A comparison of the effects of web-based vocabulary instruction vs. the conventional method on EFL learners' level of L2 lexical knowledge

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ABSTRACT: Web-based training is a contemporary approach acknowledged as a proficient pedagogical strategy for imparting knowledge on L2 lexical items. The objective of this study was to investigate if the utilisation of web-based activities for teaching vocabulary items yields distinct outcomes in terms of acquisition and retention of L2 lexical items, as opposed to conventional procedures. Sixty university students at an intermediate level of English as a Foreign Language (EFL) were purposefully chosen for this study. These participants were then divided into two separate groups. The participants in the experimental group received instruction on the target vocabulary items in a computer-supported classroom. In this setting, they could practice the lexical items interactively through web-based activities. On the other hand, the control group was given the exact target words using traditional instruction methods to maintain consistency. However, students in the control group did not have the opportunity to engage with the dynamic and active nature of the web-based instructional environment. The findings of the study, which involved the administration of the Vocabulary Levels Test and subsequent analysis utilising tests and Analysis of Variance, revealed that English as a Foreign Language (EFL) learners saw more improvement in their acquisition of second language (L2) lexical items when taught through web-based activities compared to traditional teaching methods. The implications of the data suggest that L2 teachers can enhance their teaching method by including web-based and online activities to educate students on how to acquire new vocabulary items effectively.

KEYWORDS: EFL learners; lexical items; online activities; vocabulary learning; Web-based instruction

1. Introduction

The acquisition of vocabulary is essential to a learner's language abilities. The assessment of vocabulary proficiency includes not only the number of words known, commonly referred to as breadth

but also the level of understanding and mastery of those words, known as depth. Different researchers investigated varied aspects of vocabulary (Al-Sharah et al., 2021; Asad & Shabdin, 2021; Ha, 2022; Jafari & Kafipour, 2013) as vocabulary learning is an integral part of language learning (Vnucko and Klimova, 2023) and the process of acquiring vocabulary encompasses various learning mechanisms, and the implementation of efficient vocabulary training is crucial to facilitate learners' retention of newly acquired vocabulary knowledge. According to Dobinson (2006), it is imperative for teaching strategies employed in the classroom to not only facilitate learning but also the acquisition of new vocabulary in the target language. There has been a recent surge of interest among psychologists, linguists, and language teachers in investigating the most effective methods for instructing second language learners in acquiring lexical items. The utilization of online courses and web-based learning and teaching methods has become increasingly prevalent in different fields due to the rapid advancement of broadband internet and computer technology (Su et al. 2021; Legnani et al., 2022). These forms of education facilitate the exchange of knowledge among instructors, students, and their peers. These approaches allow learners to independently select the time that suits their convenience for engaging in course activities, even in the teacher's or fellow learners' absence.

Given that most adult English as a Foreign Language (EFL) learners are engaged in professional occupations, it can be argued that web-based learning and teaching methods hold significant value for this demographic. Furthermore, students frequently depend on self-directed learning in a digital educational setting due to the limited availability of their instructors for real-time assistance. According to Robert and Dennis (2005), acquiring a second or foreign language can be enhanced by developing the learner's abilities. The utilization of information technology across personal computers, laptops, and cell phones is of significant importance in the surveillance and oversight of educational endeavors (Indra et al., 2022). Fluctuations have characterized the historical trajectory of foreign language instruction in Iran, as Rashidi and Hosseini noted. Moreover, this domain has also undergone noticeable transformations over time.

Furthermore, there has been a notable shift in the EFL teaching practices in Iran, with a decreasing reliance on traditional methods. Online and technology-based learning approaches have gained prominence within the Iranian educational context (Khazai and Dastjerdi, 2011). However, web-based computer-assisted language learning (CALL) systems are typically only utilized as a last resort, even when teaching second language (L2) vocabulary. The efficacy of these treatments may be partially ascribed to this phenomenon. There may be skepticism among English as a Foreign Language (EFL) educators over the effectiveness of these delivery techniques compared to traditional methods. The inquiry pertains to the comparative effectiveness of web-based computer-assisted language learning (CALL) applications in comparison to traditional face-to-face approaches for teaching vocabulary. This study's primary objective was to examine web-based language training's effectiveness in enhancing L2 lexical knowledge among Iranian EFL learners.

