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# The effectiveness of computer assisted instruction on vocabulary achievement

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In recent years, computer assisted language learning has come to the forefront of language learning and teaching. Computer assisted vocabulary instruction has been considered to be one of the most common applications of CALL. The purpose of this article is to investigate the effectiveness of computer assisted instruction on students' vocabulary achievement. The subjects of this quasi-experimental study consisted of 52 freshmen studying in the ELT Department of Balıkesir University in the spring semester of 2012-2013 academic year. Before the intervention, the students were randomly assigned to one of the groups; Computer Assisted Instruction or Communicative Language Teaching and they were given a pre-test. Following the pre-test, the CAVI group studied 20 target words by using a Moodle in a computer laboratory whereas the CLT group was instructed the same words by their teacher in a communicative classroom atmosphere. Both groups were given the post-test immediately after the intervention. The delayed post-test was administered to the freshmen five weeks after the intervention in order to test the retention. The results revealed that both CAVI and CLT groups had some kind of vocabulary gain as a result of the treatments. However, there was no significant difference between the groups in vocabulary gains.

## Introduction

In broad terms, Computer Assisted Language Learning (CALL) may be defined as "the search for and study of applications on the computer in language teaching and learning" (Levy, 1997, p. 1). It is often regarded as the use of computers as an aid for presenting the language material. Another definition of CALL that accommodates its changing nature is "any process in which a learner uses a computer and, as a result, improves his or her language" (Beatty, 2003, p. 7). The term is widely used to refer to "the area of technology and second language teaching and learning" (Chapelle, 2001, p. 3). CALL has come to include "issues of materials design, technologies, pedagogical theories and modes of instruction" (Beatty, 2003, p. 7). It is now used routinely in a variety of instructional situations. Language teachers are increasingly supposed to possess CALL expertise that involves both practical skills and a complete understanding of information technology theory. As a result, it is

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becoming more and more essential for teachers to be familiar with CALL applications within the classroom. They need to design, implement, and evaluate CALL activities in their classrooms (Fotos & Browne, 2004). Moreover, CALL is perceived as the most innovative area in the practice of foreign/second language items (Jones, 2001). Since the initial introduction of computers into the field of second/foreign language education, many researchers have naturally tried to evaluate the effectiveness of this new medium and its applications on language learning (Davies, 2002; Jones, 2001; Levy, 1997). Nowadays computers play a paramount role in the field of language instruction (Montazeri & Hamidi, 2013). CALL is now an integral part of EFL classrooms and is likely to assume increasing importance as technology improves.

Computer Assisted Vocabulary Instruction (CAVI) has been considered to be one of the most common applications of CALL. It consists of practices involving the use of computers for vocabulary learning and instruction purposes. Vocabulary learning/teaching has been a highly popular subject matter in computer assisted language learning applications since the early history of CALL. However, the studies which examine the effects of computer assisted language learning applications on vocabulary learning are only available in small quantities. While some of these studies (Tozcu & Coady, 2004; Eşit, 2007; Nakata, 2008; Kılıçkaya & Krajka, 2010; Lin et al., 2011; Kayaoğlu et al., 2011; Gorjian et al., 2011; Fehr et al., 2012) have examined the effectiveness of a computer assisted vocabulary instruction program to test whether it is efficient or not in vocabulary learning, others (Koçak, 1997; Özdemir, 2001; Tokaç, 2005; Cellat, 2008) have compared teacher-led instruction and computer assisted instruction in terms of vocabulary learning.

Firstly, Koçak (1997) aimed at investigating the effectiveness of computer assisted language learning on vocabulary teaching and learning. The results of the study supported the hypothesis that the experimental group liked working with computers and they learned and retained more vocabulary than the control group. Secondly, the study of Özdemir (2001) probed whether online media tools help or discourage young learners. The results of the study showed that online tool was more effective than classroom learning instruction on students' productive vocabulary. It was concluded that the computer assisted vocabulary instruction group could do better in the production test because it triggers students' motivation and students can study individually at their own pace during the application. Tokaç (2005) compared the computer assisted vocabulary instruction with teacher-led vocabulary instruction. According to the results, neither computer group nor the teacher group showed significantly more vocabulary gains. Thus, computer assisted vocabulary instruction was found to be as effective as teacher-led vocabulary instruction. Likewise, Cellat (2008) tried to identify whether learning and retaining of foreign language vocabulary would prove to be profitable for students who study vocabulary in a computer environment when compared to students who study the same vocabulary instruction material in a classroom environment under the guidance of their teacher. The findings of the research indicated that the computer assisted vocabulary instruction group performed better on both immediate and delayed tests when compared to the teacher-led instruction group.

