Journal of Modern Research in English Language Studies
Print ISSN: 2676-5357
Online ISSN: 2676-5985

Comparative Effects of Semantic vs. Structural Elaboration on Iranian EFL Learners' Vocabulary Learning Process

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Article Info

Article Type:
Research Article

Received:
13/09/2022
Accepted:
09/11/2022

ABSTRACT

Attempting to improve teaching instructions, researchers have proposed numerous instructional techniques. In vocabulary learning, as one of the key areas in EFL, inadequate knowledge leads to complications and frequent challenges faced by the learners. This study explores how an instructional technique that employs semantic, structural, and semantic/structural elaboration affects vocabulary learning. The research was carried out with 114 participants who experienced the above-mentioned elaborations in three groups. For creating a + semantic, + structural, and + semantic/structural climate in each group, participants were given flashcards containing words beside the equivalents, words by numbered letters without any equivalents, and words by numbered letters beside the equivalents, respectively. The data- obtained from Lexical Production Scoring Protocol (LPSP)- were then input into One-way ANOVA and Post-Hoc tests. To check the accuracy of Transfer Appropriate Processing (TAP) theory, different tasks during the teaching and testing phases in +semantic were designed. Due to this inconsistency, the findings proved to be in line with TAP theory, suggesting that Level of Processing (LOP) theory should be accompanied with TAP to end in facilitating results. Data analysis -mirroring the Type of Processing–Resource Allocation (TOPRA) effect- indicated that while the + semantic as compared to + semantic/structural facilitated performance on recall of words, had a negative effect in comparison with + structural. Based on the results, the limited processing resources remind curriculum developers to bear in mind which aspect of learning is of more importance to let the learners make the most and best use of their inborn gifts.

Keywords: Levels of Processing (LOP) Theory, Semantic Elaboration, Structural Elaboration, Transfer Appropriate Processing (TAP) Theory, Vocabulary Learning

Cite this article: Rahmani, N., & Maleki, A. (2023). Comparative Effects of Semantic vs. Structural Elaboration on Iranian EFL Learners' Vocabulary Learning Process. *Journal of Modern Research in English Language Studies, 10*(2), 45-67.

DOI: 10.30479/jmrels.2022.17826.2126

1.Introduction

Among various components of language, vocabularies -these fundamental units of communication- and vocabulary learning- the process by which learners become able to comprehend and produce previously unacquired words- seem to be of great significance to language learners as well as teachers (Nation & Nation, 2001). Developing our comprehending of foreign language learning is influenced by developing our comprehending of how students learn individual words (Schmitt, 2000). The point is how novel foreign words might be most efficiently learned.

The fact is that the way we process the input shapes the quality of the output. This simple reality, which stems from a recognized theory, shows that the capability to remember stimuli is influenced by how we processed them. This framework, which was first presented by Craik and Lockhart (1972) under the LOP theory of human memory, defines remember of a stimulus as a consequence of the deepness of mental processing. Although LOP theory has gained its proper place through the years, one must make a distinction among two basically dissimilar forms of rehearsal and elaboration: maintenance rehearsal vs. elaborative rehearsal and semantic elaboration vs. structural elaboration. According to Craik and Lockhart (1972), maintenance rehearsal includes only reiterating the stimuli, deprived of generating new relations; whereas elaborative rehearsal includes the formation of networks among the new stimuli and what the students previously known by employing the meaning of the item which needs creating connections. On the other hand, semantic elaboration discusses a condition in which a student's processing capabilities are directed at the meaning-related properties of word throughout input processing, while structural elaboration discusses an increased evaluation of an object with reference to its formal properties (Barcroft, 2004).

However, like any kind of scientific subject, the effectiveness of semantic and structural elaboration under different conditions cannot be taken for granted. Memory performance may not be just a function of deep processing and still another factor might be at work. Whereas numerous researchers have reported optimistic effects for increased elaboration on lexical acquisition (e.g., García-Gámez & Macizo, 2022; Kida & Barcroft, 2018; Kida, 2022; Laufer, 1997), some others have failed to find any effect (e.g., Ahmadi, 2014; Levin et al., 1982). Yet a good number of researchers have come across negative effects (e.g., Barcroft, 2004; Prince, 1996; Trofimovich, 2008). These results, which are a clear cue of dependence of structural and semantic elaboration on the nature of the task throughout the learning and examining phases, introduce an additional factor i.e., Transfer Appropriate Processing (TAP) theory. In their TAP theory, Morris, et al. (1977) stated that the memorial outcome of a variable relies on the nature of the task implemented throughout a study stage and using an examining stage.

Previous works on TAP theory have shown how data processing influences what is acquired and has implications for how that information is used in the future (Nokes & Ash, 2010).

Talking about two kinds of rehearsal and elaboration, we will come to two dissimilar sorts of processing and learning: shallow processing vs. deep processing and semantic learning vs. form learning. Craik and Lockhart (1972), differentiated between shallow and deep processing. In shallow processing, which is restricted to surface features, information is held active at a given level of analysis. In deep processing, in contrast, meaningful interpretations are activated. Whereas shallow processing causes a weak memory trace, deep processing leads to a more stable one.

