The effectiveness of different explicit vocabulary-teaching strategies on learners' retention of technical and academic words

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The effectiveness of explicit instruction, within the context of strategy development in learners, has been widely accepted for several years. However, the methods used within explicit vocabulary instruction are varied and comparatively few studies have directly compared methods. This study investigates the type of instruction (in a visual or written context) as well as the timing of the activity (before or after the main activity). Seventy Arabic learners of English were tested in a 2*2 design. Results showed a positive effect for pre-teaching vocabulary in a visual condition. We conclude that this pre-emptive multimodal approach heightens the learners' ability to notice vocabulary items thus providing an effective strategy to increase vocabulary intake.

Keywords: vocabulary acquisition, teaching strategies

Introduction

One of the many challenges facing second language (L2) learners is how to learn new words. Teachers and researchers have developed many different strategies for vocabulary instruction including conscious (or explicit) and subconscious (or implicit) strategies. The aim of much research into teaching and learning strategies has been to make the learner aware of a particular item and draw his/her attention to it to facilitate subsequent learning and recall (Oxford 2003). In recent years, the majority of this research has focussed on developing strategies for the learner to use, especially since the development of the Strategy Inventory for Language Learning or SILL (Oxford 1990) whereas comparatively fewer studies have concerned the methods of teaching. However, recent developments relating to the structure of SILL have emphasised the important role that context, and the role of the instructor, can play in the effective development of language learning strategies (Kantaridou, this volume)

Many second language (L2) studies have compared the effects of implicit and explicit lexical instruction concluding that explicit instruction is more effective that implicit instruction (Norris and Ortega 2000). However, comparatively little research has been conducted to compare the effectiveness of different types of explicit instruction. This study addresses this problem by not only comparing implicit and explicit instruction but also by comparing different explicit teaching methods provided at different time points in the lesson.

Background

In this section we will discuss two different theoretical constructs that relate to vocabulary learning that we will combine in our experimental study: the "Noticing" Hypothesis (Schmidt 1990) and Dual-Coding Theory (Paivio 1971, 1986) before turning to two empirical studies that have examined different teaching strategies in vocabulary acquisition (Hennebry et al. 2017; Sonbul and Schmitt 2009).

The "Noticing Hypothesis"

Schmidt (1990, 1992) proposed his Noticing Hypothesis arguing that linguistic features are learned when learners are conscious of their presence in the sense of awareness of the form of the input at the level of "noticing". The noticing hypothesis developed mainly in a grammar-learning context. However, lexical studies indirectly highlighted its effectiveness, by learning new vocabulary through implementing lexical form-focused instruction (FFI) (e.g. Hill and Laufer 2003; Laufer 2006; Laufer and Girsai 2008; Peters 2006; Shintani 2013). Numerous studies have investigated the role of input enhancement to increase intake both in terms of vocabulary and grammar (Lee and Huang 2008; Petchko 2011; Peters et al. 2009; Sharwood Smith 1993; Sharwood Smith and Truscott 2014). Much of this input enhancement research involves manipulating the

text visually (e.g. the use of colour) and is outside of the visual, i.e. pictorial presentation that we will use in our study. Additionally, Nation (2013) argues that noticing can be triggered if a learner has had a previous contact with the word. Therefore, pre-teaching vocabulary may help learners notice the target in another context.

Dual-Coding theory (DCT)

The second theory that feeds into our proposed combined strategy is to provide visual-aided dialogues to the target words. The purpose of that is to enhance the learners' perception and investigate the visual effects on learners' retention. The Dual Coding Theory (DCT) presumes that there are two independent but connected cognitive processes involved in the mental representation of words: verbal and imagery codes (Sadoski 2005). In this theory a concrete word (e.g. *rock*) may evoke a verbal meaning as well as its visual appearance. On the other hand, it is much harder for an abstract word (e.g., *fact*) to evoke a visual representation. Previous research on the DCT has shown that concrete words have been better recalled than the abstract ones in typically developing children (Paivio and Yuille 1969; Paivio, Walsh, and Bons 1994; Sadoski, Goetz, and Fritz 1993) and in clinical populations (Gickling, Hargis, and Alexander 1981).

