

THE USE OF LEXICAL NETWORKS IN EFL VOCABULARY TEACHING

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ABSTRACT

This study has evaluated the effectiveness of vocabulary instruction via lexical networks and whether this approach aids text comprehension and vocabulary growth in an L2 reading and vocabulary course. The instructional use of lexical networks, more commonly known as semantic maps, was tested against the word-definition matching technique, an approach that focuses on lexical items in isolation, as independent units. The main interest of the researcher was whether the use of a lexical network approach can help students recognize lexical cohesive features of a text and consequently facilitate comprehension of a text and increase vocabulary retention. The results of the study showed that learners' identification of lexical networks in a text can be a useful vocabulary learning device for advanced L2 learners, helping them establish and strengthen the links not only between the items that were the focus of the explicit instruction, but also other semantically related lexical items in the text.

Keywords: Lexical Network, vocabulary teaching, reading comprehension.

BACKGROUND TO THE STUDY

Recent studies on the process of reading comprehension of L2 learners and text coherence has shown that information presented in a coherent way and awareness of the text organization can result in better reading comprehension scores and better retention of the received information (Stoller & Grabe, 1993). A few studies suggest that verbal and visual representations of information from a text improve students' understanding, memory and recall (e.g. Paivio, 1986; Sadoski, Paivio, & Goetz, 1991). This mental representation can be created through natural means, or it can be prompted by explicit instruction. One technique that proved effective for this purpose is designing graphic organizers that match specific text structures. Visual aids (graphics, diagrams, shapes and figures) have been found to be effective in helping students visualize the interrelationships among ideas and details in the text, leading to better text comprehension. One popular type of graphic organizers is a lexical network, usually referred to as a semantic map, which shows the lexical links in a text.

Semantic mapping has been defined as "a graphic arrangement showing the major ideas and relationships in text or among word meanings" (Sinatra, Stahl-Gemakel & Berg, 1984:22). As an instructional strategy it involves establishing the links between words and concepts in the text, grouping information and creating visual displays of these categories and their relations.

The present study explores the concept of lexical networks, which has its origin in Halliday & Hasan's (1976) discussion of lexical cohesion in text, and examines its application as a vocabulary reinforcement strategy. It draws its inspirations in the way words are clustered in the mental lexicon, and compares a word association learning strategy based on reading of a text to a conventional technique, listing of words in isolation and their definitions.

Lexical Networks: A Description

Halliday and Hasan (1976) first proposed lexical cohesion as one of the cohesive devices for text coherence and organization. Their idea was further developed by de Beaugrande & Dressler (1981) and Hoey (1991) who made a graphical analysis of the structure of texts by showing the connection and nodes of connection through lexical items or words by means of drawing lines and arrows.

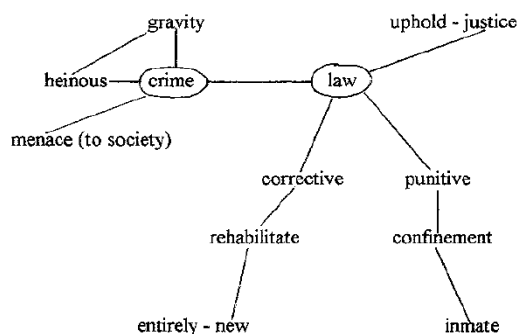
Words in an authentic text usually get linked in two different ways: paradigmatically and syntagmatically. Syntagmatic associations are those that would be related by a phrase or syntactic structure. Paradigmatic associations, on the other hand, involve the other words that could replace the target word. Common examples of paradigmatic associations are “black – white”, “man – woman”. On the other hand, “gun – shoot” can be considered a simple example of syntagmatic association. Paradigmatically related words bear a hierarchical connection to each other, and can usually fill the same syntactic slot in a sentence. Examples include superordinates (dog!animal), subordinates (dog!terrier), hyponyms (dog!cat), and so forth. Syntagmatic connections, on the other hand, exist in collocations and other types of connections which are typically from another word class, and commonly co-occur with a certain word (dog!bite, bark, furry, etc.). Studies in the mental lexicon mainly focus on the former, as evidenced in many of the studies in word association and in semantic fields (Clark, 1970; Meara, 1980; Channell, 1988; Aitchison, 1994).

The main claim of this study is that L2 readers who explore a text by noticing both the paradigmatic and the syntagmatic cohesion between the lexical items in the text would be at an advantage in terms of comprehension. By paying attention to both the paradigmatic and syntagmatic association between the lexical items used in a text, learners can process and remember the words better, too.

