

The Effect of Vocabulary Instruction through Semantic Mapping among EFL Learners with Different Perceptual Learning Styles

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Abstract

Traditional and modern vocabulary instruction techniques have been introduced in the past few decades to improve the learners' performance in reading comprehension. Semantic mapping, which entails drawing learners' attention to the interrelationships among lexical items through graphic organizers, is claimed to enhance vocabulary learning significantly. However, whether this technique suits all types of learners has not been adequately investigated. This study examines the effectiveness of employing semantic mapping in vocabulary instruction to EFL learners with different perceptual modalities. A modified version of Reid's (1987) perceptual learning style questionnaire was used to determine the learners' modality types. The results indicate that semantic mapping in comparison with commonplace approaches significantly enhanced EFL learners' vocabulary achievement. Although visual learners slightly outperformed other types of learners on the posttest, no significant differences were observed among intermediate learners with different perceptual modalities employing semantic mapping for vocabulary practice.

Keywords: vocabulary instruction, semantic mapping, perceptual modality, learning styles

Introduction

Vocabulary is one of the most important language components without which neither language comprehension nor production is possible. From a

pedagogic point of view, the inevitability of vocabulary is a concept on which both instructors and learners agree (Laufer, 1997). Word knowledge is an indispensable constituent of communicative competence (Seal, 1991); it is central in production and comprehension tasks in any language, be it first or second.

Generally, a direct link has been observed between vocabulary knowledge and language skills. Commenting on the link between lexical richness and reading skill, for instance, the National Reading Panel (2000) states, "Reading comprehension is a cognitive process that integrates complex skills and cannot be understood without examining the critical role of vocabulary learning and instruction in its development" (p. 4).

The acknowledgment of the significance of vocabulary by second/foreign language acquisition (SLA) researchers has resulted in an escalating enthusiasm centered on investigating viable methods of helping learners with the tedious task of learning new words. Nonetheless, there has been a debate in the research literature about the optimal means of vocabulary instruction. Some research findings support explicit instruction of vocabulary while others focus on implicit instruction through using semantic maps, word associations, etc. (Margosein, Pascarella, & Pflaum, 1982; Schmidt, 2000). Meanwhile, learning takes place inside the individual learners' cognition and thus learners with different perceptual modalities may approach different vocabulary instruction techniques differently (Reid, 1987; Oxford, 2001).

Optimal Vocabulary Instruction

For quite a period of time in the history of language teaching, teacher preparation programs undervalued the need for developing a sound approach to teaching vocabulary, and thus provided less relevant training on vocabulary instruction. The extent of this practice went as far as persuading teachers that learners needed no help with learning vocabulary. Allen (1983, p. 3) listed three reasons for neglecting vocabulary in the mid-20th century:

- a) excessive previous emphasis on vocabulary learning to the point of seeing language learning as solely learning vocabulary;*
- b) a conviction by some specialists that vocabulary learning was too complicated a matter to be dealt with and, consequently, that meaning of words could not be adequately taught; and*

c) *a fear by some specialists in methodology that learners would make mistakes in sentence construction if too many words were learned before the basic grammar had been mastered.*

In more recent years, however, vocabulary has been revisited by SLA researchers and several studies have claimed that vocabulary knowledge plays an essential role in L2 acquisition, and that vocabulary instruction is an indispensable part of language instruction. As Nunan (1999, p. 103) contends:

In recent years, the teaching of vocabulary has assumed its rightful place as a fundamentally important aspect of language development. This is partly due to the influence of comprehension-based approaches to language development, partly due to the research efforts of influential applied linguists, and partly due to the exciting possibilities opened up by the development of computer-based language corpora.

L2 teachers often recognize and delineate technical or unusual words in texts, as quite a number of them are unaware that knowing a word involves more than knowing its definition. Efficient vocabulary training necessitates that teachers appreciate how words are learned in non-instructional contexts in the course of oral exchanges and reading (Carter & Nunan, 2001).

There is a dispute, however, in the body of the literature centered on the best way to teach vocabulary, referred to as the fertility versus futility debate (Baumann & Kame'enui, 1991). The debate is based upon the dilemma of utilizing direct vocabulary instruction techniques (fertility) or relying on incidental learning only (futility). Several experimental studies symptomatic of larger efficiency of direct vocabulary instruction are quoted by the supporters of direct instruction. On the contrary, advocates of the futile view present evidence in support of vocabulary development within a broader educational agenda that provides opportunities for learners to map word meanings onto existing schemas. Nonetheless, research findings on the whole seem to support direct instruction in general adult SLA (Baumann & Kame'enui, 1991).