The DCT formed the basis for the Cognitive theory of Multimedia Learning (Mayer 2014). The Multimedia Principle suggests that when students are presented with both pictures and words, they learn better than when provided with words alone (Mayer 2005, 2009). This has also been supported by recent neuroscience findings (Sadoski and Paivio 2013).

As for lexical studies, contradicting results have been found in the literature for the application of multimedia for vocabulary learning. Negative results were associated with incidental implementation of visual aids to texts (Acha 2009; Kim and Kim 2012; Schnotz 2002). This may be due to the difficulties of assigning meaning to words incidentally (Mondria and Wit-De Boer 1991; Nation 2013). Xu (2015) compared the pictorial annotation to text-only annotation in terms of enhancing incidental abstract vocabulary gains. The results showed that participants gained more vocabulary knowledge through the visual annotation compared to the text-only condition. However, participants reported that they struggled to comprehend the designed visuals. Another possible reason for the unsuccessful results of some experiments in the literature is that the implementation of visual annotation is to the whole text rather than for the specific word or to the very context of the target word. That can make the learners distracted as they tend to focus more on the images and pay less attention to the words (Kim and Kim 2012; Schnotz 2002).

On the other hand, positive results were linked to the application of visual aids in vocabulary learning. Akbulut (2007) found that the learners exposed to the reading text plus visual annotation gained significantly higher incidental vocabulary than both those who were exposed to the text alone and those who were exposed to the text plus short video clips. Similarly, Yoshii (2006) found that texts plus pictures yielded significantly more incidental vocabulary gains than text only. Jones (2006) found that when supplementing listening activities with written or pictorial annotations, both types of annotations had significantly higher lexical incidental gains than those who did the listening exercises collaboratively in pairs without annotation. However, these studies have concentrated on concrete words with pictures. One of the challenges of visual representation is what to do with abstract words (Baddeley, Eysenck, and Anderson

2009). In our study, we will visually represent abstract, non-concrete technical and academic words visually using cartoons.

Empirical research on teaching strategies

In the previous sections, we have considered two theoretical constructs that motivate the use of materials in learning and teaching. In this section, we focus on two empirical studies that look at different direct (explicit) teaching methods.

Sonbul and Schmitt (2009) highlighted the importance of direct teaching focusing on the word itself, especially after incidental learning, as a consolidating strategy. They evaluated the effectiveness of explicit teaching of target vocabulary after reading by comparing learning vocabulary under implicit learning through only reading (Read-only) to learning aided by explicit teaching of word meanings (Read-Plus). Their tests assessed three levels of vocabulary knowledge (form recall, meaning recall, and meaning recognition). The results showed that the learners under the Read-Plus condition gained more target vocabulary than those under Read-only condition.

In a similar vein, Hennebry et al. (2017) examined two different methods of explicit teaching after listening activities in comparison to a control group with no explicit teaching after the listening activities. The two explicit methods related to the language of the explanations given in the teaching (either the L1 English or the L2 French). The findings showed that the explicit teaching groups surpassed the listening only group in vocabulary gains in both meaning recognition and meaning recall. Learners who received L1 English condition scored highest but higher proficiency learners were able to make use of the L2 French explanations. This study was significant in terms of comparing explicit instruction strategies to each other as well as comparing a combination of direct and implicit instructions to only implicit conditions.

As we have seen, while there are a number of studies comparing implicit and explicit instruction, little research has been conducted to compare the effectiveness of different types of explicit instruction. The current study does not only compare implicit and explicit measures but also compare the effectiveness of explicit teaching methods to each other.

Methodology

The review of previous work led us to develop three main research questions:

RQ1: Does direct vocabulary teaching enhance learners' retention of target words meanings?

In line with previous research on the benefits of explicit (vocabulary) instruction (Hennebry et al. 2017; Norris and Ortega 2000), we expect that the direct vocabulary teaching will be of greater benefit to our learners. This leads us to our second research question:

RQ2: What is most effective combination of the following direct vocabulary strategies in terms of enhancing retention of the target words meanings?

