EXPLICIT VOCABULARY LEARNING THROUGH TECHNOLOGY

A THESIS IN TEACHING ENGLISH TO SPEAKERS OF OTHER LANGUAGES

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ABSTRACT

Functional language proficiency requires mastery of a large number of words. It is therefore necessary for L2 learners to learn a large vocabulary in a short period of time. In classroom contexts, there appears to be no alternative to intentional learning of a great many new words in a relatively short period of time. With the remarkably impressive technological development that has been made in recent years, some researchers have begun investigating the role of technology in providing an optimal learning environment for L2 vocabulary acquisition.

The aim of this study was to examine the effects on second language vocabulary retention of a computer assisted vocabulary learning program I designed for the purpose of this study. Precisely, my study aimed to examine the following assumption: Learners who use a computer-assisted vocabulary learning program (CAVL) that provides them with multiple encounters with new words in different multimedia contexts (sound, pictures, and graphics) will have a better retention of new vocabulary items both in their short-term and long-term memory than learners who are taught using textbooks only. Participants in this study were two groups of male EFL grade nine students. The Experimental Group used the computer program in class to learn new words over 15 days. The Control Group was taught using textbooks only. Immediate and delayed post-tests were used to assess short-term and long-term retention of unknown words, respectively. Collected data were computed using the Box and Whisker Plot and mean comparison. To look into the abovementioned assumption, the study compared the difference in scores between the immediate and delayed post-tests for the Experimental Group, the difference in scores between the immediate and delayed post-tests for the Control Group, and the difference in scores between the Experimental and Control Groups on the delayed post-test.

To assess the short-term and long-term retention of unknown words my study sought to answer the following research questions:

1. What is the difference in scores between the immediate and delayed post-tests for the Control Group?
2. What is the difference in scores between the immediate and delayed post-tests for the Experimental Group?
3. What is the difference in scores between the Experimental and Control Group on the delayed post-test?
4. What are some of the reasons for the differences?

Concerning the first research question, data analysis suggested that there was a dramatic decrease in the Experimental Group's mean score on the delayed post-test. As for the second question, a sharper decrease characterized the delayed post-test mean score of the Control Group. Regarding the third question, the Experimental Group outscored the Control Group on the delayed post-test. Qualitative data analysis suggested that students attributed the difference in scores to some aspects of the CAVL program. The overall findings showed that although students who used the CAVL program did not have a better short-term learning gain, they had a better long-term learning gain than those who were taught using textbooks only.

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DEDICATION

I dedicate this work to my wife, Awatef Akrimi, for covering me in a major transition in my life and for being a fine example of what responsibility should be. I also dedicate this work to my good father, Mohammed Turki, for being a pillar of strength for me when I was weak. This work is also dedicated to my little angels, Alaa and Mueen. Your presence in my life made me feel real delight.

CHAPTER 1

INTRODUCTION

Over the past few decades learners' vocabulary, or lexicon, has received a lot of attention from researchers, teachers, and practitioners. However, vocabulary learning as a separate and structured activity is remarkably lacking from most foreign-language courses, unlike other language areas such as grammar that has been dominant in many course books. As is the case of many second language learning aspects, Macaro (2005), after surveying the vocabulary learning literature, concludes that "vocabulary learning has been subjected to the usual pendulum swing in language learning" (p. 63). Although different language acquisition theories have widened our perception of word acquisition/learning, little has been done to apply the findings of such theories to classroom instruction. Therefore, Groot (2000) suggests that we "need to operationalise current theoretical thinking about word acquisition" (p. 60) to verify its efficiency for L2 classrooms. Technology application to vocabulary learning may be one way of making our knowledge about word acquisition operational.

Trying to operationalise our thinking about words, my research is a further step to a project I started with the author of the *UAE English Skills* series, Terry Philips. It involved designing web-based vocabulary games intended to be used by students in the UAE. This can be found online at http://uae.skillsinenglish.com/Grade7Top/grade7v.htm. It consists of interactive vocabulary games that expand students' knowledge about words through different tasks in a multimedia context. First, the program exposes learners to the pronunciation of the target word. Then students try to guess its part of speech through a sentence that presents its most common use. After knowing the part of speech, students are given a very simple definition of the target word. Students also are given the letters that make up the word and are asked to spell it correctly before proceeding to process writing at the level of the sentence through an anagram activity. Throughout all these steps students have to make choices and interact with the computer, which gives them constant feedback. In short, the program presents the same vocabulary item through different activities that highlight the form, the meaning, and the use of that item. As such, the aim of the

program is to increase students' proficiency in vocabulary, which is a prerequisite for their overall language proficiency.

Being proficient in a language involves acquiring many thousands of words (Hulstijn & Laufer, 2001). In the case of first language, Nation (2001) cites research that estimates that for native speakers of English "a very rough rule of thumb would be that for each year of their early life, [they] add on average 1,000 [words] a year to their vocabulary" (p. 9). This means that the average child begins school with a word bank ranging from 5,000 to 6,000 words. Most words in first language acquisition are learned incidentally in an incremental way when the language learner comes across them frequently in a wide range of contexts (De Bot, Paribakht, & Wesche, 1997). All children go through this natural process of acquiring new words in their L1. However, this process is not always possible for L2 learners.

In the case of foreign/second language acquisition in instructional contexts, there is not enough time to copy the natural, largely incidental L1 word acquisition process. Acquisition of new words from authentic L2 reading texts by means of strategies such as inferring from context is also not a solution for many reasons (Laufer, 2005). There seems to be no alternative to intentional learning of a great many new words in a relatively short period of time for L2 learners to develop appropriate functional language proficiency. Moreover, Nation (1990) asserts that learners need at least fourteen encounters with an unknown word in different contexts to retain it in their long-term memory. Second language teachers are left with a fundamental dilemma: On the one hand, there is not enough time for exposure to new words in different contexts as in L1 acquisition. On the other hand, classroom teaching/learning materials do not provide enough encounters with those words. In the UAE government schools, for example, grade nine students are supposed to learn 358 new words in a time span of seven months. With the minimum of fourteen encounters stated by Nation as a condition to retain a new word, it becomes impossible for teachers/instructional material to cater for such learning conditions.

Obviously, there is no easy solution to this dilemma. One possible solution seems to be to create an environment that is maximally conducive to learning new words by striking a balance between the two contradictory demands. The Computer-Assisted Vocabulary Learning (CAVL) program (Jeddi, 2008) that I designed for the purpose of this study intends to do just that by speeding up the acquisition process; it

exposes learners through different stages to the salient features of the new L2 word in a multimedia (sound, picture, and graphics) environment. The aim of the study was to investigate the effects on second language vocabulary learning of meeting the same item in different activities/contexts using a CAVL program. I expected that learners who used the CAVL program would be likelier to retain unknown words both in their short-term and long-term memory than learners who were taught in the normal way using textbooks only.

To investigate this assumption, my study used a between-subject research design to address the following research questions:

1. What is the difference in scores between the immediate and delayed post-tests for the Control Group?
2. What is the difference in scores between the immediate and delayed post-tests for the Experimental Group?
3. What is the difference in scores between the Experimental and Control Group on the delayed post-test?
4. What are some of the reasons for the differences?

The Experimental Group used the CAVL program for 15 days to learn and practice 15 new words. The Control Group was taught the same words using textbooks and flashcards only for the same period of time. Both groups were instructed to record these words in a vocabulary notebook (see Appendix A) that all students were familiar with. These notebooks were corrected on a daily basis and specific feedback was given to students. After the training, both groups took an immediate post-test. After three months the same test was administered again as a delayed post-test. The mean scores of both tests were compared.

To conclude, this study sought to investigate the application of computer technology to second/foreign language vocabulary learning. Most importantly, it was an attempt to understand factors that facilitate long-term retention of unknown words. Getting better insights into what facilitates long-term word retention will have important implications for EFL/ESL teachers and learners, and for curriculum designers as well.

Overview of the Chapters

Chapter 2 reviews the literature related to L2 vocabulary learning and teaching. It identifies the major strands in teaching L2 vocabulary and lists the

benefits technology can bring to L2 vocabulary classes. Chapter 3 describes the major stages of the study. First, it states the research questions and gives all background information about the subjects. Then, it lists all the instruments used in this study. Finally, this chapter ends with an account of the procedure and data analysis. Chapter 4 reports the findings of the study and discusses them in detail. In chapter 5, a summary of the findings is included followed by a discussion of the pedagogical implications and limitations of the study, as well as recommendations for future research.

CHAPTER 2

LITERATURE REVIEW

The Lexical Paradox

After decades of guesswork, second language vocabulary research now widely agrees that text comprehension depends mainly on detailed knowledge of most of the words in a text (Cobb, 2007). In a language like English it is estimated that learners need to know more than 98% of tokens in a text to comprehend it (Moir & Nation, 2008). Thus readers of English "must bring *to* reading the same knowledge they are intended to get *from* reading (Cobb, 2007, p. 42, italics in original). This paradox has attracted many researchers who have tried to outline various proposals for its resolution. On the one hand, Nation (2001) argues for explicit instruction of targeted vocabulary outside the reading context itself. On the other hand, Krashen (1989) maintains that all the lexis needed for reading can be acquired naturally through reading itself, both in first and second languages. This hidden vocabulary learning from reading is seen as extensive enough "to do the entire job" (Krashen, 1989, p. 448) of acquiring a second language lexicon. These two conflicting views—implicit and explicit—represent the most influential strands in teaching and learning second language vocabulary (SLV).

In connection with word learning, a distinction is commonly drawn between incidental (implicit) and intentional (explicit) learning. Incidental learning excludes any conscious attention to the words being learned (Singleton, 1999). Intentional learning, on the other hand, differs from incidental learning when there is no such intention (Anderson, 1990). From a pedagogic perspective, this distinction is very useful when discussing the optimal way of presenting new L2 words in instructional contexts.

Sökmen (2001) summarizes the two major trends in teaching vocabulary using the continuum metaphor. She explains that at one end of the continuum is the view that vocabulary should be taught/learned implicitly. This position maintains that vocabulary is learned implicitly mainly through reading. At the other end of the continuum, there is the idea that vocabulary has to be formally taught, and that without vocabulary, language would be incomplete. This view asserts that successful

language learning is the result of explicit, or direct, learning/teaching, in class for example. Understanding both views and their theoretical underpinnings will help us evaluate their efficiency for L2 classrooms, and decide on the strategies to be included in the CAVL program.

Major Strands in Teaching L2 Vocabulary

View One: Implicit Vocabulary Learning or Vocabulary-through-Reading Approach

In the 1970s and 1980s, much vocabulary teaching was based on the communicative approach that promoted a focus on implicit learning. This position "is based on the claim that students will learn all the vocabulary they need from context by reading extensively, as long as there is successful comprehension" (Coaday & Huckin, 1997, p. 275). This idea reflects the influence of Krashen's (1989) comprehensible input hypothesis. According to Krashen, external comprehensible input coupled with an internal language acquisition device is the key to language acquisition. This is what came to be known as the default hypothesis. Laufer (2005) summarizes the default hypothesis of vocabulary acquisition as claiming "that we acquire most words in our native language through exposure to language input, rather than by instruction" (p. 311).

The default hypothesis, which was originally formulated for first language, attracted many theorists who tried to apply it to second language learning. In her evaluation of the default hypothesis, Laufer (2005) identifies five assumptions underlying this view of vocabulary learning/teaching: the noticing assumption, the guessing ability assumption, the guessing-retention link assumption, the repeated-exposure retention link assumption, and the extrapolation assumption. These assumptions attempt to explain how we acquire vocabulary through reading.

In the studies of incidental or implicit vocabulary learning, it has been argued that learners learn unknown words during reading activities. This happens according to the five aforementioned assumptions. First, learners should notice a word as unfamiliar. Schmitt (2002) states that this is an essential condition for learning new words. Second, using context clues, learners can guess the meaning of unfamiliar words. This idea led Nagy (1997) to suggest that since learners are able to learn new words by guessing their meaning from context, it is not necessary to teach vocabulary

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in schools. Third, when learners succeed in guessing the meaning of unfamiliar words, they will retain them in their long-term memory. If this is not possible during the first encounter, additional encounters are needed in order to increase the probability of retaining them. Finally it is argued that gains from repeated exposure to short texts could be extrapolated to larger quantities of reading.

Many studies have concluded that vocabulary learning is mainly incidental (e.g., Grabe & Stroller, 2002; Stahl 1999). Ying (2001) has singled out many advantages of implicit vocabulary learning. According to Ying, incidental vocabulary learning helps readers to learn words and to use them in context, it empowers learners and assists them to speed up their reading, it aids them in making intelligent and meaningful guesses, and it facilitates the development of a holistic approach toward reading. However, it should be mentioned that these studies investigated the default hypothesis only with a post-test taking place immediately after the treatment—the reading session (Read, 2000). Therefore, the claim that vocabulary is learned/taught mainly implicitly should be taken with caution.

View Two: Explicit Vocabulary Learning

The potential problems associated with implicit vocabulary learning, mainly the claim that vocabulary is acquired through inferring the meaning of words from context, led many scholars to question the efficiency of such an approach to L2 vocabulary learning. Sökmen (2001) has expressed her dissatisfaction with this approach, and she believes that "acquiring vocabulary mainly through guessing words in context is likely to be a very slow process" (p. 237). The second problem, according to Sökmen, is that inferring words' meaning is an error-prone process. This is because "not all contexts provide clues for unknown words" (Laufer, 2005, p. 315). Moreover, insufficient vocabulary knowledge makes comprehension very low. Laufer points out that for students to successfully guess from context, they should be familiar with 95% to 98% of tokens in a text. She concludes that given the L2 classroom settings, "it is hard, if not impossible for a classroom teacher, to select material …which has an optimal lexical coverage" (p. 316). Given these limitations, current research suggests that explicit vocabulary instruction should be added to the usual inferring activities in L2 classrooms.

