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The Effect of Computer Assisted Language Learning (CALL) Program on Learning Vocabulary among EFL Left and Right Hemispheric Dominant Learners

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Abstract

Vocabulary is a core component of language proficiency, and provides much of the basis for how well learners speak, listen, read, and write. Without an extensive vocabulary and strategies for acquiring new vocabulary, learners often achieve less than their potential and may be discouraged from making use of language learning opportunities around them such as listening to the radio, listening to native speakers, using the language in different contexts, reading or watching television. CALL refers to the use of computer in the teaching and learning of a second or foreign language. The field of CALL includes the use of a computer in the language process. CALL programs aims to teach students in aspects of the language learning process via the medium of computers. Unfortunately, in Iran, textbook writers and syllabus designers have paid less attention to the role played by the CALL in classrooms. Teaching is not supplemented with modern technologies, specially CALL in teaching English. The use of Computer Assisted Language Learning (CALL) in the field of education has increased remarkably in recent years due to the modern changes in language software. However, CALL is not widely employed in the field of second/foreign (L2) language learning in Iran. Interested in the application of CALL, this study examines two methods of vocabulary teaching/learning (CALL-based versus non-CALL based). For this purpose, 38 male and 48 female elementary Iranian EFL learners participate in the study. They are randomly assigned into CALL-users and non-CALL users and posttest control group design is employed. To collect data, a proficiency test will be used to homogenize the participants and a multiple-choice vocabulary test will be used as posttests to find out the effectiveness of the methods. Finally, The results of t-tests and the pedagogical implications of this study for L2 teachers and learners will be presented.

Keywords: CALL (computer assisted language learning), left hemispheric dominant learners, right hemispheric dominant learners, EFL learners

Introduction

The computer is an unavoidable technology that is prevalent in daily life. Combined modifies in computer technology have led technology into the 21st century. Braul (2006) expressed that "certain parts of society have developed an increasing reliance on computers to perform jobs, preserve the communication" (p. 7). Muffoletto and Knupfer (1993) also discovered that the effect of the computer on education is not only appropriate within the social world, but also has influenced the social world. Education is a scope with various degrees of success.

Computer-assisted instruction (CAI) refers to the use of the computer as an instrument to simplify and ameliorate instruction (Sharp et al, 1995). The term CAI came into being in the early

1960's when computers were first utilized in education (Heilman et al, 2008). Sharp indicated the appliance of the microcomputer has directed to the development of computer technology in the education field. In addition, Sharp expressed that there are five kinds of CAI that can simplify students learning through different methods containing: (1) tutorial, (2) simulation, (3) drill and practice, (4) problem solving and (5) instructional games.

Bruess (2002) described the current situation of computer technology usage in universities by stating that "the ever-growing use of computer technology in the classroom is being realized in the universities" (p. 1) and that there has been an increase in the use of instructional technology in higher education classrooms. Integrating computer technology into education can maintain students' interest as well as engage them in the classroom (Pemberton, Borrego, & Cohen, 2006). Zaremba and Dunn (2004) summarized in their report that "students have greater enjoyment of classes using active learning techniques like using computer technology in the classroom" (p. 192). As technological developments accelerate in educational settings, integrating computer technology into academic learning provides students with more opportunities to gain interest in exploring learning content.

Orshalick (1982, as cited in Schmitt, 2000) wrote a chapter entitled Instructional Computing at the University Level in the book Computer Support for Education. Orshalick listed the advantages of computer usage at the university level, which include: "it frees the instructor of repetitive tasks, it provides individualized instruction, it's more accurate, it's more patient, and it lets the student progress at his own pace" (p. 22). Computer technologies bring some problems and challenges that may keep educators from achieving the full potential of the computer. Simonson and Thompson (1997) found three problems with using computers effectively in the classroom: (1) inadequate teacher training, (2) lack of integration into the curriculum and (3) the dynamic nature of computing. Computers have also become a precious part in language programs. Some researchers have negative views about CALL. Olsen (1980) discovered that some faculty thought CAI was useless. In addition, Gips and DiMattia, (2004) displayed that the first disadvantage of the computer and its language learning programs is that they would enhance educational costs and cause educational injustice.

Second, it is necessary that both teachers and learners should have basic technology knowledge before using computer in second language teaching and learning. Unfortunately, most teachers cannot train computer to their students for language learning. As a result, those students who are not familiar with the computer miss this opportunity (Roblyer, 2003).

