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The Effect of Explicit Instruction of Clustering New Words on Vocabulary Learning of Iranian Intermediate EFL Learners through Hyperlinks

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Abstract

The effect of explicit instruction of clustering new thematic vocabulary items into two different categories through hyperlinks of PowerPoint was examined on vocabulary learning of 75 Iranian intermediate EFL learners. The sample was randomly assigned to three groups. Experimental group 1 received the meaning of new words in their First Language (L1) translation via PowerPoint, while experimental group 2 received the meanings in English definition in the same way; control group learned the meanings through a traditional method of instruction without employing any specific strategy. To measure the participants' vocabulary learning, a pretest and a posttest were administered to all groups. The result of *t-test* indicated that such explicit strategy instruction enhanced vocabulary learning of the experimental groups. According to the results of *One-Way ANOVA*, although there was no significant difference between the experimental groups, a significant difference was observed between the experimental groups and the control group in vocabulary learning.

Keywords: CALL (Computer-Assisted Language Learning); hyperlinks; explicit strategy instruction; L1 translation, English definition; vocabulary learning

1. Introduction

To develop general and academic vocabulary of students, many instructional strategies have been devised and utilized by Second/Foreign language (S/FL) teachers (Al-Jarf, 2007). Strategies should help learners not only discover the meaning of a new word but also consolidate the word in memory once it has been encountered (Decarrico, 2001). Explicit Strategy Instruction, a cluster of instructional components, has been found to have the most significant effect on the performance of students. It has been characterized by three components: explicit practice, strategy cues, and elaboration (Luke, 2006). In FL classrooms, one of the most popular techniques for introducing vocabulary items is presenting them in thematically or semantically-related sets (Tagashiro, Kid & Hoshino, 2010). According to Tinkham (1997), items clustered thematically can be " subconsciously organized in accordance with their participation within certain 'frames' or 'schemata', concepts which segmentize a speaker's background knowledge" (p.141). It has been argued that learners tend to use a variety of strategies in combination in reality (Gu, 2003).

After the development of new technologies, a boom of interest has been seen in applying them in educational arena (Sokolik, 2001). Thanks to such development, learners can consult translations, dictionary definitions, grammatical explanations, and cultural information by a simple click on a computer mouse (De-Ridder, 2002). Nowadays, a wide variety of CALL programs has been generated due to the demand for technology in the classroom (Wang, 2006). It has been increasingly argued that computer technology, in a number of ways, can support vocabulary learning (Constanitinescue, 2007). Hyperlinks allow viewers to quickly access another computer screen just by clicking on a text entry or a graphic object (Russell, 2011).

According to Hawkes (2009), PowerPoint remains just a tool at the disposal of the 'expert' teacher, who retains responsibility to plan, craft and author the lesson. The act of laying down the thinking process for a specific lesson

sequentially as a series of PowerPoint slides which can be viewed at a glance, previewed in 'presentation mode' and then easily edited, has the impact of clarifying thought during lesson planning. It makes the progression plainer within a lesson and even within a sequence of lessons, and it also can aid the teacher in ensuring that the lesson outcomes meet the learning objectives.

Although vocabulary achievement has been enhanced in most cases (e.g. Yan, 2010), the results have not been completely put into practice. That is, there is still a gap between theory and practice. Besides, there are some conflicting views about the way of presenting new vocabularies (e.g. Tinkham, 1997; Hippner-Page, 2000).

In the case of CALL, nearly all have reached to positive effects (e.g. Yoshii, 2006) but some have tried to criticize CALL materials.

Unfortunately, most of the time, Iranian EFL learners complain about their failure in vocabulary learning.

Addressing the above arguments, this study tried to solve the problem. The purpose of the present study is to shed light on the issue whether explicitly teaching of some specific vocabulary strategies via PowerPoint can be regarded as an effective strategy in vocabulary learning. If it is proved to be fruitful, it is intended to invite other teachers, teacher educators, practitioners, and syllabus designers to integrate such strategies into their teaching methodology.

2. Literature Review

2.1 Related Research Studies on the Effect of Explicit Vocabulary Strategy Instruction

Tozcu and Coady (2004) examined the effect of direct vocabulary learning through CALL on vocabulary knowledge, Reading Comprehension (RC), and the speed of word recognition. They found that although both groups showed vocabulary development, RC increase, and a decrease in reaction time for frequent word recognition, the gains of the treatment group were significantly greater than that of the control one. Therefore, it was concluded that direct vocabulary learning through CALL is beneficial in vocabulary learning.

2.2 Related Research Studies on the Effect of Combination of Vocabulary Learning Strategies (VLSs)

Ellis and Beaton (1993) conducted a controlled experiment to find out the cognitive processes involved in FL vocabulary learning. Two different strategies were evaluated in the study: keyword and repetition. Participants were asked to use a fixed strategy. What made the results interesting was optimal performance of subjects when they had combined both strategies. Some years later, a number of researchers (e.g. Gu, 2003) showed their positive attitudes toward such strategy combination.

