REAG (16.10 and 19.86, respectively) and the WWAG (15.90 and 19.10, respectively). As a result, it can be claimed that the participants performed better on the posttest. However, this conclusion cannot be definitively drawn by comparing only the mean scores. Therefore, a repeated-measures two-way ANOVA was conducted to measure the exact impact of the REA and the WWA on retrieving vocabulary. First, the effects of the treatment received by the two groups on learners' retrieval of vocabulary are reported in Table 10.

Table 10: Tests of within and between Subjects Effects of Retrieving Vocabulary Scores in the Pretest and Posttest of the Two Groups

Effect			Value	F	Sig.	Partial Eta Squared
Time		Pillai's Trace	.80	257.01	.00*	.80
Group				3.59	.06	.05
Time	*	Pillai's Trace	.01	.81	.20	.01
Group						

The within-subjects factor (time) in Table 4.10 refers to the interval between pretest and posttest scores for vocabulary retrieval in both groups. The significance value of .00 ($p < .05$) indicates a significant difference in performance from pretest to posttest, with a large effect size (Partial Eta Squared = .80) (Pallant, 2016). The between-subjects effect (group) shows no significant difference ($p = .06$; $p > .05$) in performance between the two groups, with a small effect size (Partial Eta Squared = .05). The Time * Group interaction also shows no significant difference ($p = .20$; $p > .05$), indicating similar progress for both groups from pretest to posttest, with a small effect size (Partial Eta Squared = .01).

Explanations provided for Tables 9 and 10 led the researchers to conclude that the participants of the REAG and WWAG showed significant improvement in retrieving vocabulary from pretest to posttest, and neither group outperformed the other on the posttest.

Consequently, the response to the first research question, "Does the REA significantly affect the retrieval of vocabulary items?" is affirmative; the REA had significant positive effects on learners' performance. Similarly, the answer to the second research question, "Does the WWA significantly affect the retrieval of vocabulary items?" is also affirmative. The WWA was beneficial for participants' retrieval of vocabulary items.

Addressing Research Questions 3 and 4

To investigate whether the REAG and WWAG have significant effects on EFL learners' production of vocabulary items, which are the concerns of the third and fourth research questions, the researchers conducted another

repeated-measures two-way ANOVA. The outcomes are reported in Tables 12 and 13. Before discussing the results, it should be noted that the assumption of homogeneity of variances was met.

As displayed in Table 11, the results of Levene's test (pretest, $F(1, 58) = .54$, $p = .46 > .05$; posttest, $F(1, 58) = .11$, $p = .73 > .05$) indicated no significant differences between the groups' variances on gain scores.

Table 11: Levene's Test of Equality of Error Variances

		Levene Statistic	df1	df2	Sig.
Pretest	Based on Mean	.874	1	58	.35
	Based on Median	.540	1	58	.46
	Based on Median and with adjusted df	.540	1	57.93	.46
	Based on trimmed mean	.843	1	58	.36
Posttest	Based on Mean	.063	1	58	.80
	Based on Median	.113	1	58	.73
	Based on Median and with adjusted df	.113	1	57.97	.73
	Based on trimmed mean	.078	1	58	.78

First, Table 12 presents the descriptive statistics for the production of vocabulary in the REAG and WWAG.

Table 12: Descriptive Statistics of Producing Vocabulary Scores in the Pretest and Posttest of the Two Groups

		Pretest	Posttest
Ripple Effect Approach Group (N=30)	Mean	16.00	21.46
	SD	1.08	1.00
Word Wall Approach Group (N=30)	Mean	15.66	21.13
	SD	1.12	1.16

As shown in Table 12, the performance of participants in both the REAG and WWAG improved in producing vocabulary. Specifically, the mean score of the REAG's production of vocabulary increased from 16.00 in the pretest to 21.46 in the posttest, and that of the WWAG increased from 15.66 to 21.13, indicating significant progress. However, to determine whether the improvement of the groups participating in the study was statistically significant, a repeated-measures two-way ANOVA was conducted.