2. Literature review

2.1. Web-based information technology and vocabulary learning

The emergence of web-based information technology has provided language educators with access to a wide range of tools and resources that can be utilized to enhance their teaching practices. Knowledge acquisition is no longer limited to the physical boundaries of a traditional classroom setting, characterized by four walls and a whiteboard. There is a growing ease in expanding learning beyond the confines of the classroom to optimize the effectiveness of learning activities on the learners' capabilities. According

to Kruse (2004), web-based learning provides students with increased autonomy in their learning journey, as it eliminates the limitations of time and geography. Similarly, AlOmoush (2022) highlights that e-learning platforms offer interactive online services that are not restricted by spatial or temporal constraints. The digital environment has witnessed the emergence of several methods for enhancing language proficiency (Kashefian-Naeeini and Sheikhnezami, 2020).

Consequently, the challenges that previously impeded the efficacy and productivity of language learning in traditional classrooms can now be surmounted. The field of information technology, specifically the Internet, offers educational resources that assist teachers and students in conducting a fundamental analysis of learning materials. These tools enable users to identify the essential content within the materials, distinguish it from less significant elements, and assess their progress. This process can be carried out with varying degrees of autonomy. Furthermore, the dissemination of information is facilitated through a diverse range of digital platforms, such as the Internet, intranet/extranet, audio and videotapes, satellite broadcasts, and interactive television. Additionally, students can access resources that inform them about novel concepts and ideas (Ritonga et al., 2022). In a study by Olson and Wisher (2002), the researchers examined the efficacy of web-based training and emphasized the extensive availability of instructional resources that transcend traditional classroom settings' limitations. In 2021, Hao et al. ran a meta-analysis to clarify the effects of technology-assisted second language (L2) vocabulary learning vs. traditional instructional methods for EFL learners.

Weblogs are widely preferred by numerous scholars, as evidenced by Richardson's (2004) research. Weblogs, often known as blogs, have emerged as a contemporary and rapidly proliferating mode of communication and online publishing inside the realm of the Internet. According to Kim (2006), blog-based or web-based learning can enhance traditional in-class, teacher-led education by facilitating connections with online communities and enabling knowledge sharing. As a result, it might become an essential component of the learning process. The emergence of the Internet and online technologies in recent years has significantly influenced second language (L2) teaching and learning, particularly concerning advancements in commuting and communication technology. Kim (2006) argues that e-commerce has seamlessly integrated with traditional commerce, offering numerous advantages. Similarly, web-based learning is increasingly essential to second/foreign language learning.

A primary objective of the various advancements in language learning and teaching methodologies is to augment the acquisition of second language (L2) vocabulary. The importance of vocabulary acquisition in language learning has been widely acknowledged by scholars in second language acquisition (e.g., Ramachandran and Abdul Rahim, 2004; Walters, 2004; Zahedi and Abdi, 2012). Nevertheless, it is common for learners to encounter challenges when acquiring unfamiliar vocabulary. The comprehension of a term extends beyond a mere understanding of its definition. Therefore, enhancing lexical proficiency poses a formidable challenge for individuals learning English as a second or foreign language, as it is crucial for effective communication and self-expression in a different linguistic context. According to Sadighi and Nourinezhad (2018), it has been established that incorporating formal second-language vocabulary instruction into first-language (L1) classes can be beneficial. Specific existing approaches to vocabulary instruction have proven inadequate in addressing the essential conditions required for effective vocabulary acquisition. Hence, the researchers in this study endeavored to offer a dynamic learning environment for students to acquire vocabulary through instruction delivered via the Internet.

2.2. Computer-assisted vocabulary learning

Developing computer-assisted vocabulary learning software that effectively presents, practices, and tests vocabulary in a self-study mode has been a subject of continuous research. Researchers have focused on creating multimedia vocabulary learning environments that aim to facilitate the construction of connections between verbal and visual representation systems (Mayer and Sims, 1994). These environments have shown potential in enhancing vocabulary knowledge, reading comprehension, and the speed of recognizing frequently encountered words (Tozcu and Coady, 2004). Computer-based vocabulary learning is according to Regina and Devi (2022), "a frequent and effective approach to developing retention and learning new words".