Finally, the software programs expresses the most with reading, listening and writing skills. Programs for ameliorating speech skills are the most helpful skills to communicate with native speakers are still underdeveloped. Warschauer and Healey (1998) expressed that an ideal speaking skills improvement program should be able to discover a user's 'spoken' input and distinguish a student's problems with pronunciation, syntax or usage and then determine among a range of choices.

Despite the problems faced by some faculty, the field of English as a Second Language (ESL) can be raised through the use of computer technology (Zhao, 1996). Ybarra and Green (2003) used computer technologies in their classroom which can play an important role to make the learners with worth language experiences as they need a new language.

With the development of the computer and its related software industry, integrating language arts computer programs into the curriculum is easier than other types of programs (Sharp, 2005). However, the field has not been studied very much (Zhao, 1996). Students' attitudes toward CAI-based ESL classes is a topic that deserves researchers' attention.

Statement of the Problem

According to Richards and Renandya (2002) vocabulary is a core component of language proficiency, and provides much of the basis for how well learners speak, listen, read, and write. Without an extensive vocabulary and strategies for acquiring new vocabulary, learners often achieve less than their potential and may be discouraged from making use of language learning opportunities around them such as listening to the radio, listening to native speakers, using the language in different contexts, reading or watching television. As Schmitt (2000) states, learning vocabulary is an essential part of mastering a second/foreign (L2) for both students and teachers. Concerning English, Zhang (2009) states that the effective learning of new English lexical items seems to be one of the major aims for learners of English. It is difficult to conduct a message or communicate in English with those who may know some grammar, but their vocabulary knowledge is poor. Research on vocabulary in recent years has done a great deal to clarify the levels of vocabulary learning learners need to achieve in order to read both simplified and non-simplified materials and to process different kinds of oral and written texts, as well as the kinds of strategies learners use in understanding, using, and remembering the words.

Since English is an international language, and the number of people who are learning it is increasing across the world, and one important component of every language is learning its vocabulary , the present research seek to apply CALL in the area of vocabulary learning, which is rarely researched in an EFL context in Iran. This study puts two methods of vocabulary learning (i.e., CALL-based and non-CALL) help EFL learners to maximize their range of vocabulary.

Unfortunately, in Iran, textbook writers and syllabus designers have paid less attention to the role played by the CALL in the classroom. Teaching is not supplemented with modern technologies, specially CALL in teaching English. Students are forced to follow the teacher. The classes are teacher-centered and teachers do not want to give students autonomy and independence to decline their authority. Therefore, they use traditional ways (Abdollahi-Guilani, SubakirMohdyasin & Hua, 2011).

Considering the large amount of vocabulary that language students need to learn and the limited amount of time available in the classroom, CALL is increasingly seen as an attractive option for learning. Goodfellow (1994), in a article devoted to lexical CALL issues, stated the need for technology to address or at least supplement vocabulary learning in ways a traditional classroom may be limited, such as building up a large vocabulary, giving students control over what words to learn, exercises to promote deeper learning and so on. In the view of Nation (2001), CALL can provide a key principle of vocabulary instruction which can do much to assist language learning: spaced repetition.

Research Questions

Q1: does CALL program can enhance learning English vocabulary in elementary EFL learners or not?

Q2: is there any difference between left hemispheric and right hemispheric dominant learners in learning vocabulary using CALL instruction?

Research Hypotheses

H1: CALL program enhances Learning English vocabulary in elementary Iranian EFL Context.

H2: there is no difference between right and left hemispheric dominant learners in learning English vocabulary in using CALL program.

Multimedia CALL and vocabulary acquisition

According to Hofstetter (1994), interactive multimedia is the use of computers to show and combine text, graphics, with links and instruments that let the user direct, make, and communicate. Hofstetter illustrated that multimedia permits individual learners to set their own step and branch into different choices regarding to their interest. The interaction that the system suggests increases attention, understanding, and simultaneously provides the chance to learn by carrying out (Kalmbach, 1994). It is not obvious if interactive multimedia CALL utilizing motion graphics or still graphics will be more effective for ESL students in learning vocabulary. Barker (1989) offered that multimedia computer-assisted techniques in many different interactive learning environments. These environments, are in such a way that the learning processes are learner controlled, participative, and highly motivational. In using technology to enhance linguistic acquisition, Sharp, Bransford, Goldman, Risko, Kinzer, & Vye (1995) announced that multimedia technology permits exact coordination of linguistic and visual information. According to them, multimedia technology can improve literacy foundations in children. Computer-assisted language learning can improve the English vocabulary skills of increasing numbers of students in this country and all over the world who have been determined as having restricted English proficiency (Fitzgerald, 1995). Babbit (1993) stated that computer-assisted reading materials have been discovered to be effective as a supplement to teacher-directed train for low-achieving elementary students. Babbit increased that interactive multimedia programs have been used successfully in high school social studies classes with remedial students and students with learning disabilities.