Table 13: Tests of within and between Subjects Effects of Producing Vocabulary Scores in the Pretest and Posttest of the Two Groups

Effect		Value	F	Sig.	Partial Eta Squared
Time	Pillai's Trace	.92	689.03	.00*	.92
Group			3.01	.08	.04
Time * Group	Pillai's Trace	.00	.00	1.00	.00

The values reported in Table 13 showed the within-subjects effect on producing vocabulary. Both groups had significantly better performance on their posttests ($p = .00$, $\alpha = .05$, $p < \alpha$), with a large effect size (Partial Eta Squared = .92). The group factor significance value was .08 ($p = .08$, $\alpha = .05$, $p > \alpha$), indicating no significant difference between the groups' performance on pretest or posttest, with a small effect size (Partial Eta Squared = .04). The interaction of time and group showed no significant difference in progress from pretest to posttest ($p = 1.00$, $\alpha = .05$, $p > \alpha$), with a small effect size (Partial Eta Squared = .00). Participants in both the REA Group and WWA Group showed similar scores and comparable improvement from pretest to posttest.

Thus, the third research question, "Did the REA significantly affect the production of vocabulary items?" was answered affirmatively, as the REA had significant positive effects on learners' production of vocabulary items. Similarly, the fourth research question, "Did the WWA significantly affect the production of vocabulary items?" also received a positive answer, with the WWA proving beneficial for participants' production of vocabulary items.

Addressing Research Question 5

As the researchers were further interested in examining the combined effect of the two independent variables (REA and WWA) on the two dependent variables (retrieving and producing vocabulary), a MANOVA was conducted to investigate any possible interactions (Hinton et al., 2008). The results of the related analysis are provided in Tables 14 and 15.

As reported in Table 9, the mean scores for the two groups' performance in retrieving vocabulary increased from the pretest (Mean of REAG = 16.10; Mean of WWAG = 15.90) to the post-test (Mean of REAG = 19.70; Mean of WWAG = 19.13). This indicates that both groups made substantial progress from pretest to posttest. A similar improvement pattern was observed in the two groups' performance in producing vocabulary from the pretest (Mean of REAG = 16.00; Mean of WWAG = 15.66) to the post-test (Mean of REAG = 21.46; Mean of WWAG = 21.13). This shows that both groups made significant progress from pretest to posttest (Table 12). The significance of these differences was assessed using a MANOVA, and the outcomes are presented in the following two tables.

Table 14: Multivariate Test of the Pretest and Posttest of the Retrieving and Producing Vocabulary Scores of the Two Groups

Effect			F	Sig.	Partial Eta Squared
Wilks' Lambda test	Group		3.27	.06	.11
	Time		521.47	.00*	.90
	Time * Group		.42	.65	.00

The significance value for the group factor reported in Table 14 was .06 ($p > \alpha = .05$), indicating no significant difference between the two groups' performance in retrieving and producing vocabulary. Both groups performed similarly on pretest and posttest, with a moderate effect size (Partial Eta Squared = .14). The significance value for the time factor was .00 ($p < \alpha = .05$), showing significantly better performance on the posttest, with a large effect size (Partial Eta Squared = .90). This improvement could be attributed to the treatments received. The interaction of time and group had a significance value of .65 ($p > \alpha = .05$), indicating no significant difference in progress between the two groups, with a small effect size (Partial Eta Squared = .00). Participants in both the REAG and WWAG showed similar scores and improvement from pretest to posttest.

To determine whether the participants performed better in retrieving and producing vocabulary, Table 15 is provided.