Research, according to Doughty (2003), indicates that post-critical period learners seem to have lost, at least partially, the capacity for implicit induction

of language patterns from naturalistic input. This, in turn, has serious implications for L2 pedagogy, in that adult L2 education cannot rely on mere exposure of the learners to input or even comprehensible input. Consequently, the case for the necessity of instruction in adult L2 learning is strongly advocated. Doughty (2003) states that except for a small number of researchers who advocate a strong non-interventionist position in adult SLA, most SLA researchers seem to agree on the necessity of instruction and not mere exposure to input in adult second language classrooms (Long & Robinson, 1998). The non-interventionist position asserts, that "(i) SLA is driven by the same Universal Grammar (UG) that guides first language acquisition, and (ii) that SLA, like first language acquisition, is entirely incidental" (Doughty, 2003, p. 257).

On the other hand, a meta-analysis of relevant experimental and quasi-experimental studies on the effectiveness of L2 vocabulary instruction by Norris and Ortega (2000) provided some positive evidence for the superiority of explicit instruction over implicit instruction of vocabulary and evidence for the durability of L2 instruction. A reassuring point here is that Norris and Ortega's findings echo Long's (1983) finding that instruction does positively impact classroom L2 acquisition, provided that appropriate instruction is implemented. This finding serves as a substantial impetus for practitioners and researchers in the field to seek the best possible instructional practices.

As for the type of explicit instruction, multiple techniques have been suggested. Bleckley (2006) reports that three different types of vocabulary instruction have been tested through the history of English language teaching: definition-based instruction, consisting of a list of words that learners look up and write the definitions down; context-as-a-clue instruction, through which meanings of the target words are inferred from the adjacent material; and the semantic mapping approach, in which new words are associated with other words which are already present in the learners' mental lexicon.

Semantic Mapping

Barcroft (2004, p. 200) defines semantic mapping as "the increased evaluation of an item with regard to its meaning". A semantic map can be used as a tool for discovering the conceptual relationships between vocabulary items. Semantic elaboration seems to enhance word learning and retention, through a learning phase called integration (Shostak, 2003). Integration is based on the view that in order for learning to occur, new

information should be incorporated into what the learner previously knows (Christen & Murphy, 1991, cited in Shostak, 2003). That is, instruction should guide learners to use words and ideas available to them in their word and concept repertoire to help them associate meaning with words they do not know. It is believed that this will lead to deeper learning and thus longer retention of the learned words. Previous research on vocabulary acquisition reveals a significant improvement in vocabulary learning whenever semantic maps were employed. Harley, Howard, and Roberge (1996), for instance, employed semantic maps in two French-as-a-second-language classes. The findings of their study were indicative of a significant degree of gain in vocabulary knowledge in both classes over the three to four weeks of treatment.

Barcroft (2004) argues that semantic elaboration of lexical items enhances their memory retention considerably among L2 learners. Based on previous research studies conducted and their findings, Barcroft (2004, p. 201) asserts that:

Semantic elaboration positively affects memory for (a) previously acquired words (Bower & Reitman, 1972; Craik & Tulving, 1975; Johnson-Laird, Gibbs, & de Mowbray, 1978; Hyde & Jenkins, 1969; Ross, 1981; Schuman, 1974; Tresselt & Mayzner, 1960); (b) new words recorded as known words (Atkinson & Raugh, 1975; Levin et al., 1982; Pressley et al., 1982; Ellis & Beaton, 1995); and (c) other types of stimuli (e.g. first language sentence recall: Stevenson, 1981; L1 text recall: McDaniel, 1984).

In the same vein, Bromley, Irwin-Devitis, and Modlo, (1995) assert that graphic organizers represent a graphic teaching strategy which has been devised to help learners build the conceptual connections they need to decipher any kind of words completely. It is this graphic feature of semantic maps that inspired the present study in exploring a potential gain for learners with different perceptual modalities when vocabulary is taught and learned through these graphic organizers.