- Pre-teaching with visual-aided dialogues
- Post-teaching with visual- aided dialogues
- Pre-teaching with written-only dialogues
- Post-teaching with written-only dialogues

RQ3: What are the target participants' opinions and preferences to the proposed direct vocabulary strategies after they experience them?

In the remainder of this section, we will first outline the participants and experimental tests before turning to the selection of the target words and then the development of the teaching intervention.

Participants

The study used a quasi-experimental design incorporating six intact classes (n=88 students) divided into two groups. The experimental group contained four classes (n=56) and the control group two classes (n=32). However, due to participant mortality, in the final analysis only 41 participants remained in the experimental group and 29 in the control group. The participants were male, aged between 18-21 and in their second semester of their preparatory year before continuing to study Engineering or Applied Sciences. Following a distributional sampling method, each class contained a similar distribution of scores from the first semester to allow for cross-group comparisons (Dörnyei 2007).

The control group received no explicit instruction on the target vocabulary items, but the target items were present in the listening and reading activities in the textbook. The experimental groups each received explicit direct teaching using the four teaching strategies in addition to their normal textbook-based classroom activities (explicit instruction plus the same implicit exposure that the control group received) to control for individual class differences (see Table 1 for the teaching schedule).

Experimental Tests

The experiment used a pre-, post- and delayed post-test design. All tests were administered to all groups. The pre-test contained the initial 167 target words and following Hennebry et al. (2017), participants were asked if they recognized the word (meaning recognition) and if they could translate the word into Arabic (meaning recall). This two part vocabulary test addressed some of the criticisms levelled by Laufer and Goldstein (2004) on the superficiality of some single component vocabulary tests. Based on the pre-test results many of the words were already known by the participants. Therefore, any word known by 10 or more participants was excluded, leaving 69 words. Participants, who already knew some of the target words, were omitted from the analysis in the post-test and delay post-test for those words.

The five immediate post-tests were administered weekly to all groups and consisted of the both recognition and recall tasks. The delayed post-test contained all 69 target words and followed the same pattern as the post-tests.

Selection of target words (corpus analysis)

As the participants were all enrolled on the same course, they were being taught using the same textbook: *Oxford English for Careers Technology for Engineering and Applied Sciences* by Glendinning, Lansford, and Pohl (2013). This provided the opportunity to develop a list of abstract (non-concrete) technical and academic words used in the textbook that would be relevant to their studies. As Gardner and Davies (2014, p. 306) note:

> "Almost without exception, experts are calling for more explicit instruction of academic vocabulary, including more focused lists of 'core' academic vocabulary, as well as lists specific to certain disciplines of education".

After seeking permission from the publisher, a text only version of the textbook was imported into AntConc 3.4.3w (Anthony 2014). We then compared the results with the Academic Word List (AWL) (Coxhead 2000), the Academic Vocabulary List (Gardner and Davies 2014) and the domain-technical section with the COCA (Davies 2012). Initially 167 words were selected but after excluding known words based on the pre-test (see previous), a final list of 69 words was developed (see appendix).

Teaching Materials

A dialogue was created for each target word, giving context for its usage. This is particularly important as these words were non-concrete. As the treatment involved visual or written teaching materials, cartoons of the dialogues were also created. For each unit of the textbook, we designed a lesson containing the teaching materials using PowerPoint to ensure parity of delivery across classes and conditions. Each lesson contained on average five target words relating to either a listening or reading activity from the textbook. Depending on the condition, these lessons were either presented before (pre-) or after (post-) the activity in either visual or written form (Table 1 gives the schedule for each experimental class).

Every lesson presented a target word, followed by its part of speech, visual-aided or written dialogue with the target word in red, its English definition, its Arabic equivalent and instructions for the target word read-aloud. Unlike dictionaries, where the meaning is given first for a word followed by the example sentence, the design here provided the example sentence (dialogue) first in order to give the student a chance to discover the meaning through context and/or visual links. After that, the meaning was given directly to confirm what they have discovered.

Following the explicit vocabulary teaching, two types of follow up exercises were administered: the first required the student to select the correct word to complete a dialogue and the second required them to create a sentence using the target word. Lessons took between 15-20 minutes of normal class time and were delivered by the normal class teacher but were observed by the lead researcher.