It should be noted that because of the main differences among semantic learning and form learning, the present study emphasizes the significance of distinguishing among two different kinds of output: output with and output without access to meaning (VanPatten, 2003). Coming across different types of rehearsal (maintenance vs. elaborative), elaboration (semantic vs. structural), processing (shallow vs. deep), learning (semantic vs. form), and output (with access to meaning vs. without access to meaning), Barcroft's (2002) Type of Processing–Resource Allocation (TOPRA) model for structural and semantic processing can be discussed. According to the TOPRA model, semantic elaboration is able to extend learning amount for the semantic features of vocabularies whereas concurrently reducing learning for the structural features of vocabularies; correspondingly, structural elaboration can extend learning for the structural features of novel vocabularies whereas reducing learning for the semantic features of vocabularies. This is why processing —either semantic or structural— functions as a two-edged sword.

A common belief held by majority of language educators is that having learners engaged in tasks that involve greater amounts of elaboration—semantic or structural—is an effective instructional technique. Many instructors have extended this belief to the realm of vocabulary instruction and have equipped their students with highly elaboration-focused activities while teaching a set of new words (Coomber et al., 1986).

Putting individual differences aside, a good number of learners, willingly or unwillingly, have become used to making use of semantic or structural elaboration even in an unconscious manner. Regarding learners limited cognitive processing resources, many studies have found that requiring learners to engage in such tasks can affect learning efficiency (e.g., Craik & Tulving, 1975; Hyde & Jenkins, 1969). Whilst some studies support the facilitating effect of elaboration, some others discuss the hindering effect of them and argue that increased semantic or structural processing evoked by elaborating may exhaust limited processing capabilities that might otherwise

be focused to the new forms and meanings, respectively. Despite their efforts in improving vocabulary-learning outcomes, researchers have not come to a clear-cut finding and yet there are learners who are treated as testees and the problem of developing a cohesive picture of effective vocabulary teaching instruction still seems to be unsolved. This study intended to increase our understanding of vocabulary learning process while it becomes accompanied by increased elaboration activities. This exploratory effort designed to determine the probable influences of structural elaboration, semantic elaboration, and semantic/structural elaboration on foreign language word learning process addresses the following research questions:

1. Does semantic, structural and semantic/structural elaboration as compared to each other have any statistically significant effects on learners' recall of previously unacquired foreign language words during the vocabulary learning process?
2. If they have any effects, are the effects hindering (debilitating) or facilitating?

By using this way and by looking into the influences of structural, semantic, and semantic/structural elaboration during foreign language vocabulary learning, this study has investigated the assumptions of the TOPRA model and the appropriateness of LOP and TAP theories in a reasonably communicative climate.

2. Literature Review

Regarding the influences of elaboration on lexical learning, most researches on this domain have focused on mnemonic techniques such as keyword, which may be problematic as a tool for lexical acquisition for several reasons. The main reason for the problematic nature of these techniques lies behind the fact that invoking L1 frequently and connecting new foreign language words to known L1, ones cannot be typical of naturalistic foreign language acquisition contexts (Lee & VanPatten, 1995).

Barcroft (2004) separated two kinds of learning: semantic learning, which is meaningful in nature and form learning that is meant for the formal features of stimulus. While one wants to examine the potential consequence of structural or semantic elaboration on the learning process, this distinction achieves more significance.

Figure 1 displays TOPRA model, which expresses the connection among form processing, semantic processing, form learning, and semantic learning. The model integrates the results of three areas of research: (a) the outcomes of research studies in cognitive psychology on how semantic elaboration assists semantic learning; (b) the results of VanPatten (1990), on how it is challenging for L2 students to process input for both form and meaning; and (c) the results of Prince (1996), and Barcroft (2002) on how

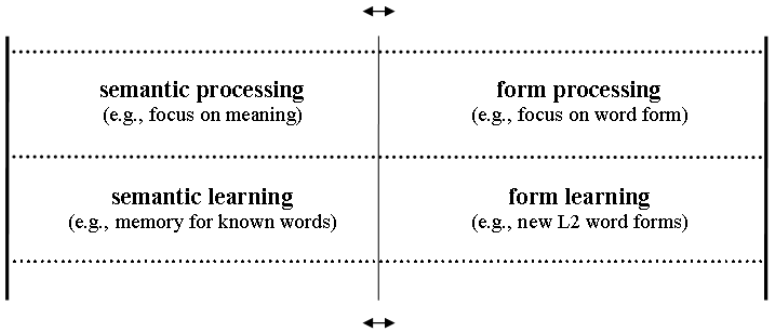
semantic elaboration can hinder new vocabulary form learning. The model presumes that processing resources are being employed at near-maximum stages, i.e., a student does not have sufficient processing resources accessible to complete both the semantic learning task and the form learning task at hand. The central component of the model is the movable center line that separates semantic learning from form learning. As the center line moves toward the right, semantic processing and semantic learning rise while form processing and form learning reduce. As the center line moves toward the left, semantic processing and semantic learning reduce while form processing and form learning increase (Barcroft, 2002).

Barcroft (2002) believed that while the centerline in the model transfers to left and right, outer lines that are representative of processing resources accessible to a student remain stable, which is a cue of limited quantity of processing resources. That is, a student does not have enough processing resources to complete both the semantic learning and the form learning tasks concurrently.

In this way, if a learner who is primarily supposed to encode new form is asked to elaborate semantically at the same time, her or his rate of form learning may decrease because he or she will have fewer processing resources left to encode the new form. Therefore, the TOPRA model gives a logical picture of difficulty of processing input for both form and meaning (VanPatten, 1996).