Multimedia vocabulary learning environments can vary in form based on the instructional setting and the requirements of the learners (Abraham, 2008). Chun and Plass (1996) conducted a study wherein they integrated video as a visual organizer for the reading text and annotations on specific vocabulary items encompassing visual and spoken information. Tozcu and Coady (2004) implemented the Tutorial CALL pattern, incorporating study, practice, and review strategies. Their objective was to facilitate personalized vocabulary practice by allowing students to add words to a customized list for future study. Additionally, students could set reminders to aid in comprehending words through synonyms, antonyms, translations, or paraphrases. In their study, Sun and Dong (2004) emphasized the need to use an engaging framework, such as a famous Disney animation, when designing a vocabulary learning environment targeted explicitly towards young learners. However, without providing enough support, such as sentence-level translation and target warming-up, the attractiveness of the learning environment may not guarantee a more effective acquisition of second-language lexical items.

In a separate investigation, Naraghizadeh and Barimani (2013) conducted a study to examine the efficacy of Computer-Assisted Language Learning (CALL) in enhancing the acquisition of vocabulary among Iranian English as a Foreign Language (EFL) learners. The research was carried out in two educational institutions located in Tehran. The group engaged in 16 instructional sessions utilizing computer-assisted Language Learning (CALL) technology. The control group of participants received equivalent instructional time and materials, presented solely in written format without audio-visual elements. Rahimi and Mouri (2016) also investigated the impact of computer-assisted language learning on Iranian EFL students' vocabulary learning in some language institutes in Ahvaz, who were randomly divided into control and experimental groups. The control group learned lexical items conventionally through the printed textbook, whereas the experimental group was taught using the software version of the same book. Likewise, Bagheri et al. (2012) involved 61 Iranian EFL learners from a private language institute. The participants who were recruited through a proficiency placement test encompassed 32 CALL-users and 29 non-CALL users. Bagheri et al. strived to examine CALL-based versus non-CALL based methods of vocabulary teaching/learning in the short and long-term learning and to determine which method was more effective for teaching English vocabulary to young elementary Iranian EFL learners.

Considering students' past knowledge or experience is a crucial factor in determining the implementation of online delivery (Volery, 2001). In addition to acquiring knowledge and skills, the successful implementation of web-based education necessitates learners' perceptions and attitudes towards using technology for educational purposes (Tobin et al., 1994; Albalawi, 2007). In their study, Khazaei and Dastjerdi (2011) undertook a comparative investigation to examine the effects of conventional and computer-assisted language learning methods on the acquisition and retention of vocabulary among Iranian English as a Foreign Language (EFL) learners. The primary objective of this

study was to investigate the utilization of online and web-based training in teaching second language (L2) vocabulary. The students' evaluation was conducted regarding their ability to recognize and retain lexical items. The study revealed that students exposed to the learning content via a web-based approach demonstrated superior test performance compared to their counterparts who received it through traditional methods. In general, the research results validated the substantial complementary function of Computer-Assisted Language Learning (CALL) in the instruction of novel vocabulary items.

2.3. Studies on web-based vocabulary learning

Many academics that have examined the web-based learning technique and its impact on vocabulary acquisition have documented numerous beneficial outcomes. The study conducted by Zhang et al. (2011) aimed to assess the efficacy of web-based training in vocabulary learning. The researchers compared two distinct groups of students enrolled at a Chinese institution to evaluate the impact of the intervention. One cohort of students engaged in web-based activities to study a predetermined set of vocabulary, whereas the other cohort utilised traditional paper materials to work on the identical list. Upon comparing students' test results, it was seen that vocabulary acquisition was more efficient in the short term through online activities than traditional paper-based materials.

Zapata and Sagarra (2007) examined the advantages of utilizing an online vocabulary management system in their study. They discovered that, following one semester of instructional treatment, there were no notable distinctions between the groups using the online system and those using traditional paper workbooks. However, in the subsequent semester, the group utilizing the online workbook demonstrated more success than those using paper workbooks. Klickaya and Krajka (2010) conducted a study to examine the use and effectiveness of the WordChamp vocabulary management system in university English Communication courses. The study compared WordChamp drills with traditional paper-based methods for studying frequency word vocabulary. The effectiveness of WordChamp was found to surpass that of traditional paper-based methods.