Furthermore, Chambless & Chambless (1994) study compared the effectiveness of computer-based instruction in grades K-2 to traditional instruction of second graders in reading and writing. Students of the same socioeconomic status, race, and sex were compared in reading and writing tests. The writers reported that students who used computer-based instruction carried out better than those who used traditional instruction. Holmes & Keffer (1995) used a computerized program over a six-week period to teach high school students to use Latin and Greek root words for discovering English terms. The aim was to enhance their scores on the verbal portion of the Scholastic Aptitude Test (SAT). The computer program was based on the Apple Hypercard system. In the study, 128 participants from the college-preparatory-level English classes at one high school participated. Their findings showed that those who used the computer program performed better and also enjoyed their instruction more than those who did not use the computer program.

A study containing the use of computers to learn vocabulary was conducted by Gan, Low, & Yaakub (1996). The study was an effort to model teaching of vocabulary with a computer-assisted approach in the Teaching of English as a Second Language (TESL) pre-service teacher education program. Computer-assisted approach provides both the speed and the memory power to search whole texts for the multidimensional outbreak of words. Forty eight subjects in the TESL Matriculation Program were randomly determined to either an experimental or a control group. The results generally represented that the computer-assisted approach was more effective than the conventional classroom instructional approach for teaching vocabulary skills. Due to the participants' replies in the feedback questionnaire, the writers advised that the computer-assisted approach be used as a complement to conventional classroom instruction in vocabulary skills. They added that the computer-assisted approach can enrich the multi-context vocabulary learning experience. Researchers are showing interest in using multimedia programs to test various language learning outcomes.

Raphan (1996) developed a multimedia CALL program used to conduct a pilot study to determine how adult ESL students would handle the multimedia screen with simultaneous audio, visual, and note taking. The result showed that students adapted to the multimedia information

quickly. Additionally, students interacted positively with the system, practiced grammar and vocabulary in context and commented on the usefulness of the individualized instruction. Furthermore, students' listening comprehension and vocabulary improved. There was also an improvement in their reading ability. Raphan (1996) admitted that learners learn best from presentations that most closely simulate reality. She recommended the use of multimedia CALL as a supplement to enhance ESL programs.

A similar study was directed by Masters-Wicks, Postlewate & Lewental (1996). They developed interactive multimedia software as a section of multimedia technology into language curriculum. Their main purpose was to develop faculty awareness of the hidden of multimedia instruments in language instruction.

Learners were displayed to new vocabulary and language functions through the video sections of the lesson. The video sections provided the immediate real-life contexts that improved to the lesson materials. The outcome of the study and interview directed after the lesson represented that students expressed enthusiasm for the interactive multimedia program. The students also felt that their listening comprehension skills enhanced and that the program was exciting. Studies (Reid, 1996) represented the effectiveness of multimedia CALL on vocabulary learning in particular and language learning in general. Based upon this review, multimedia CALL programs that use motion pictures, still pictures, and text can assist ESL students to enhance their vocabulary skills. But it is not obvious if a multimedia program with motion pictures or the one with still pictures will be more effective for intermediate level ESL students. More practical studies to examine the effectiveness of multimedia CALL with motion pictures and still pictures on vocabulary acquisition of ESL students can lead to the development of more effective methods for vocabulary acquisition.

Research on CALL and vocabulary learning

Research in this domain focuses student interaction with on-line materials as a need for learning, either interceded by an on-line workbook or with some interlocutor (Zapata and Sagarra, 2007). Studies have offered that simply displaying material via an exercise or trying to get learners to address items via textual increment may not be as effective for vocabulary retention as actually doing something with the words (Folse, 2004), which may direct to deeper processing. Chun (2007, p. 245) addresses that for vocabulary learning some visuals and glosses is useful, while she advises that many studies represent no effect of annotations and visuals for overall reading comprehension. Furthermore, CALL's ability to provide immediate, individualized materials and feedback has been represented to be useful in increasing long-term retention of vocabulary items practiced (Heilman et al., 2010). Goodwin-Jones (2010) provides a detailed overview of the current themes that this paper addresses: individualization of learning, the context in which CALL is implemented and specific tools such as on-line glosses.

