



ESP Students' Aviation Vocabulary Learning: Effects of Synonym/Antonym vs. Input Enhancement

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Abstract

This study investigated the impact of two instructional techniques (synonym/antonym vs. input enhancement) on ESP students' aviation vocabulary learning. Furthermore, it meant to specify the Vocabulary Learning Strategies (VLS) most frequently utilized by the participants. The study included sixty male aviation ESP Learners, who were randomly put into three groups (one control and two experimental ones). Sixty new aviation lexical items were administered to the learners in the form of a Vocabulary Knowledge Scale (VKS). Forty aviation vocabulary items were chosen to construct a multiple-choice test to be applied as pre- and post-tests. To examine the frequency of VLS, the researchers made use of a VLS questionnaire. The results indicated a substantial enhancement in the performance of the experimental groups versus that of the control group, which reveals the noticeable role of contextual and textual clues in ESP vocabulary learning. Moreover, the findings pointed out that the input enhancement technique was superior to the synonym/antonym technique. Finally, similarities and differences were detected between the experimental groups regarding frequently-used VLS. The findings of the study have implications for ESP teachers, students, and syllabus designers.

Keywords: aviation vocabulary, ESP, input enhancement, synonym/antonym, vocabulary learning strategies

1. Introduction

Vocabulary knowledge means to know a lexical item and be able to use it. There are different levels of knowing a word: (1) having no knowledge, (2) having a general sense of a word, (3) having a limited knowledge, and (4) having a sound knowledge. The learners will not be provided with enough information about the word to use it appropriately in the first two levels. The learner, in the third level, has a context-bound knowledge of the word, which means that the learner is only capable of using the word in a specific situation and cannot generalize the word meaning to different situations. In the highest

level of knowledge of vocabulary, the learner has a sound knowledge of the vocabulary item and is capable of generalize the word meaning to various situations (Beck, McKeown, & Kucan, 2002).

Vocabulary knowledge is mostly regarded as a vital device used in all types of learning including learning English for Specific Purposes (ESP) since restricted vocabulary knowledge in a foreign language (FL) hinders successful communication. Borkovska (2007) describes the direct and complementary relationship that language use and vocabulary knowledge have; from one perspective, language use is qualified through knowledge of vocabulary and, from another perspective, vocabulary knowledge is increased through language use. Schmitt (2000) emphasizes that “lexical knowledge plays a pivotal role in both communicative competence and Second Language Acquisition (SLA)” (p. 55).

Two basic methods of vocabulary teaching involve incidental and intentional methods. Intentional vocabulary teaching has been defined as an instruction with the clear intention of teaching the word meaning. For example, providing the meaning of a word through dictionary use or a more informed individual with the aim of enabling the learners to pick up a lexical item and its meaning is called intentional instruction (Schmitt, 2008). Incidental vocabulary instruction takes place when words are picked up as learners' attention is on language use (Zimmerman, 2014). The teaching process draws learners' focus from the meaning and form of words to word uses while there is a focus on communication, and finally the learner acquires the word's meaning. Media, conversations, and written documents such as magazines, letters, or books are some sources that enable students to learn vocabulary incidentally. (Beck, McKeown, & Kucan, 2002).

Both intentional and incidental learning can happen through giving contextual and textual clues to language learners besides using Vocabulary Learning Strategies (VLS). Contextual clues include definition, synonym, and antonyms. We may define them as “obviously stated or inferred words or phrases which help to figure out unfamiliar words in context because they can activate the corresponding context to shed light on the contextual meanings of the words concerned.” (p. 51) (Sun & Zhou, 2005, cited in Yang Na, 2009).

Both output-based and input-based tasks have been found to lead to lexical gains in L2 learning (e.g., Duong, et al., 2021). However, the present study is concerned with input-based vocabulary instruction. A variety of techniques have been utilized to enhance the saliency of input ranging from explicit discussion, input floods, clarification requests to textual input enhancement. In this technique, some parts of the input are intentionally enhanced through typographically manipulating (e.g., underlining, italicizing, highlighting, and bolding) of the form of new words to cause the learners pay attention to the formal properties and increase perceptual saliency of the language to reinforce L2 development.

In psycholinguistic-based studies and regarding teaching methods and techniques, input enhancement (i.e., drawing the learners' attention to particular points in the language they receive) has received significant consideration. The theoretical foundation underlying the studies is that attention has a vital role to play in the development of second or foreign language (Robinson 1995; Schmidt 1995). However, the way of input presentation for the learners to be well-noticed is a debatable idea among researchers. The central point of Input Enhancement (IE) is focusing on methods that help the teacher make particular linguistic features more noticeable for learners to increase their understanding and awareness which finally leads to facilitating acquisition (Smith, 1991, 1993). Textual input enhancement (TIE) is among the useful and practical procedures in SLA intending to promote the acquisition.

Another key point investigated in the current study is VLS, which refer to the activities chosen by learners to learn new aviation words. Two main categories for VLS have been proposed: (a) Discovery strategies which refer to strategies used by learners to gradually increase degree of familiarity with unknown words (b) Consolidation strategies which refer to strategies used by learners to consolidate new words (i.e., to retain the previously encountered words) (Schmitt, 1997). It also needs to be noted that sometimes learners tend to use some strategies more than others (Tran, 2020).2.

2. Literature Review

2.1. Synonym/Antonym

In learning a foreign language, vocabulary is a crucial component. Learning vocabulary is viewed as the fundamental stage of learning a foreign language. Many different techniques of language learning have various perspectives about words (Jesa, 2008). Some of the main language teaching methodologies have focused on vocabulary learning, and some other methodologies have not considered it (Schmidt, 2000). Nowadays, learning vocabulary is a critical element of one's mother tongue acquisition and of FL learning (Morra & Camba, 2009). Furthermore, it is stated that researchers involved in FL learning pay special attention to FL lexical development (Zu, 2009). Moreover, it is argued that having a high lexical knowledge facilitates communicative competence and is a main aspect of language acquisition (McCrostie, 2007).