2.3 Related Research Studies on the Effect of Thematic Clustering

Tinkham (1997) conducted a research study with 48 native English speakers to consider the effects of semantic and thematic clustering on the ease of L2 vocabulary learning. It was suggested by data analysis that while the semantic clustering served as a determinant and hindrance to vocabulary learning, thematic clustering served as a learning facilitator. Al-Jabri (2005) also observed the positive effect of thematic presentation of words on L2 vocabulary learning. Recently, Motallebzede and Heirany (2011) reported their findings from an experimental research study in determining the effect of thematically-clustered L2 vocabulary on RC ability of Iranian intermediate EFL adult learners (N=50). Subjects of experimental group learned new vocabulary items using thematic clustering technique; the same reading texts were given to the students of control group as an extra-classroom task. The study findings supported the Tinkham's results (1997). Both experimental studies of Hippner-Page (2000) and Liu (2003; as cited in Chepyshko & Truscott, 2009), on comparative experiments on thematic and semantic clustering, failed to find any significant differences between the semantically and thematically-presentations of a set of words.

2.4 Related Research Studies on the Effect of (combination of) L1 and L2 Glosses in a Multimedia Environment

Hulstijn, Hollander, and Greidans (1996) carried out an experimental research study with Dutch advanced students of French to examine incidental vocabulary learning. The subjects read a French short story in one of the three text reading conditions: marginal glosses (provision of L1 translation of new words), bilingual dictionary use, and reoccurrence of the unknown words. Reading the story having completed, the subjects' recall of 16 words which had appeared either once or three times in the text was tested. The study indicated that frequency of occurrence fostered incidental vocabulary learning more when readers were provided with the meanings of new words through marginal glosses or when they looked up the words in a dictionary than when they were given no external information about the meanings.

In one study by Davis and Lyman-Hager (1997), it was indicated that there was a tendency among learners to consult English word definitions from the available software options. Hill (1998) used a multimedia program with

around 200 tertiary Chinese students learning English at Hong Kong University. The program focused on a short text with new words. The learners were instructed to select their required information by clicking on new highlighted words to help them learn the target words from context. Using the program, students could access a text, along with a range of information about individual words: L1 and L2 meanings, sound, root and additional lexical information. It was revealed that the program was effective.

Recently, Yan (2010) explored the impact of CALL on de-contextualized vocabulary learning with 155 College freshmen students via a vocabulary learning multimedia software in Taiwan. Three groups were selected: one control group (taught in a regular classroom; method 1), and two experimental groups (taught in a computer laboratory). While one experimental group used the program with English and Chinese (L1) word glosses on the computer screen (method 2), the other experimental group used it with English and Chinese word glosses along with the English word pronunciation sound gloss (method 3). The study demonstrated that the two experimental groups outperformed the control group in vocabulary learning. Moreover, the third group had better and higher scores than the other two groups.

2.5 Related Research Studies on the Comparison of L1 and L2 Glosses

Jacobs, Dufon, and Hong (1994) conducted a research study with 85 English speaking participants who were Spanish language learners. They compared L1 with L2 glosses in a way that the subjects should read a Spanish text under three conditions (1) L1 (English) gloss; (2) L2 (Spanish) gloss; and (3) no gloss. According to the results of the immediate vocabulary test, the gloss-conditioned subjects gained better outcomes than the no gloss users. In fact, no significant difference was found between L1 and L2 glosses. Yoshii (2006) examined the effectiveness of L1 and L2 glosses on incidental vocabulary learning in a multimedia environment. The study examined the impacts of additional pictorial cues in L1 and L2 gloss and how those additional cues could influence vocabulary learning. The results indicated that there were no significant differences between L1 and L2 glosses for definition-supply and recognition task. However, significant differences were found between picture (text + picture) and no picture (text only) glosses in definition-supply test only. According to the findings, both L1 and L2 glosses were proved effective for incidental vocabulary learning.

Although the findings of the Jacobs *et al.* (1994) were verified by those of Yoshii's study (2006), a questionnaire revealed that L2 gloss had been preferred to L1 gloss by the participants of Jacobs *et al.*'s study (1994). The advantage of one type of gloss was explored by Miyasako (2002) who examined the effects of reading, glossing and English ability on incidental vocabulary learning with Japanese senior high school students (N = 187). Six groups were selected: (1) L2 (English) multiple-choice glosses (MCG), (2) L1 (Japanese) MCG, (3) L2 single gloss (SG), (4) L1 SG, (5) no glossing, and (6) control (no reading). According to the results, vocabulary was learned incidentally through reading; passage glossing, especially L2 MCG enhanced indirect vocabulary learning. Moreover, it was revealed that L2 glossing was more beneficial for higher-ability learners and L1 glossing was more effective for lower-ability ones.