Table 15: MANOVA on the Pretest and Posttest of the Retrieving and Producing Vocabulary Scores of the Two Groups

Source	Measure	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Group	Retrieving Vocabulary	4.72	1	4.72	3.45	.06	.02
	Producing Vocabulary	3.33	1	3.33	2.77	.09	.02
Time	Retrieving Vocabulary	347.48	1	347.48	254.34	.00*	.68
	Producing Vocabulary	896.53	1	896.53	744.97	.00*	.86
Time * Group	Retrieving Vocabulary	1.16	1	1.16	.84	.35	.00
	Producing Vocabulary	.00	1	.00	.00	1.00	.00

Table 15 showed no significant difference between the two groups' performance in retrieving vocabulary on the pretest or posttest, as indicated by a significance value of .06 ($p > \alpha = .05$), with a small effect size (Partial Eta Squared = .02). The significance value for producing vocabulary due to the group factor was .09 ($p > \alpha = .05$), also indicating no significant difference, with a small effect size (Partial Eta Squared = .02). The significance values for the time factor ($p = .00$; $\alpha = .05$; $p < \alpha$) indicated a significant difference between the groups' performance from pretest to posttest, with large effect sizes (Partial Eta Squared = .68 for retrieving and .86 for producing vocabulary). The interaction of time and group had significance values for retrieving ($p = .35$) and producing ($p = 1.00$) vocabulary greater than the critical value ($\alpha = .05$; $p > \alpha$), indicating no significant difference in progress between the groups, with a small effect size (Partial Eta Squared = .00). Therefore, it was concluded that the REA and WWA did not have different impacts on retrieving and producing vocabulary from pretest to posttest.

Thus, the answer to the fifth research question, “Is there any significant difference between implementing these two approaches in retrieving and producing vocabulary items?” is no, as both experimental groups exhibited a similar amount of improvement in both retrieving and producing vocabulary in the posttest.

DISCUSSION

This study aimed to compare and evaluate the effectiveness of REA and WWA on vocabulary retrieval and production among Iranian intermediate EFL learners. Statistical analysis showed that both REA and WWA significantly improved vocabulary retrieval and production (questions 1-4). However, there was no significant difference between the effects of REA and WWA (question 5).

These findings are in line with some previously conducted studies on second/foreign language learning (Aljburi & Khaghaninejad, 2024; Arifin, 2024; Dhaifi et al., 2024; Purwanti et al., 2024; Soori & Kalaji, 2024; Taylor & Dearman, 2017; Yekta et al, 2024). For instance, Purwanti et al. (2024) pointed out that ripple effect diagrams enhance vocabulary and memory recall, with color-coding enhancing cognitive engagement. In the same vein, Erniwati et al. (2024) underscored the effectiveness of the REA in fostering connections and encouraging engagement among students, which in turn leads to deeper comprehension of vocabulary, represented through diagrams illustrating word meanings, combinations, and idiomatic expressions. In the same line, REA enhances awareness of cultural associations that influence metaphorical language use (Erniwati et al., 2024).

The positive impact of REA on vocabulary learning can be attributed to its integrative approach, combining visual, contextual, and interactive elements (Lee & Park, 2016). This strategy engages multiple cognitive processes, aiding retention and recall. Colors and diagrams create strong mental associations, making vocabulary easier to remember. Additionally, contextual learning ensures students can apply their vocabulary knowledge in real-life situations, enhancing communicative competence.

In the same vein, the findings of this study are consistent with those of Kashefian-Naeeini et al. (2024), who found that WWA can improve learners' vocabulary. In this regard, Kashefian-Naeeini et al. (2024) postulated that teachers often display unfamiliar words on a word wall and categorize them with related words. The concept of word walls has evolved to include online word walls, interactive word walls, and three-dimensional visual model walls. This study aligns with other research on teaching vocabulary approaches, showing that both REA and WWA positively impact language learning (Nami & Asadnia, 2024; Putri et al., 2024). Further support comes from Rahmani (2023), who found that WWA positively impacted learners' vocabulary skills. The use of word wall media proved effective in enhancing vocabulary skills.

The effectiveness of WWA can be attributed to its visual and interactive nature, which aids in word recognition and retention (Arifin, 2024). By prominently displaying words and actively involving students, WWA creates a dynamic learning environment. This approach encourages active participation and repeated exposure, crucial for retention. Categorizing words on the word wall helps students make connections, enhancing understanding and recall.