CALL and ICALL: Vocabulary and Other Applications

Personal computers obviously play a significant role in the classroom and suggest many advantages like vocabulary acquisition to both the language learner and teacher. (Mohseni-Far, 2008a; Papagno & Vallar, 1992; Schmitt, 2000) and the ease of mechanical repetition to assist in memory (Segler, 2002). Computers can also provide structured practice, training, and testing in ways that best help to vocabulary acquisition (Ellis, 1995). Studies carried out on learning in a longer period of time at set intervals have been represented to be more effective than the other kind of learning for many materials, containing L2 vocabulary (Baddeley, 1997; Hulstijn, 2001;) and a computer program could be used to simplify such study intervals. Another possible advantage in the use of a CALL program in vocabulary acquisition is its "ability to meet learners' individual requirements as an inherent characteristics of multimedia CALL; it permits learners to choose the

choices which best help them in deriving correct word meanings" (Grace, 1998, p. 38). In addition, the use of CALL looks like available dictionaries can give students not only the correct definitions of terms, but also examples in context plus other information, all of which assists to motivate vocabulary acquisition (Ellis, 1995).

Other feasible usages of CALL activities contain potentially enhanced understanding of multidimensional language constructs, more useful testing (Chapelle, 2001), corpus samples used during a learning activity or as feedback (Desmet & Paulussen, 2007), smart phone systems and associated personalizable functions (Pemperton, 2007), or many other uses. Further examples are expanded by Wible et al. (2006) to locate chunks automatically within the millions of words in the British National Corpus or the sophisticated ICALL programs that make use of artificial intelligence and can reply to users in ways that is not explicitly programmed (O'Brien, 1994). Another usage of computers in language learning is to connect all the computers in a classroom to provide not only learner-computer interactions but also learner-learner interactions (Chapelle, 2001) in the form of synchronous and asynchronous computer-mediated communication.

Several researchers such as Ogasawara (1994) and Vanderplank (1993) believe that displaying captioned movies in language classrooms motivates L2 learners in second language learning because, by decreasing the affective filter effect during the learning process, it provides a relaxing and interesting environment for students.

On the other hand, some studies have represented that headline of movies are only be used for advanced and intermediate learners. If they are used for beginners, they should be integrated to the learners' proficiency level (Baltova, 1999, Danan, 2004). Bird and Williams (2002), and Koolstra and Beentjes (1999) believe that captioned movies are useful for learners with high reading ability, but not a poor reading skill cannot understand the film well. Other researchers such as Neuman and Koskinen (1992) also constituted that the modality of the captioned film may cause misunderstanding in the learning process. The fact that L2 learners attempt to watch the pictures of the movie and read the written texts on the screen simultaneously, causes difficulty in their comprehension.

Yeh and Wang (2003) attempted to represent the effect of multimedia vocabulary annotation and learning style on vocabulary learning. The outcomes displayed that the most effective type of vocabulary annotation was text plus picture.

Jones (2004) examined the effects of pictorial and written annotations on L2 vocabulary learning which represented the written annotation and the pictorial and written annotation groups had higher scores than the comparison group, but the difference between the pictorial annotation group and the comparison group was not meaningful.

Another study was carried out by Yoshii (2006) on the effects of many glossing on incidental vocabulary learning in a multimedia environment, the effects of multimedia sections like visual text, spoken text, and graphics on L2 vocabulary learning. Outcomes represented that the textual-pictorial glosses group did better than the textual glosses group on the definition-supply test.

Yanguas (2009) investigated the effects of various multimedia glosses (textual, pictorial, and textual-pictorial on L2 vocabulary learning. The results represented that textual-pictorial gloss group performed better that all other groups.

Sydorenko (2010) surveyed the effect of input modality in three stimulus conditions (video, audio, and captions) on 1) the learning of written an aural word forms, 2) overall vocabulary gains, 3) attention to input, and 4) vocabulary learning strategies. He divided the learners into three groups. The first group was VAC that received video, audio, and captions, the second group that received video and audio was named VA, and the third group was VC that watched video and captions. The results showed that the scores of the VAC and VC groups on written recognition of words were

higher than on aural recognition of the words, while the VA group scored higher on aural recognition of word forms than on written recognition. The findings also indicated that the VAC group learned more word meaning than the VA group.

In another study, Zarei and Rashvand (2011) investigated the effect of multimedia on L2 vocabulary learning in different captioning conditions. They examined the effect of verbatim and nonverbatim inter-ligual and intra-lingual subtitles on L2 vocabulary comprehension and production. The results displayed that nonverbatim subtitles had positive influence on vocabulary comprehension irrespective of whether they Intl. J. Manag. Human. Sci. Vol., 2 (S), 1011-1020, 2013, 0103 were interlingual or intralingual. The outcomes also represented that regardless of whether captions were verbatim or non-verbatim, intralingual subtitles affected vocabulary production positively.

