

Original Paper

The Development of EFL Lexical Competence through the Use of Computer Assisted Language Learning in Qassim University

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Abstract

The current study aimed to investigate the effectiveness of Computer Assisted Language Learning (CALL) on vocabulary learning and its perceived benefits and challenges among Saudi learners of English as a foreign language (EFL). 64 homogeneous male and female participants were selected and assigned to experimental and control groups with equal numbers. The experimental group was taught vocabulary using the Blackboard Collaborate Ultra and a supplementary online website, while the control group was taught using the traditional face-to-face (FTF) approach. The treatment lasted for 8 weeks. Both groups of learners took pre- and post-tests for vocabulary achievement. Based on the descriptive statistics, independents samples t-test, and paired samples t-test, the experimental group outperformed the control group. However, there was no significant difference in the vocabulary test performance between male and female learners allocated in the experimental group. The follow-up interview revealed several benefits of this approach for their English vocabulary development though a few students pointed at some challenges that hinder them from making a good use of technology in enhancing their vocabulary.

Keywords

CALL, vocabulary learning, lexical competence, EFL learners

1. Introduction

Scholars and researchers have emphasized the role of vocabulary learning in enhancing learners' second/ foreign language (L2/FL) learning (Krashen, 1989). As argued by Krashen (1989), for

language learners to use L2 effectively, they should have adequate vocabulary size. Otherwise, their language use will be hindered by their lack of vocabulary. Similarly, lack of vocabulary results into reading difficulty for learners of English as a foreign language (EFL) and their vocabulary knowledge plays a crucial role in contributing to their improvement of reading comprehension (Khezrlou & Ellis, 2017; Roth, Speece, & Cooper, 2002; Wagner, Muse, & Tannenbaum, 2007). Moreover, vocabulary learning is more important than grammar since grammar errors may be overlooked by message receivers when they get the message clearly delivered (Jordens & Lalleman, 1996). This suggests that it is possible to communicate very effectively with imperfect grammar if vocabulary use is appropriate. In fact, research assumes that lexical errors impede comprehension more than grammatical errors since they are judged by native speakers as more serious (Ellis, 1994).

Despite this emphasis on vocabulary learning, research suggests that one of the challenging aspects of EFL learning is vocabulary learning. Many EFL students find it difficult to understand conversations and or reading passages because of their limited understanding of most of the vocabulary used in such contexts. According to Shokrpour et al. (2019), despite their years of EFL instruction at schools and universities and the emphasis on vocabulary knowledge as a fundamental component in successful reading comprehension, many EFL learners lack vocabulary knowledge that is necessary to facilitate their language learning (Fehr, Davison, Graves, Sales, Seipel, & Sekhran-Sharma, 2012). Like other EFL Arab learners, students of English in Gulf countries are challenged by their limited vocabulary size. This, consequently affects their idea expression in English productive skills, including writing (Dodigovic, 2005). This burden is no exception for EFL students in the Kingdom of Saudi Arabia (KSA) as most of them are often challenged by their limited vocabulary size. Although learners are introduced new words in reading textbooks where they should understand almost 90% of these new words from contexts, producing the language (e.g., being assigned to a writing task) places much greater burden on them. As indicated by Groot (2000), a vocabulary size of 2000 words usually acquired by EFL students from the courses and materials delivered to them in the early stages of language learning may not be sufficient for them to use the language effectively.

Due to the challenging nature of vocabulary knowledge and its essential role in successful language learning in general and in particular, in learners' effective reading comprehension, studies have explored different strategies in how to improve learners' vocabulary teaching (Abraham, 2008). One of these approaches is computer-assisted language learning (CALL) supported vocabulary instruction or learning. This approach has attracted the attention of many researchers due to the increasingly designed educational technological tools and programs. In its early development (1980s), CALL-supported vocabulary instruction was devoted to simply designed programs that focused on vocabulary learning activities, such as vocabulary games, gap-filling activities and text constructing activities (Levy, 1997). However, more recently, due to the development of language learning and teaching approaches that emphasize integration of language skills into the curriculum and owing to the advances of educational technologies, vocabulary learning has been integrated into CALL-supported programs rather being

viewed and practiced as an isolated language activity (Abraham, 2008; Butler, Urrutia, Buenger, Gonzalez, Hunt, & Eisenhart, 2010; Ma & Kelly, 2006). Therefore, several studies have investigated this interesting research area. According to Fehr et al. (2012), recently, the focus of CALL-supported studies in vocabulary learning has been on the implementations of programs, multimedia software, online dictionaries and computerized glosses to facilitate learners' vocabulary learning.