Like pronunciation and grammar, knowledge of vocabulary is a central component of language learning (Nation & Waring, 1997). Vocabulary should be taken into account as an obligatory component of learning an FL as it facilitates interaction so that a required vocabulary knowledge independently might be sufficient for some communication to happen (Wallace, 1982). Furthermore, Celce-Murcia and Rosensweig (1989) have a similar idea that lexical knowledge needs to be established as an essential component from the onset of language teaching. In addition, they are of the contention that having a sufficient vocabulary knowledge with a limited knowledge of grammar generally aids the language learner in reading and achieving more effective cooperation than enjoying an impeccable knowledge of grammar without a sufficient lexical repertoire.

Few studies have explored the impacts of synonym/antonym utilization on vocabulary learning. Higa (1963) reported that the learning of two synonymous lexical items simultaneously is more complicated than the learning of two antonyms. Moreover, he found synonymy to make vocabulary more difficult to learn (Laufer, 1990). Besides, synonymy was argued to be one of the seven interlexical ingredients that can decree vocabulary learning opportunities (Laufer, 1990). She reported two reasons for the relative difficulty of acquiring synonyms, as compared to other vocabulary items. Firstly, making mistakes about synonyms is frequent as some synonyms lend themselves to being properly replaced in some, but not all, contexts. For instance, powerful and strong are considered as synonyms; however, mainly tea is solely strong, and engines are rarely strong but may be powerful. This point reveals the relative difficulty of acquiring some synonyms in comparison to others. This is because synonyms with the same meaning sometimes have different collocations. Secondly, attempts by low level learners to acquire words with the same meaning are unlikely as they prefer to invest their time on learning words with unfamiliar meanings rather than synonyms.

The efficacy of synonymy in improving Japanese EFL learners' word knowledge was examined by Webb (2007) examined. He employed two sets of words (mostly verbs and nouns). The word sets included 10 less frequent lexical items without high-frequency synonyms and 10 less frequent lexical

items with high-frequency synonyms. Glossed sentences were employed to expose the participants of one experimental group to the target words, and word-pairs were utilized to present the target words to the participants in another experimental group. Synonymy was found to facilitate vocabulary learning. Participants' marks for lexical items with known synonyms were considerably better than their scores for words without known synonyms. The findings indicated the easiness of learning synonyms for known words in comparison with the learning of the words without known synonyms.

Hoshino (2010) investigated the effect of five kinds of lists of lexical items including antonyms, synonyms, thematic, categorical, and arbitrary on the vocabulary learning of Japanese EFL learners. The subjects were put into five groups (one control and four experimental ones). After the instruction, the comparative efficiency of the word lists types was scrutinized. The inquiry demonstrated the kind of word list had no substantial impact on vocabulary learning and no type of word list was called the most effective type. However, the experimental group's learners memorized the lexical items more effectively than the subjects in the control group. Hence, word list type was argued to affect vocabulary learning more strongly than the individual learning style.

Al-Khawaldeh, et al. (2024) investigated the impact of vocabulary instruction via semantic relations (i.e. hyponymy, metonyms, synonymy, antonymy, homonymy and polysemy) on the breadth and depth of EFL learners' vocabulary knowledge. The findings indicated that Jordanian EFL learners are unaware of all semantic associations. Despite being capable of identifying hyponymy, synonyms and antonyms, they could not provide various words having these semantic relations.

2.2. Input Enhancement

The effectiveness of TIE in the instruction of language sub-skills such as grammar, vocabulary, and collocations on the one hand and in skills of listening, reading, speaking, and writing on the other, has been investigated by various research studies since its introduction in the 1990s. For example, the efficacy of input enhancement in improving Iranian intermediate EFL learners' listening comprehension was investigated by Tabatabaee and Kashavi (2016). They reported that the input enhancement technique through the forms of slowing down the rate of speech and repetition was superior to the traditional way of teaching listening.

Jones and Waller (2017) also scrutinized the efficacy of textual and aural input enhancement in teaching lexical items in productive and receptive forms to 40 Turkish elementary EFL learners. The results showed statistically significant larger gains of lexis in the experimental group.

Along the same lines, Ghanei Arani and Yazdanimoghadam (2016) attempted to investigate the effect of textual enhancement (TE) and input flooding (IF) on syntactic development in EFL learning. The first group of their participants received reading comprehension passages including flooded structures; while, the second group was exposed to reading comprehension texts that were textually enhanced, and the third group received the reading comprehension passages containing enhanced structures in the forms of input flood and textual enhancement. This study revealed the efficacy of textual enhancement and input flooding in syntactic recognition and production. Moreover, higher acquisition scores were achieved in production and recognition when these techniques were combined.

The efficacy of textual input enhancement in the lexical intake of 91 elementary EFL learners was investigated by Nahavandi and Mukundan (2014). Five reading texts following comprehension questions were given to both the control and experimental groups. The results of their inquiry indicated

that the group receiving texts with input enhancement through bolding outperformed the group which received no enhanced input in multiple-choice recognition tests.

Jabbarpoor and Abdollahzadeh (2013) investigated the impact of textual enhancement on the acquisition of linguistic forms of 30 homogenous freshmen majoring in applied linguistics. Due to the pre-test lowest mean scores, subjunctive mood and inversion were chosen as the target structures among four English structures – namely, prepositions, modals, subjunctive moods, and inversion. They presented authentic texts containing 48 subjunctive target structures during 12 treatment sessions. Through the use of underlining, bolding, and italicizing, the texts were typographically enhanced for the experimental groups. Another target form used in this study was inversion structures which required learners to change the usual word order of subject and verb. Textual enhancement was revealed to assist the learning of the grammar structures. However, short-term and long-term superiority of subjunctive form over inversion was detected.

Loewen and Inceoglu (2016) examined the effect of visual (textual) enhancement of input on the development of past tense in L2 Spanish. They investigated the impact of highlighting particular grammatical forms in a text on increasing learners' knowledge and perception of target structures. The results showed the learners' awareness of the grammatical structures highlighted in the passage. Nevertheless, the study could not find a significant difference in the quantity of attention between the unenhanced and enhanced conditions, and finally no differential advancement was detected between the subjects in the two conditions.