A similar study was directed with 120 first-year B.A students by Zarei and Sadeghi (2011), which investigated the effectiveness of synchronous and asynchronous interlingual and intralingual captions on L2 learners' vocabulary comprehension and production. The results represented no significant differences among the four groups in L2 learners' vocabulary comprehension and production.

In another study, Tabatabaei and Shams (2011) examined the effects of many multimedia glosses, namely text, on online computerized L2 vocabulary learning of Iranian EFL learners. The result represented that using multimedia gloss could have positive effect on online computerized L2 vocabulary learning.

Rezaee and Sharbaf Shoar (2011) examined the effect of using multimedia, images and movies on learning vocabulary items resulted in a reading comprehension text. The results displayed those students who were exposed to reading comprehension passages with movie clips outperformed the two other groups in learning and recalling of vocabulary.

Investigating the effect of mobile learning as a kind of multimedia environment on language learning, Khazaie and Ketabi (2011) resulted that L2 learners with high-visual and high-verbal abilities could learn more vocabulary when they were exposed to pictorial and written annotation. However, exposure to learning materials without annotations for L2 learners with low-visual and low-verbal abilities resulted in better vocabulary learning.

Another study by Zarei and Oshnouie Mahmoudzadeh (2013) examined the effects of many multimedia glosses on L2 vocabulary learning and reading comprehension. The three experimental groups received multimedia glosses in different conditions which involved a) textual glosses, b) pictorial glosses, and c) textual-pictorial glosses. Analyses discovered that differences between each of these three experimental groups (textual, pictorial, and textual-pictorial) and the control group in vocabulary production was statistically significant, but the differences among the three groups was not statistically meaningful.

In sum, many perspectives of multimedia and L2 vocabulary learning have already been studied separately. Hence, there appears to be a little research on the effect of specific mixture of multimedia on EFL vocabulary comprehension and production. The present study, therefore, aims to fill part of the existing gap in this area and shed light on some of the issues surrounding this little explored area.

Methodology

Participants

Eighty- six participants participated in this study at the first stage. The participants were almost 38 male and 48 female students in elementary EFL learners, studying English in Qalame Bartar language institute. Their ages are between 15 to 25 years old (male and female) with a very

basic knowledge of English language, who are familiar with the use of computer and internet. To ensure the homogeneity of the participants, a version of PET test was administered in this study. After administering the test, 65 learners who were between one standard deviation above the mean and one below the mean were selected as the main participants. Then, they were divided into an experimental group and a control group in the intact classes.

Instrumentation

General English Proficiency Test: The PET proficiency test was utilized as the pedestal for assessing the subjects' level of proficiency in English. This test comprised 30 multiple-choice vocabularies, grammar, and reading comprehension items .

Diagnostic Test of Unknown Items: It is used to verify the students' level of vocabulary proficiency and to determine which selected items the students do not know before the treatment. It was devised by the researcher according to the test procedure description provided in Ellis et al. (1994). The test contained the list of 45 items and simply asked to underline the items the students knew. After that, the unknown items (i.e. those that were not underlined) were identified and the percentage of the students not knowing the items was calculated. The 10 least known items were selected and included in the dimensional tests discussed in the next subsection. In order to test the three dimensions of L2 vocabulary development, 45 concrete nouns similar conceptual difficulty were selected for the study in consultation with the participating teachers. Following the vocabulary selection procedure, out of 45 items, 10 nouns not known at least by 88% of the students were chosen for treatment and subsequent testing. In addition, students were asked not to study the items during the research study. On the basis of the results, the researcher chose 10 items that were not known by a minimum of 88% of the students. The items include conducting baton, cord, cushion, faucet, grinding mill, molasses, pliers, rake, weeder, and welder. These items were consequently included in the treatment activity and the tests.

Hemisphere dominance questionnaire: The hemisphere dominance questionnaire survey developed by McCrone to determine left hemisphere vs. right hemisphere dominant learners. The questionnaire included 16 items. Then, the participants were matched on the basis of their brain dominancy. According to scoring procedures of the test, learners whose left total score based on brain dominance test was above or equal to 10 were considered as left hemisphere dominant and learners whose right total score was above or equal to 10, were treated as right hemisphere learners. Lastly, those whose sum of total score was below 10 were regarded as balanced hemisphere learners. In the next procedure, left brained learners and right brain learners were randomly assigned to experimental group and control group.