As stated above, there are also some studies which have examined the effectiveness of a computer assisted vocabulary instruction program to test whether it is efficient or not in vocabulary learning. The study of Tozcu & Coady (2004), for instance, examined the effect of direct vocabulary learning using computer assisted language learning on vocabulary knowledge, reading comprehension, and speed of word recognition. It was found that the treatment students showed significantly greater gains than the control students even though both groups showed increases in vocabulary gain, and reading comprehension, and a decrease

in reaction time for frequent word recognition. The next study applied in EFL context in Turkey was the study of Eşit (2007) which investigated the effectiveness of an intelligent computer assistant language learning program on Turkish learners' vocabulary learning. The results of the study revealed that reading activities with the Intelligent Computer Assistant Language Learning Program had positive effects on both learners' vocabulary learning and their attitudes towards the use of an Intelligent Computer Assistant Language Learning application in the classroom. Focusing on a different point, Nakata (2008) aimed at comparing vocabulary learning with word lists, word cards, and computers in order to determine which material leads to the most superior spaced learning. The study showed the superiority of computers over lists, the limited advantage of word cards over lists, and no statistically significant difference between computers and cards. The study of Yan (2010) attempted to examine the effect of computer assisted language learning on de-contextualized multimedia software vocabulary learning and retention for college level students in Taiwan. The findings of the study showed that the de-contextualized multimedia vocabulary-learning software program had better learning and retention result than traditional classroom teaching. In the study of Kılıçkaya & Krajka (2010) the effectiveness of online vocabulary teaching and the traditional methods were compared. The results of the study demonstrated that the learners in the experimental group outperformed the learners in the control group and that the experimental group students better remembered the words studied online. Another study examining the effectiveness of a computer assisted vocabulary instruction program on vocabulary learning was the study of Lin, Chan & Hsiao (2011). According to findings, learning collaboratively with computers were not outperformed in vocabulary tests designed for individual study; however, they showed better retention, outperforming the others in the delayed post-test. The next study which was applied in EFL context in Turkey was carried out by Kayaoğlu, Akbaş & Ozturk (2011) and explored whether any difference exists between the students having a traditional text-based method and those having computer-based method. The results of the study suggested that using multimedia such as animations contributed to students' achievement in vocabulary learning. Gorjian, Moosavinia, Kavari, Asgari & Hydarei (2011), on the other hand, measured the impact of asynchronous computer assisted language learning approaches on high and low achievers' vocabulary retention and recall of English as foreign language learners. High achievers benefited from the computer assisted language learning approach to learn vocabulary in both retention and recall processes whereas the low achievers gained the chance of learning vocabulary just in retention period. Lastly, the study of Fehr, Davison, Graves, Sles, Seipel & Sekhran-Sharma (2012) attempted to decide the effects of an individualized, online vocabulary program on picture vocabulary test scores. Post-test scores indicated that the students in the treatment condition outperformed control students. It was concluded that the computer-adaptive, individualized instruction provided by this vocabulary program addressed a need for efficiency in remediation of vocabulary deficits.

To put it shortly, previous research has generally supported the idea that computer assisted vocabulary instruction facilitates L2 vocabulary acquisition and has provided us with some practical and theoretical insights to understand computer assisted vocabulary instruction (Koçak, 1997; Özdemir, 2001; Tozcu & Coady, 2004; Eşit, 2007; Nakata, 2008; Cellat, 2008; Kılıçkaya & Krajka, 2010; Lin et al., 2011; Kayaoğlu et al., 2011; Gorjian et al., 2011; Fehr et al., 2012). Nevertheless, there are also some studies which have revealed that computer assisted vocabulary instruction is not more effective than teacher instruction (Tokaç, 2005; Cellat, 2008). Taking all these into account, this article aims at investigating the effectiveness of computer assisted instruction on ELT freshmen's vocabulary achievement. The article also explores whether gender plays a role in vocabulary achievement of ELT freshmen.