More recently Rezvani and Polemikou (2020) probed into the efficacy of different sorts of input enhancement (i.e., input flooding, and semantic and visual input enhancement) in vocabulary development of Iranian learners at intermediate level of EFL proficiency. The participants were assigned to one control and three experimental groups. The findings indicated that all the treatment groups performed better than the control group on comprehension and production of L2 vocabulary. As to the three input enhancement types, no substantial discrepancy was detected among them.

In Iranian ESP context, Shahpari and Ahmadishokouh (2020) inquired into the effect of input enhancement (microgenetic method) on 40 Iranian students' production of conjunctions. The participants were 40 male ESP students studying Electronics in a university in Tehran. The results highlighted that input enhancement significantly improved conjunction production by Iranian ESP learners.

2.3. Vocabulary Learning Strategies

Vocabulary learning strategies play a determining role in learners' success in L2 vocabulary learning, confirming the significance of VLS research and application (Coady 1997; Gu 2003a; Mercer 2005; Nation, 2006; Schmitt 2000). Furthermore, the language learning context significantly influences the vocabulary learning strategies utilized by L2 learners. The findings of a number of relevant studies are present below.

Nacera (2010) endeavored to find out if there was a relationship between vocabulary size and language learning strategies. The study found that the strategies mostly utilized by learners with higher vocabulary size are different from the ones applied by learners with lower vocabulary size.

Regarding the usefulness of strategy instruction in L2 vocabulary learning, Nshwi (2020) explored the efficacy of explicit vs. implicit instruction of cognitive and memory strategies in L2

vocabulary learning. The study found that training students to use memory and cognitive strategies explicitly augments learning vocabulary more than implicit instruction.

Concerning the role of students' word level, Citrayasa¹, et al (2022) described and analyzed the VLS utilized by low-frequency-word level learners. The authors concluded that low-frequency-word level learners mainly used guessing, dictionary, and activation strategies. Whereas, rehearsal, note-taking, metacognitive strategies were the least frequent VLS.

With respect to the most frequently used VLS in ESP context, Duong (2022) found that learners used strategies for learning ESP vocabulary moderately. Moreover, metacognitive strategies were the most frequently employed among six groups of VLS, while social strategies were the least frequent.

The last, but not the least, Feng, et al. (2023) investigated the efficacy of mind mapping, as widely used helpful vocabulary-learning strategy, in Iranian EFL learners' lexical improvement. They examined how the mind-mapping technique affected Iranian EFL learners' vocabulary recall and retention. They maintained that the treatment enhanced the participants' vocabulary learning and improved their creativity.

2.4. Present Study

Due to paucity of studies on the possible influences of input enhancement and synonym/antonym technique on vocabulary learning (strategies) in ESP context, this study was undertaken to shed more light on developing target language vocabulary learning for specific purpose. In fact, one contribution of the study is to work on proper teaching techniques to help learners acquire specific aviation terms to better understand the aviation texts. Moreover, VLS vary significantly across different contexts, influenced by factors such as language type, learners' language proficiency level, and instructional methods. The influence of instructional methods on the use of VLS seems to be an under-investigated area. Therefore, another contribution of the study is to explore the VLS most frequently used by ESP students across the two instructional conditions.

3. Research Questions

This study seeks to contribute to the growing body of literature on flipped learning by providing comprehensive insights into its impact on the reading skills of engineering students. By examining a larger population within a specific educational context, this research aims to offer practical recommendations for educators seeking to enhance language learning through innovative pedagogical approaches. More specifically, this study focuses on the following research questions:

1. What is the impact of the flipped classroom approach on engineering students' language achievement?
2. What are the engineering students' views towards the flipped classroom approach?

4. Method

4.1. Research Design

This study utilized a quantitative quasi-experimental design to evaluate the impact of the flipped classroom approach on engineering students' language achievement and their perceptions of this instructional method. The study was conducted with two groups: an experimental group, which was

instructed using the flipped classroom approach, and a control group, which received traditional lecture-based instruction. Each group comprised 20 students, totaling 40 participants. The design incorporated a pretest-posttest structure to allow for comparative analysis of language achievement scores before and after the intervention. The independent variable in this study was the type of instructional approach (flipped classroom versus traditional lecture-based), while the dependent variable was students' language achievement, measured through standardized language tests. Additionally, students' motivation and perceptions regarding the flipped classroom approach were assessed using a questionnaire adapted from Aljaraideh (2019) and administered to the experimental group.

4.2. Participants

This study was conducted in Khatam-ol-Anbia University, on intermediate male students who were studying their specific English course "Command English" (Arnold & Sacco, 2013) in their fifth educational semester. The participants were 60 male randomly selected students, aged between 19 and 23, who were randomly assigned to three groups (one control and two experimental ones), each consisting of 20 learners. All of the participants had the same condition of learning settings.

4.3. Instruments and Materials

4.3.1. Aviation English Words

In the present study, a word list containing 60 English aviation words and expressions was utilized. The words were selected from "Command English" (Arnold & Sacco, 2013). The selected items belonged to various parts of speech including nouns, verbs, and adjectives.

4.3.2. Vocabulary Knowledge Scale (VKS)

The list of aviation terms was accompanied by the second instrument, a VKS, developed by Wesche and Paribakht (1997). The scale consists of five hierarchical categories about the different aspects of a single word. The first category shows that the participant has not even seen the word and the fifth one indicates that the participant knows how to use the word semantically and syntactically. This scale aimed at assessing the qualitative knowledge of participants about each word. The stages mentioned by Wesche and Paribakht are as follow:

1. I don't remember having seen this word before;
2. I have seen this word before but I don't know what it means
4. I have seen this word before and I think it means.....
5. I know this word. It means.....
6. I can use this word in a sentence.