Figure 1

TOPRA Model for the Connection Among Form Processing, Semantic Processing, Form Learning, and Semantic Learning (Barcroft, 2002)



Based on Barcroft (2004), speaking about new words meanings, concentrating on various backgrounds in which the words can be employed, likening new words, and creating relations among new words and personal experiences are all samples of semantic elaboration. On the other hand, crossing out vowels in a word is a clear sample of Structural elaboration, (Tresselt & Mayzner, 1960).

Consequently, according to the difference among processing for form and processing for meaning, the influences of structural elaboration on form learning may be very different from its influences on semantic learning, which is also the case on the subject of semantic elaboration. In other words, it is expected that semantic elaboration assists performance on semantically based tasks and structural elaboration assists performance on structurally based ones (Morris, et al., 1977).

There are very few studies in the research literature on how semantic and structural elaboration influences lexical acquisition in more naturalistic language learning situations. Furthermore, among the performed studies, academics have arrived at differing outcomes regarding the influences of elaboration on lexical learning. In this section, which is allocated to review of the literature on the influences of elaboration on lexical learning, related studies have been presented under three titles: facilitating effects, no effects, and hindering effects.

2.1. Facilitating Effects of Elaboration

Thomas and Dieter (1987) investigated the influence of writing foreign language words and saying them audibly while trying to acquire their English equivalents by English-speaking students with no former French language knowledge.

By analyzing the results, Thomas and Dieter concluded that written free recall of vocabularies was discovered to be improved by writing task, while associative recall, as determined by a matching test, was not consistently affected by this parameter. Taken together, the result proposed that when learners write new vocabularies throughout a study phase, memory for the spellings of the vocabularies is improved and copying words helps the creation of memory codes for their written forms.

2.2. No Effect of Elaboration

To compare different semantic contextual learning situations with keyword method, Levin, et al. (1982) accompanied two experiments on the influences of different learning situations. In Experiment 1, students employed either a mnemonic contextual or a verbal contextual process. In Experiment 2, three other situations i.e., experiential context, non-keyword pictorial context, and no-strategy control situations were assimilated to the keyword context situation.

Results revealed that although experiential and pictorial context situations signified more naturalistic types of learning than keyword and situations of semantic elaboration when compared to the no-strategy control situation, the keyword technique showed more effectual for improving children’s achievement of new words in both experiments.

2.3. Hindering Effects of Elaboration

The study conducted by Prince (1996) compared the effects of sentence-level translation learning versus context learning on L2 lexical learning among French-speaking ESL learners. The contributors tried to learn English vocabularies in one of two situations: (a) a situation in which the target words were presented next to their French translations, i.e., translation learning; and (b) a condition, with greater semantic elaboration, in which the target vocabularies were presented in English sentences, i.e., context learning. The participants were allotted 25 minutes to study new words appeared in one of the two conditions. Next to the exposure stage, all of the contributors were given a translation recall and a context recall test. In the translation recall test half of each group translated French to English and half from English to French sentences and in the context, recall test the participants were requested to complete blanks in English sentences where the correct target vocabularies were supposed to go.

Results explained that the performance of the high-level learners was meaningfully superior than that of the lower-level learners in the context situation and overall, but the lower-level group performed better in translation condition which may have been due to the lower-level group having more difficulty comprehending the L2 sentences. Finally, recall was significantly better in the L2-to-L1 direction than in the L1-to-L2 direction for the lower-level learners only.

Barcroft (2002) looked at the influences of structural and semantic elaboration on L2 lexical acquisition among English-speaking learners. Contributors tried to acquire Spanish words in semantic elaboration, structural elaboration, and no elaboration situations. Under the semantic elaboration situation, the contributors were requested to make pleasantness rankings about each item that they detected. The ranking ranged between 0 (meaning extremely unpleasant for the participants) and 14 (meaning extremely pleasant for the participants for some reason according to their experiences, general feelings, or both). Under the structural elaboration situation, the contributors were requested to count the quantity of letters in every vocabulary and circle the number on the scale that matches to the true number of letters for every vocabulary. Finally, those in the control condition were requested to “do their best” to acquire the novel vocabularies.

Findings showed greater L1 recall for structural elaboration, greater L2 recall for semantic elaboration, and greater overall recall for no elaboration than for structural elaboration and semantic elaboration. Barcroft believed that these findings prove that more semantic processing can hinder one’s capability to encode the formal features of novel vocabularies.

In another study by Barcroft (2004), the influences of writing novel vocabularies in sentences with word-picture repetition learning alone were studied. In this research, L2 Spanish students tried to acquire novel Spanish vocabularies in one of two situations while showing word-picture pairs.

The findings showed that writing novel vocabularies in sentences negatively influenced efficiency on a productively based measure of L2 lexical achievement while compared to word-picture repetition learning alone and while compared to a no-sentence writing situation employing the similar appearance format. The undesirable influence of sentence writing according to syllable scoring furthermore mitigated over time.

2.4. Recent Studies on the Elaboration

Kida and Barcroft (2018) investigated how semantic and structural tasks influence the mapping part of second language (L2) word learning in Japanese-speaking L2 English students. Findings of L1 and L2 free recalls and L2-to-L1 and L1-to-L2 cued recalls indicated better free recall in the semantic situation over the structural situation and better cued recall in the mapping situation over the structural and semantic situations, presenting new proof for TOPRA model anticipations.