## Method

### *Research Design*

Lacking random selection of participants and having treatment groups constructed from intact classes, this study employed a quasi-experimental pre-post test control group design with two groups (experimental and control groups). While the experimental (CAVI) group was treated in a different way from the control (CLT) group, the two groups received the same pre-, post- and delayed post-test.

Table 1. The Research Design

| | Pre-test | Experiment | Post-test | Delayed Post-test |
|---|---|---|---|---|
| Experimental Group (CAV | 1st week | 4 weeks | 5th week | 10th week |
| Control Group (CLT) | 1st week | 4 weeks | 5th week | 10th week |

### *Participants*

The present study was conducted with the participation of 52 freshmen studying in the English Language Teaching Department of Balıkesir University, Turkey in the spring semester of 2012-2013 academic year. All students were native speakers of Turkish and their ages varied between 18 and 24. The freshmen were randomly assigned to one of the groups; Computer Assisted Vocabulary Instruction (CAVI) or Vocabulary Instruction through Communicative Language Teaching (CLT). There were 6 male and 20 female students in the CAVI group (26) whereas there were 9 male and 17 female students in the CLT group (26).

### *Instruments*

The data were collected through the vocabulary achievement test. The vocabulary achievement test developed by Caplan & Douglas was adapted from the vocabulary sections of the book Q: Skills for Success Reading and Writing (Caplan & Douglas, 2011). The test included 20 multiple choice questions designed to assess the participants' knowledge of the target vocabulary. In order to test the reliability of the achievement test, another group of participants from the Department of English Language Teaching at Balıkesir University (150) was chosen. This group was asked to take the test before administering it to the real participant group. Item difficulty indices ($\overline{P}$ = 0.77) and discrimination indices ($\bar{r}$ = 0.55) were calculated for each item. Using the data from item analysis the Cronbach alpha reliability coefficient was calculated as 0.83 which indicated that the test was highly reliable (Özdamar, 2004: 633).

### *Procedure*

Before the intervention, the students were randomly assigned to one of the groups; Computer Assisted Instruction (the experimental group) or Communicative Language Teaching (the control group) and they were given a pre-test. Following the pre-test, The CAVI group studied 20 target words by using a Moodle in a computer laboratory. They studied the target vocabulary interactively through a sequence of vocabulary learning activities which were planned by the researcher. The target words were presented with textual, visual and audio media. When they clicked on a highlighted word, they could see the definition of the word, hear the pronunciation of it, see the grammatical form of it such as noun, adjective, verb and see the word in a sentence example. They were also provided with

computerized multiple choice comprehension questions, matching, fill-in-the-blanks, true-false activities, crossword or word search puzzles, and games. In other words, they were actively engaged in vocabulary practice thanks to these types of exercises and games. Moreover, they were given computer-based immediate feedback on their answers to questions. During the sessions, the researcher guided the freshmen to use the software and helped them whenever they had a problem with the software. However, the researcher never interfered with the freshmen's practices and learning pace. They all studied the target vocabulary individually and at their own pace.

The CLT group, on the other hand, was instructed the same words by their teacher in a communicative classroom atmosphere. The instruction consisted of the same reading texts, words, definitions, example sentences, exercises, and games as those designed for the CAVI group. During the classroom applications, the teacher fostered a communicative atmosphere through the classroom activities such as games, pair-works, and discussions. First, vocabulary items were presented by the teacher through the use of a variety of vocabulary teaching techniques such as making a definition of the word in the target language, using real objects, mime or gesture, synonyms, antonyms or hyponyms, employing visual aids such as pictures or board drawings, using word networks, dramatization, illustrative sentences, guessing words from the context, vocabulary games, puzzles etc. Then the freshmen practised the words with several activities. After each activity, the teacher checked the answers of the students and made any necessary corrections. During the sessions, the freshmen were required to follow the teacher's instruction. Thus, they had to regulate their own learning pace according to the teacher.