Learners' Perceptual Modalities

In L2 learning settings, numerous cases have been reported in which learners attending the same class show significant variability in the progress

rate associated with learning language elements. Investigation into this observed inconsistency is suggestive of divergence in learner characteristics being the explanation. Ellis (1994) provides a rather comprehensive inventory of these characteristics quoting various other scholars as presented in Table 1 below.

Table 1 – Factors listed as influencing individual learner differences (IDs) in language learning (adopted from Ellis, 1994)

Atman (1980)	Skehan (1989)	Larsen-Freeman and Long (1991)
<ol style="list-style-type: none"> 1. Age 2. Sex 3. Previous experience with language learning 4. Proficiency in the native language 5. Personality factors 6. Language aptitude 7. Attitudes and motivation 8. General intelligence (IQ) 9. Sense modality preference 10. Sociological preference (e.g. learning with peers vs. learning with the teacher) 11. Cognitive styles 12. Learner strategies 	<ol style="list-style-type: none"> 1. Language aptitude 2. Motivation 3. Language learning strategies 4. Cognitive and affective factors <ol style="list-style-type: none"> a. Extroversion / introversion b. risk-taking c. intelligence d. field independence e. anxiety 	<ol style="list-style-type: none"> 1. Age 2. Socio-psychological factors <ol style="list-style-type: none"> a. motivation b. attitude 3. Personality <ol style="list-style-type: none"> a. self-esteem b. extroversion c. anxiety d. risk-taking e. sensitivity or rejection f. empathy g. inhibition h. tolerance of ambiguity 4. Cognitive style <ol style="list-style-type: none"> a. field independence/ dependence b. category width c. reflexivity/impulsivity d. aural/visual e. analytic/gestalt 5. Hemisphere specialization 6. Learning strategies 7. Other factors e.g. memory, sex

Lightbown and Spada (1999) classify learner characteristics that conspicuously affect language learning success into six main categories: motivation, aptitude, personality, intelligence, learner preferences, and age. Within the discussion of IDs, the aspect which has recently been a topic of great interest and pertinent to the present study is what Atman (1980, cited in Ellis, 1994) refers to as *sense modality preference*. In Larsen-Freeman and Long's (1991) classification, the attribute falls under cognitive style. Many other researchers (e.g. Oxford, 2001; Doyle & Rutherford, 1984) categorize perceptual modalities under learning styles.

According to Oxford, (2001) “Perceptual modalities refer to physical and perceptual learning channels with which the learner is the most comfortable” (p. 360). Oxford perceives perceptual modalities as comprising four main areas: visual, auditory, kinesthetic (movement-oriented), and tactile (touch-oriented). Accordingly, visual learners rely to a significant extent on visual backup in the process of learning, and lessons involving mere lectures, conversations, or oral instructions can easily perplex them. They prefer to read and gain significantly from visual stimulation. Auditory learners, on the other hand, can benefit from lengthy lectures and oral instructions; they take pleasure in taking part in classroom conversations and need little or no visual aid. Finally, kinesthetic and tactile learners seem to enjoy working with more concrete elements such as flashcards and collages. They like moving around; thus sitting at a table for hours can be a challenge to their patience.

Doyle and Rutherford (1984) seem to have merged Oxford's fourth category for sensory preference, namely tactile, into the kinesthetic area. Oxford herself, along with many others, frequently refers to both interchangeably. A central point regarding perceptual modalities is that any one of these preferences, as measured by the instruments available, is not a single marker of sensory preference in any one person. This is demonstrated by Reid (1987) who treats sensory preferences in his questionnaire, i.e. the perceptual learning style preference questionnaire (PLSPQ). He uses terms such as major, minor, and negative to describe one's sensory preference. Moreover, there are some learners who have more than one preferred sensory modality. That is, they feel comfortable receiving and processing information through more than one sensory channel. These learners have been called multisensory learners (Meyers, 1980, p. 64).

In line with what was discussed above, this study set out to investigate the effectiveness of vocabulary instruction via semantic mapping vis-à-vis the commonplace vocabulary teaching techniques in Iran. The second objective that the study sought was to unearth a potential match – if any – between any groups of learners (based on perceptual modality) and employing semantic maps in vocabulary instruction. In other words, it attempted to discover which learner groups (auditory, visual, kinesthetic, or multisensory) benefit more from employing semantic maps in vocabulary learning tasks. The study, therefore, aimed at answering the following research questions:

1. *Does teaching vocabulary to adult EFL learners via semantic mapping significantly improve their vocabulary?*
2. *Do adult EFL learners' perceptual modalities significantly affect the relative efficacy of employing semantic maps in vocabulary instruction?*

Method

The methodology employed to answer the aforementioned research questions is delineated in the following section.