Barcroft (2021) explained which types of input and tasks are most efficient for indorsing Spanish word learning in Meaning-Oriented Instruction. Regarding input, he suggests input that is sufficiently understandable, enhanced recurrence of novel vocabularies, input improvement in both the written and spoken manners, and the ongoing build-up of language particular vocabulary usage and meanings over time. It is furthermore recommended that tasks should not include a great extent of semantic elaboration or forced output without access to meaning and that students are provided with chances to regain novel vocabularies on their own.

García-Gámez and Macizo (2022) conducted a study to assess the effectiveness of two learning approaches for the learning words in a foreign language (FL). In the semantic approaches, FL vocabularies were given with pictures showing their meaning and the students were trained with a semantic grouping task (to identify whether FL vocabularies were examples of a semantic type). In the lexical method, FL vocabularies were paired with their translation in the first language (L1) and the students trained with a letter-monitoring task (to specify whether L1-FL words enclosed a grapheme). The findings suggested that a single period of semantic learning improves the formation of connections among semantics and the vocabularies acquired in a new language.

Kida (2022) employing TOPRA basis, surveyed the influences of processing type (structural, semantic, control), exposure frequency (one exposure, three exposures), and their arrangement on the learning of new L2 vocabularies over reading. The unpredicted first language L1-to-L2 and L2-

to-L1 cued recall were administered. The constructive influences of structural processing and exposure occurrence were evidenced in L1-to-L2 cued recall. The outcomes, additionally, recommended that influences of word processing type and exposure frequency differ hinging on how word achievement is determined.

In another study, Kida et al (2022) examined whether learning types, free of the overall extent of word acquiring, would influence the extent to which lexicalization happens. With the purpose of study, the chance of a dissimilar pattern among extent of word acquiring and extent of lexicalization, the research involved two dissimilar learning tasks, one concentrated on form and the other on meaning. The outcomes of the recall tests confirmed that semantic processing improved memory for novel vocabulary meanings whereas reducing memory for novel vocabulary forms. These outcomes are accordant with the expectations of the TOPRA model, indicating the dissociability of vocabulary meanings and vocabulary forms in L2 word acquiring.

2.5. Interpretation of the Previous Research

Overall, the review of the literature related to the influences of elaboration on lexical learning suggests that this influence relies on the kind of task in which a student is involved through testing and study stages and on the part of vocabulary knowledge being determined. According to the previous studies, the function of the elaborative activities may be threefold: facilitative, ineffective, or even debilitative.

Additional research in this field is necessary to expand our knowledge of how elaboration affects memory for the meaning and form of target vocabularies. Although research in cognitive psychology have surveyed the influences of structural and semantic elaboration on memory for earlier learned vocabularies, relatively few studies have explored the influences of structural and semantic elaboration on new word acquiring and there is an absence of research simultaneously comparing the influences of semantic, structural, and semantic/structural elaboration in this domain.

The present study was accompanied for these aims and more explicitly- to explain the appropriateness of LOP and TAP theories and the expectations of the TOPRA model- the influences of semantic, structural, and semantic/structural elaborations on lexical learning have been compared directly.

3. Method

The purpose of this section is to describe in detail the methods and procedures used in carrying out this research. This study was a quasi-experimental, with a pretest-treatment-posttest design conducted on Iranian

EFL learners. Learning conditions were the independent variables and lexical items produced (score) was the dependent variable of the research study.

The present study examined learners' performance under three learning situations: semantic elaboration (+ semantic), structural elaboration (+ structural), and semantic/structural elaboration (+ semantic/structural).

To put it briefly, according to Barcroft (2002), learning the new words through the equivalents—output with access to meaning—was the main characteristic of + semantic condition. Focusing on the number of letters of each new word and copying them—output without access to meaning—was the main feature of + structural condition. And finally, a combination of tasks during the mentioned conditions composed the + semantic/structural condition (personal communication, August, 2009).

3.1. Participants

Through a simple random sampling, the original pool of contributors meeting the criteria for this research consisted of 128 university-level Persian-speaking EFL male and female students, ranging in age from 20 to 23 studying at the University of Zanjan (Table 1).

With regard to the nature of the tasks, the participants were asked to perform in this experiment and since the novelty of the chosen words for this population was the first concern of the study, all of the participants were supposed to enter the pretest phase. The pretest consisted of 27 under-discussion experimental new words. Each new word was accompanied with four options of which one was the response. Any participants who demonstrated knowledge of one or more of the experimental words were eliminated from the study.

After the pretest phase, 14 out of 128 participants were excluded due to their ability in finding the appropriate equivalents for a number of words and a total of 114 participants remained. Subsequently, the remaining participants who had taken OPT and proved to be comfortably in level B2, were divided into three groups which enjoyed three different word presentation orders.

Table 1
Demographic Background of the Contributors

No. of Students	114
Gender	49 Females & 65 Males
Native Language	Persian
Proficiency Level	Intermediate
College	Engineering College

3.2. Materials and Instruments

A variety of instructional and testing materials (pretest, treatment, and posttest) were utilized in the current study. A description of each of these materials is provided in order.

A pretest on 27 experimental words was used in this experiment, which was administered in reverse order from that of the subsequent learning stage to avoid habituation. The pretest intended to prove the participants' unfamiliarity with the experimental words.