The intervention took four weeks for both groups. All students received two class hours of instruction per week. Both groups were given the post-test immediately after the intervention. The same test was also used as the delayed post-test which was administered to the freshmen five weeks after the intervention in order to test the retention.

### *Data Analysis*

The quantitative data collected from the vocabulary achievement test were analysed by SPSS 16.0 (Statistical Package for the Social Sciences) Software. Before running t-test and One-Way ANOVA test, both normality and homogeneity of variances assumptions were satisfied. Normality of variances assumptions of t-test were satisfied through Kolmogorov-Smirnov Test ($p>.05$) whereas homogeneity of variances assumptions of One-Way ANOVA were satisfied via Levene Test of Homogeneity of Variances ($p>.05$). First, the scores of pre- and post-tests were compared for each group. Then, the results of post-tests for both groups were compared through t-test. Finally, the mean scores of delayed post-test for both groups were compared. In order to find out the difference in success levels between male and female students, independent samples t-test was conducted. One-Way ANOVA test was also applied in order to see whether these results were random or not.

## Results

Table 2 shows the results of the pre-test for both groups. Close mean scores (.571 and .573) between the two groups indicated that the participants' target vocabulary knowledge were almost the same before the intervention. Statistical analysis showed no statistically significant difference between the groups according to the results of pre-test ($p= .935>.05$) which is higher than .05.

Table 2. The Comparison of the Pre-test Scores of the Two Groups

| Groups | N | Means | Std. Dev. | -t- | -p- |
|---|---|---|---|---|---|
| CAVI | 26 | .571 | .090 | .082 | .935 |
| CLT | 26 | .573 | .077 | | |

The pre-test and post-test results of the experimental and control groups were compared through paired-samples t-test. The statistical findings regarding the experimental group are presented as follows (see Table 3):

Table 3. The Comparison of Pre- and Post-test Scores of the CAVI Group

| Tests | N | Means | Std. Dev. | -t- | -p- |
|---|---|---|---|---|---|
| Pre-test | 26 | .571 | .090 | 40.995 | .000 |
| Post-test | 26 | .957 | .054 | | |

The paired-samples t-test analysis of the pre- and post-test for the CAVI group was computed as .000 at the .05 level of significance. This shows that there was a significant difference before and after the intervention in the CAVI group ($p<.05$). In other words, the group's vocabulary knowledge increased after the intervention when we consider the mean scores.

In order to discover whether the CLT group's target vocabulary knowledge increased after the intervention, the pre- and post-test scores of the CLT group were compared (see Table 4).

Table 4. The Comparison of Pre- and Post-test Scores of the CLT Group

| Tests | N | Means | Std. Dev. | -t- | -p- |
|---|---|---|---|---|---|
| Pre-test | 26 | .573 | .077 | 43.571 | .000 |
| Post-test | 26 | .925 | .075 | | |

As seen above, the mean scores of the CLT group was calculated as .573 for pre-test, and as .925 for post-test. The result of the analysis indicated that there was a significant difference between the pre- and post-test scores of the CLT group ($p<.05$) in terms of their target vocabulary knowledge. That is to say, Communicative Language Teaching helped the students to develop their vocabulary knowledge. In order to find out whether CAVI group learned more vocabulary than the CLT group, both groups were compared according to their post-test scores. Table 5 shows the results of the post-tests for both groups:

Table 5. The Comparison of Post-test Results of the CAVI and CLT Groups

| Groups | N | Means | Std. Dev. | -t- | -p- |
|---|---|---|---|---|---|
| CAVI | 26 | .957 | .054 | 1.799 | .079 |
| CLT | 26 | .925 | .075 | | |

The value of .079 $p>.05$) showed that there was no significant difference between the post-test scores of the experimental and control groups. Therefore, it can be said that both instruction types (CAVI and CLT) are successful in teaching vocabulary and their effects do not have any significant difference.