The total period of treatment was eight weeks, including gap period to do the post-delayed test (two weeks). Teaching conditions were changed each week with immediate weekly post-tests. The different teaching conditions of direct lexical teaching and the treatment plan are as the following:

- Pre-teaching with visual-aided dialogues
- Post-teaching with visual- aided dialogues
- Pre-teaching with written-only dialogues
- Post-teaching with written-only dialogues

The teachers of the control groups were asked to continue teaching the text-book as usual, but the lead author would conduct some surprise tests after finishing some units.

Results and Analysis

In order to address the first research question comparing the implicit only control group with the explicit teaching experimental group, we calculated gain scores from the pre- to post-test and then from the pre- to delayed post-test for the experimental group as a whole, regardless of treatment, and the control group. As we used gain scores, we could exclude any items that were already known on the pre-test. We also excluded any participant who had not completed all the tests. This gave 41 in the experimental group (out of the initial 56) and 29 in the control group (out of the initial 32). In the results we found that many participants ticked more recognition scores in the pre-test than the post-test and as they may have exaggerated their knowledge, we have focussed on the recall scores. Table 2 gives the means, s.d. Mann Whitney U test (due to non-normal distributions based on Shapiro-Wilks tests) and Cohen's D scores for each of the between groups comparisons. This is also represented visually in Figure 1.

Table 1. Treatment design

Group	A	B	C	D
Week	**Teaching conditions**			
	pre-teaching	pre-teaching	post-teaching	post-teaching

1	(written-only)	(visual-aided)	(visual-aided)	(written-only)
Immediate post-test 1				
2	pre-teaching (visual-aided)	post-teaching (visual-aided)	post-teaching (written-only)	pre-teaching (written-only)
Immediate post-test 2				
3	post-teaching (written-only)	pre-teaching (written-only)	pre-teaching (visual-aided)	post-teaching (visual-aided)
Immediate post-test 3				
4	Mid-term break			
5	post-teaching (visual-aided)	post-teaching (written-only)	pre-teaching (written-only)	pre-teaching (visual-aided)
Immediate post-test 4				
6	pre-teaching (written-only)	pre-teaching (visual-aided)	post-teaching (visual-aided)	post-teaching (written-only)
Immediate post-test 5				
7				
8	Delayed post-test			

Table 2. % Recall of target items under explicit and implicit teaching conditions in two testing periods (immediate & delayed)

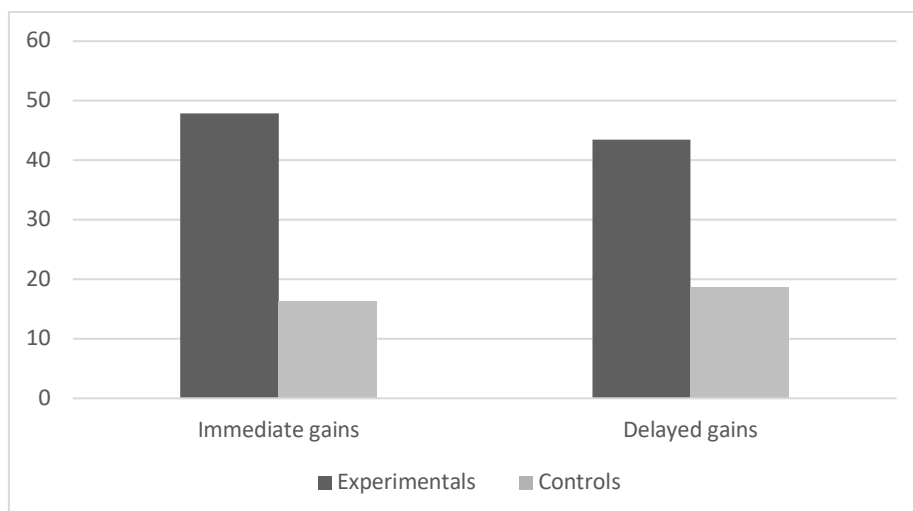|	Immediate tests				Delayed test			
Group	**M**	**SD**	**p**	**Cohen's d**	**M**	**SD**	**p**	**Cohen's d**
Experiment	47.8%	24.4			43.4%	26.1	<	
			< .001	1.45			.001	1.02
Control	16.4%	16.7			18.7%	21.1		