The second type of materials developed particularly for this study as treatment materials were a collection of flashcards. The first set included 27 flashcards with each containing a single new word plus its equivalent (for the learning phase during + semantic condition). The second set consisted of 27 numbered flashcards each containing only a new word written on each focusing on the number of letters without presenting the equivalent (intended for the learning phase during + structural condition). The last set included 27 flashcards each containing a new word with emphasis on the number of letters plus its equivalent (for the learning phase during + semantic/structural elaboration condition). In addition, for the learning phase under + structural and + semantic/structural conditions, word-writing sheets with instructions for the word-writing task and numbered spaces in which only the new words were to be written were presented.

The last instrument was a set of vocabulary posttests administered to test the extent of word acquiring. The posttest consisted of introduced equivalents for + semantic condition, separate underlines representative for the number of letters for new words beside outstanding letters of each presented as a guideline for + structural condition, and a combination of these two for + semantic/structural condition.

3.3. Procedure

3.3.1. Data Collection Procedures

Data were gathered in the contributors' regular classes based on the following steps: As the opening step, general instructions concerning step-by-step procedure of all the phases were described and each of the proposed questions by the participants was addressed comprehensively not to let any vague point remain untouched. The only secret point was concerned with the hypotheses so that the subjects did not have any pre-judgment regarding the outcomes under each condition.

Getting the whole picture of their task, the whole pool of participants took the pretest, on which they were requested to read each new word and the given options of which just one was the response. To avoid habituation of the

contributors to the presentation order employed in pretest and the subsequent study stage, the words were presented in reverse order in these two phases. Any participant who could guess the correct equivalent of words on the pretests was excluded from the subsequent sections of the study. In this way, the number of participants was reduced from 128 to 114.

After the pretest stage, the participants composed three groups with 38 members who enjoyed three conditions in different presentation orders at different meetings. The first group, i.e., Group 1, was supposed to acquire words 1-9 (A-I) in the + semantic situation, 10-18 (J-Q with two Os) in the + structural condition, and 19-27 (R-Z) in the + semantic/structural situation. The second group, i.e., Group 2, were supposed to acquire words 1-9 (A-I) in the + structural condition, 10-18 (J-Q with two Os) in the + semantic/structural situation, and 19-27 (R-Z) in the +semantic condition. The third group, i.e., Group 3, were supposed to acquire words 1-9 (A-I) in the + semantic/structural condition, 10-18 (J-Q with two Os) in the + semantic condition, and 19-27 (R-Z) in the + structural condition (Table 2).

Table 2
Counterbalancing of Conditions and Presentation Orders

	Presentation Order G1 (n = 38)	Presentation Order G2 (n = 38)	Presentation Order G3 (n = 38)
Words 1-9	+ Semantic	+ Structural	+ Semantic/Structural
Words 10-18	+ Structural	+ Semantic/Structural	+ Semantic
Words 19-27	+ Semantic/Structural	+ Semantic	+ Structural

For creating a +semantic climate in each group, each participant was given nine flashcards for the words (A-I in Group 1, R-Z in Group 2, and J-Q with two Os in Group 3). These nine unknown new words were all written beside known equivalents from the pretest phase and the subjects were asked to learn them while they were hearing them, as well.

As the next step, to serve a + structural condition (J-Q with two Os in Group 1, A-I in Group 2, and R-Z in Group 3), each participant was given nine flash cards containing the appropriate word written on them only by numbered letters without any equivalent. The structural elaboration situation required the participants to pay attention to the words' forms by counting each individual letter in every word acquired in that situation and copying them while they were hearing them, as well. Word-writing sheets with numbered spaces with instructions for the word-writing task were given to the participants, as well.

In order to exert a combination of these two conditions, i.e., a + semantic/structural condition, the participants were presented with nine flash cards for the related word class (R-Z in Group 1, J-Q with two Os in Group 2, and A-I in Group 3). These flash cards included the information of both of

the previous conditions, i.e., equivalents and numbered letters. Accordingly, the participants were required to make use of a combination of the previous tasks. Going through the numbered letters of each, they were doing their best to acquire the unknown vocabularies through the known equivalents. They were also requested to copy the new words. Like the + structural situation, the subjects were presented with word-writing sheets with numbered spaces to write only the new words on them.

Immediately after the study stage, the contributors were requested to turn in the flash cards and the word-writing sheets to the experimenter and catch their breath for 20 minutes and help themselves with drinks without talking about the under-discussion words.

On the posttest phase, the contributors were requested to try their best to write the target vocabularies in the pre-determined spaces. It is worth noting that owing to the TAP theory, regarding the nature of conditions and type of the tasks that the subjects were required to carry out in the study stage, different learning conditions would lead to different tasks during the testing phase. Consequently, those words which had been introduced under + semantic and + semantic/structural conditions were to be tested through the known equivalents of the learning phase. On the other hand, + structural condition needed a type of task in which the new words could be tested in a pure structural manner without any semantic cue. To gain this aim- for generating structural reminders- outstanding letters of each word were presented in the proper position of them in the vocabulary and the number of the remaining letters were illustrated via separate underlines.

As a result, each group was presented with different posttests. Group 1, could employ equivalents for words 1-9 and 19-27 which were taught under + semantic and + semantic/structural conditions whereas they were asked to write words 10-18 by the helping hand of the given structural cues. Group 2, utilized equivalents for producing words 10-27 and structural signals for words 1-9. Based on the plans, participants in Group 3 were to write words 1-18 in semantic concerned tasks and words 19-27 through structural related ones.