Explicit Vocabulary Learning through Classroom Activities

      Nation (2001) looked at teaching activities that could be used to communicate the meaning of words to learners. He identifies four "psychological conditions that need to occur in order for vocabulary learning to take place" (p. 60). These conditions are the learning goal of the activity, what "psychological condition" the activity uses to reach the learning goal, the observable signs of learning, and the design features of the activity. For the purpose of this paper, we will be looking at the first two conditions only, since they are directly related to the way of teaching L2 vocabulary.

      Nation (2001) suggests that teachers should firstly "consider all the aspects involved in knowing a word" (p. 62). He points out that "at the most general level, knowing a word involves form, meaning, and use" (p. 26). In other words, any lexical item has a spoken and written form that signals a certain meaning or concept. It is also associated with other items and/or can be replaced by other words. That lexical item occurs in specific patterns, and is used in specific contexts. Once teachers know these aspects, they should decide "which of these is the learning goal of the activity. For example, is the learning goal to learn the spelling of some words, their pronunciation, or … to recognize a word form and link it to its meaning?" (p. 62). Thus, determining the learning goal of the activity is a prerequisite for the second condition, which is the psychological condition the activity uses to help reach the learning goal.

      Reaching the learning goal, according to Nation (2001), depends on "three important general processes that may lead to a word being remembered" (p. 63). These processes include noticing, retrieval, and creative use. Noticing a word is the first step in acquiring it. This can occur in a variety of ways, such as listening, reading, discussion, dictionary use, or deliberate study. The second process that can lead to word retention is retrieval. Nation distinguishes between receptive and productive retrieval. The former involves "perceiving the form and having to retrieve its meaning when the word is met in listening or reading" (p. 67). The latter involves learners' desire to communicate the meaning of the word and use it in spoken or written discourse. The third process, creative or generative use, entails using a word in ways that differ from the previous encounter with that word. This forces learners to rethink the meaning of a word, and consequently leads to a better retention of that word.

Sökmen's Mixed Approach

Another suggestion, in line with explicit vocabulary instruction, comes from Sökmen (2001). Sökmen argues that "no one is advocating throwing out contextual guessing" (p. 238); however, adding explicit instruction may be more beneficial to L2 learners. When surveying the vocabulary teaching/learning literature, Sökmen found that the following "pedagogical themes emerge: build a large sight vocabulary, integrate new words with the old, provide a number of encounters with words, promote a deep level of processing, facilitate imaging and correctness, use a variety of techniques, and encourage independent learner strategies" (p. 239). These themes seem attractive to EFL/ESL teachers, but how could this kind of vocabulary instruction be implemented in L2 classrooms?

Sökmen (2001) believes that developing L2 vocabulary is essential to the successful use of the language. She associates the building of a large sight vocabulary with the learning of the 2,000 most frequent words in English. As learners are dealing with new words, teachers should help them link these new words to the ones they already know. Furthermore, Sökmen points out that "it is unlikely that an L2 student will be able to grasp even one meaning sense of a word in one encounter" (p. 242). Therefore, it is the responsibility of teachers to provide enough encounters with a word so that students can meet that word in a variety of activities and in different contexts.

In the process of acquiring L2 vocabulary, it is very important that teachers vary their instructional techniques. According to Sökmen (2001) these techniques should take into consideration "various verbal and non-verbal learning styles which different students may have" (p. 245). Teachers could, for example, resort to the use of dictionaries, word unit analysis, semantic elaboration, oral production, etc. This "mixed approach" is, in fact, rooted in Nation's investigation of different vocabulary learning strategies. Nation found that the most successful students in learning L2 vocabulary were those who used several vocabulary learning strategies.

Planned Lexical Instruction

Another approach that advocates explicit L2 vocabulary teaching has been offered by Laufer (2005). Her Planned Lexical Instruction (PLI) was mainly developed in reaction to the shortcomings of the vocabulary-through-reading

approach. Laufer examines the assumptions underlying this approach and concludes that the default hypothesis, although applicable for L1, could not be applied to L2 vocabulary acquisition since "L2 learning is a different case" (p. 320). She maintains that given the special context of L2 learning, "the main source of L2 vocabulary knowledge is likely to be word focused classroom instruction" (p. 321). Furthermore, in debunking the claims of the default hypothesis, Laufer suggests the following:

> There is a fundamental fault in the default hypothesis…. None of the assumptions that underlie this position can be taken for granted. Learners do not necessarily notice unfamiliar words in the input. When they do, guessing is not always possible. If it is possible, it does not necessarily lead to the retention of the guessed word. (p. 152)

This position finds empirical support in many studies showing that only a few words can be picked up from exposure to texts without any subsequent explicit vocabulary instruction (Day, Omura, & Hiramatsu, 1991; Horst, Cobb, & Meara, 1998; Zahar, Cobb, & Spada, 2003).

The umbrella term Planned Lexical Instruction includes both incidental and pre-planned lexical instructions. Laufer (2005) argues that both Focus on Form and Focus on Forms (focus on linguistic features in their own right) approaches are needed for successful vocabulary learning to take place. She adopts Ellis's (2001) definition of form focused instruction, in which form involves more than grammar. According to this definition, learners' attention could be drawn to lexical items in the same way it is drawn to grammatical features. This focus on form could happen in different meaning-based tasks, such as communicative events (e.g., a reading task with dictionary use) and decontextualized vocabulary activities (e.g., cross-word puzzles).

Form focused lexical instruction, according to Laufer (2005), can be incidental or pre-planned. It can be incidental, for example, in a discussion that involves unknown words for learners. Then, the teacher draws learners' attention to these unfamiliar words, and engages them in the process of discovering their meaning using different techniques. Form focused lexical instruction, on the other hand, could be pre-planned in tasks such as a reading task with unknown words pre-selected by the teacher for instruction in class. In such a task, the primary focus should be the meaning of the words. Another example of pre-planned form focused lexical

instruction could be gapped sentences with missing words given in a list. Students are then required to focus on the isolated words themselves, since they are needed for the completion of the task.

In discussing the useful function of PLI, Laufer (2005) draws our attention to a very important factor teachers should consider. She states that "PLI makes sure that when words are selected for learning, they are attended to, whether in a reading passage, or a specially designed activity" (p. 323). This confirms the idea that there is no learning without attention. Once learners notice new words and engage in inferring their meaning from context clues, the teacher will be available to make sure that the guesses are correct, and to supply meanings when context clues are unavailable.

Another very important advantage of Laufer's (2005) PLI is that it provides learners with additional exposures to unfamiliar words in planned input. This overcomes the unrealistic claim of the default hypothesis, that learners need exposure to words through a "flood of reading" (p. 324). PLI, in this way, makes up for the limited reoccurrence of words in instructed learning contexts. Laufer sums up the advantages of PLI as follows:

> It [Planned Lexical Instruction]…ensures noticing, provides correct lexical information, and creates opportunities for forming and expanding knowledge through a variety of word focused activities. (p. 323)

Finally it should be noted that the PLI approach does not rule out the importance of reading as the source of initial knowledge of words. Nor does it neglect the educational value of reading activities. It is simply a plea for re-structuring the way we, as teachers, communicate the meaning of words to our students.

Which Approach: Implicit or Explicit?

In order to evaluate both implicit and explicit vocabulary instruction approaches, we need to look at the procedures used by studies advocating one approach or the other. Studies that have confirmed the effectiveness of incidental vocabulary learning (Nagy, Herman, & Anderson, 1985; Saragi, Nation, & Meister, 1978) are not flawless. These experimental studies used a post-test to determine how many new words the subjects learned during the experiment. First, the post-test took place immediately after the experiment, so we could not assert that the new words were retained in the long-term memory. Second, the post-test was merely a multiple-

choice test, which at best could only assess learners' receptive word knowledge (Cohen, 1994). The subjects' productive vocabulary knowledge was left out.

One major difference between the implicit and explicit vocabulary learning approaches is their perception of instructed learning. The former argues that instruction should be confined to reading, inside and outside the classroom. It is argued that guessing from context is the only source for L2 learners to develop their vocabulary. The latter perceives instruction in a wider perspective. Reading could be one possible activity that may be the source of vocabulary, but it is not the only one. Learners need to focus on words in their own right. It is through noticing words, processing their possible meaning in meaning-based tasks, that learners can retain them.

Given the fact that acquiring a second language is different from acquiring an L1, it is highly probable that the process of acquiring new words is, consequently, different. Research on L2 vocabulary acquisition has shown that incidental learning (as in L1) does not apply so strongly to second language learners (Nation, 2001; Zimmerman, 1997). In addition, L1 learners enter school education with adequate vocabulary already in their lexicon as a basis for incidental learning. In sharp contrast, most L2 learners start learning the target vocabulary from scratch. Therefore, as Stoller and Grabe (1993) concluded, "a curriculum with a comprehensive vocabulary component should include opportunities for explicit learning as well as implicit learning" (p. 38).

Implications of L2 Vocabulary Research for Teachers

L2 vocabulary research has important implications for vocabulary teaching/learning. One major finding of this research is the importance of explicit instructions in learning unfamiliar words. This implies that "teachers must give vocabulary proper attention in class" (Folse, 2007, p. 10). In other words, teachers must spend more time explicitly dealing with some of the new vocabulary items. Numerous studies have shown the effectiveness of direct vocabulary instruction in acquiring new words (e.g., Coaday, Magoto, Hubbard, Graney, & Mokhtari, 1993; Kaspar, 1993). As such it is very important for teachers "to do *something* with the word" (Folse, 2007, p. 13, italics in original). They can, for instance, give information about the pronunciation and spelling of a word, its common collocations, etc.

Teachers should also provide opportunities for practicing previously taught words through a variety of ways. During these practice activities it is crucial that teachers encourage retrieval of actual words.

In regard to the problematic issue of using context clues for guessing and learning the meaning of words, L2 vocabulary research advises us to "seriously question the current practice of prioritizing context clues over explicit instruction of new vocabulary" (Folse, 2007, p. 11). Laufer (2005) has demonstrated the inefficiency of relying on context clues for dealing with unfamiliar words. However, teachers should distinguish between using context clues for learning new words and using them to remember and know more about a new word. To sum it up, context clues can help learners guess the meaning of unknown vocabulary, but their use "results in only minimal incidental acquisition of vocabulary" (Folse, 2007, p. 17). Bearing this in mind, it becomes essential for L2 learners to depend on explicit instruction and sufficient practice in the process of learning new words.

Learning Vocabulary through Explicit Learning Strategies

Much of the vocabulary research literature agrees on successful learning strategies that learners use for memorizing vocabulary. Macaro (2003) lists the different strategies used in different combinations by learners. Learners may notice something about a word such as its written form, its meaning, or its unusual position. Learners might, as well, write words down in some way. Another strategy is the instant sound-link repetition after encountering a new word. Learners may want to review the new word through planning future meetings with it. They might also use the lexical item in their real-life communication or through collaborative learning.

Gu and Johnson (1996) looked at general strategy patterns mostly used by second-year non-English major Chinese L1 students learning English vocabulary at the Beijing Normal University. They report a high correlation between memorization strategies of a very large sample of students (N=850) and increase in vocabulary size and general proficiency. They found that the majority of students used memory strategies such as association, imagery, and visualizing the word's form. These findings substantiate Nation's (1990) definition of knowing a word. He considers that knowing a word includes at least knowing its form, both spoken and written, its position, its function, and its meaning. Learners can use different strategies to gain

knowledge about a word. Nation (2001) narrows down the categories of strategies to noticing, retrieval, and generative (creative) use. Noticing involves giving selective attention and de-contextualizing the lexical item. Retrieval strengthens the memory trace. Finally, generative use—using the word in new sentences and new contexts—helps learners to semantically organize their lexicon.

One major research question that has been addressed by different studies concerns the number of times a word must be encountered in order to be learned (Zahar, Cobb, & Spada, 2001). Estimates range from six (Saragi, Nation, & Meister, 1978) to 20 (Herman, Anderson, Pearson, & Nagy, 1987). Laufer (2005) believes that "repeated exposures to the same word are indeed related to its retention" (p. 318). What is even more important, according to Nation and Wang (1999), is that repeated exposure to unknown words should happen in different contexts. In this digital age we are living in, new computer technologies offer rich contexts that allow multiple encounters with new words. These encounters are believed to help store vocabulary in the long-term memory (LTM) through the short-term memory or working memory.

L2 Vocabulary Learning: A Cognitive Perspective

Our discussion of the acquisition/learning of L2 vocabulary in this paper is situated within the cognitive processing model of language acquisition. Within this framework, the Connectionist Model (McClelland & Rumelhart, 1986) explains language acquisition using an analogy with a computer. According to this view, language is stored in LTM through an infinitely complex set of connections between nodes or cells in the brain. Macaro (2003) explains how language is stored and retrieved in the connectionist model using an example of how the English word *ash* might be learnt in the brain of a French L1 adolescent:

> The word hits a post [i.e., a node] with which it *associates* but also rebounds and makes a number of connections with other posts: *hâche* (L1 phonological connection), hash (other L2 phonological connection), *le frêne* (L1 semantic connection), tree (L2 semantic connection), *arbre* (L1 semantic connection), *the* tree (syntactic L2 connection) … the ash is big (syntactic connection), *le frêne dans le jardin de ma grand-mère* (emotional connection). (p. 33, italics in original)

Macaro explains that the storage of this word will be secured by these and other connections and that retrieval of this word will be through activating these connections. Although the connectionist view of language acquisition does not provide a full spectrum of how this happens, it nevertheless accounts for some aspects of learning vocabulary.

What this view is saying is that language learning results from the growing strength of connections and interconnections between nodes via continuous restructuring of input. This model also points to the incremental nature of learning in general. It accounts for "information that is not part of the L1 nor the L2, but nevertheless is systematic and which the learner is constantly updating" (Waring, 1996, para. 13). Since vocabulary research literature agrees that vocabulary learning is incremental and done in successive and/or recursive steps (e.g., Waring & Nation, 2004; Waring & Takaki, 2003), instructional materials should cater for this need. In this context and from a connectionist perspective, the use of computer technology can contribute to the strengthening of neural networks over time as the learner encounters the vocabulary item many times in the input provided by the computer.