The criterion for including the words in the experiment was the total unfamiliarity of the participants with the words, as indicated by stages 1 and 2 in the scale. Besides, the KR-21 reliability value of this scale reached 0.83 estimated through a pilot study done with 30 ESP students who shared similar characteristics with the main sample of this study. Meanwhile, two university TEFL instructors accredited the content validity of this instrument.

4.3.3. Vocabulary Learning Strategy (VLS) Questionnaire

A questionnaire from Cheung (2004) was chosen to examine the frequency of VLS used by the participants. This questionnaire was constructed on the basis of Schmitt's (2004) VLS taxonomy. It included 27 statements as follows: cognitive strategies (five statements), determination strategies (nine statements), memory strategies (ten statements), and social strategies (three statements).

A 5-point Likert scale was utilized to measure the frequency of use of the strategies. (1 = Never to 5 = Always). The Cronbach's alpha reliability index of this scale turned out to be 0.87 estimated through the pilot study, and, two university TEFL instructors accepted the content validity of the questionnaire.

4.4. Procedure

To conduct the present research, three groups of learners were selected. Sixty English aviation-specific terms were chosen from the participants' course book "Command English". Enjoying both synonym/antonym and input enhancement techniques for word choice was the first priority in this selection stage. These target words included diverse word types including verbs, nouns and adjectives. Next, Wesche and Paribakht's VKS (1997) accompanied the list. VKS consisted of five categories, each representing one aspect of each target word. Unfamiliar or unknown words were used in the experiment. When the participants marked the first two categories, the unfamiliarity of the target terms were approved for the researcher. Put another way, the ultimate criterion to include the selected words in the experiment was the total unfamiliarity on the part of the participants. The excluded words (20 in total) were those which were known to the participants. Following the vocabulary pre-test administration, an average of five words for each session was presented to the participants. The synonym/antonym group received the instruction through synonym/antonym technique of vocabulary instruction, and the input enhancement group was exposed to instruction through typographical enhanced clues such as highlighting, underlining, CAPITALIZING, and italicizing. However, those in the control group received the conventional teacher fronted way of vocabulary instruction. In fact, the teacher defined the new words and made the students to repeat the correct pronunciation of the new word. The treatment period lasted for eight sessions and all other conditions were the same in the three groups.

4.5. Statistical Analysis

To examine the researcher-made vocabulary test reliability, KR-21 and to compute the final results, SPSS version 22 were used, respectively. Paired Samples T-test was adopted to compare the mean score of each group from pre-test to post-test. In addition, one-way Analysis of Variance (ANOVA) was applied to make a comparison between the scores obtained from the experimental groups and the scores of the control group to decide if any significant difference existed between them. Regarding using VLS, descriptive statistics was utilized to determine the most-frequently used strategies.

5. Results

Initially, a pre-test was run to scrutinize the homogeneity of the groups (synonym/antonym, input enhancement, and control) with respect to vocabulary knowledge before any intervention. The data were analyzed using SPSS 22. The results are as follows.

According to Table 1, the pre-test mean score for the synonym/antonym condition was 11.90, and the corresponding standard deviation was 1.25. Furthermore, the pre-test mean score for the input enhancement condition was 13.05, and the associated standard deviation was 1.53. Finally, the pre-test mean score of the control condition was 12.05, and the resultant standard deviation was 1.14.

As to the post-test, the mean for the synonym/antonym condition reached 16.80, and the standard deviation was 1.15. Moreover, the mean score of the input enhancement condition was 22.00 with the standard deviation was 2.44. Finally, the mean score for the control condition was 15.90, and the corresponding standard deviation was 1.68.

As demonstrated in Table 1, the means for the three groups were not the same. To see if these differences were statistically significant, the researcher conducted One Way between groups ANOVA. The results of Test of Homogeneity and ANOVA for the pre-test scores are available in Table 2 and Table 3, respectively.

Table 1

Descriptive Statistics of Vocabulary Tests for the Three Groups

		Sum of Squares	df	Mean Square	F	Sig.
Between Groups	(Combined)	32.652	11	2.968	3.216	0.006
	Linearity	24.578	1	24.578	26.625	0.000
	Deviation from Linearity	8.074	10	0.807	0.875	0.567
Within Groups		25.848	28	0.923		
Total		58.500	39			

As it could be understood from Table 2, the Levene's test p value was insignificant ($p = 0.24$), so we were in a safe place to report the ANOVA result for the pre-test.

Table 2

Homogeneity of Variances for Pre-test

Levene Statistic	df1	df2	Sig.
1.453	2	57	0.243

As see in Table 3, the results were significant, $F(2,57) = 0.076$, $p > 0.05$. As $p > 0.05$, so it was confirmed that the three groups do not differ significantly from each other in the pre-test.

Table 3

ANOVA for Vocabulary Pre-test Scores

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	15.633	2	7.817	4.469	0.076
Within Groups	99.700	57	1.749		
Total	115.333	59			

To answer research questions 1 and 2, the researchers conducted a post-test after both interventions. For each group, a paired samples t-test was run to decide if a significant change took place in the subjects' scores from pre-test to post-test. The results of the descriptive statistics and paired samples t-test for the synonym/antonym condition are presented in Table 4 and Table 5 respectively. As it is shown in Table 4, the pre-test mean score was 11.90, and the post-test mean score was 16.80. To

decide if the change is statistically significant, the researchers made use of paired samples t-test, the results of which appear in Table 5.

Table 4

Descriptive Statistics for Synonym/Antonym Condition

	Test Time	N	Mean	SD	SEM
Pair 1	Pre-test	20	11.90	1.25	0.284
	Post-test	20	16.80	1.15	0.251

As it is demonstrated in Table 5, $t(19) = -22.64$, $p = 0.001$, $p < 0.05$, which shows the existence of a significant difference between the mean scores i.e., 4.90. Therefore, we could conclude that there was a noticeable improvement in the synonym/antonym group's mean score from the pre-test to the post-test.