In presenting the paradigmatic and syntagmatic association of words used in a text, a visual, graphic display would be more explicit and impressive (Kameenui, Dixon & Gamine, 1987:143-144). By drawing arcs between words and forming nodes, lexical networks can be drawn up which graphically and vividly present the connection between the lexical items. The following gives an illustration of how to construct a lexical network from a text. Consider the following passage adapted from a text used by a reading skills course book with ten vocabulary items underlined and bold typed.

The purpose of the law is to **uphold** justice. If a man commits a **heinous** crime like murder, and the court has found him guilty, he should be sentenced to a punishment based upon the **gravity** of his crime. Putting a man in prison should not only serve a **punitive** purpose but also a **corrective** one. In many modern societies, the government provides opportunities for prison **inmates** to **rehabilitate** and even offers prisoners opportunities for adult education. The idea is to punish the criminal and make him suffer for his crime by long-term **confinement** but at the same time rehabilitate him so that when he comes out of prison, he will be an **entirely** new person, more responsible and no longer a **menace** to society.

If we look at the ten vocabulary items chosen, they are mainly related to law and crime. Thus 'law' and 'crime' can be chosen as the topic or key peg words. The two words 'uphold' and 'entirely' do not seem to link with the key peg words and the other words in the network easily because semantically they do not seem to belong to the same lexical set with the other words. One way to overcome this problem is to emphasize the collocational relationship of “uphold” with “justice” and of “entirely” with “new” in the text. This produces the lexical network shown in Figure 1.



The lexical network activity is a post-reading, test-based, vocabulary consolidation activity. It demands that learners have already mastered the vocabulary items and understood the text. The semantic association of the lexical items is mainly determined by the way the words are used in the text, not pre-determined in the semantic field or the mental lexicon, as in the example of 'entirely - new' mentioned above. It is this characteristic that mainly distinguishes a lexical network from a semantic map. However, in this paper, both concepts are used interchangeably so as not to confuse the readers and take them away from the main points made in the study.

Teaching vocabulary via lexical networks may also have the potential to result in better comprehension of a text. Representation of vocabulary items in a text in a web-like diagram makes it possible for learners to activate their prior knowledge of the topic, which should, in turn, help them to grasp, internalize and evaluate information in the material (Johnson, Pittelman & Heimlich, 1986). It also helps learners thematically group the key vocabulary based on the concepts presented in the text. That enables learners to recognize the multiple functions that words have in the text and to identify the semantic relationships between ideas which are not explicitly shown. Considering that sentences central to the topic tend to contain a larger number of lexical links (Hoey, 1991), a visual framework of lexical links that contribute to the cohesiveness of the text should help students recognize the links between the concepts and identify important information in the text. A more coherent representation of a text is expected to make discourse processing easier for learners, enabling them to channel their cognitive resources to unknown words in the text, which again should enhance vocabulary development. In other words, a graphic presentation of the information in the text may facilitate not only learning of items presented in the network, but also implicit learning of novel words in the text. This study builds on the assumption that vocabulary treatment that exploits lexical links in the text can make a better learning environment than other forms of direct instruction where the target words are presented as discrete items.

The present study makes the claim that instruction that studies and visualizes information via the lexical network technique will be more effective in assisting text comprehension and vocabulary retention than an approach where learners are just required to pair the target words with their explanations or definitions.

Participants

The study involved 32 advanced Turkish adult learners of English as a foreign language (EFL) enrolled in the language preparatory school of a university. They attended EFL classes 4 hours during the weekdays. The study took place as a part of the reading lessons. The participants were randomly assigned to two classes: the lexical network (LN) group which consisted of 15 students and the word listing (WL) group with 17 students.

Materials

Four articles were selected from English magazines such as Time and Newsweek. All texts had universal topics. Familiarity of the topics was deemed important so that all the students had sufficient content schemata, which is believed to have contributed to the readability of the texts.

Selection of the Words

Vocabulary selection was done in two steps. First, ten words with the highest number of lexical links were chosen by the researcher from each of the four articles. The software "Vocabulary Profiler" was used to determine the items with the highest repetition rate in the text. This is because repetition is considered to be one of the most common types of lexical cohesion (Halliday & Hasan, 1976). Different inflectional forms were taken as a single word. Personal nouns and "delexicalized" content words (items such as *number, fact, issue* etc. which have a discourse-organizing function) and the words used in another language were eliminated from the analysis. Lexical-semantic relations among the remaining words with high intra-textual frequency were then established. The analysis relied on the models of lexical cohesion proposed by Halliday & Hasan (1976) and revised later by Hasan (1984). These items were the focus of explicit instruction offered either through classical word listing or lexical network approach. In the discussion that follows, these words will be referred to as the *treatment* words.