Collentine (2000) conducted a study investigating the utilization of the Wordchamp vocabulary management system, along with other online applications, to facilitate learners in achieving enhanced levels of vocabulary and reading competency in a time-efficient manner. Loucky promotes the utilization of WordCamp as a means to enhance vocabulary acquisition and comprehension in the context of online reading. This can be achieved by employing WordCamp for pre-reading or post-reading exercises aimed at vocabulary development or by utilizing it to access and store multilingual glosses when engaging with any online document. According to Collentine (2000), using rapid corpus analysis to create online flashcards, quizzes, and collaborative chats has been identified as a successful strategy for acquiring more challenging vocabulary.

According to Wang and Newlin (2000), it was shown that cyber-students with lower academic abilities had lower performance when working independently, such as during final exams. However, their homework scores showed improvement when they received assistance from study groups. Hence, the authors proposed that additional investigation is warranted to enhance comprehension of how learning communities might effectively support remote learners. The flexibility of web-based training allows learners to determine when and where they engage in learning activities independently. Consequently, students' motivation becomes a significant determinant that can influence the overall effectiveness of web-based instruction. Wang and Reeves (2006) conducted a study to examine the impact of web-based instruction on students' motivation. Biner, Bink, Huffman, and Dean (1995) conducted a study to examine the influence of personality traits on academic performance in televised courses. The study's

findings revealed that successful telecourse students had characteristics such as self-sufficiency, a preference for group work, and introversion. According to Berge, Collins, and Dougherty (2000), web-based courses were particularly well-suited for students with self-directed solid qualities. This is due to the absence of external reminders to log in and participate in the course, as the online environment is characterized by a greater degree of openness.

Moreover, using the Michigan test and some pretest-posttests, Hajebi (2018) investigated the effect of learning lexical items through web-based vocabulary learning software based on life syllabus rules among intermediate EFL learners and its contribution to students' perception. In another study, Gorjian (2012) explored the impact of Web-Based Language Learning (WBLL) and the paper-based (conventional) approaches on vocabulary retention of Iranian EFL learners. He selected a homogenous sample of 300 EFL students on the basis of a TOEFL test, Barron's edition. The participants of the WBLL group were introduced to a WBLL approach for the vocabulary retention; however, those on the paper-based presentation group were taught in accordance with the convention of teaching in ordinary classes in Iranian University context. Thus, students were provided a printed form of the material. Some comparisons were later made between the two groups.

Concerning prior information, Pulido (2004) conducted a study examining the influence of background knowledge on the acquisition of vocabulary incidentally. The findings indicated that background knowledge did not assist students with lower levels of L2 reading competency and limited vocabulary knowledge. According to Dinh and Vo (2022), integrating online learning with traditional courses necessitates the identification of learners' preparedness to engage in this novel learning environment. Consequently, evaluating the efficacy of both online and traditional approaches becomes indispensable and adhering to the more advantageous approach within the appropriate context becomes crucial. Similarly, considering the significance of web-based education in potentially shaping language teaching methods, this research aimed to examine the effects of a web-based instructional approach on learning second language (L2) vocabulary among Iranian English as a Foreign Language (EFL) learners.

2.4. Objectives and the research question

There exists a requirement for empirical support to substantiate the efficacy of web-based instructional techniques as a pedagogical instrument in the L2 teaching and learning process, specifically concerning its significant influence on enhancing the total language competency of EFL learners, with a particular focus on L2 vocabulary acquisition. This study attempted to examine the possible advantages of utilizing web-based activities to improve the level of second language (L2) lexical knowledge among Iranian English as a Foreign Language (EFL) learners. The research question addressed in this study is as follows:

What is the impact of web-based vocabulary education methodologies on the development of L2 lexical knowledge among EFL learners?

3. Method

3.1. Design of the study

Utilizing a quantitative research design employing experimental methodologies for data analysis was deemed advantageous for the objectives of this study. Consequently, utilizing a quantitative research design, the researchers sought to investigate the potential effectiveness of web-based instructional activities on English as a Foreign Language (EFL) learners' proficiency in English vocabulary. This was accomplished by analyzing and comparing the pretest and posttest scores of the participants on

vocabulary tests. Purposive sampling was considered the best method for this study, through which the researcher purposefully selected a sample that adequately represented the target population on variables such as previous English knowledge.