Despite the difficulty involved in drawing conclusions on the impact of CALL-supported instruction on vocabulary learning since delivery and presentations of new words in these studies vary (Shokrpour et al., 2019), these studies have supported the effectiveness of CALL-supported instruction and programs on learners' vocabulary retention and gains in comparison to traditional vocabulary learning through textbooks. In addition, they have attributed the effectiveness of CALL-supported instruction on learners' vocabulary learning to the affordances of CALL-supported tools and programs used in vocabulary learning, including authentic materials (Ariew, 2006; LeLoup & Ponterio, 2005), visual aids, repetition, immediate feedback and audio input (Hirschel & Fritz, 2013; Miles & Kwon, 2008; Nakata, 2008; Schmitt, 2000; Sagarra & Zapata, 2008). All these features are argued to facilitate students' comprehension of texts in which new words are presented and consequently, foster their vocabulary retention. CALL provides learners with an interactive multimedia environment where they can read a text and refer to hyperlinks that offer them multimodal information through sounds, videos, images, thus adding to increasing interactivity compared to the traditional approach to vocabulary learning through textbooks (Beach, Hull, & O'Brien, 2011).

Based on the above problem and issue, this study aimed to examine the effectiveness of computer software i.e. Duolingo in developing students' vocabulary by measuring the differences in EFL students' performance in vocabulary pretests and posttests in a KSA university. It also attempted to explore students' perceived benefits and challenges in CALL-supported vocabulary learning. In order to achieve these aims, the study addressed the following research questions:

- 1- Does the CALL-supported vocabulary learning treatment significantly affect EFL learners' vocabulary learning in English?
- 2- Are there any significant differences between male and female students in their performance in the vocabulary tests?
- 3- What are the perceived benefits and challenges involved in CALL-supported vocabulary learning?

The study tested the following null research hypotheses accordingly:

1. There are no statistically significant differences at the level (0.05) between the mean values of the experimental group students taught vocabulary via the computer-assisted vocabulary learning approach in the pretest and posttest.
2. There are no statistically significant differences at the level (0.05) between the mean values of the control group students taught vocabulary via the traditional approach in the pretest and posttest.
3. There are no statistically significant differences at the level (0.05) between the mean values of the

experimental group and the control group in the posttest.

4. There are no statistically significant differences at the level (0.05) between the mean values of the males and females of the experimental group in the posttest.

2. Literature Review

2.1 *The Effect of Computer-Assisted Vocabulary Learning on Learners' Lexical Competence*

CALL is increasingly providing ESL/EFL learners more opportunities to learn vocabulary, practice it and enhance their vocabulary learning than textbooks. CALL vocabulary programs are afforded several features that facilitate learners' improved vocabulary learning, including repetition, immediate feedback and audio input (Hirschel & Fritz, 2013; Miles & Kwon, 2008; Nakata, 2008; Schmitt, 2000; Sagarra & Zapata, 2008). In addition, CALL programs enable language learners to work and practice vocabulary at their comfort and control their own vocabulary learning as opposed to traditional learning (Hirschel & Fritz, 2013; Sagarra & Zapata, 2008).

Several studies have examined the effectiveness of various CALL-supported programs in ESL/EFL students' vocabulary learning, including their lexical competence, vocabulary retention and vocabulary gains in English. By conducting experimental studies comparing students' vocabulary learning through CALL programs versus traditional learning or learning from vocabulary text books or notebooks, word cards, these studies tested the effectiveness through administering vocabulary pretests and posttests. For instance, Miles and Kwon (2008) reported that learners who used CALL-supported vocabulary programs scored higher than those students who were taught vocabulary in the traditional approach. The authors concluded by strongly recommending CALL applications for vocabulary learning as they assist learners in vocabulary learning and retention through repetitions. Similarly, Hirschel and Fritz (2013) tested the effectiveness of CALL program on vocabulary gains among 140 Japanese university students. The authors found that the CALL-program group and the notebook group as indicated by their pre-to posttest gains performed almost equally as both groups showed an increase in their scores and there were no statistically significant differences between the two groups in the short-term vocabulary achievements. However, in terms of the long-term achievements, the CALL program group scored better than the notebook group.