2.6 Related Research Studies on the Effect of a Hypertext/Hypermedia Condition on Vocabulary Learning

De-Ridder (2002) investigated whether the highlighting of hyperlinks can affect incidental vocabulary learning, text comprehension, and reading process of 60 native Dutch second year economics students. Besides, he tried to answer whether hyperlinks (visible/invisible) influence FL learners' look-up behavior and learning outcome. For addressing these issues, he focused on the signaling-mode of glosses. Two glossed French economic texts were read by the subjects. Through online reading of the text, subjects accessed the glosses by just clicking on the defined word. Then, a pop-up window containing a Dutch (L1) translation and French (L2) definition appeared on the screen. Each text had two versions: a marked version (i.e. words were hyperlinked visibly) and an unmarked version (i.e. words were hyperlinked invisibly).

The results demonstrated the following findings:

- The subjects clicked more in the marked condition.
- The vocabulary loss of those in the marked condition was not greater than that of those in the unmarked condition.
- No difference could be found between the two conditions in reading time, incidental vocabulary learning, reading process and comprehension.

McAlpinea and Mylesb (2003) proposed a new type of electronic dictionary which presented typical phraseology rather than words in isolation; that online dictionary could treat multi-word lexical units and common collocational patterns which were cohered around a node word and could fully illustrate them with sentence examples. Words

and expressions in the head word list had been hyperlinked to topic words and basic English synonyms. The study showed the positive effects of hyperlinks on vocabulary learning.

On the other hand, the effectiveness of using a hypertext/hypermedia environment on teaching Spanish vocabulary to 48 high school students through semantic mapping was investigated by Senconis and Kerst (1995). Results found no significant difference between semantic mapping and traditional word listing approaches to vocabulary development. Consequently, semantic mapping activity, in a hypertext/hypermedia environment, was not effective in vocabulary development of the subjects. It can be argued that the findings of Senconis and Kerst's study (1995) were against the findings of other researchers in hypermedia/hyperlink environments (e.g. McAlpinea & Mylesb, 2003; De-Ridder, 2002; Senconis & Kerst, 1995).

Conflicting results concerning the effects of VLSs highlighted the importance of the present study as a step toward finding a fruitful approach for vocabulary learning. Three different research questions along with their null hypotheses were formulated to fulfill the purpose as follows.

RQ1: Does explicit instruction of clustering new words into their first language translation using hyperlinks has any effect on enhancing vocabulary learning of Iranian intermediate EFL students?

RQ2: Does explicit instruction of clustering new words into their English definition using hyperlinks has any effect on enhancing vocabulary learning of Iranian intermediate EFL students?

RQ3: Is there any difference among vocabulary learning of experimental group 1, experimental group 2, and the control group?

3. Methodology

3.1 Research Design

The study had a quasi-experimental design in which the classes were assigned into intact groups.

3.2 Participants

In the summer semester of 2011, 85 female learners registered in intermediate classes of an English language institute in Iran, Qom. Their age ranged from 14 to 17 (M=15.5). They were randomly assigned to three different groups of 25.

3.2.1 Sampling Procedures

The type of non-random sampling used for the study was the convenience one in which the participants were those who happened to be available for the study (Mackey & Gass, 2005) after receiving passmark in a standard homogenizing test. The Nelson English language test (Fowler & Coe, 1976) was used to homogenize the students' level from which the test 200 A was selected from "Book 2 Intermediate".

3.3 Materials

3.3.1 Vocabulary Selection and Passage Characteristics: The Experimental Groups

To be armed with a fruitful contextualized approach, the researchers decided to introduce some new intermediate words in appropriate contexts. We sought for a standard book in which some intermediate words had been presented in a context or followed by some relevant contexts. The researchers found ***Intermediate Vocabulary*** by Thomas (1986) suitable for learners to use both in the class and at home. Among a wide range of topics covered in the book, only nine passages from nine different topics were selected. Some modifications were made to the original passages of the book in terms of passage length but not in sentence structures or content. In the book, each passage had some blanks to be filled with the introduced words of available captions. Since fill-in-the-blank is a vocabulary learning/teaching technique in itself, the researchers themselves filled the passage blanks with the appropriate suggested words. The passages, next, were typed in slides of a PowerPoint program; the words were highlighted and hyperlinked (about 80 words).The passages of both experimental groups were the same.

3.3.2 Vocabulary Selection and Presentation: The Control Group

The control group was expected to learn the same target vocabulary of the experimental groups through a traditional method of teaching, without employing any specific vocabulary strategy. Since both contextual approach and thematic clusters of vocabulary are considered VLSs, a handout of the same words was provided by the researcher in which the words were introduced out of context, without any thematic relationship to each other. Consequently, each participant was given a copy of the handout.