<div align="center">Vocabulary and Computer Technology</div>

The most recent effort to enhance the process of second language vocabulary acquisition has involved computer technology. Since the introduction of computers into second/foreign language education, many researchers have concurred that computer technology holds great potential for language learning (Levy, 1997; Warschauer, 1996). Thus far, numerous studies (e.g., Al-Seghayer, 2001; Chun & Plass, 1996; Groot, 2000, Laufer & Hill, 2000) have shown that computerized media and multimedia environments can be helpful for learning second/foreign language vocabulary.

An area that has received attention in the field of second language acquisition is the impact of glossing individual vocabulary via annotations embodied by different modes and media. Al-Seghayer (2001) explains the rationale behind this interest in "the premise that a variety of glosses for words in various modalities, such as printed text, graphics, dynamic video, and sound, might have differing capacities to facilitate vocabulary acquisition" (p. 203). Many studies have emphasized the benefits of introducing new vocabulary items in a multimedia environment. Chun and Plass

(1996) ran three studies with their second-year students of German using a multimedia program called CyberBush. This program provides annotations through pictures, printed texts, and video. After reading the story, the students took a vocabulary test and wrote a recall protocol. The results indicated that the recall of words with visual annotations was higher than for words annotated with text alone. Chun and Plass postulated that associating lexical items with different types of media fosters richness of recall cues and increases the likelihood of retention. These results also suggest that adding a technological dimension to EFL/ESL materials can benefit learning and retaining unfamiliar words.

The increasing availability of impressive computer technology has resulted in a plethora of multimedia programs for learning/teaching second language vocabulary. These programs have many advantages. First, they "provide opportunity for meeting the needs of students with various learning styles" (Lafford & Salaberry, p. 146). For example students with aural or visual learning style will find these multimedia programs useful in learning unknown words, and they will be more motivated to learn them. Second, multimedia cues have a great effect on vocabulary comprehension and retention. Lomicka (1998) and Laufer and Hill (2000) have confirmed that multimedia glosses and dictionary definitions aid textual comprehension and vocabulary knowledge.

Many other studies on using computer technology to aid retention of unknown words showed that L2 learners can successfully learn words using special programs available on CD-Roms (e.g., Pawling, 1999). Tsou, Wang, and Li (2002) have also demonstrated how computers facilitate English foreign language learners' acquisition of English abstract words using a multimedia system connected to the internet. Palmberg (1988) has even shown how popular computer games can be used to aid retention of words. All these and other studies have underscored the advantages of using computer technology in vocabulary learning. Takač (2008) summarizes these advantages of computers in the fact that they "bring together several dimensions of L2 learning, such as texts, pictures, sound, realistic activities, as well as feedback" (p. 63). However, these attractive advantages of computer programs are not enough by themselves to lead to long-term retention of lexical items unless those programs are based on solid research findings.

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Theoretical Underpinnings of the CAVL Program

The CAVL program (Jeddi, 2008) is a computer program for vocabulary acquisition in a second language. I designed it on the basis of vocabulary research findings about how words are learned, stored, and retrieved. Since learning a word is an incremental process, "one exposure does not result in learning a word, but repeated exposures do" (Laufer, 2005, p. 317). According to the generative theory of multimedia learning (Mayer, 1997; Mayer & Moreno, 2003), meaningful learning is enhanced when a learner can construct and coordinate visual and verbal representation of the same material. Mayer's claim is based on the dual-coding theory. Mayer asserts that "within the context of a dual-coding view, there can be two kinds of selecting processes: selecting words and selecting images…. The learner selects words for a verbal representation … [and] the learner selects relevant images for a visual representation" (p. 5). This theory assumes that memory and cognition are served by two separate systems, one dealing with verbal information, such as printed words, and the other for non-verbal information, such as pictures or objects. Since the two systems are interconnected, representations in one system can activate those in the other.

Vocabulary research findings have also stressed the importance of translating L2 unknown words to their L1 equivalents if they exist. This aids the learner to discover the meaning of unknown words. Swan (2001) maintains that

> second language learners have one great advantage over infants: they have already learnt how one culture categorizes and labels the world….[They are] likely, then, to short-cut the process of observing a new word … by mapping the word directly onto the mother tongue. (p. 165)

He further explains that in the bilingual's lexicon, the network of associations that exists between words in one language is enriched and strengthened by further association with words in the other language.

Another very important aspect of knowing a word, according to Nation (1990), is knowing the form of a word. Form includes knowledge of orthographic and phonological form. Ryan (2001) states that learning L2 vocabulary "involves not only an understanding of how a word looks on the page but also how it is spelled and how it sounds, both when listened to and spoken" (p. 181). She further asserts that knowing the orthographic form of a word has two outcomes: recognizing the written

word and distinguishing it from other similar forms, and producing it in a form that other people can also recognize. This implies both the ability to read a word and controlling the realization of sound and meaning in written form. This form processing ability is usually referred to as bottom-up processing. Thus, Ryan believes that retaining new words starts with the learning of word forms, which is vital in this process.

Knowledge of the phonological form is not sufficient in itself if the learner does not acquire "the lexical units of language and their sequences in clauses and collocations" (Ellis, 2001, p. 139). Ellis suggests that teachers should give more attention to teaching useful "stock phrases," since they allow learners to enter into further investigations about language. He further explains that "speaking natively is speaking idiomatically using frequent and familiar collocation" (p. 129). Therefore, he maintains, the job of the L2 language learner is to learn these familiar word sequences. Finally, it is the rehearsal of those memorized sequences of language in the short-term memory that establishes their long-term retention and facilitates the acquisition of other aspects of language.

The research findings described above are operationalized in the various sections of the CAVL computer program. It takes the learner systematically through the sequence of learning activities that will hopefully speed up the acquisition process of unknown words. To secure learner involvement, the program is interactive. Sometimes, the learner has to make choices and is given feedback by the computer. The program presents the target words in a multimedia environment using sounds, pictures, and graphics. Every word is presented through 10 tasks. Each task has its theoretical underpinning in the above mentioned research findings.

Tasks Included in the CAVL Program

The CAVL program used in this study included 15 target words (ten nouns: reporter, prize, degree, manager, typist, office, mass media, envelope, factory, salon; three adjectives: late, lazy, shy; and two verbs: shout, punish). The words had to meet many criteria to be selected. First, they had to be noncognate words for the learners. Second, the choice of words particularly depended upon whether or not they could be effectively drawn as pictures. These target words as well needed to have a direct Arabic equivalent. All the target words appeared in *UAE English Skills*, book 9

(Philips & Philips, 2007b) in theme three, Work and Business. The CAVL program introduced every target word through 10 different interactive tasks. Tasks 1 and 6 dealt with the English written form of the word and its pronunciation. Task 2 illustrated the meaning of the word through a picture. This was further consolidated in task 3 by the Arabic L1 equivalent. In task 4 students discovered the part of speech of the target word. Tasks 5, 8, and 9 gave learners practice in the spelling of the word through different activities. Finally, in tasks 7 and 10 students practiced the productive use of the word at the level of the sentence.

The following steps illustrate how the learner is introduced to the verb "shout." In task 1, the learner's attention is directed to noticing the most salient morphological features of the target word. The learner is introduced to the word's written form and its pronunciation as is shown in Figure 1.

Figure 1. Task 1

Then, the learner is invited to link the form of the word to its pictorial representation in task 2 (see Figure 2). The learner is given a picture that illustrates the meaning of the target word and is asked to think of the word s/he has just met in the previous task. The aim of this activity is to strengthen the connection between form and meaning through pictorial representation of the target word. The picture used in this task illustrates the most common use of the target word.
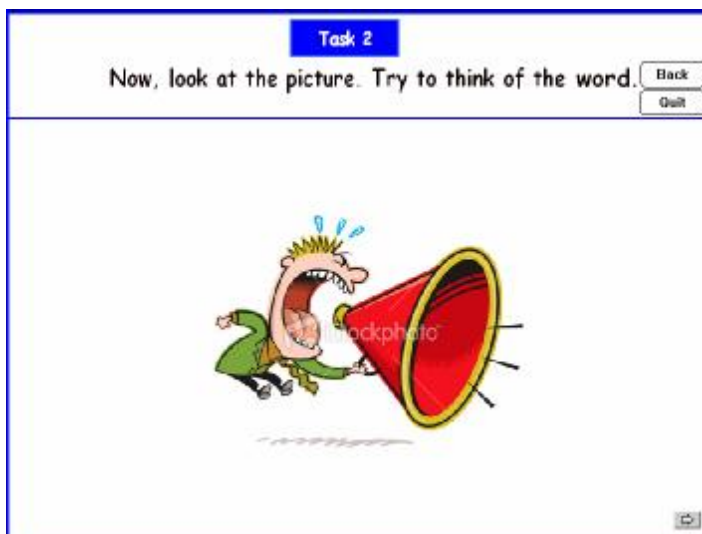
Figure 2. Task 2

Since vocabulary acquisition research agrees that translation of unknown words to students' L1 can facilitate their retention (e.g., Swan, 2001), the Arabic equivalent of the target word is then presented in task 3. All words used in this study have direct Arabic L1 equivalents. Figure 3 illustrates this.
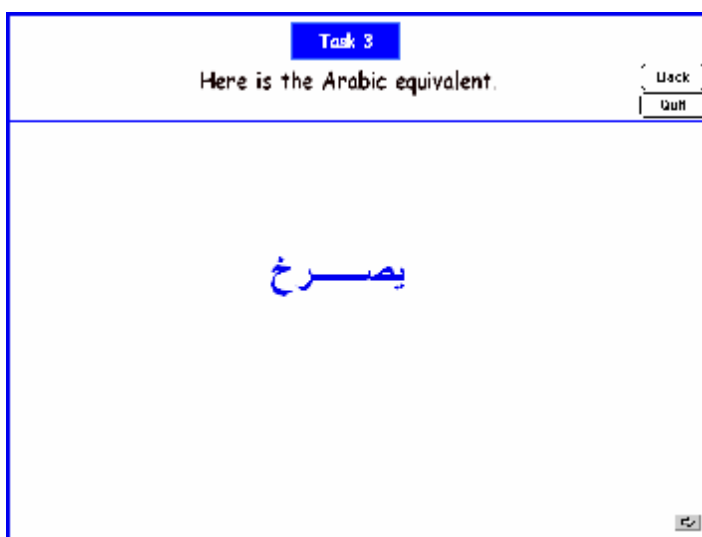
Figure 3. Task 3

To consolidate the meaning, an example sentence containing the word is given to the learner, and s/he is asked to guess the part of speech of the highlighted word. Knowing what part of speech the word is and how it fits into the sentence can help the learner in manipulating the word. The example sentence used illustrates the most

common use of the target word. The computer gives feedback till the learner finds the correct answer (see Figure 4).

Figure 4. Task 4

In task 5, letters that constitute the word are presented and the learner is asked to spell the word correctly, and feedback is also given as is shown in Figure 5. This is very important for L2 learners to recognize it, later on, in print.

Figure 5. Task 5

To strengthen the learner's recognition of the orthographic and phonological forms of the target word, a "time challenge" exercise is presented (see Figure 6) in which the learner has to identify the sentence containing the target word in less than

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15 seconds. This task gives learners practice in recognizing the written form of the target word by linking it to its phonological form.
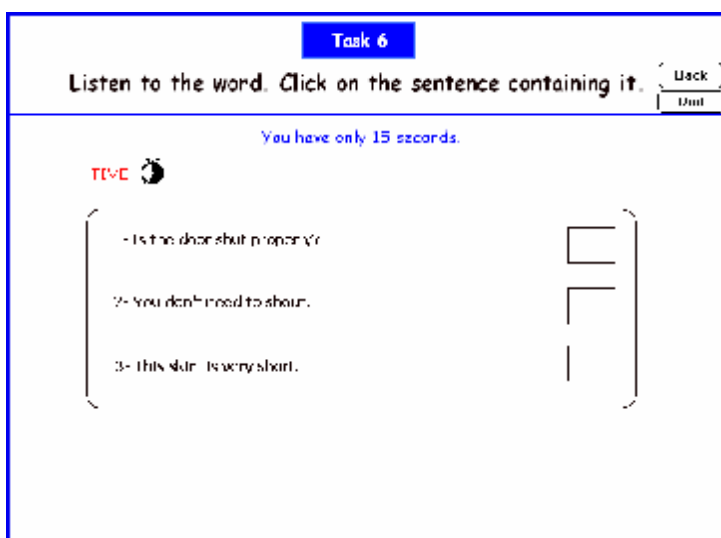
Figure 6. Task 6

Then, a kind of process writing at the level of the sentence allows the learner to identify the sequence of the word in a written text through an interactive anagram exercise in task 7 (see Figure 7). The target word is highlighted and the learner is asked to identify the correct place of the target word by rearranging the words to make a meaningful sentence.
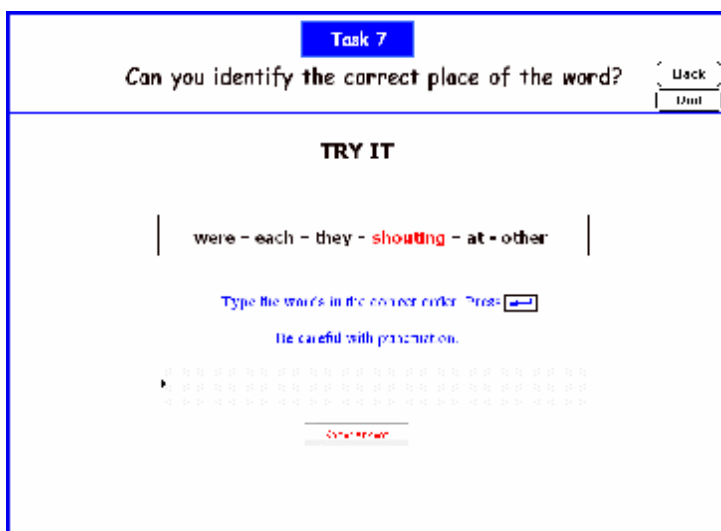
Figure 7. Task 7