According to Naraghizadeh and Barimani (2013), the results obtained from a comparison of CALL-supported instruction on vocabulary and traditional vocabulary learning among EFL Iranian students confirmed the effectiveness of CALL-supported instruction in improving students' vocabulary learning. In a study by Talarposhti and Pourgharib (2014), the researchers reported the more significant vocabulary performance of the CALL-related group. This result was justified by the effectiveness of CALL-supported instruction on vocabulary and specifically, the combination of aural, visual and contextual presentation of new words as opposed to textbook. In comparing the contextualized vocabulary learning on paper and through CALL on EFL learners' vocabulary gains, Ahmadian et al. (2015) found that CALL vocabulary contextualization through PowerPoint had more significant impact

than the traditional paper-based vocabulary contextualization on Iranian learners' vocabulary. The authors attributed this result to the opportunity offered by CALL materials to learners in engaging in intensive mental processing of words, which leads to their long-term recall of words.

This result supports the results obtained by Khoshnoud and Karbalaei (2015) that the use of CALL-supported instruction facilitates vocabulary learning as the experimental group of EFL learners who received CALL-supported instruction outperformed the control group who received non-CALL-supported instruction. The authors provided possible explanations of this result, including the enhanced exposure to vocabulary through CALL, the feedback they received and comprehension checking activities and exercises. In supporting this result that CALL-assisted vocabulary learning through mobile application was found more effective in enhancing learners' vocabulary knowledge in the context of Saudi Arabia, Taj, Ali, Sipra and Ahmad (2017) justified this result by the anytime and anywhere- access to vocabulary through mobile phone applications that enabled students in the experimental group to learn vocabulary in their own self-regulated manner.

Another study (Nejati, Jahangiri, & Salehi, 2018) in which the CALL-supported group performed better than the control group in vocabulary tests attributed this result to possible factors, including the CALL-supported group's control over their vocabulary learning, their learning at their own pace, their fostered motivation to learn and their interaction in online learning environments. In examining the effect of CALL-supported instruction and traditional instruction on EFL Iranian students' vocabulary learning, Shokrpour et al. (2019) found that the CALL-supported instruction group outperformed the traditional instruction group in the vocabulary pretests and posttests, which was attributed to the CALL-supported explicit instruction on vocabulary. However, no significant difference between males and females in their vocabulary gains. However, it was not clear what specific CALL-supported vocabulary instruction the students received in this study.

Some studies have reported contradictory results on the effect of CALL-supported instruction on students' vocabulary learning. For instance, according to Nakata (2008), there were no statistically significant differences in the vocabulary test scores gained by CALL-supported students and those students learning vocabulary using word cards. Several explanations were given as factors behind this result, including students' unfamiliarity with technology use for vocabulary learning, insufficient experience in CALL-supported vocabulary learning and the design of CALL-supported program used in the study-it was designed for the purpose of testing learners' memory retrieval without presenting new vocabulary through multimedia, feedback and interactive exercises. Similarly, Alemi, Sarab and Lari (2012) reported that no significant differences were found between the post-test results of the experimental and control groups.

The above result was also supported by other studies on the use of Augmented Reality (AR) technology, which is a form of virtual reality where learners learn new vocabulary through audio and visual media, including its audio pronunciation and pictures and video materials that explain the meaning and use of new vocabulary. For instance, Binhomran and Altalhab (2021) in the context of KSA. According to

them, despite the different mean scores of both CALL-supported and traditional approach-supported groups of learners in vocabulary performance, these differences were not statistically significant. The researchers attributed this result to several probable factors affecting learners' retention of vocabulary, their lack of technical knowledge, distraction, and chaos resulting from CALL-supported vocabulary learning. According to Solak and Cakır (2015), the use of AR was effective for Turkish EFL learners' vocabulary learning as it assisted those learners in the experimental group to achieve higher scores than participants in the control group and to outperform them in information recalling. This is also similar to result reported by Maftoon, Hamidi, and Najafi (2012) that computer-assisted vocabulary learning did not enhance EFL learners' vocabulary learning.