Procedure

To accomplish the purpose of the study, the following procedures were carried out:

At the beginning of the study, Preliminary English Test (PET) PET was applied to participants to determine the homogeneity of the groups regarding their levels of proficiency. After collecting data through brain hemisphericity inventory, the researcher analyzed the obtained results, based on the scoring procedure suggested at the end of the inventory. Learners whose left total score based on brain dominance test was above or equal to 10 were considered as left hemisphere dominant and learners whose right total score was above or equal to 10, were treated as right hemisphere learners. Then, the students were randomly assigned to two groups including one control and one experimental group. Next, before the treatment, a test of 30 multiple choice vocabulary test was developed by the researcher and was administered to ensure that the new words were unfamiliar to participants. This test was used as the pretest. The test was administered to a pilot group. The reliability of the test was calculated by using KR-21 formula which is 84%. The scores in the pretest

were used by the researcher to check the initial differences in vocabulary knowledge between the participants in the two groups.

In treatment phase, an online English vocabulary learning website called www.learnthat.org was used in this research. The treatment lasted 6 sessions: 2 sessions a week: each session lasted one and a half hour. This online vocabulary learning website was used for the experimental group and control group was taught vocabulary without computer and internet. They are helped to memorize and retrieve the words. In control group, we asked the students to do the exercises but no strategy was taught in order to learn the vocabulary words. After doing the treatment, the researcher administered the posttest after one week, to compare the mean scores of the two groups in both pretest and posttest to shed light on the fact that whether Call-based program can affect on vocabulary learning enhancement. To control the test effect or practice effect, the interval between the pretest and posttest was long (about one month and a half). Therefore, it was less probable for the examinee to learn something from the previous administration or memorize some of the items.

Results and Discussion

Research question: Does CALL program can enhance learning English vocabulary in elementary EFL learners or not?

To examine the impact of CALL on vocabulary learning, a vocabulary knowledge test as pretest was used. This pretest also served as post-test and was piloted with 26 learners, including 13 right hemisphere learners and 13 left hemisphere learners, similar to the sample in the current study and the poor items were discarded.

To control the test effect or practice effect, the interval between the pre-test and post-test was long (about one month and a half) so it was less probable the examinee to learn something from the previous administration or memorize some of the items. Furthermore, a Pearson product-moment correlation coefficient was computed to assess the relationship between the scores of pretest and posttest. The scores of pretest and posttest were positively correlated. The R-observed value was .76. This amount of R-value was higher than the critical value of .242 at 98 degrees of freedom. The result was statistically significant at .01 level. Based on the effect size criteria developed by Cohen (1988) a Pearson correlation coefficient above .5 is considered to be of high value. Thus, the test was reliable one with Cronbach reliability of .76 .

Next, the researcher administered pretest to detect whether four groups were homogeneous and at the same level of vocabulary knowledge or not. The results of the participants' performance in the four groups on the vocabulary pretest are presented in table 1.

Table 1: Descriptive statistics on the performance of the groups on the vocabulary pretest

Group	N	Mean	Standard deviation
Ex-LH	18	10.483	1.735
Con-LH	14	10.658	1.439
Ex-RH	16	10.780	1.767
Con-RH	12	10.340	1.604
Total	65	10.640	1.786

Further, ANOVA was conducted to examine differences in the mean performances of the four groups. The Levene's Test shows the Equality of Error Variances which demonstrates minimal differences in the variances of the performance of the four groups. Table 2 shows the result of Levene's test for homogeneity of variances.

Table 2: Levene's test of equality of error variances

Levene Statistics	df1	df2	Sig.
.684	3	65	.378

Levene's test for homogeneity of variances tested whether the variance in scores was the same for each of the four groups. As Table 2 shows, the significance value (Sig.) for Levene's test was greater that .05. In the current study the Sig. value is .378, therefore, the homogeneity of variances assumption was not violated.

On the other hand, as Table 3 illustrates, the differences in the means of the four groups on the pre-test are not meaningful. Thus, the four groups were not statistically different from each other on the pre-test.