A further consolidation of the association between the pictorial representation of the word and its meaning/form is the aim of task 8 through the famous hangman exercise. The learner is given a picture that illustrates the meaning of the target word and asked to guess the word by clicking on the letters that constitute it. If the learner fails, the computer gives the correct spelling of the vocabulary item (see Figure 8).
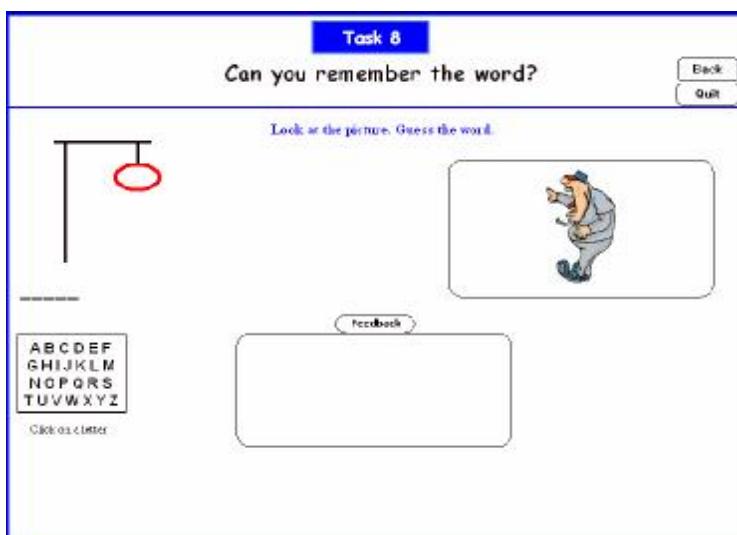
Figure 8. Task 8

Task 9 gives the learner another opportunity to practice the spelling of the target word through a fun game. Using a brief definition of the target word as a clue, the learner enters the missing letters, as is shown in Figure 9.
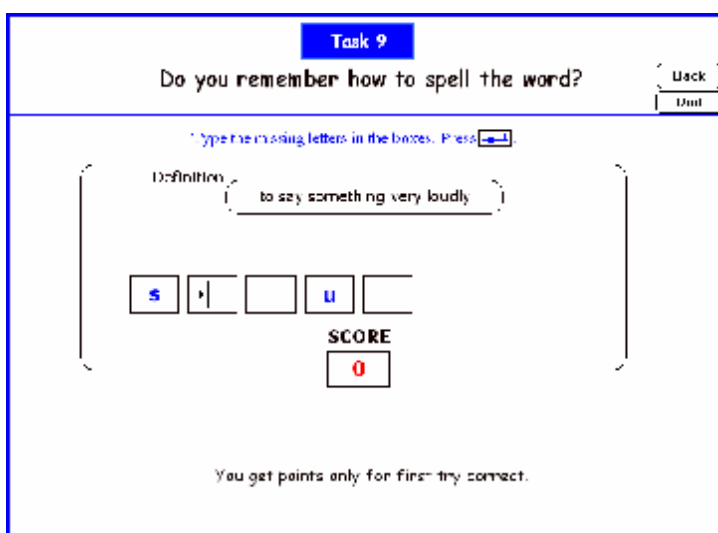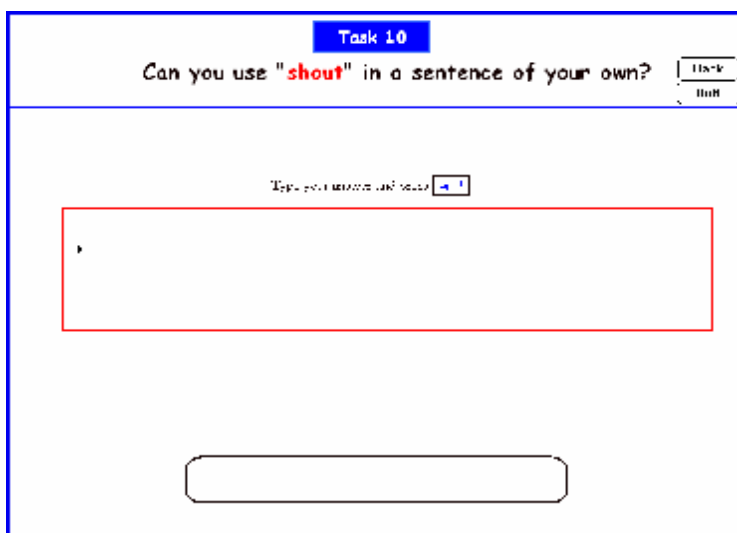
Figure 9. Task 9

Finally, since knowing a word involves its productive use, the learner is asked to use the target word in a sentence of his/her own. In fact, this productive use of the target word shows whether the learner has understood it (see Figure 10).

Figure 10. Task 10

The written sentence will be stored in the learner's local drive, and will be retrieved later for correction and feedback.

The tasks explained above make the CAVL program in line with the explicit vocabulary learning and teaching approaches. Every task has its foundation in the vocabulary research literature. The rationale behind such tasks is to give learners enough practice of the target words through multiple encounters of the same item in different contexts to facilitate its short-term and long-term retention. The CAVL program also encourages repeated retrieval of the target vocabulary items. To summarize, the CAVL program focuses on the following prerequisites, discussed in the vocabulary research literature, for retaining an unknown word:

- knowing how the word sounds
- knowing its L2 (in this case Arabic) equivalent
- spelling the word accurately
- recognizing it in print
- knowing its most commonly used meaning
- knowing what part of speech it is
- knowing where the word fits in the syntax of the sentence

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- using the word in a productive (written) way

Hopefully, this knowledge about unknown words that the CAVL program embodied can lead to their short-term and long-term retention. This was what this study investigated.

Conclusion

This literature survey suggests that vocabulary learning should be an integral part of any L2 curriculum. Both implicit and explicit vocabulary instruction should be adopted. While implicit instruction exposes learners to more complex aspects of unfamiliar words, it is insufficient to retain those words in students' long-term memory. Therefore, explicit vocabulary instruction is necessary for learners to build their lexicon and practice words in different classroom meaning-based tasks. Finally, it is very important for EFL/ESL teachers to prioritize the latter for the benefits it can bring to the process of acquiring the backbone of language—vocabulary. One way of making explicit vocabulary instruction our first option is through presenting and practicing words in a computerized multimedia environment. In fact, computer technology offers a great opportunity for teachers to foster their students' long-term retention of unfamiliar words. This research is an attempt to investigate possible ways of gaining knowledge about words by adding a technological dimension to usual classroom instruction.

CHAPTER 3

METHODOLOGY

Research Questions

Given the L2 classroom time constraints, teachers often find themselves unable to provide learners with multiple encounters of the same vocabulary item in different contexts. Moreover, many textbooks do not cater for the multiple-encounter condition that is a pre-requisite, according to the vocabulary research literature, for retaining unknown words. The CAVL program used in this study (Jeddi, 2008) intended to speed up the acquisition process of unknown vocabulary by providing multiple encounters of the same vocabulary items in different multimedia environments and interactive activities. I expected that learners who used this program, along with textbooks, to learn new words would have better short-term and long-term retention of those words than learners who were taught using textbooks only. To examine this assumption, my between-subject research design used an Experimental Group and a Control Group. The Experimental Group used the CAVL program for 15 days to learn the new words, and the Control Group was taught using textbooks only. To assess learners' short-term and long-term retention of the target words, the same test was used as both an immediate and as a delayed post-test. This test included three sections: word recognition, matching a word to its definition, and giving the L1 Arabic equivalent. The following four specific research questions guided my study:

1. What is the difference in scores between the immediate and delayed post-tests for the Control Group?

2. What is the difference in scores between the immediate and delayed post-tests for the Experimental Group?

3. What is the difference in scores between the Experimental and Control Group on the delayed post-test?

4. What are some of the reasons for the differences?

Answering these questions was three-fold for my study. First, by comparing the mean scores of the same group on both the immediate and delayed post-test, I intended to identify how learners within each group went about learning new words. Second, the comparison of the mean scores of both groups on the delayed post-test

would reveal the effects, if any, of the training, the use of the CAVL program in this case, on learners' overall retention of the target words in their long-term memory. Third, I also wanted to know some of the reasons that made the scores different.

To answer these questions, collected data were first graphed using Box and Whisker Plots. Then, I compared the immediate and delayed post tests mean scores for the Experimental Group and the Control Group. Similarly, I compared the mean scores of the delayed post-test for both groups. Based on the mean scores, I also calculated the short-term and long-term learning gains for both groups. To gain some insights into what could have made the scores different, reasons given by students were examined and sorted into categories to help me in interpreting the differences in test scores.

Subjects

Participants in this study were 60 male EFL grade nine students in a government school in Fujairah—Saif Al Dawla Basic School for Boys Cycle 2—all 14 or 15 years old. All participants were Emirati. They had been studying English as a second language for nine years in schools where the medium of instruction is Arabic. They also studied IT for three years, so they had basic knowledge for operating and using common computer applications. They were using *UAE English Skills* (Philips & Philips, 2007b), an English curriculum consisting of a student's book and a workbook. As grade nine students, they studied English for six classes a week, with each class lasting for 45 minutes.

Participants were split into two groups, an Experimental Group (grade nine, section 1) and a Control Group (grade nine, section 2), with 30 students each. I was the English teacher of both groups. For the purpose of this study, and after the approval of my school administration, I selected students of both classes according to their English annual mark (85% and above) in grade eight. There was a total of 175 students in grade nine in my school. Only 67 of them had above 85% in grade eight. In my school, normal class size was 25. Franenkel and Wallen (2003) suggested that the minimum sample numbers for experimental studies should range from 15 to 30 per group. Following their advice, and for my statistical analysis to be reliable, I chose to have 30 students per class. Although students were randomly assigned to groups in advance, a proficiency level test (see Appendix B) was used to check that

both groups had almost the same proficiency level. The English proficiency test's mean score was 62 out of 70 for the Experimental Group and 61.5 out of 70 for the Control Group.

Prior to starting the study, students of the Experimental and Control Groups were informed about the purpose of my research, and they were given the opportunity to withdraw from the experiment and join another class if they wanted to. All 60 students were also given an approval form to be signed by their parents that would allow me to involve them in the study. They all returned the signed approval forms with no objections. I also explained the purpose of my research to students of the Control Group and promised to make the CAVL program available to all grade nine students after the study was over. My English supervisor in Fujairah Educational Zone was also informed about my research.

The Proficiency Level Test

The proficiency level test used in this study (see Appendix B) appeared in the *UAE English Skills Assessment Booklet* (Philips & Philips, 2007a) that came with the *UAE English Skills* textbooks, but it had never been used by teachers in our school before. It is quite high in terms of content validity since it was based on the specific themes and language skills contained in the textbooks. It was also unfamiliar to students, so they were unlikely to have developed test-wiseness. The test was also slightly revised and approved by the language assessment specialist of the American University of Sharjah, Dr. Betty Lanteigne. After revision, Dr. Lanteigne suggested some modifications to the test such as changing the distractors in some multiple-choice questions and eliminating some confusing possible answers. She also proofread the test and corrected many punctuation mistakes.

This test consists of four sections: listening, reading, writing, and grammar. The listening section consists of three parts. Part 1 asks students to listen and write the sentences they hear. In part 2, students listen to questions and write short answers. Part 3 asks students to listen to incomplete sentences and number the words that complete them. The reading section contains a reading passage followed by four types of questions: true or false, multiple-choice gapped sentences, Wh-questions with multiple-choices, and matching words to their meanings in the passage. The writing section comprises two parts. At the word level, students are asked to correct the

spelling of 10 words. At the paragraph level, students have to read an e-mail and write a response. Finally, the two parts of the grammar section ask students to choose the correct option from four distracters, and to circle the correct option that completes the sentence in a paragraph.

Although participants were chosen before the experiment based on their annual English mark (85% and above) in grade eight, the proficiency level test was used to check that both the Experimental Group and the Control Group had similar proficiency levels and to make the groups more or less balanced. For this purpose, I moved six students between the Control Group and the Experimental Group to make the mean scores of the proficiency level test similar for both groups while maintaining an equal number of students in both groups (30 students in each group). This made the proficiency level test's mean score 62 out of 70 for the Control Group and 61.5 out of 70 for the Experimental Group.

Diagnostic Test

Before conducting my study, a diagnostic vocabulary test (see Appendix C) consisting of 15 target words and 15 distracters (words students had already learnt in grade eight) was used to verify the participants' lack of familiarity with the new words included in the CAVL program. This test was adapted from Yoshii and Flaitz's (2002) study of the effects of text and picture annotation types on second language vocabulary retention. The test used a very simple format that was valid and reliable. It was reliable in that it had very clear and specific scoring criteria. It was also valid since it measured the knowledge of a word through eliciting explanation of the target words either in students' L1 or L2. Participants were asked to put a check mark by a word they knew and to provide a brief written explanation in either Arabic or English.

This test helped me to identify and remove from the study three students with high scores. These students already knew between three and six of the target words while all the other students scored 0% on this diagnostic test. Since the test was administered to three grade nine classes, it was easy for me to find students who did not know the words to replace those learners. However, the process of finding three students with a similar proficiency level, and who did not know the target words was somewhat complicated. I administered the proficiency level test again to 20 grade nine students, who did not take the test at the beginning, and then I randomly chose

three students with exactly the same scores as those removed from the study. Ultimately, each group consisted of 30 students with almost the same proficiency level as indicated by the proficiency level test's mean scores of both groups.