From the above studies, it can be concluded that computer-assisted vocabulary learning has gain widespread in education, in particular in EFL learning and teaching. A few studies, two of which cited above (Taj et al., 2017; Binhomran & Altalhab, 2021) in addition to another study (AbuSeileek, 2007) have been conducted in the context of Saudi Arabia. These studies suggest that online instruction including vocabulary learning instruction is more effective with the use of advanced technologies. They also suggest the need for further exploration of this research topic especially in language learning.

2.2 Students' Perceived Benefits and Challenges in Computer-Assisted Vocabulary Learning

Several studies have explored learners' views on CALL-supported vocabulary learning through different online or electronic (e-) programs and dictionaries. Their findings indicate that students expressed their positive views on the benefits of CALL-supported vocabulary learning, including the freedom to access and learn new vocabulary regardless of time and place especially when accessing these sources via phone mobile devices (Lew, 2010; Mohamad, Rashid, & Wan, 2017) ease of use (Amirian & Heshmatifar, 2013; Mohamad et al., 2017), clear instructions on the meaning and use of new vocabulary (Fageeh, 2014; Mohamad et al., 2017). According to Binhomran and Altalhab (2021), most of the students expressed their satisfaction about their experience in CALL-supported vocabulary learning, expressed their positive attitudes towards it, seemed motivated to learn new vocabulary and perceived technology as an interactive learning environment for vocabulary. Some other benefits reported by this latter study are understanding the meaning of new words without the need for teacher's help.

However, there are several challenges and difficulties encountered by learners in CALL-supported vocabulary learning. These include their limited access to the Internet, incomplete or insufficient definitions of new vocabulary and distraction to their attention when learning using e-sources for vocabulary (Mohamad et al., 2017). As found by Binhomran and Altalhab (2021), despite their positive views on CALL-supported vocabulary learning, some students did not enjoy their experience in learning vocabulary using technology because of the distraction caused by using a tablet, the difficulties encountered in understanding the meaning of the new words. This suggests the need for teacher's support and guidance.

3. The Study

3.1 Research Design

The current study focused on the effectiveness of the computer-assisted vocabulary learning approach in comparison to the traditional approach to learning in enhancing EFL learners' vocabulary gains. Therefore, the study used an experimental research design that involves one experimental group and one control group.

3.2 Study Setting and Participants

The assigned participants (n.88) were chosen randomly from undergraduate students in the College of Sciences & Arts, Unaizah Qassim University, KSA, who study English as a foreign Language. They of an equal number of males (n.44) and females (n.44) who were joining a reading and vocabulary course. The participants' age ranged from 20 to 24 years and their first language was Arabic while they studied English as a foreign language. The students took the Oxford Quick Placement Test (2001) as a proficiency test. Based on the results, only 64 students (32 males and 32 females) from the two sections were found homogeneous and therefore, they were selected as the study sample. Then, they were randomly assigned to the two equal groups (experimental and control groups), each consisting of 32 participants, out of which are 16 males and 16 females. The experimental group was taught the course online while the control group was taught in the FTF classroom.

3.3 Instruments

In order to collect the data, two main instruments were used: vocabulary test and follow-up interviews. The vocabulary test was designed for the purpose of pre-testing and post-testing for both groups. It was designed by the course instructor. The test consisted of 45 items, 10 of which are cloze items and 35 of them are multiple choices. The vocabulary items included content words that are essential for learners' reading comprehension skills. The follow-up interview was a semi-structured interview. It was intended to explore the affordances and challenges perceived by learners in learning vocabulary online. In other words, it was aimed to address the third research question regarding learners' perception of the computer-assisted vocabulary learning approach. The interview was conducted in English, but Arabic was also used for enabling interviewees to fluently express their thoughts and ideas about their experience in vocabulary learning online. It was conducted online using Zoom Meeting. It lasted for an hour and fifty minutes.