Table 5

Results of Paired Samples Test for Synonym/Antonym Condition

	Paired Differences			t	df	Sig. (2-tailed)		
	Mean	SD	SEM				95% Confidence Interval of the Difference	
							lower	upper
pair 1 pre-test post-test	-4.90	0.96	0.21	-5.35	-4.44	-22.64	19	0.001

The descriptive statistics and paired samples t-test results for the input enhancement group are demonstrated in Table 6 and Table 7 respectively. As it is shown in Table 6, the pre-test mean score was 13.05 while post-test mean score was 22.00. To see if this difference is statistically significant, the researchers utilized paired samples t-test (Table 7).

Table 6

Descriptive Statistics for Input Enhancement Condition

	Test Time	Mean	N	SD	SEM
Pair 1	Pre-test	13.50	20	1.54	0.343
	Post-test	22.00	20	2.45	0.547

As Table 7 shows, $t(19) = -21.32$, $p < 0.05$, indicating the existence of a significant difference between the pre-test and post-test mean scores. Therefore, taking into account the descriptive statistics and paired samples t-test results, the researchers concluded that there is a significant improvement in the input enhancement group's mean score from the pre-test to the post-test with the mean difference of 8.95.

Table 7

Paired Samples T-Test for Input Enhancement Condition

	Mean	SD	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2- tailed)
				lower	upper			
Pair 1								
Pre-test	-8.95	1.87	0.420	-9.828	-8.071	-21.32	19	0.001
Post test								

Table 8 and Table 9 contain the descriptive statistics and paired samples t-test results for the control group, respectively. The results indicated that the mean score for pre-test was 12.05 and that of post-test was 15.90. To decide whether this difference is statistically significant, the researchers performed paired samples t-test (Table 9).

Table 8

Descriptive Statistics for Control Condition

	Test Time	N	Mean	SD	SEM
Pair 1	Pre-test	20	12.05	1.14	0.357
	Post-test	20	15.90	1.68	0.582

Table 9 shows that paired samples t-test result was significant, $t(19) = -10.34$, $p < 0.05$, indicating the existence of a significant difference between the control group's pre-test and post-test mean scores. In fact, the results showed that the mean difference was 3.85.

Table 9

Results of Paired Samples Test for Control Condition

	Mean	SD	SEM	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
				lower	upper			
Pair 3								
Pre-test	-3.85	0.842	0.211	-4.721	-3.567	-10.34	19	0.003
Post test								

To answer research questions 1 and 2, the researchers compared the participants' mean scores on the post-test. As Table 10 reveals, the means for the three groups were not the same. However, to see if these differences were statistically significant, the researcher conducted One-way ANOVA.

Table 10

Descriptive Statistics for Vocabulary Post-test Scores

Group	N	Mean	SD	SEM
Synonym/Antonym	20	16.80	1.15	0.252
Input Enhancement	20	22.00	2.44	0.545
Control	20	15.90	1.68	0.371
Total	60	18.23	3.25	0.429

The results of Test of Homogeneity of Variances and ANOVA are available in Table 11 and Table 12, respectively. As it can be understood from Table 11, Leven's test result was not significant, $p = 0.12$, so we were in a safe place to report the ANOVA result.

Table 11

Homogeneity of Variances (Post-test Scores)



Levene Statistic	df1	df2	Sig.
4.032	2	57	0.123

As it's evident from Table 12, ANOVA results, $F(2, 57) = 64.049$, $p = 0.000$ revealed that there was a significant difference between the three groups in their post-tests. To see where the significant difference lied, and consequently to answer research questions 1 and 2, the researchers conducted the Tukey test (Table 13).

Table 12

ANOVA for Comparison of Vocabulary Post-test Scores

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	433.733	2	216.867	64.049	0.000
Within Groups	193.000	57	3.386		
Total	626.733	59			

Regarding research question 1, as seen in Table 13, post hoc Tukey HSD revealed the lack of a significant difference ($p = 0.28$, $p > 0.05$) in the mean score of ESP students' vocabulary learning between the synonym/antonym and control groups with the mean difference of just 0.90 on the benefit of the synonym/antonym group; accordingly, it can be concluded that synonym/antonym technique does not influence ESP students' vocabulary learning. Furthermore, according to Table 13, post hoc Tukey HSD indicated the existence of a statistically significant difference ($p = 0.000$, $p < 0.05$) in the mean score of ESP students' vocabulary learning between the input enhancement and control conditions with the mean difference of 6.10 on the benefit of the input enhancement group; thus, it can be claimed that input enhancement technique affects ESP students' vocabulary learning.

Table 13

Tukey HSD Test Results

Dependent Variable	(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Tukey HSD	Synonym/antonym	Input enhancement	-5.20	0.581	0.000	-6.600	-3.799
		Control Group	0.90	0.581	0.277	-2.300	0.500
	Input enhancement	-6.10	0.581	0.000	-7.500	-4.699	

Concerning the second research question, as demonstrated in Table 13, post hoc Tukey HSD showed a statistically significant difference ($p = 0.000$, $p < 0.05$) in the mean score of ESP students' vocabulary learning between the input enhancement and synonym/antonym conditions with the mean difference of 5 on the benefit of the input enhancement group; therefore, it can be declared that input enhancement technique is more effective than synonym/antonym to improve ESP students' vocabulary learning.

As to research question 3, the most frequent VLS used by the ESP students was explored through examining the mean of the data obtained for each item of the VLS questionnaire in the experimental conditions.