Instruments

Immediate and Delayed Post-Tests

In this study, the same test (see Appendix D) was used as both an immediate post-test and as a delayed post-test after three months. This test was adapted from Yoshii and Flaitz's (2002) study mentioned above. The rationale behind choosing this test was its high degree of construct validity. Knowing a word, according to Nation (2001), involves at least knowing its form, meaning, and use. This test measured these abilities quite well. Moreover, the choice of this test could be justified by the fact that I was partially replicating Yoshii and Flaitz's study, mainly the effect of text, pictures, and sounds on vocabulary retention, although the focus of my study was the effects of multiple encounters of the same vocabulary item in different multimedia contexts. For validation purposes, the test was piloted with a group of grade nine students (N = 20) not participating in the study one week before actually administering it to the subjects of this study.

Test-item analysis revealed that the test was quite high in different indices. For example, the Item Difficulty Index for the 30 multiple-choice questions included in this test ranged from 0.21 to 0.88. Eight items had a quite high difficulty index (between 0.21 and 0.32) while only 11 items had a low difficulty index (between 0.71 and 0.83). Bearing in mind that the p-value for an item should ideally range from 0.15 to 0.85 (Brown, 2004), the post-test seemed appropriate in terms of difficulty.

This immediate and delayed post-test consisted of three sections: word recognition (based on a given picture), matching a word to its definition, and giving the Arabic translation of the target word. In section one, students were given a word and four pictures, and were asked to choose the picture that better expressed the meaning of that word. In section two, students had to identify the correct definition of the given word. Finally, the third section asked students to translate the target words into their L1 Arabic equivalent.

Informal Interviews

To understand the differences in test scores, and during the training, I conducted many oral interviews with individual students, groups of students, or with the whole class. After the end of each class, I asked students questions about things they liked and things they did not like in the CAVL program. I encouraged students to respond in whatever language they felt comfortable with. After obtaining the permission of students, I audiotaped some of these interviews and transcribed some of their relevant comments as notes in my thesis journal. After the training, I met with students of the Experimental Group and asked them to evaluate the CAVL program and to give their suggestions for improving it. I also observed students while they were interacting with the program. Sometimes, I even indirectly listened to and wrote down what students were saying to each other as they were using the program. This qualitative data was very helpful for me to understand the difference in mean scores between the two groups, mainly on the delayed post-test. Many students related their retention of some of the target words to some features of the CAVL program.

Procedures and Analysis

Procedure

After administering the proficiency level test and balancing the two groups, I administered the diagnostic test to the Experimental and the Control groups. The Control Group studied the 15 target vocabulary items (*envelope, factory, office, shout, punish, manager, shy, degree, salon, mass media, late, reporter, prize, typist,* and *lazy*) using the *UAE English Skills*, book 9 textbooks only. I used flashcards and pictures to illustrate the meaning of the new words. Students practiced these words for 15 minutes per session over 15 days through filling in the blank and matching exercises available in their books. They also had some pronunciation exercises which involved identifying the stressed syllable of words. Before introducing any new word, and during the warm-up activity in every lesson, students had the opportunity to review the words that had already been taught through oral examples. Control Group students were also instructed to record these new words, at home, in a vocabulary notebook (see sample page in Appendix A) they had been using for more than one year. I collected these notebooks on a daily basis and gave students regular feedback.

As for the Experimental Group students, they used the CAVL program for 15 days to learn the target words for 15 minutes during each English class (one word per day). Every student had access to the CAVL program through a separate computer. Students practiced the pronunciation, the spelling, and the use of the target words through ten different tasks. One of these tasks asked students to use the target word in a sentence of their own. This sentence was stored on the local computer disk and was retrieved later on for correction. Besides, like the Control Group, students of the Experimental Group were asked to record the new words in their vocabulary notebook at home. Similarly, these notebooks were corrected and students were given feedback. The Experimental Group students also had the opportunity to revise, using the CAVL program, the new word they had learnt on the following day before starting to learn another one.

At the end of the training, after using the CAVL program for 15 days, the two groups took the immediate post-test at the end of November 2008. After three months, at the end of February 2009, the same test was administered again as a delayed post-test. Students took the delayed post-test after Eid al Ethha and the mid-year school break. This made it possible for me to test their long-term retention of the target words since the immediate and the delayed post-tests were administered in two different school semesters with a time span of three months between the two. For reliability reasons, students were not told that they were going to take the same test again after three months. The test administration conditions were comparable for each test. Students took the tests in a large room that had adequate light. There was also enough space between desks to prevent students from cheating or talking to each other. I invigilated both tests with the help of one of my colleagues.

Analysis

Data in this study consisted of the scores of the immediate and delayed post-tests. Data were analyzed using a number of statistical procedures. First, descriptive statistics including the standard deviation, the mean score, the median, the mode, the 25th percentile, the 50th percentile, the 75th percentile, the minimum, and the maximum were calculated. Based on these statistics, a Box and Whisker Plot for every group of scores was graphed. Second, I compared the mean scores of the Control Group on the immediate and delayed post-tests. Similarly, I compared the

mean scores of the Experimental Group on both tests. Finally, I compared the mean scores of both groups on the delayed post-test. I used the following formula to calculate students' learning gain:

Immediate Post-test Score – Delayed Post-test score = Long-term Learning Gain.

This formula was used by Davidson and James (2001) in their study of vocabulary retention and vocabulary notebooks. This formula allowed me to calculate the long-term learning gain for both the Control and Experimental Groups.

Although this quantitative data I had collected informed me about the performance of both groups on the two tests and spotted the difference in mean scores between the two groups, it remained insufficient to understand the settings of my experiment and to get a little deeper below the surface. My qualitative data were valuable for such a purpose. Through interviewing students and discussing the use of the CAVL program with them, I gained very important insights into what might have made the Experimental Group tests' scores higher than those of their Control Group peers. I was also able to make sense of behavioral patterns I observed when students were interacting with the computer program.

CHAPTER 4

DATA ANALYSIS

In this chapter, data analyses are described and the findings are presented in terms of descriptive statistics illustrated by Box and Whisker Plots, mean scores, and long-term learning gains. The chapter is divided into three sections. Each section pertains to the first three research questions of this study. Findings related to the first research question, the difference in scores between the immediate and delayed post-tests for the Control Group, are reported and discussed under the heading "Control Group Performance." Findings related to the second research question are reported and discussed under the heading "Experimental Group Performance." Findings related to the third question are reported and discussed under the heading "Long-Term Retention of both Groups." Findings related to the fourth research questions, the possible reasons for the differences are discussed in each of the preceding three questions.

Control Group Performance

Control Group students were taught using textbooks only. They also used their vocabulary notebooks to record the target words. Analysis of their test scores yielded the descriptive statistics presented in Table 1.

Table1. Control Group Students' Descriptive Statistics

	Immediate Post-test	Delayed Post-test
Mean	34.98	7.70
Median	35.50	7.00
Mode	39.00	5.00
Std Dev.	4.38	3.35
25th Percentile	32.00	5.00
75th Percentile	39.00	11.00
Minimum	26.00	3.00
Maximum	41.00	15.00
Range	15.00	12.00

Both the immediate and delayed post-tests were scored out of 45. Table 1 indicates that none of the Control Group students got full marks on both tests. Moreover, the standard deviation of the Control Group in both tests (4.38 in the immediate post-test and 3.35 in the delayed post-test) suggests that students' scores were tightly scattered around their mean as indicated by the following Box Plots.
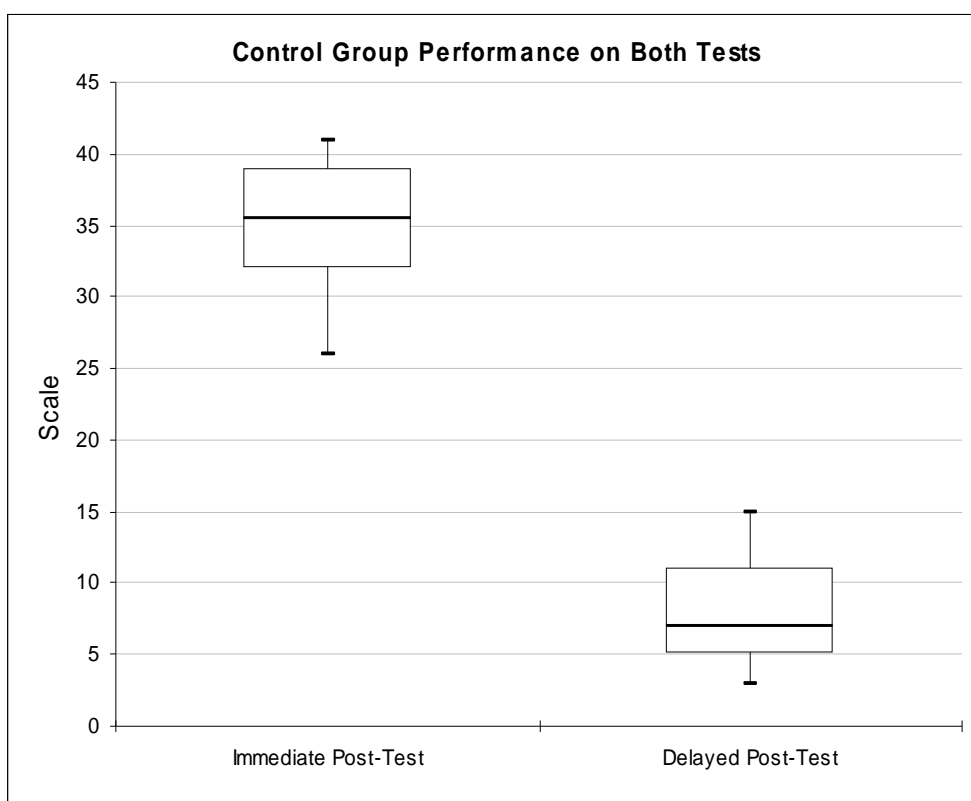
Figure 11. Box Plots for the Control Group on Both Tests

Comparison of the mean scores of the Control Group students on both tests indicates that there was a dramatic fall in students' test results. The mean score of the immediate post-test was almost 35, whereas that of the delayed post-test was only 7.70 although the delayed post-test was exactly the same as the immediate post-test. Bearing in mind that all students did not know the target words at the onset of the study, since they all scored zero on the pre-test, students' potential learning gain was 100%. The immediate post-test score suggested that the Control Group students achieved 75.50% of their potential learning gain as indicated by the following formulas:

- 100% = 45 (total test score)

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- 100% - 0 (pre-test score) = 100% = Potential Learning Gain
- Immediate Post-test Score – Pre-test Score = Short-term Learning Gain (or the actual gain)
- 34.98 (Immediate Post-test Score) – 0 = 34.98, which is 75.50% of the total possible score (45) or students' Potential Learning Gain

For students of the Control Group, achieving 75% of their potential learning gain meant learning more than 11 words in two weeks. This was an excellent rate for this group of learners, who had been taught in a crowded classroom with no opportunity for every single student to practice the new words in class and encounter them repeatedly in their textbooks. My informal interviews and class discussion with learners of this group revealed that students relied heavily on their vocabulary notebook to help them retain the words. One student expressed the following concern when giving the possible reasons for forgetting the target words: "We [students] need more time teacher …. You explain but we forget the word …. The vocabulary notebook works for these words …. I draw and give meaning in Arabic; I also see my notebook every time" (student's exact words in English). This student attributed students' poor retention of words they had already learnt to the lack of time. He felt this was compensated for, however, by his use of the vocabulary notebook that was always available for him.

Many other students expressed similar concerns about insufficient time to practice the target words. They also found their vocabulary notebooks very helpful for them to remember some of the words. For instance, one student raised a very important issue related to time constraints when learning new words and the use of the vocabulary notebook. His suggestion was that the teacher and his students "meet [during the morning assembly] in the classroom and you [the teacher] answer our questions to know the words" (student's exact words in English). This suggestion seemed outstanding to me since it could help teachers and students overcome the time constraints. This student was probably asking for more feedback from the teacher and for sessions that would completely be devoted to learning new words.

Experimental Group Performance

The Experimental Group was taught using both the students' textbooks and the CAVL program. They also used vocabulary notebooks to record the new words.

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Data analysis of the pre- and post-test scores yielded the descriptive statistics presented in Table 2.

Table 2. Experimental Group Students' Descriptive Statistics

	Immediate Post-test	Delayed Post-test
Mean	39.46	23.56
Median	41.00	26.00
Mode	41.00	17.00, 28.00, 29.00
Std Dev.	3.86	6.56
25th Percentile	36.75	17.00
75th Percentile	42.00	28.25
Minimum	31.00	14.00
Maximum	45.00	39.00
Range	14.00	25.00

What was striking in this group was that the mean score for the immediate post-test was quite high (39.46 out of 45). Students' scores on the delayed post-test were also more scattered around their mean than those of the Control Group as indicated by the standard deviation (6.56) and the visual representation of the data using Box and Whisker Plots, as shown in Figure 12. The range of scores on the delayed post-test was almost twice as big as that of the immediate post-test (25 and 14 respectively). There was much more variability in the delayed post-test scores which suggested that the individual differences between learners could be better seen after a three-month period, i.e., in their long-term retention of the target words. The longer whisker in Figure 12 is on the top, indicating a longer tail toward bigger values, whereas the longer whisker of the immediate post-test Box Plot is toward the smaller values.

Comparison of the mean scores on both tests also indicates that there was a striking decrease in the mean score of the Experimental Group on the delayed post-test. Students of this group had a mean score of about 40 out of 45 in the immediate post-test. However, this fell to around 24 on the delayed post-test. Further computing of this data using Davidson and James's (2001) formulas showed that the

Experimental Group students achieved almost 88% of their potential learning gain as indicated below. This was equivalent to learning more than 13 words in two weeks.