3.4 Procedure

The procedure was initiated by assigning the study sample to experimental and control groups. This was followed by administering a pre-vocabulary test to both groups. Then, the treatment covering 8 weeks started. During the treatment, the experimental group was taught vocabulary through the Blackboard Collaborate Ultra, which is a synchronous conferencing platform that combines voice/audio and text channels for communication and interaction. In addition, the experimental group's vocabulary learning was supplemented with an online learning website that presents the new vocabulary taken in the reading lessons or passages in an interactive manner and by combining the highlighted new vocabulary with its

audio for its accurate pronunciation, short video clips explaining its meaning and its use in sentences and short text notes on it. This website provided the experimental group more exposure to the new words in addition to their learner-learner and learner-instructor interactions in the Blackboard Collaborate Ultra. They were also introduced to gap-filling activities, retrieval activities and spelling activities in this online supplementary website. However, the control group was taught vocabulary using the traditional reading and vocabulary approach in FTF classes along with text books.

The treatment was followed by administering a posttest to both groups. This was aimed to determine the effect of using technology in vocabulary learning at the end of the course. The final stage was conducting the follow-up interview with the experimental group.

3.5 Data Analysis

The data was analyzed quantitatively and qualitatively. For students' scores in the pretests and posttests, they were analyzed quantitatively using Statistical Package for Social Sciences (SPSS) software. Specifically, to find the effect of the two approaches to vocabulary learning, descriptive statistics (means and standard deviations) were used. The study also used independent samples t-tests to find out if there were any statistically significant differences between the control and experiment groups. To determine the performance of the experimental group in relation to gender, the scores of males and females were compared using a t-test.

For the qualitative data, the interviews were transcribed and revised. Then, the Arabic sentences and phrases were translated into English. This was followed by careful reading of the interview transcripts by adopting a thematic approach to coding. This coding involved the researcher and an external expert in order to enhance the reliability of the thematic analysis (Strauss & Corbin, 2008).

4. Results

This section presents the findings of the current study according to the three research questions:

4.1 CALL-based vs. Traditional Groups' Performance in Vocabulary Tests

Table 1 presents the means and standard deviations for both control or traditional vocabulary instruction group and experimental or CALL-based vocabulary instruction group, respectively. As shown, the mean values for both groups' scores in the pretest were 28.5313 and 25.8125, respectively. Despite this difference, the P value was higher than .05, which means that no statistical significance was found between the groups in terms of their performance in the pretest. This suggests that the students assigned to the two groups were almost similar in their English language proficiency levels.

Table 1. Companion of the Experimental and Control Groups' Scores in the Vocabulary Pre-test

		N	Mean	Std. Deviation	Std. Error Mean	Sig
Pretest scores	Traditional vocabulary instruction group	32	28.5313	6.98840	1.23539	.592
	CALL-supported instruction group	32	25.8125	7.07306	1.25035	

To answer the first research question, a paired samples test was also used to examine if there were significant differences in the scores of each group in the pretest and posttest. Table 2 and Table 3 present the results for the control group and experimental group, respectively. The results indicate that despite the different mean values of the scores between the pretest and posttest for both groups, the differences for the experimental group were statistically significant ($P = .025$, $P < 0.001$) while there were no significant differences between both tests for the control group ($P = .911$, $P > 0.001$).

Table 2. Companion of the Scores in the Pretest and Posttest for the Control Group

		N	Mean	Std. Deviation	Std. Error Mean	Sig
Control group	Pretest scores	28.5313	32	6.98840	1.23539	.911
	Posttest scores	32.2188	32	11.00948	1.94622	

The above result suggests that the treatment or intervention used in this study seemed effective in improving the vocabulary knowledge and retention among students assigned to the experimental group. So while the first null research hypothesis was rejected, the second null research hypothesis was accepted.

Table 3. Companion of the Scores in the Pretest and Posttest for the Experimental Group

		N	Mean	Std. Deviation	Std. Error Mean	Sig
Experimental group	Pretest scores	25.8125	32	7.07306	1.25035	.005
	Posttest scores	33.9375	32	7.86145	1.38972	

To identify the significance of the differences in the posttest mean scores of the control and experimental groups, independent samples t-test was also applied in this study. The results presented in Table (4) indicate that there is a statistically significant difference in the posttest scores between the two groups ($P < 0.05$). Thus, it can be concluded that this difference can be the result of the CALL-supported vocabulary instruction. Therefore, the third null research hypothesis was rejected.