The aim of this study is to assess the lexical network activity as a technique for vocabulary instruction in the context of an advanced EFL reading class. By the very nature of the lexical links students will know many, if not most, of the words used in the semantic mapping exercise. Thus the value of the semantic mapping exercise in terms of vocabulary learning will not be reflected solely -- if at all -- in terms of how well it facilitates learning of those items in the network not previously known. Rather, of interest is the effect semantic mapping will have on reading comprehension and the incidental learning of new vocabulary in the text. The specific focus is on the potential facilitation that the relational information captured in the mapped links will have on reading comprehension and vocabulary learning.

Words with the highest number of lexical links are often the most frequent words that advanced learners are likely to be familiar with. Therefore, the attention was on the acquisition of other words in the text that may be acquired incidentally while students are completing the semantic mapping or word listing tasks. In addition to the ten treatment words, two experienced teachers of reading were asked to identify 20 words from each article that were likely to be new to the learners and were considered important for understanding of the text. In total, there were 120 items on the pre-test (30 test items per article). In the discussion that follows, these items are referred to as the implicit *target* words.

Experimental Design

The study used a pre-test – treatment(instruction) – post-test experimental design. The data collection consisted of four parts: (1) Vocabulary pre-test (translation into L1); (2) Vocabulary instruction (3) Comprehension post-tests (cloze summary test); (4) Vocabulary post-test (translation into L1).

Pre-teaching Vocabulary Test: In the pre-test, learners were asked to translate 25 target words into L1. The students were given 25 minutes to complete the task. Each correctly translated item was awarded 1 point.

Vocabulary instruction sessions: In order to ensure that both types of treatments were tested under fair and equal conditions, both groups were given equal exposure to the reading material and teachers provided equal input and interaction as well as equal class time assigned to the tasks.

Word-Definition Matching Approach: The treatment provided an L2 definition of the target words and how they are used in the authentic texts. The definitions were usually synonyms, antonyms, short explanations or paraphrases, and the sample sentences were taken from *The Longman Dictionary of Contemporary English*

Online. The students were first given examples from the dictionary, then a list of target words and a list of definitions and were asked to do the matching activity. After the instructor provided explanations where necessary, the students were asked to fill in sentences taken from the four articles from which the target words were deleted. In the end, the learners were required to look at the relevant sentences in the article and check their own responses. The time given for the task was 30 minutes.

Lexical Network Approach: The lexical network activity used in this study consisted of "nodes" that include the key words in circles and the links (arrows) that lead to supporting concepts. First, the students received a map in which only the main concepts and the subordinate links were shown, which implied the number of links from each subcategory. Students were also given a list of words from the text to be read and these words were related to the central concept and supporting links. They were made to work in pairs and complete the lexical network by putting the words from the list in the appropriate slots.

The instructor provided corrective feedback, focusing especially on the text-specific lexical links and the words that learners were not able to categorize themselves. Finally, students were told to find the words from the lexical network in the article. The time assigned for the activity was 30 minutes.

Measuring Reading Comprehension: Comprehension of the texts by both groups was measured by a cloze summary test. The texts had been summarized earlier by the researcher and then gaps had been left in the summary for completion by students. Every 7th content word was deleted in the cloze test. The students were given 20 minutes to complete the task. One point was given for each correct answer. "Correct item" was defined as a word that makes sense.

Post-Teaching Vocabulary post-test: The test followed the same format and scoring procedures as the pre-tests.

RESULTS

Results of the Pre-teaching Vocabulary Test (translation): In the pre-test, the learners were instructed to translate the English words into Turkish (L1). The average number of the "already known words" was relatively high – W-DM 47%; LN 43%. The results showed that both of groups had almost the same level of prior lexical knowledge. A similar calculation was also done on the 40 treatment words that would be the object of vocabulary teaching. As can be anticipated, a very high level of familiarity with the items was observed in both groups (W-DM 85%; LN 88.5%).

Vocabulary instruction sessions: Both of the groups were able to complete the tasks within the allotted time. In the LN group, some students initially reported some challenge and difficulties in understanding a lexical network and sorting the target words, but with help of their peers they usually managed to actively participate in the activity. Students involved in the lexical network drawing showed a higher level of interest than when they were working on more conventional tasks such as matching words with their definitions.