3.3.3 PowerPoint Program

Microsoft Office PowerPoint 2003 was selected as an appropriate program. The researchers made a 100-slide PowerPoint containing nine different passages in the first 17 slides. We explained to the experimental groups' subjects that each of the nine passages had been distinguished from each other with one specific topic. The passages containing the hyperlinked words were typed in the first 17 slides of the PowerPoint and the rest slides contained the meaning of the hyperlinked words. Two versions of the same PowerPoint program were designed: One version presented the meaning of the new words in their L1 translation (for the first experimental group) and another version presented the meaning of the same words in their English definition (for the second experimental group).

The hyperlinked words were in pink color and whenever they were clicked on, they became light pink. There was a back button in the left bottom of each hyperlinked slide; by hyperlinked slide we mean the slide which presented the meaning of the hyperlinked words. If a back button was clicked on, the slide would turn back to the main slide having the passage in which the target vocabulary had been licked on. The title, lines, and texts non-target words all were in black color. New Times Romans with the font of 12 points was set for all slides of the PowerPoint. Although the program had been created with PowerPoint 2003, it was saved as Power Show and was opened either with PowerPoint 2003 or with PowerPoint 2007.

3.3.4 Measurement Tools: Pretest and Posttest

Two measurement tests were administered: pretest (r = .75) and posttest (r = .82). The tests were 40-item MC questions. All groups received the same pretest and posttest along with a separate answer sheet. All tests were similar in terms of rubric, direction, timing, and administration. The researchers themselves prepared the vocabulary tests using two English dictionaries to take some ideas for conducting questions stem: *Longman Dictionary of Contemporary English (2009)* and *Cambridge Advanced Learners Dictionary (2003).* Despite having a few items in common, the tests had different questions and options. The pretest was given to each subject of the three groups in the second session. Teaching having been finished, the posttest was given one week later.

The measurement tests were valid in terms of content as a correspondence was seen among the test content, vocabulary learning, and the study instructional objectives regarding the effectiveness of explicit strategy instruction of a combination of vocabulary strategies in a CALL environment. Indeed, the tests had acceptable construct and face validity.

3.4 Procedure

3.4.1 The Procedure of Homogenizing and Group Assignment

Among 85 participants taken the Nelson test, 78 students were determined to be at the same level of proficiency. Three students dropped out in pretesting session; consequently, a final participant pool of 75 learners was yielded. They were randomly assigned to three different groups of 25: two experimental groups (method 1; method 2) and one control group (method 3).

3.4.2 The Procedure of Teaching: The Experimental Groups

In the third session of both experimental classes, a quarter of time was devoted to introduce the work. As each class was equipped with just one computer, the seats were rearranged in a way that the computer screen could be seen with no barrier. Therefore, it was the responsibility of the teachers to click on each highlighted, hyperlinked word; the subjects were expected to look at the class computer screen and ask their teacher to click on the words as many times as they needed. Despite describing the general objectives of the study, the specific goals of the research was not revealed to avoid the effect of participants' attitude such as hawthorn effect or hallo effect; the comprehensive explanation of the study objectives had been away to improve the internal validity of the research (Mackey & Gass, 2005). Moreover, nothing was mentioned about the posttest. At the end of the third session, a CD, already written from the original CD of the researcher, was given to each experimental subject to review and work on the words in their personal computer at home. The method of vocabulary teaching lasted for 12 sessions.

3.4.3 The Procedure of Teaching: The Control Group

The control subjects were expected to learn the same target words using the researcher-made handout of the words through a traditional method of teaching. The teacher, one of the researchers, devoted about half an hour of the control class to teach the words; she read the words from the handout, around six new words per session, or asked one of the student to read them aloud. Next, the meanings were provided either by the teacher or by the students. Unlike the experimental groups, the teacher did not use any specific (or even combination of) vocabulary strategies

to present the meanings. This method of vocabulary teaching lasted for 12 sessions. The control participants were told nothing about the posttest.

3.4.4 The Procedure of Scoring and Data Analysis

The items of the tests were scored objectively due to their MC format. Equal weight was considered for each item. Both numerical and graphical techniques were applied to test the normality of obtained data. Then, *independent/paired-samples t-test* and *one-way ANOVA* were computed to analyze the compiled normal data.

4. Research Results

4.1 Effect Size and Power

According to Soleimani (2009), a desired *power* value is set at 0.80 in statistical tests. Table 1 shows the *observed power* and the *partial eta squared* of the posttest administered to the groups. Based on the table, the *observed power* of the tests is 1.0, which is above the desired *power* value (i.e. 0.80). The interpretation is that the posttest had a perfect *power* for the researchers to correctly reject the null hypotheses with confidence.