Figure 1: % Recall of target items under explicit and implicit teaching conditions in two testing periods (immediate & delayed)

As Figure 1 shows, the control groups' scores are comparatively low in meaning recall in both testing sessions (16.4% & 21.1%) whereas the experimental groups scored much higher (47.8% & 43.4%). Mann Whitney U tests (as shown in table 2) showed that these differences are statistically significant and the scores showed large effect sizes (Cohen's d) towards explicit teaching as (d= 1.45) in the post-immediate tests and (d= 1.02) in the post-delayed test (Cohen 1988; Plonsky and Oswald 2014). This suggests a benefit for explicit teaching over purely implicit teaching of vocabulary.

Our second research question asked what combination of pre-teaching versus post-teaching in a visual or written medium would be most beneficial on learner's recall. Table 3 gives the overall means and standard deviations for each of the gains in the immediate and delayed post-tests for the experimental groups.

Table 3. % Recall of target items under different combined teaching conditions in two testing periods (immediate & delayed)

Teaching method	n	Immediate tests		Delayed test	
		M	SD	M	SD
Pre-visual	41	61.6 %	22.7	56.7 %	26
Pre-written	41	46.8 %	28.8	42.9 %	32.5
Post-visual	41	49.4 %	32.6	41.9 %	27.2
Post-written	41	43.6 %	29.6	37.9 %	28.7

These results are represented visually in Figure 2. The results clearly show an advantage for the pre-teaching, visually presented condition in the immediate and delayed tests (61.6%; 56.7 % respectively). On the other hand, the lowest score was through post-teaching in written-only dialogues in both tests (43.6% & 37.9%).
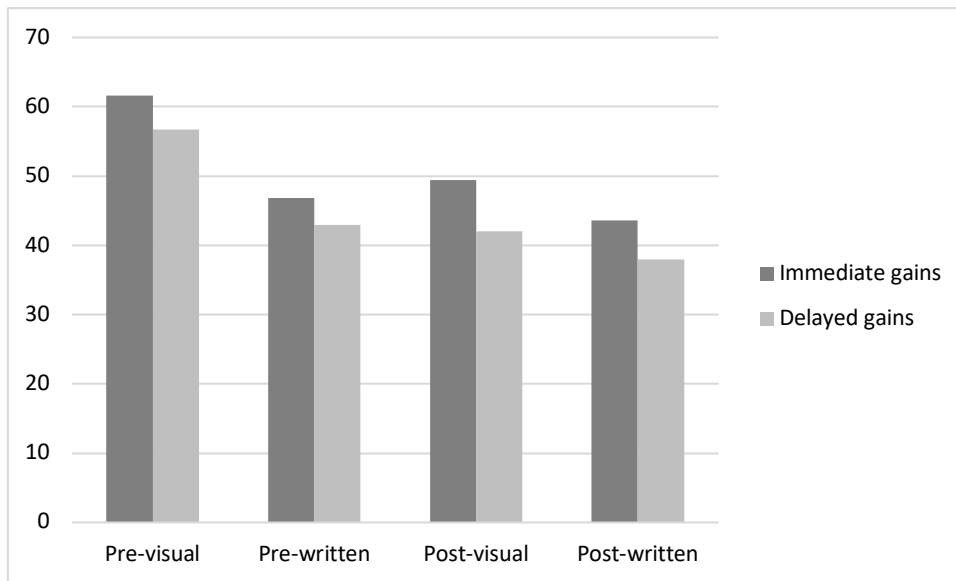
Figure 2: % Recall of target items under different combined teaching methods in two testing periods

In order to compare the differences between the four direct teaching conditions firstly a Kruskal-Wallis showed a main effect of group for gains at the post-test ($\chi^2 = 9.440$, $p=.024$) and at the delayed post-test ($\chi^2 = 10.111$, $p=.018$). Therefore, Mann-Whitney U Tests were conducted to compare between groups. The results are shown in Table 4:

Table 4. Mann-Whiney U tests comparing the differences between the four teaching methods