3.2. Participants

From the population of undergraduate students majoring in Information Technology (IT) at the University of Applied Sciences and Technology, Shiraz, Iran, an initial sample of 100 students was selected. Most students had already studied the English fundamental subject as a compulsory course in their BA program. Besides, they had studied English for at least eleven years (eight at the primary and three at the secondary school level). Based on the placement test score, 60 Intermediate EFL learners were selected and considered as the study's final sample.

3.3. Instruments

3.3.1. Oxford placement test (OPT)

A sample of 100 undergraduate students majoring in Information Technology (IT) was first picked from the community of students at the University of Applied Sciences and Technology in Shiraz, Iran. Most students have previously completed the English fundamental subject as a mandatory Bachelor's degree program component. Moreover, the participants had undergone a comprehensive English language education spanning a minimum of eleven years, encompassing eight years at the primary school level and an additional three years at the secondary school level. The researcher employed purposive sampling as the preferred sampling method for this study. This approach involved deliberately selecting a sample that effectively reflected the target population, specifically regarding factors such as prior English proficiency.

3.3.2. Vocabulary tests

Given that this study employed a quasi-experimental research methodology, wherein distinct treatment types were administered to both experimental and control groups, a vocabulary test was developed to evaluate the impact of these treatment kinds. The vocabulary test was administered to the participants before and after the treatment sessions, as this study employed a mixed design incorporating both within-subject and between-subject factors.

The format of the vocabulary retention test was derived from Nation's (2001) vocabulary level test. The vocabulary retention assessment comprised 31 English words extracted from a passage sourced from the National Geographic Journal. The vocabulary items were categorized into ten groups, including six English words. Within each group, three were the target words mentioned in the reading text, while the remaining three were distractors. Three distractors were incorporated into each set to mitigate the influence of guessing. The participants had to associate the three definitions with the corresponding three terms from the text. They selected the 31 target words for inclusion in the vocabulary retention test, which involved providing an article from the National Geographic Journal to 20 intermediate students who were not involved in the study. The participants were instructed to identify and underline unfamiliar words they desired to acquire knowledge of. Furthermore, the material mentioned above was distributed among the participating educators, who were instructed to identify and underline any words they believed their students could be unfamiliar with. Furthermore, the underlined words were tallied, and the 31 most often occurring unfamiliar terms were identified afterwards. The most often occurring unfamiliar words were analysed using an online vocabulary analysis program called "Web Vocab Profiler," developed by Tom Cobb in 2005.

The reliability of our instrument was established via Cronbach's alpha. It is an internal consistency reliability coefficient measuring the degree to which items agree with each other. The Cronbach's alpha for the whole questionnaire was found to be 0.81 which is a high and acceptable value. The following **Table 1** indicates the Cronbach alpha indexes.

Table 1. Reliability statistics of Cronbach's alpha.

Cronbach's alpha	Cronbach's alpha based on standardised items	N of items
0.810	0.811	40

4. Data collection and data analysis

The data-collection procedure comprised three distinct steps, each conducted on separate days. Initially, the Oxford Placement Test (OPT) was administered to the community to ascertain the homogeneity of the selected sample in terms of their intermediate level of language proficiency. The final sample of 64 undergraduate students was selected based on the scores obtained from the placement test. Once the target students were chosen, a vocabulary retention exam was delivered to them as a pretest to assess their proficiency in English lexical knowledge. The examination consisted of 31 multiple-choice questions administered to the participants, who were instructed to complete them within 20 min. The primary factor taken into account for the calculation of students' final scores was the proportion of correct answers they obtained. The participants were selected for instructional sessions and post-test based on their results acquired from the pretest. They were then divided into the experimental and control groups. The pretest and post-test scores of the groups were compared using Paired and Independent Sample *T*-Tests. Both control and experimental groups were provided with the target lexical items but with different instructional procedures.

The treatment material involved thirty-one words taken from an article in the National Geographic Journal, the article itself, pictures, sample sentences, and English definitions related to the selected words. The treatment material also incorporated such activities as matching, crossword and word search puzzles for both groups. However, the presentation environment of the vocabulary items was different for the experimental group. In fact, for the experimental group, the participants were taught the target vocabulary items in a computer-supported classroom where they could rehearse the lexical items interactively using web-based activities. Concerning experimental group instruction, web-based activities such as hyperlinks, hypertexts, podcasts, video casts, etc., were selected based on learners' interests and options.