- 100% = 45 (total test score)
- 100% - 0 (pre-test score) = 100% = Potential Learning Gain
- Immediate Post-test Score – Pre-test Score = Short-term Learning Gain (or the actual gain)
- 39.46 (Immediate Post-test Score) – 0 = 39.46, which is 87.68% of the total possible score (45) or students' Potential Learning Gain
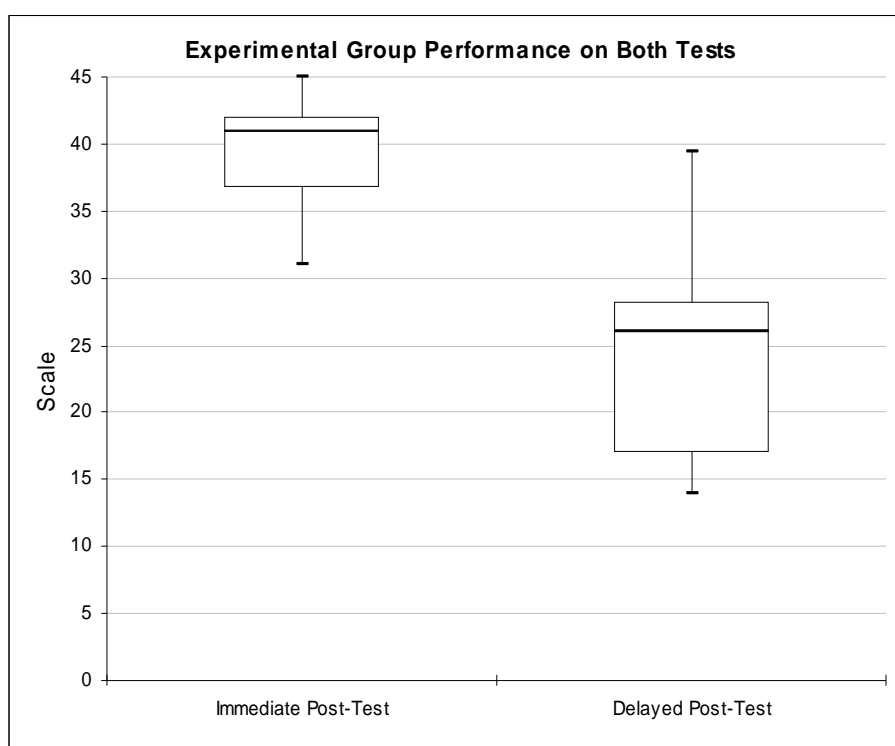
Figure 12. Box Plots for the Experimental Group on both tests

When asked about what helped them retain this quite high number of words, several students of this group expressed their satisfaction with the amount of time devoted to studying these words in class. For example, one of the Experimental Group students said, "I do not go very quickly when I work with words again and the computer program … more words .... I come to the room and see many words" (student's exact words in English). This student seemed satisfied with the availability of the computer program during the break. In fact, I made the computer program available for students to review and practice the words they had already learnt during the twenty-minute daily break from 9: 45 a.m. to 10: 05 a.m. He seemed to like the

opportunity to study the words at his own pace as expressed by his words: "I do not go very quickly." (See Appendix E for a complete transcription of the whole discussion with the Experimental Group students about the use of the CAVL program.)

Some other students, responding to my question about how often they used computers in their lessons, explained that this was the first time they used a computer program repeatedly in their lessons. One student said, "Teachers use computers with PowerPoint but not students. We cannot touch the computer" (my translation of student's Arabic words). This student was probably referring to the use of computers by teachers to introduce new words to their students through PowerPoint presentations. He also pointed at computers as being the property of teachers in the classroom. Actually many other students echoed this complaint as shown by the following transcription of a part of an audio-taped discussion I (T) had with two of the Experimental Group students (S1 and S2) when they were using the computer program during the break. The whole discussion was in English:

T: Now you can use the computer on your own?

S1: Yes, very easy.

T: Would you like me to use the computer program to teach you the words, or do you like to study the words yourself using the computer program?

S1: I want to come here. (He points to the room where they study the words.) I study here the words better …better.
     (S2 joins the conversation.)

S2: When I open the computer, I can see the words better.

T: You learn them better?

S2: Yes, yes!

T: How? Can you explain more?

S2: I work on the computer…. I have picture and games to see everything.

These two students thought that having access to computers and using the computers themselves, rather than only watching teachers using the computers, helped them to learn the words better. In this excerpt S2 linked using the computer to learning the new words better, as suggested by his words, "When I open the computer, I can see the words better." These two students were relating the place (the

Independent Learning Center that contained computers) to success in learning the target words. In the last line, S2 was also hinting at the features of the CAVL program, mainly pictures and interactive games, which made learning the words easier for him.

Experimental and Control Group's Performance on the Delayed Post-test

   Although the difference in mean scores on the immediate post-test for both groups was not striking (34.98 and 39.46 out of 45 for the Control Group and the Experimental Group, respectively), comparison of the delayed post-test mean scores revealed a notable difference as illustrated by Figure 13. The Control Group's mean scores fell from 39.46 out of 45 on the immediate post-test to 23.56 out of 45 on the delayed post-test, whereas the mean scores of the Control Group decreased from 34.98 to 7.7 out of 45.

Difference in Mean Scores
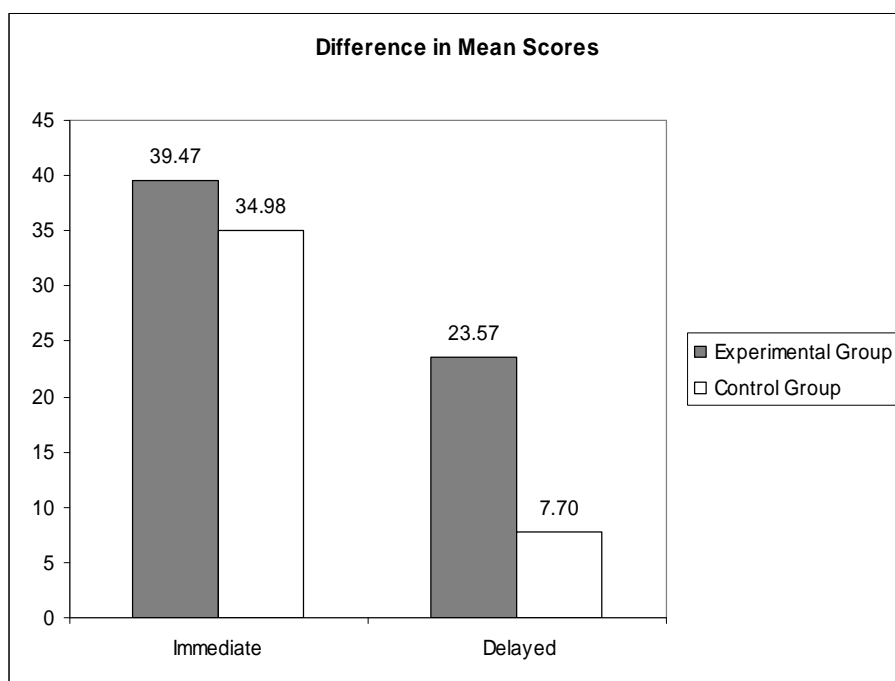
Figure 13. Difference in Mean Scores on the Delayed Post-test for Both Groups

Further data analysis using percentage change in mean scores could better show the difference between the performances of the two groups. For the Control Group students, their mean scores decreased by 60.62% on the delayed post-test (i.e., from 77.73% on the immediate post-test to 17.11% on the delayed post-test). As for the

Experimental Group students, their mean scores decreased by only 35.34% on the delayed post-test. The mean score of this group on the immediate post-test was 87.69% of a total possible score of 45. The mean of the delayed post-test decreased to 52.35% of the total possible score of 45.

This difference in mean scores between the Experimental and Control Groups on the delayed post-test can be better seen in the visual representation of both data sets through the Box and Whisker Plots in Figure 14. These Box Plots suggest that the delayed post-test scores of the Experimental Group span between 14.00 and 39.00 out of 45 marks, while those of the Control Group range from 3.00 to 15.00. Moreover, the median delayed post-test score (the horizontal line that divides the box in Figure 14) is more than three times that of the Control Group: 23.56 for the Experimental Group and only 7.00 for the Control Group. Also, Figure 14 shows that, in general, the Experimental Group had better delayed post-test scores. Three-fourths of this group had a score of 17 or higher (the bottom line of the box in Figure 14) on the delayed post-test, while not even one student in the Control Group reached this score. In fact, this difference is impressive and it strongly suggests that something more than individual variances caused these relatively high delayed post-test scores.
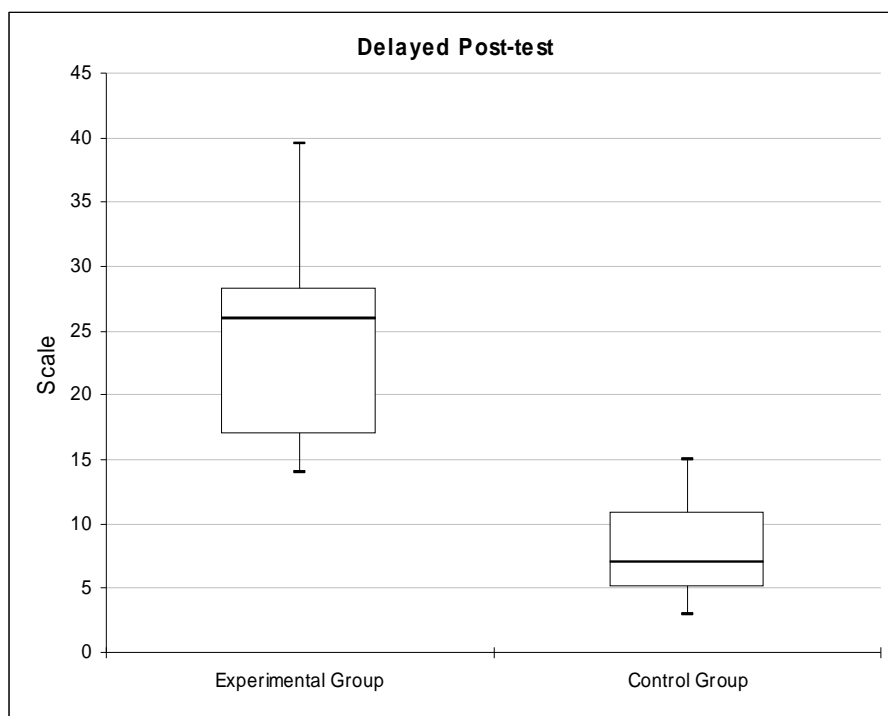
Figure 14. Box Plots for Both Groups on the Delayed Post-test

Let's remember that both groups had almost the same initial proficiency level. Besides, I was the teacher of both groups, and I tried to maximize my control of different variables that may affect the reliability of the test scores. For instance, test administration conditions were comparable for both groups. The same invigilators supervised the tests. Moreover, the test scoring criteria were very clear and reliable. Then, what made the scores of the Experimental Group remarkably higher on the delayed post-test? One possible explanation could be the attention these students were paying to their English classes. However, if students' attention or commitment to the course was a factor, then it most probably would have been seen only in individual students' scores rather than in the total group scores.

My informal discussion with students and observing them during their interaction with the CAVL program were very useful for me to understand possible reasons for the difference in scores between the Experimental and Control groups on the delayed post-test. Some students indicated that they could listen to the pronunciation of the word as many times as they needed using the CAVL program. They thought that asking the teacher to pronounce a word again might embarrass them in front of their peers. Therefore, according to these students, the computer program helped them overcome their timidity. When evaluating the CAVL program after the training was over, for instance, one Experimental Group student told me, "When I ask you to repeat the word, my friends laugh at me… and all look at me" (my translation of student's Arabic words). Another student shared the same feeling, saying, "The computer does not … get tired … Ah! Yes, yes, bored. I press many times and listen. I like to use that [pointing to my computer headphones]. It's good … me only" (edited version of student's English words). These students apparently found the computer program appropriate for their individual learning preferences. The second student seemed to think that the use of headphones to listen to the words made his learning experience more personal.

Other students reported that the computer program kept them engaged through different animation features. One learner explained, "The sounds played during feedback offered by the computer made me wait for the feedback impatiently" Another student shared the same feeling, saying, "The computer does not … get tired … Ah! Yes, yes, bored. I press many times and listen. I like to use that [pointing to my computer headphones]. It's good … me only" (edited version of student's English

words). This learner emphasized the importance of the computer feedback in keeping him more engaged to learn about words. Many other students stated that having feedback available for every task included in the CAVL program helped them remember the spelling of the words. One learner, speaking in English, exclaimed, "When I enter the word wrong, I am angry, and I enter the word again careful!" This learner was probably emphasizing the attention he was paying to the form of the word when interacting with the computer. As a matter of fact, being attentive to word form and practicing their spelling can aid their retention.

A point that was even more relevant to my research was the fact that many students noticed that all 10 tasks included the target word in different activities. During our informal discussion after classes, I asked some students of the Experimental Group to think of whether the CAVL program was similar to or different from the way they learn new words in their textbooks. One of them responded in Arabic and remarked, "Arabic … the word is written in Arabic.… You don't allow us to use Arabic. You never write the Arabic word on the board" (my translation of student's Arabic words). His classmate strongly agreed with him and, speaking in Arabic too, added, "We know how to write the word and do it again in the three sentences and also in that game … the hangman. I don't like the computer to cut off my head, and I think before I click any letter" (my translation of student's Arabic words). This idea of meeting the same word in different activities was, in fact, at the heart of the CAVL programme. Every task included in this program was meant to facilitate and strengthen the acquisition of the target word form through multiple encounters. From this perspective, remembering the word form and its L2 equivalent, as well as practicing it in different activities, could probably explain the remarkably high delayed post-test scores of the Experimental Group, compared to those of the Control Group.