Teaching methods	n	Post-immediate tests		Post-delayed test	
		p	Cohen's d	p	Cohen's d
pre-visual vs. post-written	41	0.002	0.68	0.003	0.68
pre-visual vs. post-visual	41	0.072	0.43	0.014	0.55
pre-visual vs. pre-written	41	0.018	0.46	0.035	0.57
post-visual vs. post-written	41	0.56	0.18	0.44	0.14
post-visual vs. pre-written	41	0.81	0.03	0.99	0.08
pre-written vs. post-written	41	0.58	0.11	0.58	0.16

In both testing periods, the pre-visual condition significantly outperformed the post-written ($p= .0003$; $p= .006$) and the pre-written conditions ($p= .018$; $p= .035$). There was no statistically significant difference albeit a moderate effect size ($d=.43$) between the pre-visual condition and the post-visual condition ($p= .072$) in the

immediate post-test. However, in the post-delayed test the pre-visual condition significantly outperformed the post-visual group (*p*= 0.14). Other teaching conditions did not show any significant differences when compared to each other. This suggests that pre-teaching vocabulary through a visual medium was most beneficial to the learners' subsequent recall.

The third research question concerned the participants' opinions and preferences to the proposed direct vocabulary strategies after testing was complete. Table 5 shows the statements of the given questionnaire and the participants' responses towards them (n=41). The following scales were used to indicate the how they agree or disagree with each statement:

Table 5. Students' opinions and preferences to the proposed direct vocabulary strategies after they experienced them
1 = strongly agree   2 = agree   3 = disagree   4 = strongly disagree

Statement	Mean	SD	Max	Min
1- Pre-teaching helps me notice the target words in their units	1.80	0.56	3	1
2- Pre-teaching improves my understanding of some reading texts and listening conversations.	1.88	0.51	3	1
3- Pre-teaching helps me memorize the words when encountered it again in the unit.	1.80	0.60	3	1
4- Vocabulary pre-teaching is a helpful introduction to the target units	1.56	0.59	3	1
5- Vocabulary pre-teaching is difficult as it is done before having any idea about the target unit.	2.85	0.69	4	1
6- When words are being post-taught, I have already noticed them in their reading texts or listening conversations.	1.78	0.61	3	1
7- When words are post-taught, I feel have not encountered them before in the unit.	2.76	0.62	4	2
8- Vocabulary post-teaching helps me memorize the meanings of the encountered words.	1.93	0.82	4	1
9- Vocabulary post-teaching is easy as I have encountered the target words before in the taught unit.	2.15	0.73	4	1
10- I prefer vocabulary pre-teaching to vocabulary post-teaching.	1.88	0.95	4	1
11- There is no difference between pre-teaching or post-teaching for me	3.22	0.76	4	1
12- Vocabulary pre-teaching or post-teaching is a waste of time	3.66	0.48	4	3
13- Leaning vocabulary through dialogical cartoons makes it easier for me to understand the meaning of the target words	1.29	0.60	4	1
14- Cartoons help me remember target words and their meanings.	1.34	0.48	2	1
15- Learning vocabulary through dialogical cartoons is a waste of time	3.76	0.49	4	2

16- I prefer learning vocabulary through dialogical cartoons to learning vocabulary through written-only contexts.	1.39	0.67	4	1
17- There is no difference between teaching vocabulary through dialogical cartoons and teaching vocabulary through written-only contexts for me	3.56	0.50	4	3
18- The exercises provided after the vocabulary teaching sessions help me memorize the meanings of target words	1.71	0.56	3	1

According to the scores of the given questionnaire, the students thought that vocabulary pre-teaching helped them notice the words in their target unit (M= 1.80, SD= 0.56), improved their understanding of some reading texts and conversations (M= 1.88, SD= 0.51) and helped them memorize the words when met again in their target units (M= 1.80, SD= 0.60). They also considered that pre-teaching some target words could be a helpful introduction to the unit (M= 1.56, SD= 0.59). On the other hand, they did not think vocabulary pre-teaching was a difficult process as it was implemented before having any ideas about the target unit (M= 2.8, SD= 0.69). As for post-teaching, they thought they could recognize that the target words have been met earlier in their contexts before teaching them again (M=1.78, SD= 0.61). They do not think they had not noticed the post-taught words in the target unit (M=276, SD= 0.61). They found post-teaching helpful in memorizing the meanings of the target words (M= 1.93, SD= 0.82). They tended to agree that post teaching the target words was helpful as they had encountered the target words before (M= 2.15, SD= 0.73). They preferred pre-teaching the target words to the post-teaching (M= 1.88, SD= 0.95). The students disagreed with the statement that claims there was no difference between pre-teaching and post-teaching of the target words (M= 3.22, SD= 0.76).