Table 1. tests of between –subjects effects: the observed *power* and *effect size* of posttest

Source	Type III Sum of Squares	df	Mean Squares	F	Sig.	Partial Eta Squared	Nomcent parameter	Power
Corrected Mode	.000	0	.	.	.	.000	.000	.000
Intercept	14310.613	1	14310.613	1344.937	.000	.948	1344.937	1.000
Error	787.387	74	10.640					
Total	15098.000	75						
Corrected	787.387	74						

To interpret the obtained *partial eta squared* (.948), the Cohen's guidelines (1988, p.22) shown in Table 2 were taken into account. *Eta squared* of .138, in table 2, shows a large effect size. Accordingly, it is logical to interpret that the *partial eta squared* of .948 (table 1) is a very large *effect size*.

Table 2. Cohen's guidelines (1988). (Note 1.)

Size	Eta squared (% of *variance* explained)	Cohen's d (*SD* units)
Small	0.01 or 1 %	.2
Medium	0.06 or 6 %	.5
Large	0.138 or 138 %	.8

4.2 Testing Normality

On the part of SL acquisition researchers, a pivotal decision to be made is concerning the choice of appropriate statistical techniques; that is, whether to apply a parametric test or a non-parametric one to interpret the research results (Soleimani, 2009). Two methods were used for the present study to test the normality of data distribution: descriptive numerical method (*skewness*) and theory-driven graphical and numerical method (Q-Q plot; *Kolmogorov-Smirnov*). According to the results of testing normality of the pretest and posttest, the data distribution was normal.

Mackey and Gass (2005) enumerate three assumptions for the application of parametric techniques in L2 research as follows.

1. The data should be normally distributed.
2. The data should be interval in nature.

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3. The observation should be independent; that is, scores on one measure (e.g. test) do not influence scores on another measure.

Since the above assumptions were met in the present study, parametric statistics were applied to test each null hypothesis.

4.3 Testing Hypotheses

4.3.1 Testing Null Hypothesis 1

RH0 1: Explicit instruction of clustering new words into their L1 translation using hyperlinks has no effect on enhancing vocabulary learning of Iranian intermediate EFL students.

To test the above null hypothesis, *independent* and *paired samples t- tests were computed.*

Independent-Samples t-test:

Table 3 shows *independent-samples t-test* between the posttest of the experimental group 1 and the control group. Based on the table, the *significant* (*sig*.) *level* for *Levene's test* is .027, which is less than the specified α value of .05. Therefore, the second line should be used. The *sig. (2-tailed) value* of the second line is .000, which is less than .05. Consequently, there was a statistically significant difference in the *mean* scores of the posttest for the experimental group 1 and the control group (*Mean Difference* = 4.28).

Table 3. independent-samples t-test between the experimental group 1 and the control group

	Levene's Test Equality of Variances		T-test for Equality of Means						
	F	Sig.	t	df	Sig (t-tailed)	Mean difference	Std. Error difference	95% Confidence Interval of the difference	
								Lower	Upper
Posttest Equal Variance Assumed	5.183	.027	5.504	48	.000	4.280	.778	2.717	5.843
Equal Variance not Assumed			5.504	42.26	.000	4.280	.778	2.711	5.849

Table 4 shows *critical values (cv)* for the *t-test* statistics. According to table 3, the *t-value* is 5.50, with the *degree freedom (df)* of 42.26. Since the exact *df* of 42.26 is not in table 4, the closest value below it is taken to be conservative (Brown & Rodgers, 2002). In table 4, the closest value below 42.26 is 40. In that row, 2.02 is the *cv* for *t* at the .05 level of significance. The *t-value* of 5.50 is greater than the *cv* found in table 4 at .05. So, there was a significant difference between the experimental group 1 and the control group at $p < .05$.

Table 4. Critical values for the t-test statistic; Note 2

One-tailed	.05	.025	.01	.005
Two-tailed	.10	.05	.02	.01
df				
30	1.697	2.042	2.457	2.750
40	1.684	2.021	2.423	2.704
60	1.671	2.000	2.390	2.660

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According to table 5, the experimental group 1's *mean* (15.52) is significantly higher than the control group's *mean* (11.24) in the case of vocabulary learning. This *mean difference* and all above results led to the conclusion that explicit instruction of clustering new words into their L1 translation had positive effects on vocabulary learning of the experimental group 1. So, the first null hypothesis was rejected.

Table 5. groups' tests *mean* and groups' number

	Pretest mean	Posttest mean	N
Experimental group 1	4.36	15.52	25
Experimental group 2	4.28	14.68	25
Control group	5.32	11.24	25

Using information provided in table 3 and 5, the researcher calculated *eta squared value* for the obtained *t-test (t=5.50)*. According to Pallant (2007, pp. 236), the formula for calculating such *eta squared* value is as follows.

$$Eta\ squared = \frac{t^2}{t^2 + (N1 + N2-)}$$

$$Eta\ squared = \frac{5.50^2}{5.50^2 + 48} = .38$$

To interpret the above obtained *eta squared* value, Table 2 was used. The calculated *effect size* is .38. By comparing this number with the Cohen's guidelines (table 2), it can be argued that this value is very large. That is, the magnitude of the differences in the posttest *means* (*Mean Differences* = 4.28) was large (*eta squared*= .38).