Table 14*Descriptive Statistics for Items of VLS Questionnaire*

Items	Input Enhancement group		Synonym/Antonym group	
	M	SD	M	SD
I repeatedly say the word in my mind frequently.	2.36	0.49	3.33	0.54
I repeatedly spell the word in my mind.	1.53	0.51	1.45	0.51
I repeatedly say the word aloud.	1.89	0.71	2.06	0.63
I repeatedly write the word.	1.25	0.65	1.25	0.69
I analyze the word by breaking it into sound segments.	1.58	0.50	1.55	0.56
I analyze the word by breaking it into meaningful parts.	1.06	0.67	1.25	0.65
I link the word to a visual image in my mind.	2.92	0.77	2.11	0.42
I link the word to another English word with similar sound.	1.17	0.68	1.03	0.72
I link the word to a Persian word with similar sound.	1.11	0.67	1.07	0.58
I use sound and meaning associations.	2.14	0.72	2.00	0.63
I group words together with storyline.	1.75	0.73	1.94	0.63
I remember the sentence in which the word is used.	3.02	0.47	2.14	0.68
I remember the new word together with the context where the new word occurs.	3.06	0.53	2.14	0.59
I make up my own sentences using the new word.	3.08	0.65	2.11	0.47
I try to use newly learned words in imaginary situations in my mind.	3.19	0.67	2.19	0.66
I remember words by doing dictations.	2.28	0.66	2.25	0.60
I remember words by doing group work activities in class.	2.19	0.42	2.31	0.47
I remember words by doing a project.	2.42	0.50	2.42	0.50
Analyze the part of speech of the new word	2.17	0.56	2.25	0.60
Analyze the affixes and roots of the new word	2.14	0.59	2.19	0.62
Check for the LI meaning of the new English word	2.33	0.54	3.28	0.51
Analyze any available pictures or gestures to guess the word	2.02	0.51	2.19	0.58
Guess the meaning of the new word from the story	2.11	0.58	2.28	0.58
Use a dictionary to check the words	2.31	0.57	2.31	0.57
Ask teacher for the new word's synonym.	2.22	0.59	3.31	0.53
Ask teacher for, translation	3.17	0.61	3.25	0.50
Ask classmates for meaning of the word	3.39	0.60	3.44	0.55

As the questionnaire data analysis results in Table 14 revealed and considering the Likert scale span devised for this questionnaire from 1=never to 5=always, the descriptive statistics indicated that most learners' scores were in the average range, between 2 and 4.

According to the results shown in Table 14, some similarities and slight differences between the two groups were clear. Concerning similarities, both groups tended to ask the teacher for translation, and ask their peers for meaning of the word.

Regarding the differences, the input enhancement group tended to remember the sentence containing the new word, remember the word and the context in which it is applied, construct their own sentences utilizing the word, and attempt to apply the newly learned words in imaginary situations in their mind. On the other hand, the synonym/antonym group tended to repeat the word in their mind, check for the LI meaning of the new English word, and ask teacher for the synonym of the new word.

6. Discussion

In the present investigation, the researchers aimed to scrutinize the efficacy of synonym/antonym and input enhancement teaching techniques in the learning of aviation vocabulary by intermediate ESP students. Furthermore, the study was an attempt to determine what VLS ESP learners use most frequently.

The results demonstrated that the performance of both the synonym/antonym group and input enhancement group were better on the test after the treatment than on the test prior to instruction. To put it another way, there was an improvement from the pre-test to the post-test in the learners' lexical knowledge in both groups.

The statistical analyses demonstrated a noticeable efficacy for the input enhancement technique, but not for synonym/antonym technique, as compared with the group not receiving either of the treatments. Furthermore, the results suggested that the participants in the input enhancement condition demonstrated more success in learning the new aviation lexical items than the learners in the antonym/synonym group. In other words, the study findings provide a piece of evidence for the superiority of input enhancement technique over synonym/antonym technique in Iranian intermediate ESP learners' vocabulary learning. Consequently, the importance of considering input enhancement technique in teaching new aviation words to the ESP learners is shown. This technique should be taken into account because it could lead to recognizing the intended aviation words easily while reading texts, and also could result in better comprehension of texts.

What this study indicated is congruent with what Jones and Waller (2017), Nahavandi and Mukundan (2014), and Torki (2017) reported regarding the input enhancement technique. For instance, Jones and Waller (2017) inspected the efficacy of aural and textual input enhancement in learning lexical items in productive and receptive forms, whereby, the outcomes presented a statistically significant achievement of lexis in the treatment conditions. Additionally, Nahavandi and Mukundan's (2014) study revealed a noticeable difference between the treatment group and the group receiving no enhanced input.

Along the same lines, Torki (2017) confirmed the same idea by investigating the impacts of input enhancement and noticing the gap on recognition and production of conjunctions among EFL learners. The outcomes demonstrated the significant efficacy of input enhancement in recognizing and producing conjunctions. Nevertheless, in regard to the comparison of input enhancement and noticing the gap, his research findings did not confirm what the present research has indicated. He asserted that noticing the gap group outperformed the input enhancement technique group in recognizing and producing conjunctions on both sentence and supra sentential levels.

Unexpectedly, the results of this study are not compatible with Rostami's (2017) study that suggested a moderate effect for textual input enhancement in EFL learning at intermediate level of proficiency. He argues that textual input enhancement merely exhibited a moderate effect on the students reading comprehension rather than a remarkable impact. The researcher asserts that learners not paying satisfactory attention to textual input enhancement may account for the insubstantial impact of input enhancement.

The findings of this investigation are compatible with those of Webb (2007) and Hoshino (2010). The former study exhibited the easiness of learning synonyms for familiar words. Besides, the latter study revealed that type of word list, such as synonym or antonym, had a strong impact on the

vocabulary acquisition of learners. However, our findings regarding synonym/antonym technique seem not to be in line with those of Higa (1963) and Laufer (1990). They found that learners who were taught by this technique cannot acquire English words easily so that acquiring two synonymous words at the same time is more convoluted than getting two antonyms, and synonymy is viewed as one of the primary factors that can make lexical items more complex to learn.

Another point of concern in the present study was to determine what VLS ESP learners use most frequently. The study revealed that certain strategies were associated with the more successful group (i.e., input enhancement group). This is in congruence with Zhang and Liang's (2024) suggestion, in a literature review, that certain strategies lead to effective vocabulary learning. The superiority of input enhancement condition to synonym/antonym condition may be accounted for by the differences in the strategies that the learners used more frequently. Furthermore, these differences in VLS use may have been brought about by the differences of the instructional conditions existing in the study.

7. Conclusion

Our study demonstrated that the participants who received input enhancement to learn the new aviation words not only developed their aviation vocabulary knowledge from pre-test to post-test, but also were more competent in their vocabulary performance than other groups.