Table 3: Comparison of the groups on the pretest

Pretest	(I) Groups	(J) Groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
	EXLH	CONLH	.135	.489	.916	-1.250	1.420
		EXRH	-.284	.483	.923	-1.583	1.184
		CONRH	.332	.488	.921	-1.143	1.624
	CONLH	EXLH	-.127	.480	.986	-1.425	1.170
		EXRH	-.476	.482	.860	-1.728	.859
		CONRH	.232	.483	.969	-1.268	1.399
	EXRH	EXLH	.282	.474	.934	-1.119	1.668
		CONLH	.411	.475	.856	-.844	1.713
		CONRH	.629	.475	.610	-.732	2.117
	CONRH	EXLH	-.328	.487	.927	-1.639	1.128
		CONLH	-.222	.484	.964	-1.524	1.213
		EXRH	-.631	.479	.631	-1.997	.827

The main concern of the research question was to examine whether teaching vocabulary based on Computer-Assisted Language Learning (CALL) can assist significantly the learning of the new vocabularies or not. The researcher administered the post test, one week after the treatment, to compare the mean scores of the four groups in both pretest and posttest and to shed light on the fact that whether CALL had any significant effect on the students' performance on vocabulary knowledge test. Table 4 shows descriptive statistics of the four groups' performance on the both Pre-test and posttests.

Table 4: Descriptive statistics of the four groups' performance on the pre and posttests

Group	Test	Mean	SD	Std.Error
EXLH	Pretest	11.563	1.415	.470
	Posttest	13.115	1.662	.500
CONLH	Pretest	11.258	1.359	.2284
	Posttest	11.783	1.485	.2335
EXRL	Pretest	11.381	1.556	.352
	Posttest	14.482	1.422	.335
CONLH	Pretest	12.140	1.417	.331
	Posttest	12.930	1.525	.347

As can be seen in Table 4, the four groups' mean scores on the posttest are greater than those on the pretest. Besides, the posttest mean scores of the two experimental groups are higher than those of the two control groups. To measure the differences among the means, ANOVA was run. As Table 8 shows, the results of ANOVA demonstrated that there was statistically significant difference at the .05 significance level in the posttest mean scores for the groups: (F (3,65)=5.271). The F-value of 5.271was higher than the critical value of 2.980 at 3 and 65 degrees of freedom. On the other hand, the P value was lower than .05 significance level (.004<.05). Further, the effect size, calculated using eta squared, was .21 which is of high value based on criteria proposed by Cohen (1988).

Table 5: ANOVA for four groups' performance on the posttest

Change	Sum of squares	df	Mean square	F	Sig
Between group	52.429	3	17.113	5.271	.004
Within group	183.438	65	2.980		
Total	235.867	62			

Although the F-value of 5.271 denoted significant differences among the four groups' mean scores on the posttest, the multiple comparisons on the post hoc test (Table 6) was run in order to locate the exact place of differences among the four groups' mean scores.

Table 6: Multiple comparisons on the performance of the four groups on the post test

(I) Groups	(J) Groups	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
EXLH	CONLH	1.121*	.312	.038	.1171	2.766
	EXRH	.0350	.395	1.00	-1.2652	1.355
	CONRH	1.365*	.385	.023	.1338	2.875
CONL	EXLH	-1.431*	.371	.018	-2.862	-.217
	EXRH	-1.466*	.375	.027	-2.769	-.076
	CONRH	.0213	.365	1.000	-1.269	1.333
EXRH	EXLH	-.035	.365	1.000	-1.352	1.345
	CONLH	1.316*	.365	.023	.0764	2.806
	CONRH	1.410*	.381	.017	.1132	2.715
CONRH	EXLH	-1.461*	.393	.013	-2.865	-.134
	CONLH	-.0133	.394	1.000	-1.233	1.86
	EXRH	-1.32*	.380	.017	-2.758	-.224
*. The mean difference is significant at the 0.05 level.						

In comparison to the results on the pretest, in which there was no significant difference among the four groups, the mean performances of the four groups' on the posttest showed significant differences except between the two control groups and between two experimental groups, i.e. right brained experimental group and left brained experimental groups. Hence, it can be concluded that the two experimental groups outperformed the two control groups on the post-test.

Post-hoc comparison indicated that the mean score for left brained experimental group (M=13.115, SD=1.662) was significantly different from left brained control group (M=12.930, SD=1.525), and right brained control group (M=12.930, SD=1.525). In other words, there was a significant difference between left brained experimental group and left brained control group (P=.028<.05) and left brained experimental group and right brained control group (P=.023<.05).

Furthermore, the results of multiple comparisons shed light on the fact that, the mean scores of right brained experimental group (M=14.482, SD= 1.422) was significantly different from left brained control group (M=11.783, SD=1.485), and right brained control group (M=12.930, SD=1.525). In another sense, there was a significant difference between right brained experimental group and right brained control group (P=0.23<.05) and left brained control group (P=0.17<.05).