Paired-Samples t-test

Table 6 shows the *paired-samples t-test* between the pretest and posttest of the experimental group 1. Based on Table 6, *Sig. (2-tailed)* is .000, which is less than *.05*. Therefore, there was a significant difference in vocabulary learning of the experimental group 1 at time 1 (pretest) and time 2 (posttest).

Table 6. Paired-samples t-test between the pretest and posttest of the experimental group1

	Paired Difference					t	df	Sig (2-tailed)
Pair 1 Pretest-posttest	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the difference				
				lower	Upper			
	8.44	5.863	.829	6.774	10.106	10.179	49	.000

According to table 5, the *mean* score of the experimental group 1's pretest is 4.36 and its *mean* score of the posttest is 15.52. So, there was a significant increase in vocabulary scores from the pretest to posttest. Consequently, the first null hypothesis was rejected.

The following formula, proposed by Pallant (2007, pp.240), is one way to calculate the *effect size* statistic.

$$Eta\ squared = \frac{t^2}{t^2 + (N - 1)}$$

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$$Eta\ squared = \frac{10.17^2}{10.17^2 + 24} = .81$$

In table 2, the value of .138 has a large *effect size.* The obtained *eta squared* value of the *paired-samples t-test* for the experimental group 1 is .81, which is greater than .138; consequently, explicit instruction of thematic clustering new words into their L1 translation had a very large effect on vocabulary scores obtained after the intervention. Thereby, the first null hypothesis was again rejected.

4.3.2 Testing Null Hypothesis 2

RH0 2: Explicit instruction of clustering new words into their English definition using hyperlinks has no effect on enhancing vocabulary learning of Iranian intermediate EFL students.

Independent-Samples t-test

The Experimental group 2 and the control group were taken into account to test the above null hypothesis. According to table 7, the *sig. value* obtained from the posttest scores of the two groups is .31, which is greater than the value of .05. Thereby, the first line of table 7 is used to interpret the results. Based on the table, the *sig. (2-tailed) value* is .000 and below .05. Hence, there was a significant difference between the *mean* scores of the posttest of the two groups. According to table 7, the obtained *t-value* is 5.01 (*df* = 48).

Table 7. Independent-Samples t-test between the experimental group 2 and the control group

	Levene's Test Equality of Variances		T-test for Equality of Means						
	F	Sig.	t	df	Sig (t-tailed)	Mean difference	Std. Error difference	95% Confidence Interval of the difference	
								Lower	Upper
Posttest Equal Variance Assumed	1.041	.313	5.018	48	.000	3.440	.686	2.062	4.818
Equal Variance not Assumed			5.018	46.37	.000	3.44	.686	2.060	4.820

Since table 4 shows no exact *df* of 48, the *df* of 40 (the closest value below it), having the *cv* of 2.02 for *t* at .05 is selected to interpret the differences between the two groups. Since the *t-value* (*t* = 5.01) is greater than 2.02, there is a significant difference between the experimental group 2 and the control group at $p < .05$.

To indicate the magnitude of *effect size*, the *eta squared* formula (Pallant, 2007, pp. 236) for *independent t-test* was used as follows.

$$Eta\ squared = \frac{t^2}{t^2 + (N1 + N2 - 2)}$$

$$Eta\ squared = \frac{5.01^2}{5.01^2 + 48} = .34$$

According to Table 2, the obtained *eta squared* (.34) is also a large effect. Therefore, explicit instruction of clustering new vocabularies to their English definition had a large effect on vocabulary learning of the experimental group 2. In other words, the magnitude of the *mean difference* (3.44) between the two groups was

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large (*eta squared* = .34). Moreover, according to table 5, the *mean* posttest score of the experimental group 2 (14.68) was higher than that of the control group (11.24). Consequently, the second null hypothesis was rejected.

Paired-Samples t-test

Table 8 shows the *paired-samples t-test* between the scores of the experimental group 2 on two different occasions (pretest and posttest). Based on the table, the obtained *sig. (2-tailed)* is .000 and less than the value of .05. Accordingly, there was a significant difference in vocabulary learning of the experimental group 2 at time 1 (pretest) and time 2 (posttest).

Table 8. Paired-Samples t-test between the pretest and posttest of the experimental group 2

	Paired Difference					t	df	Sig (2-tailed)
Pair 1 Pretest-posttest	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the difference				
				lower	Upper			
	7.98	5.309	.751	6.471	9.489	10.629	49	.000

According to Table 5, the mean score of the pretest is 4.28 and the *mean* score of posttest is 14.68 for the experimental group 2. Therefore, there was a significant increase in vocabulary scores from pretest to posttest; the treatment was effective in vocabulary learning of the subjects of the experimental group 2. Consequently, the second null hypothesis was again rejected.