The students almost strongly agreed with that dialogical cartoons help them understand the target meanings (M= 1.29, SD= 0.60) and remember them (M= 1.34, SD= 0.48). Moreover, they almost strongly preferred learning the target words through dialogical cartoons to learning them through written-only context (M= 1.39, SD= 0.67). They almost strongly disagreed with that learning the target words through visual-aided dialogues was a waste of time (M= 3.76, SD= 0.49). Finally, they found that the consolidative exercise given after the end of each vocabulary lesson were helpful in terms memorizing the target word meanings (M= 1.71, SD= 0.56).

Discussion

The first research question asked whether explicit teaching was more beneficial than implicit only teaching. The statistical results showed that explicit, direct teaching of target academic and technical vocabulary is significantly more effective in terms of target meanings retention in comparison to implicit only teaching. The results here are consistent with other similar studies which took place in different context such as Sonbul and Schmitt (2009) and Hennebry et al. (2017). In Hennebry et al. (2017) explicit teaching took place only after listening activities and the experimental manipulation was in terms of the language of the vocabulary explanations (in their case French or English). They found a sharp drop between the immediate and delayed post-tests and also in the overall number of words used. In our study, we did not find this large drop between the immediate and delayed post-tests and overall, the scores tend to be higher. In the (Hennebry et al. 2017) study, there were no consolidation activities following the teaching interventions and it is likely that the differences between the two studies can be attributed both to the use of consolidation activities but also the different mediums of presentation. In the Hennebry et al study, participants heard the word and then were given the meaning of the word in either French or English. In our study, they were given the word in a visual or written dialogue context and then the meaning in both English and Arabic.

The type of context that the dialogues were presented in, was specifically investigated in our second research question comparing the timing of the instruction (pre or post the reading/listening activity). The statistically significant differences and percentage increase towards pre-teaching through visual-aided dialogues shows that such a combination of lexical teaching strategies is effective in terms of target meaning retention. In order to examine why the participants' scores were better through the pre-teaching plus visual-aided instruction, the questionnaire administered for our third research question can provide some interpretations from the students' perspective.

The third research question concerned the participants' opinions and preferences regarding the direct vocabulary strategies after they experienced the four experimental conditions. The participants did not think that vocabulary direct teaching (whether pre-teaching, or post-teaching; through cartoons or written-context only) was a waste of time. They preferred pre-teaching to post-teaching the target words and found it helpful in terms noticing the words again in their target unit, understating the target contexts and memorizing the target meanings. Learning and memorizing can be, generally,

enhanced by noticing, and attention (Robinson 1995; Robinson et al. 2012). Noticing is considered as a major component in the processes of vocabulary learning and memorizing and it is enhanced by a previous exposure to the target words (Nation 2013). Pre-teaching here could serve as an enhancer to the target words before meeting them in their context as confirmed by the participants whereas in post-teaching, the learners may have noticed the target words in their original context to a lesser extent.

In some English L2 text-books, target vocabulary is highlighted explicitly before, after or during the target contexts. However, to our knowledge, no experimental study has compared pre-teaching lexical items to post-teaching in terms of lexical gain. Some previous studies, however, investigated the role pre-teaching compared non-teaching and reported positive results in terms text comprehension (McKeown et al. 1985) and in improving the quality of writing (Duin and Graves 1987). Other studies such as Alessi and Dwyer (2008) reported no effect of lexical pre-teaching in terms of reading comprehension. According to (Nation 2013) such inconsistent results are due to the type of instruction. In other words, if pre-teaching is rich, it will facilitate target texts comprehension whereas if the teaching does not deeply target what is involved in knowing a word, pre-teaching will appear without any significant effect. In our study the teaching was rich in that in contained both the target items, contexts, definitions and consolidation exercises. Having this rich input as pre-teaching addresses Nation's concern and perhaps increased the participants' ability to notice these vocabulary items again in the listening and reading tasks thus resulting in the increased gains we see in the post-tests.