Other explanations of this difference in delayed post-test scores might be attributed to the novelty of the tool, i.e., the effect of the computer program that was used in this study. Students might have reacted positively to the availability of this program during class time. In fact, my observation of students' behavior during practice of the target words indicated that there was a positive reaction among Experimental Group students to the different multimedia aspects of the CAVL program. For example, one student when learning the word "prize" saw the picture of

a cup that might be awarded to the winner of a football competition on the computer screen, shouted at his friend, "We [the school football team] get the prize next week" (student's exact English words). The picture used to illustrate the meaning of the word "prize" triggered the productive use of this target word in a context that was relevant to this learner. During another session, two other students were competing against each other in a task that required them to identify the target word "late" in three written sentences in the minimum possible time. When one of them clicked on the word "last" and thought that it was the target word "late," the other learner exclaimed, "No, that is not late … late with no –*s*!" This appeared to me like a negotiation of meaning between these two learners. According to the vocabulary research literature, this negotiation is a prerequisite for the retention of unknown words.

As a result, during class discussion after the experiment was over, many students showed interest in having this program as a part of their ordinary classroom practice. Many students thought that the most important thing that helped them to understand the words and to remember some of them was the inclusion of pictures and L2 translation in the CAVL program. Others also pointed out that the CAVL program facilitated recording the words in their vocabulary notebooks.

Students of the Control Group, when informed about the results of the experiment, listed many possible reasons for the difference in scores. The following excerpt from the discussion I (T) had with students of the Control Group (S1, S2, S3, and S4) during class time might better explain their opinions:

T: Why do you think the scores of grade nine, section one, were better than yours?

(The whole class starts murmuring; students look at each other.)

S1: Teacher … teacher, they … (Arabic word meaning to cheat)…. Yes. (He swears in Arabic.)

T: No, they didn't … believe me. I was there during their tests. Mr. Ali was with me, too.

S2: Teacher … you tell them … better.

T: I tell them what?

S2: You like all grade nine one. You give them more (Arabic word meaning marks).

T: Come on! You are all my students and I like you all. Let me tell you something. Mr. Ali and I corrected all the tests, and we don't know your names because we put a sticker over all names before marking the tests.
     (Students start talking to each other in Arabic)

T: Ok, maybe they work more than you do.

S2: No, no, no…. You see all day we write everything (holding his vocabulary notebook).

S3: No, also … using Internet.

T: Do you use the Internet to study?

S3: Teacher … they use Internet and computer.

T: Grade nine one?

S3: Yes.

T: They don't use the Internet in class maybe at home.… I don't know … and they use the computer. Yes, they use the program I told you about before doing this.

S4: (speaking in Arabic) Let us use the computer program and our tests next time will be better than grade nine one.
     (The whole class agrees with S4.)

T: Ok boys. I will give you the program and see your marks.

In the excerpt above, some students mentioned cheating as one possible reason for the difference in scores. Of course, since I invigilated the tests of both groups, I was sure that this reason was far from being true. The technological component of classroom instruction (the CAVL program) was also seen as a major difference by the Control Group Students. S3 and S4 made this explicit in their remarks as indicated by their use of words such as "Internet and computer" and "the computer program." Moreover, S4 seemed certain that the computer program would make their scores better. This might, as well, inform us about students' eagerness to have computer programs available for them during classes.

In short, the results of the Control and Experimental groups were different on both tests. On the immediate post-test, this difference in scores was smaller, but still interesting. However, the Experimental Group remarkably outscored the Control Group on the delayed post-test. For this group of learners, the change in test scores

could perhaps be explained in terms of repeated exposure to the target words. The CAVL program offered students the opportunity to meet each target word ten times. The different tasks kept students engaged in knowing more about the aspects of the target word (pronunciation, spelling, pictorial representation, part of speech, and L2 equivalent). Students who used the program also reported its efficiency in terms of time spent learning each new word (15 minutes daily). From this perspective one might conclude that the CAVL program speeded up the process of learning the target words by exposing learners to them repeatedly in a short time.

CHAPTER 5

CONCLUSION

Adding a technological dimension to the usual classroom practice of learning unknown words appears to have benefited the Experimental Group in this study based on students' test scores. Test scores of the two groups varied remarkably. The Experimental Group slightly outscored the Control Group on the immediate post-test. However the former outstandingly outpointed the latter on the delayed post-test. The Experimental Group students seemed to retain more words in their long-term memory as suggested by their remarkably high delayed post-test scores compared to those of the Control Group. In fact, the Experimental Group students achieved a better long-term learning gain than their peers in the Control Group. The findings of this study indicate that the computer program did not make a striking difference in the short-term retention of unknown words as suggested by the mean scores of both groups on the immediate post-test. However, the findings support the assumption that learners who use a computer-assisted vocabulary learning program to practice and learn new words during English classes will have a better retention of those words in their long-term memory.

Pedagogical Implications

Our aim as teachers is to make our students successful vocabulary learners. Success in learning new words does not only involve retaining words in the short-term memory. It necessitates working on these words until they are stored in the long-term memory. Once successfully stored in the long-term memory, those words will be ready for learners to use according to their needs. Bearing in mind the time constraints that teachers and learners face, explicit vocabulary teaching should be incorporated into teachers' and learners' practice (Folse, 2008). Explicit vocabulary teaching can be supported by different classroom activities that expose students to aspects of unknown words repeatedly and in a relatively short time. Technology offers teachers/learners ample opportunities to make explicit vocabulary strategies a rewarding aspect of teaching/learning repertoire.

If our ultimate goal, as EFL teachers, is to facilitate retention of unknown words in students' long-term memory, explicit vocabulary strategy training should be

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our priority. Making use of the different modalities inherent in computer applications such as sound, pictures, videos, and graphics can improve retention of new vocabulary and make students' experience with these words enjoyable and tempting. EFL teachers could for instance use the computer multimedia environment to make learners notice the salient features of an unknown word. These include form, meaning, and use (Nation, 1990). Once learners notice these features, teachers can engage them in retrieving words by presenting them in interactive computer activities that encourage retrieval.

The findings of this study also have important implications to curriculum designers and stakeholders in the educational field. We are living in a digital age characterized by the use of computers everywhere around us. Computer technology dominates nearly every aspect of our life, so why not in the high school context? It is high time for us to consider including technological elements in current classroom resources. The benefits of computer technology have been widely reported in the language acquisition literature (e.g., Chun & Plass, 1996; Groot, 2000; Warschauer, 1996). The current study seems to confirm these benefits as related to vocabulary learning.

Suggestions for Improving the CAVL Program

Now that my study is over and I have observed students interacting with the CAVL program, I have come to realize that this program could be improved in many ways. One suggestion would be to make navigating through its different sections easier for learners. This would eliminate much of their frustration. Another suggestion would be to integrate hyperlinks to online electronic dictionaries and thesauruses to maximize learners' exposure to other aspects of the target words, such as their synonyms and antonyms. Furthermore, future research could consider integrating an electronic version of students' vocabulary notebook with the CAVL program. As such, learners would find it easier and more motivating to work on vocabulary items in the same program. Finally it would be very interesting to think of illustrating the meaning of words through video clips, since many studies have reported their efficacy (e.g., Al-Seghayer, 2001).

Limitations of the Study

Despite considerable effort I employed to make the Control and Experimental Groups as similar as possible, differences between the two groups could by no means be completely wiped out. Although the proficiency level test confirmed that the two groups were very similar in language abilities, they might have varied in terms of learners' individual characteristics such as motivation and learning style. This makes my research incomplete and not without limitations. One of these possible limitations is the Hawthorne effect. This relates to the effect produced by the introduction of a new element into a learning situation, including changes in the normal behavior of research subjects when they know that they are being observed. For example, in my study, it is conceivable that the high test scores of the Experimental Group may not be due to the aspects of the CAVL program, but to the fact that it is new. This effect could have had a possible impact on students' performance. To counteract this effect, I tried to minimize its impact by informing both groups of students about the aim of the experiment and by introducing the use of computers long before the actual training started.

The possible hard feelings of the Control Group students could, as well, have affected the test scores and the way these students responded to my instructions. The fact that these students did not have access to the computer program during the study might have affected the reliability of the data. In fact, some Control Group students attributed the difference in scores to the quality of teaching itself. In the excerpt on page 44, for example, S2 was probably signaling that I taught the Experimental Group students in a better way. Trying to minimize the effect of such feelings, I did all I could to ensure that the Control Group students could feel that their participation in the study was as important as that of their Experimental Group peers and that I treated them in a similar way as the Experimental Group students. I also promised to give them the CAVL program after the training was over. The friendly relationship I had with all students also helped me to ease their hard feelings.

Another limitation is related to students' behavior outside the classroom. It is almost impossible for any research to control such variables. Some Experimental Group students might have encountered some of the words more than other students during their daily life. In addition, students have different personal and social backgrounds that could have encouraged or discouraged practicing the target words

outside school. Some students could as well have spent more energy when recording words in their vocabulary notebooks. As such, the depth of processing of the target words could never be standardized among all students.

A further limitation concerns the type of words included in the CAVL program. The study included three parts of speech: nouns, verbs, and adjectives. These parts of speech vary in the degree of difficulty related to their retention. According to Folse (2008), "nouns are probably the easiest part of speech to learn, followed by verbs, adjectives, and adverbs" (p. 14). Thus, had the study focused on one specific part of speech, the findings would have been more reliable. Inclusion of different parts of speech with variable learning difficulty could have posed problems to some learners. Therefore, for future research, these limitations should be taken into considerations.

My research does not claim generalizability. Its findings relate to the context in which it was carried out. However, investigating other aspects of the relationship between vocabulary retention and computer technology will be of great benefit to EFL teaching/learning. The results of my study suggest the possible value of focusing on one part of speech at a time when choosing words for investigation. In this way the findings will relate to that one specific part of speech and can inform us more about how that part of speech is learnt. I also recommend careful and detailed observation of learners' behavior while interacting with the computer. It would be interesting to know not just what learners do with the words but also how they do it.

Finally, a more qualitative approach in addressing the issue of using technology to enhance vocabulary retention could be beneficial in getting better insights into how learners move from retaining unknown words in their short-term memory to constantly storing them in their long-term memory. Careful observation of learners while interacting with and around the computer could reveal useful insights as to why some learners are successful in retaining those words while others seldom remember them even for a short time after their first encounter with those words. A within-subject research design seems more suitable for this purpose. Another interesting method that could be useful in understanding the complex nature of learners' interaction with the computer would be to organize an online discussion board, where learners could reflect on their learning experience and reveal possible patterns of their classroom behavior.

Despite the abovementioned limitations, the findings of the current study, especially the impressive delayed-post test scores of students who used the CAVL program, are certainly an important step towards a better understanding of the benefits technology can bring to teaching and learning L2 vocabulary. The Experimental Group student seemed to have reacted positively to the multimedia dimensions of the CAVL program, which in turn could have made them able to remember more target words than their Control Group peers after three months.

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Appendix A

Vocabulary Notebook Sample Page

English Word	L1 Translation (Arabic)	Picture	Synonym(s)	Example Sentence(s)

Proficiency Level Test

(From Philips & Philips, 2007a)

Section 1: Listening

A- Listen and write the sentences. [5 marks]

Example:

You hear: *1 The computer club is at five today.*

You write:

1- *The computer club is at five today.*
2- --
3- --
4- --
5- --
6- --

B- Listen and write answers to questions. Use short answers. Give true information. [5 marks]

Example:

You hear: *1 What is your favourite subject at school?*

You write:

1- Science *or* Maths *or* English *or*…

2- --

3- --

4- --

5- --

6- --

C- Listen and number the next word in each case. [5 marks]

Example:

You hear: *1 My father is …*

You write:

[　　] 　a bank

[*1*] 　an accountant

[　　] 　hours

[　　] 　a job

[　　] 　midnight

[　　] 　a salary

Section 2: Reading

Education and employment
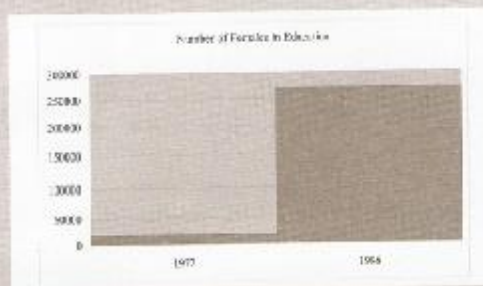
Figure 1: Females in Education in the UAE
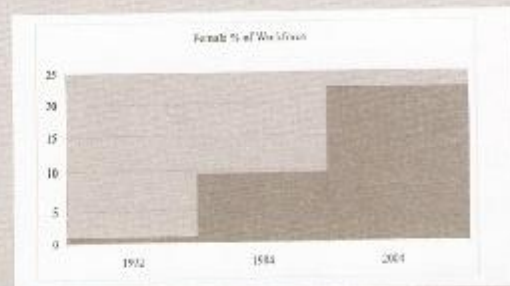
Figure 2: Female % of Work Force in the UAE

You will probably have many different jobs in different fields in your life. So what is the main factor in getting a good job, again and again? Is it intelligence or personality? Is it your social group or your upbringing? Is it your family name? Is it the amount of money your family has? It is none of
5 these things. The main factor is education.

Education gives you knowledge and skills. Knowledge is sometimes useful in a future job. Perhaps the most obvious examples are in Maths and Science. Someone with a good knowledge of Maths and Science will be able to do many tasks in his or her future jobs. Skills are sometimes useful, too. For example, many jobs need English nowadays, so
10 English lessons may help you get good jobs again and again.

However, a good education gives you something much more important than knowledge. It helps you to think for yourself. It enables you to evaluate information, to decide if something is true or not. This is sometimes called critical thinking. Employers want people who can think critically. So employers want educated people.

15 There is a good example of the power of education in the employment market in the UAE. In 1972, 19,000 girls were enrolled in schools in the country. By 1996, this figure was 270,000. In 1975, 3,005 UAE women had a degree. By 1995, this figure was 61,496. So the growth of education for women in about 20 years was enormous. And the result? In 1972, women probably accounted for less than 1% of the work force. By 1984, the figure was only 9.6%,
20 but 20 years later, it was 22.4%.