3.3.2. Assessment Procedures

Throughout the assessment phase, an autonomous evaluator who was instructed on how to employ the adopted scoring protocol in advance was invited to score the posttest. To maximize the accuracy level of the outcome, all items scored by the evaluator were rechecked by the researcher, as well.

Since this study was naturally concerned with new word production which is habitually performed in bits and pieces, it was tried to adopt a scoring system which was an indication of partial lexical learning and included partial scores for partial word production. To this end, a lexical

production scoring protocol (LPSP) that is perceptive to this type of partial vocabulary acquiring and met the need of the present research was employed (Barcroft, 2004). This scoring protocol that reflects creation of both entirely produced and incompletely produced words has several characteristics that are fully discussed below.

According to Barcroft (2004), in the LPSP the term "correct" denotes any letter of a vocabulary written in its exact location in the vocabulary, and the term "present" denotes any letter of a vocabulary written but not located in its exact location. The score set for a vocabulary is obtained by the percentage of letters correct or letters present.

As shown in Table 3, for example in the word *laconic*, the following answers would each obtain a score of 0:

[nothing written], "epse", and "a..."

The following answers would obtain a score of 0.25:

"l . . ." or ". . . c" (since at least one letter is correct in each case) and "beci . . ." or "cutisn" (since at least 1/4 but less than 1/2 [2 of 7 = 28%; 3 of 7 = 42%] of the letters are present).

The following answers would obtain a score of 0.50: "la . . ." or ". . . nic", (since at least 1/4 but less than 1/2 [2 of 7 = 28%; 3 of 7 = 42%] of the letters are correct) and "mical . . ." or "acltin" (since at least 1/2 but less than 3/4 [4 of 7 = 57%; 5 of 7 = 71%] of the letters are present).

The following answers would obtain a score of 0.75: ". . . acon . . .", "lacon . . .", or ". . . aconic" (since at least 1/2 but less than 100% [4 of 7 = 57%; 5 of 7 = 71%; 6 of 7 = 86%] of the letters are correct) and "alncin" or "laconich" (since at least 3/4 but less than 100% [6 of 7 = 86%] of the letters are present or additional letters are added).

As a final point, only the responses that manifest the exact word, regarding the correctness and presence of the letters, in this example "aphasia" would receive a score of 1.

Table 3

Lexical Production Scoring Protocol (Barcroft, 2004)

.00 points	.25 points	.50 points	.75 points	1 points
None of word is written; this includes:	25% of word is written; this includes:	50% of word is written; this includes:	75% of word is written; this includes:	Entire word is written; this includes:
Nothing is written	Only 1 letter is correct	25-49.9% of the letters are correct	50-99.9% of the letters are correct	100% letters are correct

The letters present do not meet any "for .25" criteria	25-49.9% of the letters are present	50-74.9% of the letters are present	75-100% of the letters are present

After all of the words were scored for every contributor, scores for words 1-9, 10-18, and 19-27- ranging from 0 to 9 for each condition- were calculated separately.

3.4. Data Analysis

The information gathered in this way were then submitted to the SPSS software. Five different analyses were used: (a) Frequency analysis, (b) Mean analysis, (c) One-way ANOVA, (d) Post-Hoc (Tukey).

Frequency and mean analyses were conducted to identify the proportion and percentage of scores in the different subgroups of the sample. The one-way ANOVA (which is used to compare the performance of more than two groups) was performed to analyze the influences of + semantic, + structural, and + semantic/structural conditions on word acquiring process of different groups. The post-hoc (which is used to determine the location of the difference when the *F* value is significant) was carried out to clarify the position of different conditions compared to each other.

4. Results and Discussion

The first part of this section discusses the statistical techniques used to analyze the information to obtain the results that clarify the answer to the research questions. Two basic types of statistical analysis, namely descriptive and inferential statistics, were used in the current study.

4.1. Descriptive Statistics for Different Conditions

Before discussing the results related to descriptive statistics of the scores, it should be noted that since each participant was supposed to learn the new words under + semantic, + structural, and + semantic/structural conditions, the original word list which contained 27 words was divided into three segments. As a result, each condition had nine words and the score of each condition could range between 0 and 9. The main descriptive statistics used in this study were frequency, mean, mode, and standard deviation that are presented using figures and tables.

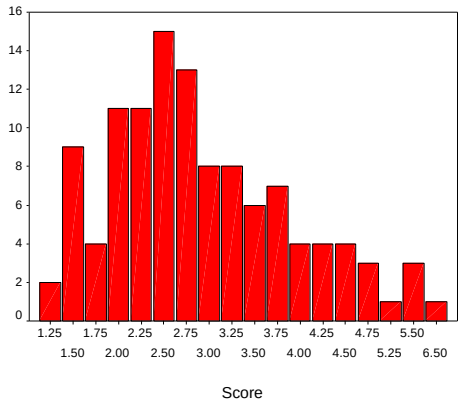
4.1.1. Descriptive Statistics for Semantic Elaboration Condition

Figure 2, which is a description of descriptive statistics under + semantic condition, indicates that 1.25 and 6.5 were the lowest and highest scores, respectively. Moreover, score of 2.5 has occurred most frequently and plays the role of mode under + semantic condition. As shown in the Figure,

the pick of the distribution has fallen towards the left side of the graph and shaped a positively skewed distribution. This positively skewed distribution indicated that, as compared to normal distribution, the majority of scores are low.