The students also preferred learning the target lexical items trough visual-aided dialogues to learning them through written-only contexts. They found the cartoons to be helpful in terms of understanding and memorizing the target words items. In general, the role of visual aids in foreign language teaching is believed to be important. However, there are some experiments in the literature that showed no effects of using visual aids in lexical instruction and learning (Acha 2009; Kim and Kim 2012; Schnotz 2002). Such experiments as, discussed previously, either applied visual aids to target vocabulary without explicit instruction which created some kind of confusion, or applied visual aids to the whole texts which created distraction as the learners focused on the images and neglected the texts. The current study, on the contrary, implemented explicit instruction to the target words and applied the images only to dialogues created separately for each word, not for the target text. That can explain the positive results of

the current experiment in applying the visual aids as it avoided the potential risks of ambiguity and distraction. The application of multimedia learning in vocabulary teaching can be beneficial in terms of lexical meaning perception and retention (Sadoski and Paivio 2004). It makes learners, especially lower-achieving learners, feel positive as they notice learning in such a way is interesting and easier and, therefore, their attention span is enhanced, and their learning performance is increased (Chen and Fu 2003).

In our study, the target textbook, like many other L2 textbooks, applies visual aids to more concrete nouns when dealing with target lexical items instruction. However, this experiment linked the visual aids to teaching target non-concrete words and the students found it helpful in terms of enhancing their understanding of the target meanings. These findings are in line with the Dual Coding Theory that suggests that words evoke both verbal and imagery codes (Sadoski 2005). By using the visual cartoons to present the target vocabulary, it allows learners to use both the verbal and imagery codes in order to acquire the target item. Moreover, this result is especially interesting and innovative as it applies this method to non-concrete items, suggesting that even in these more abstract situations, the imagery code is still used.

Conclusion

In conclusion, the study has confirmed the results of similar experiments, in different contexts, that compared combining implicit and explicit lexical instruction to implicit instruction alone. Schmitt and McCarthy (1997, 3) highlighted that issue as they stated "we believe we should not be thinking in terms of better/worse or either/or, but rather we should see the two methods as complementary". In comparing different methods of explicit instruction (visual versus written) at different times of the class (pre and post the target listening or reading activity), we have shown that pre-teaching the vocabulary through a visual means is not only more beneficial in terms of intake but also possible even with non-concrete items. This is in line with the "Noticing Hypothesis" (Schmidt 1990, 1992; Robinson 1995) and the Dual Coding Theory (Paivio 2008; Sadoski 2005). We suggest that adult L2 learners can best learn vocabulary if they are aware of it (explicitly) and through activating both the lexical form and the visual imagery in accordance with the 'multimedia effect' view of language learning (Mayer 2005).

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Appendix : Target words for experimental groups

Target words	
1- survey	36- current
2- assurance	37- recognize
3- involve	38- precision
4- appeal	39- trend
5- assess	40- prior
6- diagonally	41- prospect
7- realize	42- emphasize
8- evaluate	43- specialism
9- afford	44- regulate
10- ratio	45- germinate
11- bend	46- cultivate
12- intensity	47- discharge
13- responsive	48- poverty
14- function	49- potential
15- pressurized	50- contamination
16- rapidly	51- permeability
17- apply	52- apparently
18- dummy	53- sector
19- patrol	54- consume
20- surveillance	55- respectively
21- restrain	56- split
22- reinforced	57- illustrate
23- adjust	58- vary
24- bolt	59- photovoltaic
25- prefabricated	60- revenue
26- eventually	61- viable
27- numerical	62- accommodate
28- permit	63- characteristic
29- demanding	64- volume
30- individual	65- relevant
31- defect	66- sufficient
32- induce	67- issue
33- ventilated	68- considerably
34- rate	69- figure
35- mental	

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