Table 4. Companion of the Scores in the Posttest between the both Groups

		N	Mean	Std. Deviation	Std. Error Mean	Sig
Pretest scores	Traditional vocabulary instruction group	32	32.2188	11.00948	1.94622	.002
	CALL-supported instruction group	32	33.9375	7.86145	1.38972	

4.2 Males' and Females' Performance in Vocabulary Tests

In order to answer the second research question and the second null research hypothesis, independent samples t-test was used for the purpose of comparing the score mean values in the experimental group's

posttest between males and females. Although males' and females' score mean values are different (Table 5), this difference was not statistically significant ($P = .823$, $P > 0.001$), which means that the gender variable has no significant influence on learners' vocabulary gains resulting from the CALL application. Therefore, the fourth null research hypothesis was accepted.

Table 5. Companion of the Scores in the Posttest between the Males and Females in the Experimental Group

		N	Mean	Std. Deviation	Std. Error Mean	Sig
Pretest scores	Males	16	33.0000	8.28654	2.07163	.823
	Females	16	34.8750	7.56197	1.89049	

4.3 Perception of Computer-assisted Vocabulary Learning

In answering the second research question, students' follow up interview was analyzed. Findings revealed several affordances of computer-assisted vocabulary learning. As displayed in Table 6, the majority of interviewed students (n. 28/87.5%) described their experience in computer-assisted vocabulary learning as interesting and wonderful. Some of them (n.13/40.6%) also viewed their experience in vocabulary-assisted learning as exciting. These students appeared to compare computer-assisted vocabulary learning to the traditional classroom where they often feel bored due to their reliance on printed textbooks for reading and vocabulary in English.

Table 6. Perceived Benefits of Computer-supported Vocabulary Learning

Perceived benefits	Sample interview quotes
Interesting	It was an interesting and wonderful experience for me to learn vocabulary online
Exciting	We were excited to learn vocabulary in the course online.
Comprehending	I think we could better understand the meaning of new vocabulary because of the video explanation.
Listening to word pronunciation	You know? For many of us, we may not pronounce new words correctly in reading, but in online, we just click on its blue color and move us to the dictionary to listen to it.
Word imaging	It was kind of wonderful to see images of new words in the website.
Word contexts	I liked the sentences where new words are used.

When asked to give reasons why they described their computer-assisted vocabulary learning as interesting and exciting, some of the interviewed students (n. 14/41%) supported the role of technology in making vocabulary comprehensible for them. Some other students (n.11=34%) pointed out that they could listen to the pronunciation of a new word by clicking on its audio/voice icon in the online reading website. One interesting feature of computer-assisted vocabulary learning is that some new words

referring to objects, places or things are presented in the form of pictures or images. This, consequently, helped many learners to understand its meaning. Finally, since word context is important for vocabulary learning, most of the interviewed students (n.23=72%) stated that they admired the way the new words they came across in the online lessons were presented and used in new sentences, which also contributed to their better comprehension of the meaning of these new words.

Despite the above-mentioned affordances, computer-assisted vocabulary learning was not without any challenges. In this regard, the thematic analysis of the follow-up interviews revealed several limitations and challenges or disadvantages of this approach to vocabulary learning (Table 7). Most of the participating students (n.25=) highlighted the issue of distraction caused by the large number of messages in the online sessions. Many of them (n.20=) also talked about the internet-related challenges, including their net disconnection and weak connectivity. However, these challenging issues did not frequently occur in the online vocabulary learning classes.

Table 7. Perceived Challenges in Computer-supported Vocabulary Learning

Perceived challenges	Sample interview quotes
Distraction	Sometimes, online vocabulary learning was distracting and could not focus because of the many chat messages online during the class.
Internet disconnection	I hated it when my net suddenly went off.
Connectivity weaknesses	Sometimes, my net was weak and this took time from me to log into and study online.
Lack of FTF interaction	One thing about online vocabulary class was the interaction as no face-to-face.
Accessing devices	Because sometimes, I logged in by my mobile, it was difficult for me to follow the lesson.
Familiarity	It was my first time experience and sometimes I didn't know how to follow the lesson.