Figure 2

Bar Chart of Scores Frequencies under + Semantic Condition

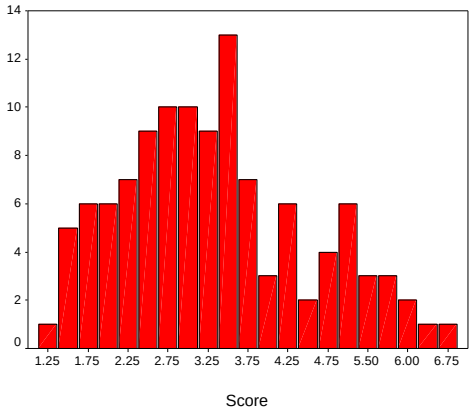


4.1.2. Descriptive Statistics for Structural Elaboration Condition

As it can be concluded from Figure 3, under + structural condition the lowest score was 1.25, the highest was 6.75, and 3.5 is the mode of scores in this condition. Thus, the mode under this condition is one score above + semantic condition.

Figure 3

Bar Chart of Scores Frequencies under + Structural Condition



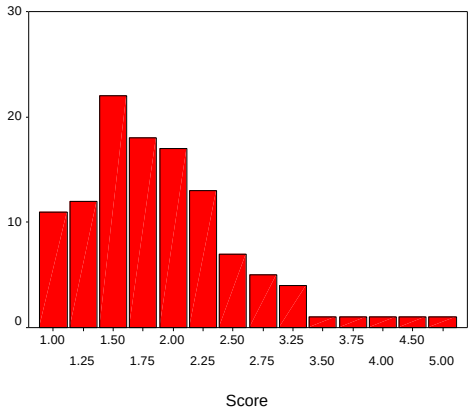
4.1.3. Descriptive Statistics for Semantic/Structural Elaboration Condition

Figure 4, which is a description of descriptive statistics under + semantic/structural condition, illustrates that the minimum score was 1 and the maximum was 5. As compared to + structural and + semantic conditions, it reveals that the lowest and the highest scores in + semantic/structural condition are both less than + semantic and + structural conditions. As it can be observed from the Figure, score of 1.5 is the mode of scores which is less than the modes of + structural and + semantic conditions.

The comparison of Figures 2, 3, and 4 indicates that in + semantic/structural condition we are faced with a more positively skewed distribution than + semantic condition, which itself had similar status compared with + structural condition.

Figure 4

Bar Char of Scores Frequencies under Semantic/Structural Condition



4.1.4. Means in Semantic, Structural, and Semantic/structural Elaboration Conditions

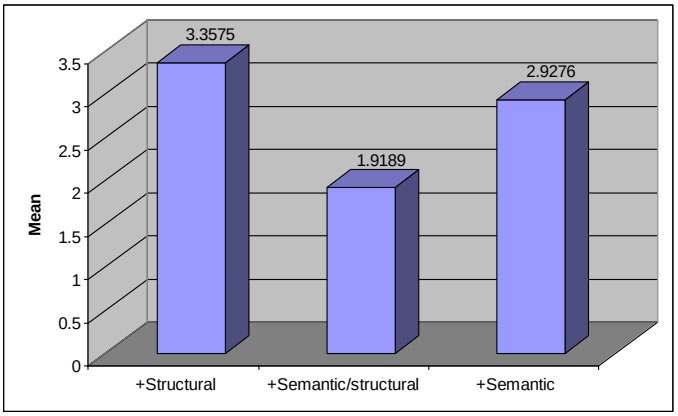
Means for different conditions appear in Table 4. One point, which should be taken into consideration, is that since each group of participants was supposed to learn the new words under different conditions through three different presentation orders, the actual number of participants was in practice multiplied into the number of presentation orders. In this way, as it can be concluded from the Table 4 below, the actual number of participants i.e., N = 114 was changed into N = 342. As it can be concluded from the table, the data revealed overall mean is highest in the in the + structural situation and lowest in the + semantic/structural situation.

Table 4
Mean, Standard Deviation, Maximum and Minimum Scores

	N	Mean	Std. Deviation	Minimum	Maximum
+ Semantic	114	2.9276	1.0485	1.25	6.50
+ Structural	114	3.3575	1.2188	1.25	6.75
+ Semantic/structural	114	1.9189	.7275	1.00	5.00
Total	342	2.7346	1.1818	1.00	6.75

Graphical mean rank comparisons also support this finding. As is evident from Figure 5, mean is greater in the + semantic situation (2.93) than in the + semantic/structural situation (1.92) and maximum in the + structural situation (3.36).

Figure 5
Comparison of Mean Ranks in Different Conditions



4.2. Inferential Statistics for Different Conditions

The main inferential statistics used in this study were one-way ANOVA, post-hoc (Tukey), and two-way ANOVA that are presented by means of tables.

4.2.1. One-Way ANOVA

Following the posttest phase, LPSP scores were submitted to one-way analysis of variance (ANOVA). Condition (+ semantic, + structural, and + semantic/ structural) was independent variable and the dependent variable was score. Alpha was set at 0.05 for the statistical analyses.

Table 5 indicates that results of one-way ANOVA revealed there were statistically significant differences among different conditions [$F_{(2, 339)} = 59.888$, $p < 0.001$, eta squared = 0.261].