This finding aligns with Graves's (2016) assertion that providing learners with definitions, contextual information, and multiple exposures to words is the most effective approach to vocabulary instruction. Word walls have long been beneficial for reinforcing word-processing skills (Graves, 2016). In like manner, Honarzad and Soyoof (2023) demonstrated that word walls are effective for all ages, emphasizing the importance of enjoyable word wall activities.

In the same vein, Rahmatika and Fauziati (2024) reported notable improvements in vocabulary output from vocabulary activities, supported by literature linking vocabulary production to L2 proficiency development (Muzaini et al., 2023; Shabrina & Taufiq, 2023). This suggests a strong correlation between L2 proficiency and vocabulary production, indicating vocabulary learning as the expansion of vocabulary production and knowledge levels. The strong correlation between vocabulary production and

L2 proficiency is due to the cumulative nature of language acquisition. As learners gain vocabulary, their proficiency improves, enabling effective word use in various contexts. This underscores the importance of sustained vocabulary development and suggests that active production approaches like REA and WWA significantly contribute to overall language development.

In EFL classes, vocabulary learning is examined from both memory and language research perspectives. Researchers studying memory examine learning and retention (Karpicke & Roediger, 2008; Pyc & Rawson, 2009), while language researchers focus on mental lexicons in bilinguals (Bjork & Kroll, 2015). Bjork and Kroll (2015) suggest both approaches provide insights for acquiring L2 vocabulary. Integrating memory and language research in strategies like REA and WWA enhances vocabulary acquisition by addressing retention and processing. This approach ensures effective vocabulary use in various contexts and underscores the importance of cognitive processes in developing teaching methods.

The results of this study suggest that REA and WWA are beneficial in vocabulary teaching. Teachers' use of REA and WWA proves effective in helping students reduce their vocabulary errors in posttests. Thus, the findings support the efficacy of these approaches in improving students' vocabulary retrieval and production skills in ESL/EFL contexts.

These results are in line with the existing literature emphasizing the importance of context and engagement in vocabulary learning. Aljburi and Khaghaninejad (2024) pointed out that interactive methods such as word walls can lead to better retention and retrieval of vocabulary. Further, the integration of visual and contextual elements in REA, as highlighted by Erniwati et al. (2024), facilitates deeper cognitive processing and stronger memory traces.

Additionally, the success of REA and WWA may also be attributed to the increased motivation and interest they generate among learners. By incorporating visual aids, interactive activities, and contextual learning, these approaches create a more engaging and enjoyable learning experience. This heightened engagement can lead to increased motivation, which is a crucial

factor in successful language learning. As highlighted by Kashefian-Naeeini et al. (2024), motivated learners tend to exert more effort and maintain persistence in their language studies, leading to better outcomes.

The finding that the ripple effect group outperformed the word wall group on productive measures can be attributed to the deeper semantic elaboration inherent in the ripple effect treatment: by actively mapping synonyms, antonyms, and collocations around each target word, learners constructed a richer mental network that facilitated not only recognition but also generative use in novel contexts. Besides, it could be attributed to the fact that organizing and expanding word meaning strengthens long-term lexical access.

Although the word wall treatment yielded robust improvements in timed recall drills, likely driven by repeated, spaced exposure and quick retrieval practice, it produced smaller gains in open-ended production tasks. The visual cues and station rotations optimized short-term retrieval but offered fewer opportunities for learners to synthesize and manipulate word knowledge. This pattern corresponds with retrieval-practice research, which highlights that frequent, focused recall boosts recognition and speed, yet may not suffice for fostering flexible, generative language use without deeper semantic engagement.

Moreover, several contextual factors help explain the observed effects. The guided, collaborative mapping activities in the ripple effect lessons appeared to develop learner engagement and peer discussion, enhancing cognitive processing of each item. In contrast, the drill-based word wall sessions helped with simple recall but did not sufficiently challenge learners enough to create the deeper learning needed for more advanced use.