The data obtained through the VLS questionnaire revealed a two-sided fact. First, some strategies were more frequently used than others and second, use of these strategies somewhat differed in the two groups. The participants of the input enhancement group tended to remember the sentence containing the new lexical item, remember the word within the context in which it occurs, apply the lexical item in their own sentences, and attempt to utilize the new words in fictional situations in their mind. However, the participants of the synonym/antonym group tended to repeat the word in their mind, check for the meaning of the word in L1, and ask the teacher to provide them with the synonym of the word.

The results of this investigation can be beneficial for EFL and ESP students, teachers, and syllabus designers. EFL and ESP students can utilize synonym/antonym and input enhancement techniques in order to boost their vocabulary knowledge easily. Besides, teachers can implement the techniques to teach vocabulary in the classroom settings. Additionally, syllabus designers can provide vocabulary tasks that involve the related techniques.

Regarding future research, studies investigating the impacts of synonym/antonym and input enhancement through reading different types of texts, for instance expository, narrative, and informative, would be an appropriate follow-up to this study. Furthermore, further research can be done by using the same techniques, but in literal and inferential levels of reading comprehension. Moreover, the efficacy of synonym/antonym and input enhancement techniques on students' vocabulary knowledge can be examined at different levels of EFL proficiency.

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Authors' Contributions

All authors have conducted the study, collected data, analyzed and interpreted the data, and written up the manuscript.

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Competing Interests

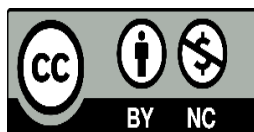
The authors declare that there is no conflict of interest.

References

- Al-Khawaldeh, N., Al Khalaf, E., Rababah, L. M., Al-Shboul, O. K., Krishan, T. A., & Alkayid, M. M. (2024). Developing EFL learners' vocabulary repertoire through semantic relations techniques. *Theory and Practice in Language Studies*, 14(8), 2552–2562. <https://doi.org/10.17507/tpls.1408.28>
- Arnold, J., & Sacco, R. (2013). *Command English*. Longman
- Beck, I. L., McKeown, M. G., & Kucan, L. (2002). *Bringing words to life: Robust vocabulary instruction*. Guilford Publications.
- Borkovska, N. (2007). The effect of specialized vocabulary presentation technique on non-native speakers' vocabulary retention. *Taylor and Francis*, 2014. <https://s3-eu-west-1.amazonaws.com/s3-euw1-ap-pe-ws4-cws-documents-ri-prod/9780415819947/The%20Effect%20of%20Specialized%20Vocabulary%20Presentation.pdf>
- Celce-Murcia, M., & Rosenzweig, F. (1979). Teaching vocabulary in the ESL classroom. In M. Celce-Murcia & L. McIntosh (Eds.), *Teaching English as a second or foreign language* (pp. 241–257). Newbury House.
- Cheung, C. Y. (2004). *The effectiveness of vocabulary learning strategies of Chinese low achievers* [Unpublished master's thesis]. The University of Hong Kong, Hong Kong.
- Citrayasa1, V., Marsella, E., & Nernere, M. S. (2022). Strategies of vocabulary learning employed by low-frequency-word level students in international class. *Journal on English as a Foreign Language*, 12(1), 97–116.
- Coady, J. (1997). L2 vocabulary acquisition: A synthesis of the research. In J. Coady & T. Huckin (Eds.), *Second language vocabulary acquisition* (pp. 273–290). Cambridge University Press.
- Duong, T. M. (2022). Insights into ESP vocabulary learning strategies used by Vietnamese tertiary students. *Journal of Language and Education*, 8(1), 38–49. <https://doi.org/10.17323/jle.2022.10924>
- Duong, T., Montero-Perez, M., Desmet, P., & Peters, E. (2021). Learning vocabulary in spoken input- and output-based tasks. *TASK Journal on Task-Based Language Teaching and Learning*, 1(1), 100–126. <https://doi.org/10.1075/task.00005.duo>
- Feng, R., Alsager, H. N., Azizi, Z., & Sarabani, L. (2023). Impact of mind-mapping technique on EFL learners' vocabulary recall and retention, learning motivation, and willingness to communicate. *Heliyon*, 9(6), 1–13 <https://doi.org/10.1016/j.heliyon.2023.e16560>
- Ghanei Arani, S., & Yazdanimoghadam, M. (2016). The impact of input flooding and textual enhancement on Iranian EFL learners' syntactic development. *Teachers College, Columbia University Working Papers in TESOL & Applied Linguistics*, 16(1), 25–37.
- Gu, P. Y. (2003). Vocabulary learning in a second language: Person, task, context and strategies. *TESL Electronic Journal*, 7(2), A–4. <http://tesl-ej.org/ej26/a4.html>
- Higa, M. (1963). Interference effects of intralist word relationships in verbal learning. *Journal of Verbal Learning and Verbal Behavior*, 2(2), 170–175. [http://dx.doi.org/10.1016/S0022-5371\(63\)80082-1](http://dx.doi.org/10.1016/S0022-5371(63)80082-1)
- Hoshino, Y. (2010). The categorical facilitation of L2 vocabulary learning in a classroom setting. *RELC Journal*, 41(3), 301–312. <http://dx.doi.org/10.1177/0033688210380558>