One main challenging issue encountered by some students (n. 14=) in computer-assisted vocabulary learning is the lack of FTF interaction. Since all the interaction occurred online, these students seemed to miss interaction in person in the traditional classroom context. In addition, devices used for accessing the online vocabulary learning lessons appeared a critical factor affecting the perceived benefits of computer-assisted vocabulary learning among a few students (n. 9=) who used their mobile phones to access the lessons. In other words, these students sometimes found it difficult to follow the lesson through mobile phones.

A final challenge faced by students in computer-assisted vocabulary learning was the unfamiliarity of some students (n.8=) with technology in general and in particular logging into and navigating the online reading and vocabulary website as well as checking meaning of new vocabulary despite the instruction given during the training session. Although this challenge seemed to occur among many students in the initial stage of the experiment as evidenced by the frequent WhatsApp messages sent by some students to the course instructor, only a few of them articulated such challenge in the follow-up

interview. This is because they could overcome this challenge with the instructor's help and with their more practice over the academic semester.

5. Discussion and Implications

The current study aimed to investigate the effect of computer-assisted vocabulary learning on EFL learners' vocabulary retention and development over an academic semester. To achieve this, the study compared this effect to the impact of the traditional approach to vocabulary learning. It was found that while significant differences were found in the mean values of the pretest and posttest of the experimental group, no significant differences were found for the control group. Moreover, there were statistically significant differences between the mean values of the experimental and control groups in the posttests. This indicates that the computer-assisted vocabulary learning approach had a significant effect on EFL learners' vocabulary retention and learning. This led to rejection of the third null research hypothesis. This result supports the results reported in several previous studies in different ESL and EFL contexts on the significant impact of computer-assisted vocabulary learning (Ahmadian et al., 2015; Hirschel & Fritz, 2013; Khoshnoud & Karbalaei, 2015; Miles & Kwon, 2008; Naraghizadeh & Barimani, 2013; Nejati et al., 2018; Shokrpour et al., 2019; Talarposhti & Pourgharib, 2014). The result is also in line with the result of a previous study in the KSA context (Taj et al., 2017). This result could be attributed to the affordances of the computer-assisted vocabulary learning approach, such as the presentations of new vocabulary with its pronunciation and meaning through audio, video and also images as well as the space for learners' interactions and comments on new vocabulary extracted from the lessons and its use in sentences. Such affordances seemed to have helped the EFL learners in the experimental group to gain and retain their vocabulary knowledge during the posttest.

On the other hand, the above result is contradictory to results reported by a few previous studies in different contexts (Alemi et al., 2021; Binhomran & Altalhab, 2021; Maftoon et al., 2021; Nakata, 2008). These studies reported no statistically significant differences in the vocabulary posttests between the experimental groups that learned vocabulary through technological tools and the control groups that learnt vocabulary through traditional approaches. These studies attributed such results that contradict the results of the current study to different factors affecting students' understanding of the meaning of new vocabulary and their vocabulary retention including distraction, lack of technical knowledge and lack of teacher's support and direction as opposed to classroom vocabulary learning. Although distinction was reported by the students in the current study, the current study results supports the efficacy of the computer-assisted vocabulary learning approach over the traditional approach. Such contradictory results could be different to the different learning contexts including vocabulary instruction, training, educational technologies used and students' levels of education and language proficiency levels.

In answering the second research question and testing the fourth null research hypothesis, the mean values of the posttests scored by males and females were compared. The result shows no significant

difference in the mean scores between males and females. This resembles the result obtained by Shokrpour et al. (2019). Both studies suggest that by using CALL application, both males and females enhanced their vocabulary learning.