Using the *eta squared* formula of the *paired-samples t-test* (Pallant, 2007, pp.240) the researcher computed the magnitude of the effect of explicit instruction of clustering new words into their English definition via hyperlinks.

$$\textit{Eta squared} = \frac{t^2}{t^2 + (N - 1)}$$

$$\textit{Eta squared} = \frac{10.62^2}{10.62^2 + 24} = .82$$

According to Table 2, this number (.82) is a large effect size; i.e. such explicit instruction of strategies had a very large effect on vocabulary learning of the experimental group 2. Therefore, the second null hypothesis was again rejected.

4.3.3 Testing Null Hypothesis 3

H03: There is no difference among vocabulary learning of experimental group 1, experimental group 2, and Control group.

One-Way ANOVA was used to test the third hypothesis. According to table 9, the *sig. value* is .08, which is greater than .05; therefore, the mentioned assumption has been met. If such an assumption has been met, there is no need for the robust tests of equality of *means*: *Welch and Brown-Forsythe* (Pallant, 2007).

Table 9. Test of homogeneity of variances

Levene's Statistic	df 1	df 2	Sig.
2.611	2	72	.080

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Based on Table 10, the *sig. value* is .000, which is less than.05. Hence, the conclusion is that there was a difference somewhere among the *mean* scores of vocabulary learning test (i.e. posttest) for all the three groups. Consequently, the third null hypothesis was rejected.

Table 10. One-way ANOVA among posttest of all three groups

	Sum of Squares	df	Mean squares	F	Sig
Between Groups	257.147	2	128.573	17. 459	.000
Within Groups	530.240	72	7.364		
Total	787.387	74			

Table 11 tells us exactly where the differences among the groups occur. Accordingly, the following conclusions were drawn.

- There were some differences, but not a significant difference, between the experimental group 1 and 2 in vocabulary learning (*Mean Differences*=.840).
- There was a significant difference between the experimental group 1 and group 3 in vocabulary learning (*Mean Differences*=.4.280).
- There was a significant difference between the experimental group 2 and group 3 in vocabulary learning (*Mean Differences*=.3.440).

Consequently, the third null hypothesis was again rejected.

Table 11. Post hoc tests: multiple comparisons

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Group 1	Group 2	.840	.768	.521	-1.00	2.68
	Group 3	4.280*	.768	.000	2.44	6.12
Group 2	Group 1	-.840	.768	.521	-2.68	1.00
	Group 3	3.440*	.768	.000	1.60	5.28
Group 3	Group 1	-4.280*	.768	.000	-6.12	-2.44
	Group 2	-3.440*	.768	.000	-5.28	-1.60

Pallant (2007, pp. 247) believes that the information in table 10 is needed to calculate *eta squared* of the obtained results through the following formula.

$$\textit{Eta squared} = \frac{\text{Sum of squared between-groups}}{\text{Total sum of squares}}$$

$$\textit{Eta squared} = \frac{257.147}{787.387} = .32$$

The resulting *eta squared value* is .32. *Eta squared* of .138 is a large effect size in table 2. Since .32 is even greater than .138, the interpretation is that the *eta squared* of .32 is also a large *effect size*.

5. Discussion

By reviewing available literature, a number of related studies can be found concerning the effect of CALL, explicit strategy instruction, clustering, and cognitive strategies (in isolation or in combination) on vocabulary learning (See section 2). As mentioned previously, the research studies of Tozcu and Coady (2004) and Mizumoto and Takeuchi (2009) showed the positive effect of explicit vocabulary (strategy) instruction on vocabulary learning. Accordingly, it can be argued that their findings may be applicable to the results of research questions 1, 2, and 3 in which explicit vocabulary strategy instruction proved fruitful in vocabulary learning of the Iranian EFL learners. The results of the current study revealed better performance of the experimental subjects over the control ones in the vocabulary learning test.

According to Tinkham (1997), Al-Jabri (2005), and Motallebzede and Heirany (2011), thematic clustering enhance L2 vocabulary learning. Their findings was supported by the results of the research questions 1, 2, and 3 which highlighted the positive effects of clustering words on vocabulary learning of the experimental participants.

In the case of hyperlinks impacts, the positive effectiveness of hyperlinks was observed by the findings of De-Ridder (2002), and McAlpinea and Mylesb (2003). Their results were confirmed by the results of the research question 1, 2, and 3. However, the findings of Senconis and Kerst (1995) failed to show positive effect of a vocabulary strategy in a hypertext/hypermedia environment. Accordingly, it can be concluded that various VLSs response differently to a hypertext/hypermedia environment.