During the initial presentation, the experimental group was exposed to the information through hypermedia in a computer-based setting. This group was allotted two classroom sessions, each lasting approximately one and a half hours. In contrast, the control group received identical target words through conventional instruction and activities, mirroring the treatment group, to maintain comparability between the two groups. Nevertheless, this cohort was not allowed to actively participate in the interactive and socially-driven online instructional setting, limiting their exposure to novel vocabulary and opportunities to reinforce their acquired knowledge.

5. Results

5.1. A comparison of pre- and post-test scores for both groups

According to the descriptive data presented in **Table 2**, the average score of the two groups did not exhibit a statistically significant difference (56.47 vs. 58.25). Given that the p-value for Levene's test is

below the threshold of 0.05 (0.01 < 0.05), it may be concluded that the variances of the two groups are unequal. Consequently, the second line of the table is included in the report. According to the data presented in **Table 3**, the statistical analysis conducted on the control and experimental groups, with a degree of freedom of 57 and a *t*-value of −1.7, revealed a significance level of 0.93. This finding indicates no significant difference between the two groups at the 0.05 significance level. Thus, it may be inferred that the two groups exhibited homogeneity in English language proficiency, allowing for their allocation into control and experimental groups.

Table 2. Descriptive statistics for the pretest.

Groups error of mean	N	Mean	SD	Std
Control	30	56.47	3.70	0.58
Experimental	30	58.25	5.45	0.86

Table 3. Independent sample *t*-test results for the pretest.

	F	Sig	T	df	Sig 2-tailed
Equal Variances Assumed	5.90	0.017	−1.70	57	0.93
Equal Variances Not Assumed	-		−1.70	48.70	0.93	-

5.2. A comparison of pre- and post-test scores for both groups

To address the research inquiry, the study aimed to assess and evaluate the efficacy of conventional and web-based methods for teaching vocabulary to Iranian English as a Foreign Language (EFL) learners. The primary objective was to determine if one approach exhibited greater effectiveness in enhancing the participants' level of second language (L2) lexical knowledge compared to the other. The research question is depicted in the following manner:

Research Question: "What is the impact of web-based vocabulary instruction strategies on the level of second language (L2) lexical knowledge among English as a Foreign Language (EFL) learners?"

To determine the impact of employing both instructional strategies in the instruction of vocabulary items, a post-test was provided to both groups after the final session of treatment. The analysis involved the utilization of an Independent Sample t-test in examining the mean differences. The summary of descriptive statistics and *t*-test values can be seen in **Tables 4** and **5**, respectively.

Table 4. Descriptive statistics for the post-test.

Groups	N	Mean	SD	Std error mean
Control	30	57.70	4.14	0.75
Experimental	30	75.20	2.79	0.51

Table 5. Independent sample *t*-test results for the post-test.

	F	Sig	T	df	Sig 2-tailed
Equal Variances Assumed	6.55	0.13	20.26	58	0.000*
Equal Variances Not Assumed	-	-	−20.26	50.86	0.000*

P-value at the 0.05 level.

According to the data in **Table 4**, a notable disparity is observed in the average scores of the control and experimental groups (57.70 < 75.20). Indeed, the average score for the experimental group exhibited a more excellent value than that of the control group. The results of the Independent Sample *t*-test, as presented in **Table 5**, indicate that Levene's Test yielded a value of 0.02. This suggests that the assumption of equal variances was not satisfied, as the obtained value of 0.13 exceeds the critical threshold of 0.05. Therefore, it is necessary to record the first line of the table.

As depicted in **Table 5**, the statistical analysis revealed a significance value of 0.00 for the observed disparity between the two groups. This finding indicates a high significance level at the 0.05 threshold (0.000 < 0.05). Based on the observed statistical difference in means between the experimental and control groups, it can be inferred that the implementation of web-based activities as a pedagogical approach for L2 vocabulary training positively impacted the enhancement of vocabulary retention among intermediate EFL learners in Iran.

The findings of the within-group contrast and between-group contrast were reported thoroughly. While the pretest scores of the control group were marginally superior to those of the experimental group, both groups exhibited improved vocabulary due to the treatments they received. However, the post-test results revealed that the experimental group experienced significantly more significant vocabulary gains than the control group. This suggests that the treatment administered to the experimental group was more efficacious than the treatment given to the control group.