The statistical results regarding the comparison of post-test and delayed post-test scores of the CAVI group are displayed in the table below:

Table 6. The Comparison of Post- and Delayed Post-test Scores of the CAVI Group

| Tests | N | Means | Std. Dev. | -t- | -p- |
|---|---|---|---|---|---|
| Post-test | 26 | .957 | .054 | 1.742 | .094 |
| Del. Post-test | 26 | .936 | .072 | | |

Although there seemed a difference between mean scores, the results of paired samples t-test indicated that the significance value was .094 at the .05 level of significance which did not mean a statistically significant difference between the post-test and delayed post-test in the CAVI group. That is to say, computer assisted instruction seemed effective in vocabulary retention.

As for the CLT Group, the statistical results regarding the comparison of post-test and delayed post-test scores are displayed in the Table 7:

Table 7. The Comparison of Post- and Delayed Post-test Scores of the CLT Group

| Tests | N | Means | Std. Dev. | -t- | -p- |
|---|---|---|---|---|---|
| Post-test | 26 | .925 | .075 | .284 | .779 |
| Del. Post-test | 26 | .921 | .090 | | |

The results of the paired samples t-test analysis of the post- and delayed post-tests for the CLT group showed that the p value was .779 which was higher than the .05 level of significance, and it suggested that there was not a statistically significant difference between the post-test and delayed post-test results of the CLT group in terms of retention.

Even though the above-mentioned results indicated that there was no significant difference between the experimental and control groups in terms of their target vocabulary knowledge and retention levels, ANOVA was applied in order to see whether these results were random or not. Table 8 shows the result of ANOVA analysis:

Table 8. The Results of ANOVA

| Tests | | Sum of Squares | df | Mean Squares | F | P |
|---|---|---|---|---|---|---|
| Pre-test | Between Groups | .000 | 1 | .000 | .007 | .935 |
| | Within Groups | .357 | 50 | .007 | | |
| | Total | .357 | 51 | | | |
| Post-test | Between Groups | .014 | 1 | .014 | 3.236 | .079 |
| | Within Groups | .215 | 50 | .004 | | |
| | Total | .229 | 51 | | | |
| Del.Post-test | Between Groups | .003 | 1 | .003 | .454 | .503 |
| | Within Groups | .339 | 50 | .007 | | |
| | Total | .342 | 51 | | | |

The results of ANOVA analysis revealed the fact that there was no significant difference between the pre-test scores of the two groups before the intervention (p= .935>.05). After the intervention, there was no significant difference between the groups in terms of vocabulary development (p= .079 >.05), either. As for the retention level, the delayed post-test scores still did not show a statistically significant difference between the groups in terms of vocabulary retention (p= .503>.05).

This study was also aimed at discovering whether gender played a role in the vocabulary achievement of the freshmen. In order to find out the difference in success levels between male and female students, independent samples t-test was conducted. Firstly, the mean scores

of the CAVI group in two genders were calculated. Table 9 shows the post-test mean scores and gender differences:

Table 9. The Comparison of Male and Female Students' Post-test Scores in the CAVI Group

| Gender | N | Means | Std. Dev. | -t- | -p- |
|---|---|---|---|---|---|
| Male | 6 | .962 | .058 | .820 | .420 |
| Female | 20 | .941 | .053 | | |

According to Table 9, statistically there was no significant difference between genders in terms of vocabulary knowledge level (p=.420>.05) of the CAVI group. Secondly, the mean scores of the CLT group in two genders were examined in order to determine whether gender played a role in the vocabulary achievement of the CLT group (see Table 10).

Table 10. The Comparison of Male and Female Students' Post-test Scores in the CLT Group

| Gender | N | Means | Std. Dev. | -t- | -p- |
|---|---|---|---|---|---|
| Male | 10 | .895 | .059 | 1.665 | .109 |
| Female | 16 | .943 | .079 | | |

Although it seemed that female students were more successful than male students in post-test of the CLT group in terms of means, the difference between genders in terms of vocabulary knowledge level was not statistically significant (p=.109>0.05). That is to say, gender did not have a significant impact on the vocabulary achievement of the freshmen in the CLT group.