Table 5

Results of the ANOVA for Different Conditions

	SS	*df*	MS	*F*	*Sig.*
Between Groups	124.333	2	62.167	59.888	.000
Within Groups	351.899	339	1.038		
Total	476.232	341			

Although ANOVA proved that these three conditions differ regarding the obtained results, it provided no information of the location or source of the difference. To determine the location of the difference, a post-hoc comparison using a Tukey test was utilized to indicate which pair-wise condition differences were significant.

4.2.2. Post-Hoc

As shown in Table 6, Tukey revealed a substantial difference among conditions. Pair wise comparisons showed that the mean scores were greater for the + structural and the + semantic situations than + semantic/structural situation, $p < 0.001$. However, the mean score for + structural situation was also higher than the +semantic situation, $p < 0.05$ (Table 6).

Table 6

Results of the Post-Hoc Comparison

(I) Situation	(J) Situation	Mean Difference (I-J)	*Sig.*
+ Structural	+ Semantic	0.4298	.004
	+ Semantic/structural	1.4386	.000
+ Semantic	+ Structural	-0.4298	.004
	+ Semantic/structural	1.0088	.000

* The mean difference is significant at the .05 level.

4.2. Discussion

Before opening this section, one point should be taken into consideration. Sticking solely to the LOP theory, it can be claimed that the greater the processing of data during learning, the more it will be retained and remembered. Although, according to LOP theory, enhanced elaboration usually leads to better memory, such a complicated system should be processed in a more multifaceted manner. With this intention, by preparing semantic, structural, and semantic/structural elaboration conditions, the current research has followed the footprints of TOPRA model, LOP, and TAP theories altogether which are actually interwoven. The research question investigated the influence of semantic, structural and semantic/structural elaboration on students' recall of new foreign language words. After

obtaining the results through analyzing descriptive and inferential statistics in the previous part, this section states the findings:

The first finding of the present study, which is a reminder of dependence of + semantic and + structural conditions on the nature of the task in the treatment and testing stages, is consistent with TAP (Morris et al., 1977). As discussed in introduction, according to the TAP theory, the memory influence of a variable highly relies on the nature of the task performed in the study stage and the testing stage. Accordingly, + structural situation of the present study, in which learning and processing were both structural and in line with TAP theory, achieved the highest rank. The findings of the study are in line with the findings of Kida (2022) who concluded that structural elaboration is effective on the vocabulary acquisition of Adult Japanese learners of English. On the other hand, the present finding is not consistent with those of Ahmadi (2014), who observed that structural elaboration does not have an important influence on word acquiring.

However, this finding is rather odd. As discussed in introduction, LOP theory, which was first presented by Craik and Lockhart (1972), states that memory for a stimulus item relies on the level at which the item is processed and, in this research, semantic elaboration demanded the deepest processing. Therefore, due to this theory, we logically expected semantic elaboration to have the most positive effect on recall of under-question words. The reason for this discrepancy can be the inconsistency between learning and testing tasks that was the case in + semantic condition. As discussed earlier, to test the accuracy of TAP theory, there was inconsistency between task performed in the study stage and the testing stage in + semantic situation.

When asked to produce new word forms in the testing phase of + semantic condition, participants were supposed to provide the researcher with information about how many word-forms they had acquired because their memory for form was pushed whereas there was not any footprint of form learning in +semantic condition of this study. As such, it is not very odd to observe + semantic condition is placed at the second position. In other words, if the + semantic condition had been examined through oral word production or definition recall instead of written word production, the position of + semantic and + structural conditions might have been opposite.

The second and third findings of the present study, i.e., inhibitory effects of + semantic/structural situation as compared to + semantic and + structural situations, gains support from TOPRA model, which was proposed by Barcroft (2002). As discussed in the introduction, this model is concerned with the connection between form processing, semantic processing, form learning, and semantic learning. TOPRA model claims that while increased semantic processing can potentially assist semantic learning, it can concurrently inhibit form processing and form learning. Furthermore,

increased form processing can facilitate form learning, whereas this type of processing can inhibit semantic learning. In this sense, semantic and structural processing functions like a two-edged blade.

Returning to the results of the present research it is confirmed that weak performance of the learners under + semantic/structural condition placed this condition in the third and last rank. The findings of the study are consistent with the results of Barcroft (2004) came to this conclusion that increased processing can hinder one's capability to encode the formal properties of new vocabularies.

Given the superiority of + semantic and + structural conditions to + semantic/structural condition in the present study, which is consistent with TOPRA model, if the learners are to process input for both form and meaning simultaneously, they will be faced with a learning complexity. This dilemma which may result in weak results- as was the case in this study- is due to the limited processing resources that should be allocated towards different types of tasks in the + semantic/structural condition. Subsequently, when developing a curriculum, instructors and curriculum developers need to bear in mind what aspect of vocabulary learning is of more importance to them to let the learners make the most and best use of their inborn gifts.

5. Conclusion and Implications

According to the research questions that conducted this study, the results of the study suggested the following main findings: structural situation as compared to semantic and semantic/structural situations had the most facilitating effect on learners' recall of new words during EFL lexical learning process. Semantic/structural situation as compared to semantic and structural situations had the most hindering effect on learners' recall of new words during EFL lexical learning process.

Last but not least, further research can employ an oral lexical production scoring to evaluate word production in + semantic condition which due to the TAP theory, may make the + semantic and + structural results much closer to each other and due to the LOP theory may put the + semantic condition in the higher position.

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