In conclusion, the analysis of data collected from the vocabulary retention test suggests that English as a Foreign Language (EFL) learners exhibit greater effectiveness in retaining second language (L2) lexical items when they are exposed to new words through web-based and online vocabulary learning activities. The observed outcome can be ascribed to the instructional strategies employed in the interventions, which involved allocating increased time for students to engage with the designated words and allowing them frequent rehearsal opportunities. Additionally, the interventions emphasized the importance of understanding the collocational patterns associated with the words to enhance their productive use.

However, the students in the control group, who were exposed to the same treatment materials but did not have the chance to engage in online vocabulary learning activities for practice, demonstrated lower vocabulary retention. This can be attributed to the fact that the traditional techniques employed in this group did not offer the opportunities mentioned above.

6. Discussion

The primary objective of this research was to examine the impact of Web-based Vocabulary Instruction, a novel approach, on the vocabulary proficiency of Iranian English as a Foreign Language (EFL) learners—the endeavor aimed to expand the existing body of research on the subject matter. The current study's findings indicate that using web-based activities for vocabulary instruction yields superior learning outcomes compared to traditional instructional methods. Additionally, it improves the ability to retain newly acquired vocabulary pieces. Hence, it is recommended to use online activities to teach vocabulary in fundamental foreign language education. Despite the novelty of this technique for the learners and their little prior exposure to it, the experimental group outperformed the control group in the post-test.

This discovery indicates that web-based vocabulary instruction techniques enhance students' vocabulary proficiency. Indeed, the utilization of web-based activities proved to be more efficient in

enhancing learners' recall of vocabulary items than learners who participated in traditional classes. Based on the findings mentioned above, it is plausible to propose that employing this approach to vocabulary instruction may potentially augment the memory of newly acquired vocabulary items inside English as a Foreign Language (EFL) classrooms. The study's findings indicated that the experimental group participants exhibited superior performance compared to those in the control group in terms of their acquisition of the target lexical items.

This suggests that social networking sites (SNSs) had favorable impact on the students' second-language (L2) vocabulary proficiency. This observation aligns with the research conducted by Nakata (2008) and Fehr et al. (2012), which demonstrated that students who engaged in online activities within a computer-based environment to practice instructed lexical items exhibited a greater capacity to retain vocabulary items. Consequently, their overall vocabulary knowledge was significantly improved. A plausible rationale for the effectiveness of web-based and online vocabulary acquisition activities can be attributed to the frequent exposure of learners to the target words during their engagements inside these digital environments. Nevertheless, it is essential to exercise caution when interpreting this study's findings because of its limited sample size. Inasmuch as the participants were undergraduate university students majoring in Information Technology who had already studied the English fundamental subject as a compulsory course in their BA program, it is possible that these results may not apply to all English as a Foreign Language (EFL) learners or to all instructional approaches. For example, Bagheri et al. (2012) who involved Iranian EFL learners from a private language institute did not find any significant differences between the vocabulary scores of the CALL-users and non-CALL users in both short-term and long-term learning though both methods seemed to be effective. Moreover, Gorjian (2012) reported that in the long run, there were no significant differences between Web-Based Language Learning and the more traditional paper-based approaches on vocabulary retention among Iranian foreign language learners. Olson and Wisher (2002) emphasized that computer-based instruction (CBI), which shares similarities with web-based training, could be a more suitable reference than traditional classroom instruction.

The results of the current study align with the findings of Naraghizadeh and Barimani (2013), which indicated a significant disparity between the experimental and control groups in terms of their vocabulary proficiency. Specifically, implementing computer-assisted language learning (CALL) instruction enhanced the vocabulary knowledge of English as a foreign language (EFL) learner. Our results are also congruent with Hajebi (2018)'s study which reported that learners improved in the acquisition of lexical items when web-based instruction was used and a significant difference was found between the experimental and control groups pertinent to their vocabulary knowledge.