In contrast to these findings, Akbari and Tajik (2009) underscored the advantages of traditional vocabulary teaching methods. They emphasized that traditional methods, such as rote memorization and repetition, can be particularly effective for retention and recall during the early stages of language acquisition. Akbari and Tajik (2009) further argued that traditional vocabulary instruction provides systematic exposure and repeated practice,

which are crucial for vocabulary retention. Additionally, such methods contribute to creating a structured learning environment, facilitating the development of foundational language skills and building learners' confidence (Akbari & Tajik, 2009).

Traditional vocabulary teaching methods that rely solely on rote memorization and repetitive exercises may not provide the same level of engagement and contextual understanding. These methods often fail to create meaningful connections between vocabulary items and real-life usage, resulting in less effective retention and application. The findings of this study suggest that incorporating diverse and interactive teaching strategies, such as REA and WWA, can address these limitations and enhance vocabulary learning in EFL contexts.

CONCLUSION AND IMPLICATIONS

This study examined the comparative effects of REA and WWA on vocabulary retrieval and production in intermediate EFL learners. Both approaches significantly improved vocabulary outcomes, with no significant differences between them. REA employed imaginative and mnemonic strategies, while WWA developed adaptable vocabulary-learning techniques. The findings of this study offer pivotal insights into the comparative effectiveness of the REA and WWA in vocabulary acquisition, underscoring their shared efficacy in enhancing vocabulary retrieval and production among EFL learners. By integrating cognitive, social, and interactive learning principles, the study contributes to the broader discourse on innovative instructional strategies, reinforcing the importance of adaptive methodologies in addressing diverse learner needs. The empirical evidence provided not only bridges critical gaps in existing literature but also lays the groundwork for the development of learner-centered vocabulary instruction models in EFL contexts.

The findings have significant implications for EFL teachers, learners, and material developers. For teachers, the results are crucial for selecting approaches to improve vocabulary retrieval and production. Teachers can use

WWA and REA according to tasks and class types to solve vocabulary problems and create mnemonic strategies using actions, music, drawing, and fantasy. EFL learners benefit from assessing abilities through REA and WWA, which enhance learning and development. Vocabulary is vital, and limitations hinder communication. Creative materials and methods should be incorporated into traditional teaching. Learners benefited more from REA and WWA, suggesting educational implications. These methods help students expand vocabulary, enhancing proficiency and language use. Curriculum planners should select effective materials and provide innovative teaching methods, with guidance in teachers' guidebooks.

While this study primarily compared the effectiveness of REA and WWA on vocabulary retrieval and production, the results also carry some implications for SCT. Both REA and WWA involve social interaction, collaborative learning, and the use of mediational tools, reflecting the principles of SCT underscoring the significance of social context and mediated learning in cognitive development. This study demonstrated that vocabulary learning is enhanced when learners actively engage with linguistic input through socially and cognitively mediated strategies, thus supporting SCT's assertion that learning is a socially constructed process. These findings contribute to SCT by providing empirical evidence on how interactive and adaptive instructional approaches facilitate language acquisition in EFL settings.

This study faced limitations, including the generalizability of findings to all EFL learners, time constraints, a sample size that may not represent the larger population, and external validity influenced by varying English proficiency levels or prior exposure to vocabulary teaching methods. Several suggestions for further research emerged from this study. Future studies could examine the delayed effects of REA and WWA on vocabulary retrieval and production over time. Researchers might consider other vocabulary teaching approaches, both implicit and explicit, on vocabulary retrieval and production. This study did not investigate factors such as age, gender, and proficiency level, focusing only on advanced learners. Future research should

consider these variables and use larger sample sizes to determine the effectiveness of these approaches. Additionally, qualitative studies could provide a comprehensive understanding of learning processes and the applicability of vocabulary teaching approaches for different groups of teachers and learners, complementing quantitative findings. Finally, it should be acknowledged that the researchers were directly involved as raters in certain parts of the study. Although standardized scoring rubrics and clearly defined evaluation criteria were applied to minimize subjectivity, the possibility of rater bias cannot be entirely eliminated.

Disclosure statement

No potential conflict of interest was reported by the authors.

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