Although there was also difference between the mean scores of the left brained experimental group (M=13.115, SD=1.662) and right brained experimental group (M=14.482, SD=1.422), the difference was not statistically significant (P=1>.05). However, the right brained experimental group outperformed the left brained experimental group and obtained higher mean score on the posttest. Thus, it can be concluded that CALL was more effective in terms of right brained learners. On the other hand, right brained experimental group who received treatment obtained the highest mean score (M=14.482), followed by right brained experimental group (M=13.115), right brained control group (M=12.930), and finally left brained control group (M=11.783).

In a nutshell, teaching vocabulary based on Computer-Assisted Language Learning (CALL) was found to be significantly effective in improving learners' vocabulary knowledge. In other words, CALL had a significant effect on learning new words. Further, this finding highlights the worth of CALL in facilitating vocabulary language learning.

Conclusion

To summarize the findings of this study in terms of the research hypotheses, the results of the study presented in the previous chapter confirm the hypotheses that students who receive CALL will score higher on the post-test than will students who receive conventional teaching, and students who receive CALL will score higher on the retention test than students who receive conventional teaching. With respect to learning conditions, Conventional learning vs. CALL,results of the study indicate that the use of CALL during instruction facilitates vocabulary acquisition to a considerable extent. Two possible reasons for the more successful learning of the experimental group are: First, the use of CALL during instruction enhances input comprehensibility. In other words, exposing students to a simulated real-life sound-picture association of words approach gives learners the chance to experience language in real-life situations and learn language through experience rather than learn language through language. This conclusion is not surprising in light of the experimental studies cited throughout this paper (e.g., Johnson, 1986; Kulik & Kufik, 1986; Nagata, 1998; Warschauer& Healey, 1998), and is in agreement with Krashen’s (1982,1985) Input Hypothesis. Second, the use of CALL during instruction makes learners actively rather than passively involved in the learning process. That is, the learning environment created through the interaction between learners and the computer and learners and their classmates resembles the interaction between learners and native speakers or between more fluent and less fluent speakers upon which the Interaction Hypothesis operates (Long, 1991).

Moreover, the feedback that learners receive from the computer, coupled with comprehension-checking activities, not only lowers the affective filter of learners (Krashen, 1981,1982), but also enhances the input and activates the learners' mechanism of attention to notice the target vocabulary items through interaction and fine-tuning of the input. This is particularly important in view of the accumulating evidence that exposing L2 learners to large quantities of input may induce passive comprehension of the input, suggesting that some sort of attention is necessary for language acquisition to occur (see, Chapelle, 2001; Doughty & Williams,1998; Long, 1991,1996; Seiba,2001).

With respect to learning theory, results of the study indicate that the use of CALL during instruction promotes language acquisition significantly, particularly when the software learning program is built on sound theoretical constructs.

Another interesting finding of this study is related to the interaction between hemispheric dominance and learning vocabulary through CALL. The results of this study indicated that CALL was more effective in terms of right brained learners. On the other hand, right brained experimental group who received treatment obtained the highest mean score than right brained experimental group.

In conclusion, Computer-Assisted language Learning (CALL) is a tool with certain limitations, but in its short history it has profoundly transformed the nature of second language learning and teaching. As experiential or natural-growth language learning/teaching aims at engaging learners in authentic learning environments to promote language acquisition, so too can CALL be integrated into any language teaching syllabus, bringing real-life language learning to EFL settings which in the past could only be achieved through immersion in the target language environment.

Results of the study showed that the use of CALL facilitated the vocabulary development of learners by significantly improving their ability to recognize and accurately match different words to pictures in a variety of contexts. It is believed that the learning effect could be maximized through appropriate classroom management and interaction. Of course, successful interaction requires proper materials for both teacher and student. The use of a multimedia can be the essence of focused learning, because it provides a more engaging learning experience with text, audio, and video, computerized multiple dictionaries , which are all conveying information. Teacher's role is a facilitator that need to ensure all students have enough training to access computer appropriately and assist individually vocabulary learning. This method is developed from the Natural Approach to learning.

Implications of the study

The results of this study showed the effectiveness of using multimedia computer-assisted language learning programs in learning vocabulary. The pretest and posttest scores indicated that learning vocabulary based on CALL can be effective in learning vocabulary. Based on the findings of this study, the following recommendations are made:

1. Multimedia CALL can be used to supplement or complement vocabulary instruction.
2. A replication of this study should be made to see if the results of this study will be repeated.

The results of this study have practical implications for L2 teaching and software developing. The successful performance of the experiment group warrants wider application of CALL in our classrooms. Computers offer the advantage of giving appropriate instruction individually to each student; schools can use CALL to help low-achievement students in regular classroom and pull-out to reinforce learning. Teachers should pay special attention to these students and assist them to catch up with their peers.

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