Cummins and Sayers (1997) believe that dictionary definition is an artificial, monolithic approach using abstraction; according to their belief, such way of learning is not sufficient for preparing learners to deal with natural communicative situations. Their claim is against the suggestion of Ellis (1995b) (as cited in Yan, 2010) who recommends that explicit learning is suitable when applied in linking the word to its definition. Consequently, the findings of the second research question may be applicable to the claims and findings of the Ellis (1995b) (as cited in Yan, 2010) but not to the beliefs of Cummins and Sayers (1997).

According to Laufer (2005), while teaching vocabulary, the L1 translation of words should not be banded; L1 translation should be judiciously used with words that have an exact or close equivalent in L1.She considered L1 glosses beneficial for vocabulary learning and text comprehension. Nation (2005) also argues that word card learning through repetition and L1 translation is very effective. However, Chepyshko ad Truscott (2009) suggest that L1 translation of words is neglected as it has restricted practical scope and it is a misleading way of vocabulary learning. Hence, although the result of the first research question, which showed the positive effect of L1 translation on vocabulary outcomes of the experimental group 1's subjects, was in sharp contrast with the claim of Chepyshko ad Truscott (2009), they supported the ideas of Laufer (2005) and Nation (2005).

In the study done by Jacobs *et al.* (1994), the results of the immediate test indicated that the subjects of the gloss conditions, either L1 or L2 gloss users, gained better vocabulary outcomes than the no gloss users. However, no significant difference was found between L1 and L2 glosses. The results of Yoshii's study (2006) showed that there were no significant differences between L1 and L2 glosses for definition-supply and recognition task. According to the findings, both L1 and L2 glosses were proved effective for incidental vocabulary learning. Although the findings of the Jacobs *et al.* (1994) were verified by those of Yoshii's study (2006), a questionnaire revealed that L2 gloss had been preferred to L1 gloss by the participants of Jacobs *et al*.'s study (1994).The two mentioned studies showed no difference between L1 and L2 glosses. These findings are in the same trend with the results of the third research question in a way that no significant difference was found between the first and the second experimental group and that the two experimental groups outperformed the control group.

Yan (2010) explored the impact of CALL on de-contextualized vocabulary learning. The study demonstrated that the two experimental groups outperformed the control group in vocabulary learning. Moreover, the third group (using method 3, a combination of glosses) had better and higher scores than the other two groups. The findings of Yan (2010) are probably similar to the findings of the research question three in which the experimental groups outperformed the control group in the case of vocabulary learning in a CALL environment. In sum, the results of the third research question validated the results of Jacobs *et al.* (1994), Yoshii (2006), and Yan (2010).

6. Conclusion

Some researchers have highlighted the positive effects of explicit strategy instruction (e.g. Mizumoto & Takeuchi, 2009), clustering (e.g. Tinkham, 1997), cognitive strategies (e.g. Yan, 2010; Yoshii, 2006), hyperlinks (e.g. De-Ridder, 2002), and combination of VLSs (e.g. Ellis & Beaton, 1993). On the other hand, other researchers carried out various studies examining the effectiveness of the above mentioned strategies on vocabulary learning

and their findings were in sharp contrast with the results obtained from those who stressed the beneficial impact of aforementioned strategies (e.g. Senconis & Kerst, 1995).

However, the present study was in the same trend with the findings of Mizumoto and Takeuchi (2009), Tinkham (1997), Yan (2010), De-Ridder (2002), and McAlpinea and Mylesb (2003) who stressed the positive effects of explicit strategy instruction, clustering, cognitive strategies, and hyperlinks, respectively. Consequently, it can be concluded that the combination of CALL, explicit strategy instruction, clustering, L1 translation, English definition, and hyperlinks is a fruitful vocabulary learning strategy helping EFL learners in producing better vocabulary outcomes.

Among all three groups under study, even though the two experimental groups receiving the strategies outperformed the control group in vocabulary learning, the experimental group 1 had better vocabulary gains than the experimental group 2. As mentioned previously (section 3.5.2), the subjects of the first and the second experimental group had to work on their CDs at home; this was a good way of producing self-directed learners and improving independent skills. Finally, it is worth to conclude that learning new highlighted and hyperlinked words is located under the approach of intentional and explicit learning, the type of learning in which the attention is focused directly on the new information (Schmitt, 2000).

Along with discussing some pedagogical implications for learners, teachers, teacher educators, and teacher training professionals, this study provided useful theoretical implications for text book writers and syllabus designers who aim at designing, presenting, and revising the content of teaching and learning materials.

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Notes

Note 1. Adapted from Cohen, 1988; as cited in *SPSS survival manual*, by Pallant, 2007, p.236.

Note 2. Adapted from Fisher and Yates, 1963; as cited in *Doing second language research*, by Brown and Rodgers, 2002, p.207.