According to Rahimi and Mouri (2016), vocabulary learning software yielded superior outcomes compared to the use of printed books in terms of vocabulary learning, vocabulary breadth, and vocabulary depth among the participants. Likewise, Hao et al. (2021) found that technology-assisted L2 vocabulary learning is more beneficial than non-technology-assisted instruction. Additionally, Eyraud et al. (2000) conducted a study that found that students' vocabulary knowledge can be expanded by reconsidering educational priorities and implementing specific strategies. These strategies include creating an environment that promotes the incidental learning of vocabulary through exposure to rich linguistic resources and providing students with opportunities to use and apply vocabulary in various meaningful contexts. Hence, it can be inferred that the students' comprehension of the novel vocabulary and its varying connotations across diverse situations can afford such prospects (Eyraud et al., 2000).

Moreover, according to Nation (2001), there exist three notable processes that can lead to the retention of vocabulary. The procedures mentioned above encompass the acts of observation, retrieval, and innovative application. The act of noticing involves directing one's attention towards the word used and being cognizant of its significance. Providing diverse learning opportunities in online environments can facilitate students' acquisition of novel vocabulary and engage them in the initial stages of memory consolidation for new linguistic items.

Furthermore, using web-based instructional techniques in vocabulary teaching has enhanced learners' retention of vocabulary items more than traditional methods. The results of this study were consistent with the researcher's initial hypotheses since the newly introduced technique had both motivational and beneficial effects on English as a Foreign Language (EFL) learners. Similarly, Wang and Reeves (2006) documented that the implementation of web-based instruction positively impacted students' motivation.

In general, it can be said that the use of a web-based instruction strategy and Computer-Assisted Language Learning (CALL) proved to be significantly more efficacious compared to the traditional approach when it comes to instructing second language (L2) vocabulary to Iranian English as a Foreign Language (EFL) learners. This study has demonstrated that a viable approach to providing students with extensive opportunities to engage in target language practice is by including online activities. The utilization of web-based training may have offered learners a more comprehensive context for practice and learning compared to traditional approaches in vocabulary instruction. Olson and Wisher (2002) posited that web-based training can be characterized as a method that offers adaptable navigation and a more comprehensive contextual framework.

There has been a suggestion in the literature that students acquiring a language in circumstances with limited exposure to input may have low motivation levels (citation needed). One may argue that introducing a unique approach to teaching vocabulary via online sessions can bolster learners' motivation by leveraging their active involvement in the learning process, hence reducing stress levels. Drawing upon sociocultural theories of learning, it can be posited that an individual's self-regulation and internalization of information is facilitated by a progression from object regulation to other regulation, culminating in self-regulation. Hence, it may be inferred that technological alternatives establish the framework for facilitating learning through objects, ultimately leading to self-regulation.

7. Conclusion

The primary objective of this study was to evaluate the efficacy of web-based activities in enhancing the lexical knowledge of Iranian English as a Foreign Language (EFL) learners. The findings from the independent sample t-test indicate that the experimental group participants exhibited superior performance compared to the control group participants in acquiring the target lexical items. This suggests that social networking sites (SNSs) positively impacted the students' proficiency in second language (L2) vocabulary.

This work is a valuable contribution to the existing body of knowledge. In addition to other factors, it facilitates further investigations into the web-based methodology for vocabulary training. In the foreseeable future, it is widely anticipated to assume a significant role as a customary component of English as a Foreign Language (EFL) classrooms. Moreover, it implies that incorporating technology may have a significant role in educational strategies, but it should not be regarded as a universal solution. From the outset of this study, the researchers posited that specific fundamental characteristics of online

programs may facilitate student retention of vocabulary items. Nevertheless, the study's findings indicate that many pupils will require instruction in effectively strategically utilizing these online platforms.

Web-based and online vocabulary learning activities are compelling for L2 instructors seeking to teach L2 vocabulary. This is due to their ability to offer vocabulary lessons conveniently for adult learners, enabling them to manage their learning schedule effectively. Today's crucial responsibility for English as a Foreign Language (EFL) educators is to acquire knowledge about current technologies and maybe motivate their students to utilize these tools for vocabulary acquisition.

Author contributions

Conceptualization, SKN; methodology, SR; software, SR; validation, SAH, AD and MK; formal analysis, SAH, AD and MK; investigation, SR; resources, SAH and MK; data curation, SR; writing—original draft preparation, SR; writing—review and editing, SKN, SAH, AD, MK; visualization, SKN, SAH, AD and SR; supervision, SKN; project administration, SKN; funding acquisition, SKN, SAH, AD, MK. All authors have read and agreed to the published version of the manuscript.

Conflict of interest

The authors declare no conflict of interest.

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