**Discussion**

In the light of the results of this study, some concluding remarks can be made. First of all, when the two groups were investigated within themselves, the results of the study lead us to the conclusion that both instruction groups' mean scores were found to have increased significantly, and they did not experience forgetting over time. It can be deduced that learning can certainly occur no matter what the instruction type is (Gagne, Wager, Golas, Keller, & Russell, 2005).

Secondly, it can be concluded from the study that despite receiving different instruction types, there was no significant difference between the groups in vocabulary gains. In other words, both instruction types (CAVI and CLT) were successful in teaching vocabulary and their effects on the freshmen's vocabulary achievement did not have any significant difference. Contrary to what is believed, the result highlighted the significance of the fact that computer assisted instruction may not always offer better learning experience to students with respect to vocabulary learning. The teacher factor is also important and computers cannot substitute teachers (Tokaç, 2005; Cellat, 2008). So, it can be said that the findings of this study contradict the previous research (Koçak, 1997; Özdemir, 2001; Tozcu & Coady, 2004; Eşit, 2007; Nakata, 2008; Kılıçkaya & Krajka, 2010; Lin et al., 2011; Kayaoğlu et al., 2011; Gorjian et al., 2011; Fehr et al., 2012) to a certain extent despite showing parallel results with those of some studies (Tokaç, 2005; Cellat, 2008).

In contrast to the results of the prior studies (Cellat, 2008; Kılıçkaya & Krajka, 2010; Hulstijn et al.,1996; Chun & Plass, 1996) showing that the CAVI group learned and retained more vocabulary than teacher-led group, the results of this study indicated that there was no significant difference between the groups in terms of their vocabulary retention levels. Both instruction types were effective in terms of retention. Hence, the result of this study contradicts the related literature (Cellat, 2008; Kılıçkaya & Krajka, 2010; Hulstijn et al.,1996; Chun & Plass, 1996) regarding the effect of CAVI on vocabulary retention.

Lastly, the comparison of male and female students' vocabulary gains suggested that there was no significant difference between male and female students in terms of vocabulary achievement in both groups (CAVI and CLT). When the results of the study is compared with the findings of previously conducted studies (Nyikos, 1990; Lynn & Wilson, 1993; Grace, 2000; Jiménez & Terrazas, 2008; Aslan, 2009; Burgoyne, Kelly, Whiteley & Spooner, 2009; Llach & Gallego, 2012), it is seen that like in the studies of Grace (2000), Jiménez & Terrazas (2008), Burgoyne, Kelly, Whiteley & Spooner (2009), and Llach & Gallego (2012), the gender factor does not affect vocabulary achievement.

## Conclusion

This study intended to reveal whether computer assisted instruction is effective in vocabulary achievement of the ELT freshmen or not. Considering the findings, several pedagogical implications can be suggested. The most important pedagogical implication is that computer assisted language learning may be a useful aid to the language methodology. This study provided evidence for facilitating effect of computer assisted instruction on freshmen's vocabulary learning. Thus, it can be recommended that language teachers use such commercially available CAVI software to enhance learners' vocabulary knowledge in a computer based environment. As CAVI software is practical and time-saving, teachers need not waste time in preparing materials for vocabulary instruction. Therefore, integrating CAVI in language programs is worthwhile.

The results of the present study showed that both instruction types have facilitating effect on students' vocabulary learning. Here, it can be inferred that learning can certainly occur no matter what the instruction type is. With reference to the findings of this study, it could be recommended that teachers bear in their mind that there is not a "best" way to learn or teach a foreign language. Instruction types should be altered in various ways by focusing on those engaging students in meaning.

As a final note on the limitations of the research, the subjects of the study were limited to 52 freshmen studying in the English Teaching Department of Balıkesir University. Further research can investigate the effects of an integrated type of instruction (Computer Assisted Instruction & Communicative Language Teaching) by comparing it with other instruction types. It can also focus on determining the effectiveness of CALL on other skills (reading, writing, speaking, and listening).

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