The current study also addressed a third research question on students' views on computer-assisted vocabulary learning. The thematic analysis of the follow-up interviews revealed interesting perceived affordances and benefits of the computer-assisted vocabulary learning approach applied in the current study. First, most of the students reported their interesting and exciting experience in learning vocabulary online. The reasons behind their interesting experience in online vocabulary learning are their comprehension of new vocabulary including its meaning and correct pronunciation as well as its use in new sentences. This seems to corroborate what was previously reported by some studies on the features of computer-assisted vocabulary learning that assist learners to comprehend the meaning of new vocabulary, including presentation of new vocabulary and its meaning through text, image, audio and video (Amirian & Heshmatifar, 2013; Binhomran & Altalhab, 2021; Fageeh, 2014; Mohamad et al., 2017). As a result, the students in the experimental group were more able to remember the meaning of new vocabulary. In addition, with the use of educational technologies, it is possible for instructors to present new vocabulary in English in contexts-that is new words extracted from the online reading text can be introduced in written sentences with hyperlink highlights and font change, thus allowing learners to guess and understand its meaning.

Although students in the current study did not mention the social and interactive features of the computer-assisted vocabulary learning approach, it was observed that the students in the experimental group were able to interact with each other and with the course instructor during the online reading and vocabulary in the Blackboard Collaborate Ultra Platform through its voice and text chats. Furthermore, they were observed to interact and comment on the new vocabulary presented in the forms of images, videos and texts in the online reading and vocabulary websites. This suggests that when designed well, computer-assisted vocabulary learning tools can be online interactive learning environments and spaces for learners that encourage their interactions, question-asking processes and discussions.

Despite these interesting perceived benefits, no computer-assisted vocabulary learning is without challenges. These challenges are known as technical since they are related to students' use of the technology in vocabulary learning. Specifically, the students in the experimental group articulated some technical challenges, including internet disconnection and weaknesses and accessing devices. Other challenges are pertinent to students' familiarity with technology use for vocabulary learning, use of mobiles among some of them for accessing the online vocabulary lessons, distraction and lack of FTF interaction. This is almost similar to what was found by a few previous studies on the challenges encountered by students in learning vocabulary online (Binhomran & Altalhab, 2021; Mohamad et al., 2017). Therefore, teachers and instructors should engage learners in sufficient training, instruction and preparation prior to involving them in online vocabulary learning. In addition, teachers' and instructors' help and assistance should be offered to students during the experiment. This means that teachers and

instructors should be accessible to their students through the Blackboard Collaborate Ultra Platform and WhatsApp so that they can be available online for help and support when they are encountered by difficulties logging into and accessing online reading and vocabulary websites.

6. Conclusion

The current study investigated the impact of a computer-assisted vocabulary learning approach on EFL Saudi learners' vocabulary retention and development over an academic semester by comparing it against the effect of the traditional approach. This was achieved by assigning learners to two conditions: computer-assisted vocabulary learning and traditional approach-based vocabulary learning. The results demonstrated the efficiency of the computer-assisted vocabulary learning approach in learners' vocabulary learning. Despite this interesting finding, no statistically significant differences in vocabulary test scores between males and females. In addition, although many students recognized the benefits of this approach for their English vocabulary development, a few students pointed at some challenges that hinder them from making a good use of technology in enhancing their vocabulary.

The current study results may be useful for EFL teachers and learners. Such results can guide EFL teachers in evaluating their technology-mediated teaching approaches. This evaluation is very necessary especially for those EFL teachers who are interested in enhancing their teaching through technology. The results provide EFL learners with guidance and path on how to improve their language learning in general and in particular, vocabulary learning in English. In this regard, by using technology, the opportunities for learners to enhance their English vocabulary are unlimited. In addition, the present study provides researchers the opportunity to further explore EFL learning in the KSA context.

There are some limitations that should be addressed for future research. One of these limitations is the small number of the participants taking part in this study due to the small class size of the cohort joining this particular reading and vocabulary course. This might have affected the representativeness of the study sample. Therefore, the study results should be cautiously interpreted. Moreover, future studies should be carried out among a larger number of students in order to generalize the results. Another limitation is that students' perception of the benefits and limitations of the computer-assisted vocabulary learning approach used in this study was elicited by means of follow-up interviews. Future research, however, should combine both survey and interviews in order to provide a comprehensive picture of these perceived benefits and challenges. Finally, it is advisable for future researchers to investigate other vocabulary learning-assisted technological tools in order to decide the most effective tools that facilitate learners' vocabulary development.

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