Post-Comprehension Vocabulary Test (translation): At the end of the six-week instruction, the learners were administered a vocabulary post-test. The average number of words recognized by the learners on the post-test was almost equal for both conditions (LN 63.5%; W-DM 61.3%). A further analysis was also run on the subset of 40 treatment words. The mean scores for all four articles were high in both of the groups (LN 95.2%; W-DM 94.4%), and little variation was observed in performance of individual learners. These results were already expected by the researcher as the treatment words were high frequency items already-known by most learners at the pre-test stage.

Comparison of Pre-test – Post-test results: The two vocabulary instruction techniques were also evaluated in terms of retention of the target items by the students. Of interest to the researcher was the number of words learners acquired during the sessions and any possible correlation between different types of vocabulary treatment, text comprehension and word retention. First, performance across the four articles was examined. Mean values obtained were somewhat higher for LN group (93.25%), compared to WL group (92.75%).

A considerable increase in scores was also observed in the subset of treatment words. The gains were most noticeable in Article 1, which had the lowest scores on the pre-test. Due to the ceiling effect, there was slight improvement in the scores in Articles 2, 3 and 4.

The percentage of correct answers on both tests was computed to be able to compare the results of the pre-tests and the post-tests on an individual basis. The scores on the post-tests were, as anticipated, found to be higher for all the learners who completed the experiment, pointing at a positive effect of explicit instruction on vocabulary development. The LN group performed better than the W-DM group in the vocabulary post-tests on all four articles. The scores in the LN group were also steadier, with the gains varying between 18% and 28%. In the W-DM group, the percentage of learnt words was between 12% and 19%.

Overall Comparison of the Results: The Wilcoxon Signed Rank Test was run to measure the statistical significance of the differences in the students' pre-test and post-test performance. A pair-wise comparison of group performance across the articles indicated that the pre and posttest differences for both the lexical networking condition and the word-definition matching condition were statistically significant at $p < .0005$.

Comprehension tests : The mean scores for the two groups were almost identical - on average the students were able to answer about 70% of the comprehension questions correctly. Standard deviation values showed that the LN group exhibited slightly less variance, although greater individual differences in the students' performance were observed in both groups.

Vocabulary knowledge and reading comprehension: In order to determine the extent to which vocabulary instruction is likely to contribute to reading comprehension of advanced learners, the correlation between vocabulary knowledge and comprehension test scores was examined before and after the vocabulary treatment sessions.

The correlation between comprehension tests and vocabulary pre-test results: Students' scores in the comprehension test did not correlate with vocabulary knowledge at the pre-test. For the LN group, the Spearman's rho correlation between the pretest and comprehension test scores was $r = .270$; for the W-DM group $r = .192$. Neither were significant at the conventional level $p < .05$ level.

The Spearman's rho correlation was also run between the pre-test scores for the treatment words subset and comprehension test results. For the LN group, the correlation was $r = .37$, statistically significant at $p < .05$ level. For the W-DM group the correlation was $r = .17$ and was not significant at $p < .05$ level. The results suggest that vocabulary knowledge may not always be a good tool to predict text comprehensibility.

Comparing the comprehension tests and vocabulary post-test results: The Spearman's rho was run to see if there is any correlation between comprehension test scores and vocabulary post-test scores. This correlation is important as it provides some insight into the extent to which students' lexical knowledge may influence their comprehension of an L2 text. The Spearman's rho correlation between the two variables was slightly stronger than the pre-test correlations. For the LN group, the Spearman's rho correlation between the pre-test and comprehension test score was $r = .36$ and for the W-DM group $r = .25$, both significant at $p < .05$. Though relatively small, statistically significant correlation between vocabulary posttests and comprehension test scores was found in both cases. The correlation was slightly stronger in the LN group.

DISCUSSION AND CONCLUSION

The aim of this study was to compare the success of lexical networking and word-definition matching approaches to vocabulary teaching and to determine whether they facilitate text comprehension and vocabulary learning. The possible reasons behind the results gained are discussed below.

With regard to the effects of treatments sessions on vocabulary learning, the observed superiority of the LN approach could be linked to the fact that a lexical network offers graphic representation of the lexical cohesive links. Knowing a particular word will almost always be at some stage between total ignorance and full knowledge (Nation, 1990; Schmitt & Meara, 1997). All these various pieces of lexical information have to be strengthened. Visualization of the lexical relations among words may take learners' attention to the semantic properties of the relevant sense of each lexical item, facilitating merging of these properties in the mental lexicon. Categorical placement and graphic representation place emphasis on how a word fits in a learner's semantic network, rather than on what it means or how it was used in a particular sentence (Pearson, 1985). Asking student to construct an entire conceptual network of relevant lexical items allows integration of new information into the existing knowledge, thus facilitating vocabulary growth.