- Jabbarpoor, S. H., & Abdollahzadeh, E. (2013). Textual enhancement across linguistic structures: EFL learners' acquisition of English forms. *Journal of Language and Translation*, 3(2), 69–78.
- Jesa, M. (2008). *Efficient English teaching*. APH Publishing Corporation.
- Jones, C., & Waller, D. (2017). The effect of input enhancement on vocabulary learning: Is there an impact upon receptive and productive knowledge? *TESOL International Journal*, 12(1), 48–62. <https://files.eric.ed.gov/fulltext/EJ1247959.pdf>
- Laufer, B. (1990). Ease and difficulty in vocabulary learning: some teaching implications. *Foreign Language Annals*, 23(2), 147–155. <http://dx.doi.org/10.1111/j.1944-9720.1990.tb00355.x>
- Loewen, S., & Inceoglu, S. (2016). The effectiveness of visual input enhancement on the noticing and L2 development of the Spanish past tense. *Studies in Second Language Learning and Teaching*, 6(1), 89–110. <http://dx.doi.org/10.14746/ssllt.2016.6.1.5>
- McCrostie, J. (2007). Examining learner vocabulary notebooks. *ELT Journal*, 61(3), 246–255. <http://dx.doi.org/10.1093/elt/ccm032>
- Mercer, S. (2005). Vocabulary strategy work for advanced learners of English. *English Teaching Forum*, 43(2), 24–35.
- Morra, S., & Camba, R. (2009). Vocabulary learning in primary school children: working memory and long term memory components. *Journal of Experimental Child psychology*, 104(2), 156–178. <http://dx.doi.org/10.1016/j.jecp.2009.03.007>
- Nacera, A. (2010). Languages learning strategies and the vocabulary size. *Procedia Social and Behavioral Sciences*, 2, 4021–4025.
- Nahavandi, N., & Mukundan, J. (2014). The impact of textual input enhancement on Iranian elementary EFL learners' vocabulary intake. *Asian Social Science*, 10(21), 216–222. <https://doi.org/10.5539/ass.v10n21p216>
- Nahavandi, N., & Mukundan, J. (2014). The impact of textual input enhancement on Iranian elementary EFL learners' vocabulary intake. *Asian Social Science*, 10(21). <https://doi.org/10.5539/ass.v10n21p216>
- Nation, I. S. P., & Waring, R. (1997). Vocabulary size, text coverage, and word lists. In N. Schmitt & M. McCarthy (Eds.), *Vocabulary: Description, acquisition and pedagogy* (pp. 6–19). Cambridge University Press.
- Nation, P. (2006). Language education – vocabulary. In K. Brown (Ed). *Encyclopedia of language and linguistics* (pp. 494–499). Vol. 6. 2nd ed. Elsevier
- Nshiwi, D. (2020). The effect of different approaches to learning strategy instruction on vocabulary development. *Indonesian Research Journal in Education*, 4(1), 204–222.
- Paribakht, T. S., & Wesche, M. (1999). Reading and “incidental” L2 vocabulary acquisition: An introspective study of lexical inferencing. *Studies in Second Language Acquisition*, 21(2), 195–224. <https://doi.org/10.1017/S027226319900203X>
- Robinson, P. (1995). Attention, memory, and the noticing hypothesis. *Language Learning*, 45(2), 283–331. <http://dx.doi.org/10.1111/j.1467-1770.1995.tb00441.x>
- Rostami, B. (2017). *The impact of typographical input enhancement, gloss, and advance organizers on the reading comprehension of Iranian EFL students* [Unpublished Master's Thesis]. University of Qom, Qom, Iran.

- Schmidt, R. (1995). Consciousness and foreign language learning: A tutorial on the role of attention and awareness in learning. In R. Schmidt (ED.), *Attention and awareness in foreign language learning* (pp. 1–63). University of Hawaii, Second Language Teaching & Curriculum Centre.
- Schmitt, N. (1997). Vocabulary learning strategies. In D. N. Schmitt, & M. McCarthy (Eds.), *Vocabulary: Description, acquisition and pedagogy* (pp. 199–227). Cambridge University Press.
- Schmitt, N. (2000). *Vocabulary in language teaching*. Cambridge University Press.
- Schmitt, N. (2000). *Vocabulary in language teaching*. Cambridge University Press.
- Schmitt, N. (2004). *Formulaic sequences: Acquisition, processing and use*. John Benjamins Publishing Company.
- Schmitt, N. (2008). Instructed second language vocabulary learning. *Language Teaching Research*, 12(1), 329–363. <https://doi.org/10.1177/1362168808089921>
- Smith, M. S. (1991). Speaking to many minds: On the relevance of different types of language information for the L2 learner. *Second Language Research*, 7(2), 118–132. <http://dx.doi.org/10.1177/026765839100700204>
- Smith, M. S. (1993). Input enhancement in instructed SLA. *Studies in Second Language Acquisition*, 15(2), 165–179. <https://doi.org/10.1017/S0272263100011943>
- Sun, B., & Zhou, R. (2005). A research report on the senior high school students' use of contextual clues in lexical guessing. *FLTA*, 2, 49–54.
- Tabatabaei, O., & Kashavi, A. (2016). Impacts of input enhancement on listening comprehension improvement of Iranian intermediate female EFL learners. *Modern Journal of Language Teaching Methods*, 6(5). <http://dx.doi.org/10.26655/mjltm.2016.8.1>
- Tran, T. Q. (2020). Non-English majors' employment of autonomous English lexical learning strategies. *Ho Chi Minh City Open University Journal of Science*, 10(1), 43–54. <https://doi.org/10.46223/HCMCOUJS>
- Wallace, M. J. (1982). Teaching vocabulary. *RELC Journal*, 14(2), 121–122. <https://doi.org/10.1177/003368828301400217>
- Webb, S. (2007). The effects of synonymy on second-language vocabulary learning. *Reading in a foreign language*, 19(2), 120–136. <https://www.semanticscholar.org/paper/The-Effects-of-Synonymy-on-Second-Language-Webb/7e0be1400cfd206a402104173299b8111a0b94f>
- Zhang, T. & Liang, L. (2024). Vocabulary learning strategies of English as a foreign/second language. Lecture notes in education psychology and public media. *Proceedings of the International Conference on Global Politics and Socio-Humanities*. <https://doi.org/10.54254/2753-7048/45/20230216>
- Zimmerman, C. B. (2014). Teaching and learning vocabulary for second language learners. In M. Celce-Murcia, D. Brinton & M. A. Snow (Eds.), *Teaching English as a second or foreign language* (pp. 288–302). National Geographic Learning.
- Zu, F. (2009). Using lexical approach to teach vocabulary. *US-China Foreign Language*, 7(8), 44–47.



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