A- **Read the title and look at the two graphs.** [6 marks]
   Mark true (TRUE) or false (FALSE).

1- The text is about two subjects. (_____)

2- The number of females in education in the UAE went up (_____)

   by about 250,000 from 1972 to 1996.

3- In 1984, nearly 10% of the work force in the UAE was female. (_____)

B- **Read the first and second paragraphs. Complete the sentences by ticking the best answer.** [4 marks]

1- The main factor in getting a good job again and again is…

a- intelligence. ☐

b- personality. ☐

c- upbringing. ☐

d- education. ☐

2- the second paragraph is about…

a- the knowledge you learn at school. ☐

b- the skills you learn at school. ☐

c- the knowledge and skills you learn at school. ☐

d- the knowledge and skills you learn at work. ☐

C- **Read the rest of the text. Tick the best answer.** [6 marks]

1- Why do employers want people with a good education?

a- Because they have a lot of knowledge. ☐

b- Because they have a lot of skills. ☐

c- Because they can think for themselves. ☐

d- Because they are educated. ☐

2- Why did the percentage (%) of women in the work force go up from 1972 to 2004?

a- Because there were more women. ☐

b- Because there were more jobs fro women. ☐

c- Because more women were educated. ☐

d- Because education in the UAE improved. ☐

3- How many women had a degree in 1995?

a- More than 3,000. ☐

b- More than 60,000. ☐

c- 1%. ☐

d- 270,000. ☐

D- Read the text again. Match the words and phrases with their meaning in the text. The first one has been done for you. [4 marks]
The first one has been done for you.

1- **it** (line 2-3 = is it intelligence)		the ability to evaluate information
2- **it** (lines 11-12 = it helps you think)		the percentage of women in the work force
3- **this** (line 13 = this is sometimes called…)	*1*	the main factor
4- **this figure** (line 16 = the figure was only…)		the number of girls enrolled in schools
5- **the figure** (line 19 = the figure was only…)		a good education

Section 3: Writing

A- Correct the spelling of each word. [10 marks]

Example: contbute   cont**ri**bute

1- intested   …………………….

2- puntulity   …………………….

3- comittment   …………………….

4- ogenize   …………………….

5- ushualy   …………………….

6- atendence   …………………….

7-respansiblity   …………………….

8- mowtivashion   …………………….

9- acheiv   …………………….

10- stadiy   …………………….

B- Read the e-mail. Write a reply. [10 marks]

File Edit View Insert Format Tools Actions Help Adobe PDF

Reply | Reply to All | Forward

You replied on 22/00/2007 09-15.

From: Sent: Tue 21/05/2007 15:46
cc
Cc:
Subject

Dear Friend
I am writing to you because I want an e-mail friend.

My name is Julio Moreno and I am Spanish. I am 14 years old and I have two brothers and one sister. I live in Madrid. My e-mail address is jmoreno@hotmail.com.

I go to a secondary school in the centre of the city. I have lessons five days a week, from Monday to Friday. There are three terms each year. The first term is from September to December, the second term is from January to March, and the third term is from April to June. Classes start at 8.00 and end at 3.00.

I am in the second year at the school. This year I am studying more than 10 subjects, including Science, Geography, History, English and Mathematics. Next year, I can choose between university preparation and vocational training, which means training for a job.

We don't have social clubs at the school, but I play football for a local team.

Please reply and tell me about yourself.

Julio

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Section 4: Grammar

A- Find and circle the correct way to complete each sentence. [10 marks]

Example:
- When…………………………?

a. begins the lesson

b. does begin the lesson

c. the lesson begins

(d.) does the lesson begin

1. They…………… doctors.

a. am

b. are

c. is

d. have

2. She ……………… any brothers or sisters.

a. do not have

b. does not have

c. not has

d. has not

3. He ………………….. in a hotel at the moment.

a. stays

b. stay

c. is staying

d. are staying

4. I ……………………… .

a. am never late

b. never am late

c. late am never

d. am late never

5. My friend……………. .

a. late always come

b. always comes late

c. late comes always

d. comes late always

6. My teacher always says:…………………………… homework to the last minute.

a. never to leave

b. to leave never

c. leave never

d. never leave

7. How ………………… do you go out in the evenings?

a. times

b. many

c. often

d. usually

8. My town is nice because………………………many parks and gardens.

a. there is

b. there are

c. it is

d. they are

9. Doctors……………….a medical degree.

a- must be

b- can be

c- must have

d- can has

10. You…………………….bully people. It is not a good behaviour.

a- is not

b- are not

c- have not

d- should not

11. I …………………..Emirati.

a. am

b. is

c. are

d. have

B- Circle the correct way to complete each underlined section. [5 marks]
The first one has been done for you.

My name is Francoise Pascal. I am **... / the** French. I come **of / from** Marseille, but I live **in / at** Paris now. My family moved **to / in** Paris **in / at** 1998. My father works **up / for** Renault. It is **a / the** large company. He is responsible **of / for** the Sales Department. My mother teaches at a university in **a / the** north of the city. She works **from** / **at** 8:30 in the morning to 5 in the afternoon. She never works **for / at** weekends.

Appendix C

Diagnostic Vocabulary Test

(Adapted from Yoshii & Flaitz, 2002)

Directions: Please check any of the words you know by putting a check mark [√] in the box. Please write the meanings in either English or Arabic.

[ ] envelope _____

[ ] weather_____

[ ] manager _____

[ ] factory _____

[ ] clothes _____

[ ] bully_____

[ ] pray_____

[ ] typist _____

[ ] lazy _____

[ ] player _____

[ ] reporter_____

[ ] office _____

[ ] continent _____

[ ] education _____

[ ] salon _____

[ ] prize _____

[ ] average _____

[ ] shy_____

[ ] primary_____

[ ] degree _____

[ ] mass media_____

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[ ] e-mail _____

[ ] late_____

[ ] false _____

[ ] punish_____

[ ] shout_____

[ ] strange _____

[ ] ferry_____

[ ] fog _____

[ ] write_____
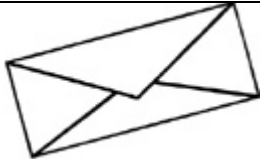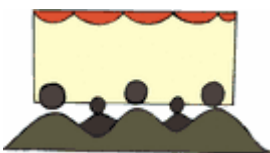
Appendix D

Immediate Post-Test
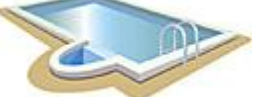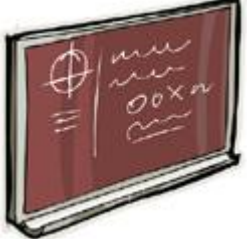
(Adapted from Yoshii & Flaitz, 2002)

A- Picture Recognition

Directions: What does each English word mean? Please choose one matching picture. Please put [**X**] in the box.

1	envelope	□	□	□	□
2	factory	□	□	□	□
3	office	□	□	□	□

4	shout	☐	☐	☐	☐
5	punish	☐	☐	☐	☐
6	manager	☐	☐	☐	☐
7	shy	☐	☐	☐	☐

8	degree	☐	☐	☐	☐
9	salon	☐	☐	☐	☐
10	mass media	☐	☐	☐	☐
11	late	☐	☐	☐	☐

12	reporter				
13	prize				
14	typist				
15	lazy				

B- Word Recognition

Directions: Please match each word with the correct meaning. Put [**X**] in the box.

1. salon
[ ] a shop where you can buy perfumes and cosmetics
[ ] a shop where you can get your hair washed, cut, curled etc
[ ] a shop where you can buy fruit and vegetables
[ ] a shop where you can buy clothes

2. degree
[ ] something you study at a school or university
[ ] the amount of money you have to pay for something
[ ] qualification given to you when you complete a course
[ ] a school for advanced education, in a particular profession or skill

3. late
[ ] happening or done after the usual or normal time
[ ] in the first part of a period of time or event
[ ] not making much noise, or making no noise at all
[ ] arriving or happening at exactly the time arranged

4. reporter
[ ] someone whose job is to write about news events for a newspaper
[ ] someone whose job is to look after a building or organization
[ ] someone whose job is making and repairing wooden objects
[ ] someone whose job is to teach a particular subject

5. prize
[ ] an amount of money that you borrow from a bank
[ ] a small amount of food that is eaten between main meals
[ ] a piece of cloth that you wear around your neck, head, or shoulders
[ ] something given to someone who won in a competition or game

6. punish
[ ] to produce a picture of something using a pencil or a pen
[ ] to give lessons in a school, college, or university
[ ] to make someone suffer because they have done something wrong
[ ] to form a word by writing or naming the letters in order

7. typist
[ ] someone who uses a typewriter
[ ] someone who takes photographs
[ ] someone who buys and sells things
[ ] someone who treats people who are ill

8. lazy
[ ] always busy doing things
[ ] showing interest about something
[ ] does not like spending money
[ ] not liking work or not making any effort

9. shout
[ ] to put food in your mouth
[ ] to say something very loudly
[ ] to write a letter to someone
[ ] to say something very quietly

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10. office   [ ] a room where someone has a desk and works
                      [ ] a room where someone usually sleeps
                      [ ] a room where a scientist does tests
                      [ ] a room where you prepare and cook food

11. envelope   [ ] a written or printed message sent by mail
                      [ ] a thin paper cover in which you put a letter
                      [ ] an address at a post office where you get letters
                      [ ] a small book that is used for writing notes in

12. mass media   [ ] television, radio, and newspapers
                      [ ] a book about different subjects
                      [ ] a short test that a teacher gives
                      [ ] a story told or shown at a cinema

13. manager   [ ] somebody who prepares medicines in a shop or hospital
                      [ ] someone who manages a company or other organization
                      [ ] a police officer whose job is to catch criminals
                      [ ] an older student who helps to control younger students

14. shy   [ ] someone who likes to go out and do things with other people
                      [ ] speaking or behaving with others in a way that is not polite
                      [ ] nervous and uncomfortable to meet and speak to other people
                      [ ] pleased and happy when meeting or doing things with others

15. factory   [ ] a building where we use machines to produce goods
                      [ ] an area of land, used for growing plants or keeping animals
                      [ ] a large sports ground with many rows of seats all around it
                      [ ] a building where sick people receive medical treatment

C- Word Translation

Directions: Please provide the Arabic equivalent to the following words.

1. late _____

2. reporter _____

3. prize _____

4. lazy _____

5. degree _____

6. manager _____

7. typist _____

8. shy _____

9. office _____

10. mass media _____

11. factory _____

12. envelope _____

13. punish _____

14. salon _____

15. shout _____

Appendix E

Sample Discussion Transcript

This discussion took place after one week of using the CAVL program with
Experimental Group students. I (T) wanted students (S1, S2, etc.) to describe what
was happening in their English classes since the start of the training.

T: How do you find the English classes so far?

S1: Ok … now all work … and …

S2: (interrupts) Not like History, we all listen …. (laughs)

T: Everybody listens in History classes?

S2: Yes …the teacher write everything on the board and we listen to them.

T: You listen more because you find History classes interesting?

S3: Yes … (many students disagree) … very hard tests.

T: Ok boys. What about our English classes? Are you doing anything different?

S1: Yes, yes … we read.…

S4: We go to speak with Suoud. I tell him in English….

T: That's good. Think of the beginning of the school year. Is there anything that you
     find different in our classes now?

S5: (He is a very brilliant student.) Teacher, you give us homework all the time.

T: Every day? What's that homework?

S5: Writing the words in vocabulary notebook.

S6: (interrupts) You take vocabulary notebook with you.

T: Ah …yes. I correct your vocabulary notebook. Is that helping you learn
     vocabulary?

S5: Yes, but it takes more time.

T: Is there anything else that is helping you remember the new words?

S7: Yes, the pictures.

T: Which pictures?

S7: In the computer.
     (Many students speak in Arabic and mention the name of the CAVL program in
     Arabic.)

T: You mean the CAVL program when we go to the ILC?

S7: Yes, teacher. I can see words better … Arabic.…

S5: The games are very good. I can remember the word now.

S7: I do not go very quickly when I work with words again and the computer program … more words …. I come to the room and see many words.

T: You mean, you can study the words slowly and see them again?

S7: Yes, all words. (pointing to his classmate) I go with Ahmad.

T: (explains in Arabic) I thought the computer program was wasting our time and thought of stopping using it.

S8: (speaking in Arabic) It is unfair … I swear.

T: (speaking in Arabic) Why is it unfair?

S8: (speaking in Arabic) We want to….

S9: (interrupts, speaking in Arabic) Teacher, put the computer program in the computer lab and we go there

T: Ok, let me tell you something.… We will continue using the program for another week and we will see whether it is good or bad. Thank you all for sharing your ideas. Now, let's move to something else. Are your workbooks ready? Let me collect them.

VITA

Abdelbasset Jeddi is an EFL teacher born in 1968 in Sidi Bouzid, Tunisia. He received his BA in English Language and Literature form the University of Human and Social Sciences in Tunis in 1992. For the past eighteen years, he has taught in different governmental schools in Tunisia and the UAE. He is involved in many professional development organizations such as TESOL Arabia and iEARN (International Educational and Resources Network). He is currently acting as the representative of both organizations in Fujairah.

His interests include using technology in the classroom, designing educational software, and teaching and learning vocabulary. He has designed interactive vocabulary games for Garnet Publishing in the UK. He has also participated in many conferences and workshops and gave a presentation about the use of technology to teach different skill areas at the 1st AUS TESOL Symposium in 2008. He is an iEARN trainer and offered training to teachers of English in many schools in Fujairah about the use of online collaborative projects to learn and practice English. He won the distinguished teacher prize in Fujairah Educational Zone in 2004 and 2008, as well as the prize for the best educational software in Fujairah in 2006.