In the W-DM approach, word meaning is studied through dictionary definitions, where the term is explained by identifying the concept to which it belongs and the unique characteristics that differentiate it from other members of its class. There are several challenges, however, resulting from this process. First, it is not easy to define words in psycholinguistic terms. Mental representations of words are still not completely understood (Jorgensen, 1990) and such mental processes are complex and not conducive to introspection (Miller, 1981; Johnson-Laird, 1987) which makes it extremely difficult to capture word meaning explicitly in a definition alone. Second, the W-DM technique sees words as individual items with the focus being placed on their meaning and use in a particular sentence. That also makes it difficult to see how these words may fit into the larger lexical network that is represented in the mental lexicon. As Kintsch (1998:43) pointed out "words become meaningful because of their relation to other words." On the other hand, the process of lexical network construction pushes students to relate the words to each other, which may have helped them establish and strengthen the links not only between the items that were the focus of the explicit instruction, but also other semantically related words in the text. Thematic organization and visualization of the lexical network may have made the process of integration and restructuring of the mental lexicon faster, resulting in more noticeable vocabulary gains.

The results of this study did not reveal any significant difference in the comprehension test scores of the two groups. It could be interpreted that both techniques can be an effective way of improving comprehension, though they may involve different psychological processes. In the W-DM approach, providing the learners with the dictionary definitions of the words as they were used in the articles probably increased the likelihood of the sentences being interpreted correctly. Moreover, the fact that during the treatment session the learners were asked to complete sentences from which the target words were deleted and then confirm their answers by finding the relevant sentences in the article may have helped them remember the target words in the cloze summaries with more ease.

The lack of correlation between the scores on the vocabulary tests and comprehension tests suggests that students' vocabulary size alone may not always guarantee higher comprehension rates. It is possible that the students have somehow learnt the new meaning and the form of individual words, but they may not have developed the ability to actively use this new word during reading comprehension. Recognition of individual words may not be enough to process a text smoothly. Advanced learners may have acquired the meaning of a large number of vocabulary items, but if these were are not well integrated and linked in the mental lexicon,

they still may report difficulties in understanding L2 texts, particularly in test situations. Thus, the tests that measure knowledge of words in isolation may not be the best predictor of the students' performance in reading. It is possible that quality of word knowledge –rather than quantity– may be a more relevant factor when it comes to text comprehension.

Another key issue that should be given attention while discussing the findings of this study is the effect of instruction on students' desire and readiness to learn. Learners' performance in the class indicates that vocabulary teaching through lexical network activity may keep the students more actively engaged in learning endeavors than traditional modes of instruction such as matching the words with their definitions. Creation of lexical networks seems to be a very effective tool in fostering pair or group work habits and thus collaboration among students. This is quite important because it is through group work, interaction and negotiation that learners can continue to expand their understanding of new words (Hunt & Beglar, 2005). Experimental studies (e.g. Newton, 1993) showed that combined lexical knowledge of learners in a class provides more extensive coverage of L2 vocabulary than the lexicon of any individual learner. What is more, group-based peer interaction offers a low-stress environment where learners are not afraid of making errors and without fear of exposing their weakness to the instructor (Long & Porter, 1985). Increased level communication and relations among the students may also be one of the grounds leading to better vocabulary scores in the lexical network group.

It seems apparent that simply telling students the meaning of new words is not enough to fully incorporate them into the mental lexicon. The results of this study suggests that, as a pedagogical tool, students may keep a 'vocabulary journal' in which they could write new words and all of the connections that they can think: part of speech; spelling, syllables and stress; words with similar meanings; opposites; categories the words belong to; words that usually connect to the word and personal experiences etc. By writing down all of these connections, the English learners would be assisting their mental lexicon in building stronger links between words which in turn would help them remember the new vocabulary.

To conclude, the results obtained in this study have indicated that the lexical network approach is a useful vocabulary-learning mechanism for advanced L2 learners. It assists consolidation of vocabulary and boosts motivation. However, the results of the study did not indicate that instruction through lexical network activities is necessarily more effective than more traditional treatments like matching words with their definitions when the main concern is improving text comprehension. It is possible that learners' gains in vocabulary knowledge do not directly result in better text comprehension and that students' comprehension test scores do not reflect their overall proficiency, either. It is hoped that the findings attained here will be useful to instructors and learners in similar instructional settings and encourage them to even further explore lexical network activities as a vocabulary teaching technique.

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