Participants

A total number of 196 adult intermediate Iranian EFL learners from different language schools in Oroomieh (the northwestern Province of West Azerbaijan) took part in this study. They were selected based on a vocabulary pretest administered to 264 subjects among whom, 196 participants whose scores fell between one standard deviation above and below the mean were selected. They were divided into two equal groups consisting of nine classes in the control and eight in the experimental group.

Instrumentation

Two tests, a questionnaire, and four reading passages were adopted in this study, which are described below.

Schmitt Vocabulary Levels Test (SVLT)

The Vocabulary Levels Test (Schmitt, 2000) was used to estimate the learners' English vocabulary size prior to the study. It consists of four sections: the 2000 word level; the 3000 word level; the 5000 word level; and the 10,000 word level. On the basis of the validity evidence presented by Schmitt, Schmitt, and Clapham (2001), the researchers adopted the first version of this test.

There are four levels with ten clusters at each level, and six words in each cluster. The total number of the test items was 120 and each test item contained six words and three definitions. Participants were expected to match the three definitions with three of the six words provided in the item by writing the corresponding number of the item next to its definitions. The following example illustrates the format of the test:

1. business
 2. clock
- _____ part of a house

- 3. horse _____ animal with four legs
- 4. pencil _____ something used for writing
- 5. shoe
- 6. wall

The Reading Passages

Four reading passages from *Select Readings: Intermediate* (Lee & Gunderson, 2001) were determined as the instructional materials for the study. This book consists of 14 reading passages accompanied by vocabulary, grammar, and reading-skill tips and exercises. The main objective of the book is to teach reading skills and strategies. From amongst the 14 themes presented in the book and based on the aforementioned criteria, four passages were selected. These include *Culture Shock* (pp. 24-35), *How to Make a Speech* (pp. 58-69), *Letters of Application* (pp. 94-107), and *John's Taiwanese Wedding* (pp. 132-143).

The book provides vocabulary glosses for some lexical items which are written in boldface letters in each of the texts. There are also some culture notes in the form of an appendix in the final section of the book which are divided into 14 sections (corresponding to the chapters), and comment on some proper names for people, places, or cultural events which are written in blue boldface letters in the texts.

The first passage, *Culture Shock* (written by Bob Weinstein, a New York journalist, for the Boston Globe), is an approximately 900-word text divided into 11 paragraphs. It summarizes the culture shock an Australian girl from Melbourne, who attended Boston College in Blackmore, experienced during her first semester at the school. The chapter containing this text aims at helping the learners distinguish and differentiate the topic and the main ideas in an English text. It also tries to introduce English collocations containing the verb *feel*. Finally, a comparison is made between *used to*, *get used to*, and *be used to*.

The second passage, entitled *How to Make a Speech* (written by George Plimpton, a writer, public speaker, editor, and actor in New York), is an approximately 950-word text which outlines eight tips on how to make a public speech. It is divided into 11 short paragraphs eight of which have headings. Chapter Six in the book which contains this passage underlines the salience of headings in trying to understand a written text. It also introduces imperative sentences and a group of English verbs it refers to as power verbs, which are verbs such as *lead*, *manage*, or *inspire* that demonstrate

action and authority (Lee & Gunderson, 2001, p. 65). The authors claim that such verbs create an impression of confidence in resumes, letters of application, and other business documents.

The third passage, *Letters of Application* (written by Andrea B. Geffner, a business educator and writer and also the former dean of the Taylor Business Institute in New York), is a text of roughly 900 words which summarizes the elements of an effective application letter. The text is divided into 14 short paragraphs. Through chapter 9, the book tries to improve the readers' skill in encountering instructional materials. It also highlights the contribution of connecting words (such as conjunctions and relative pronouns) to the coherence in a text; and the use of English modals *should* and *must*, the imperative voice, and several other expressions (such as "It's a good idea to...") to give advice.

The fourth passage, *John's Taiwanese Wedding* (written by John Felty, a graduate student in Asian Political Systems, and Bill McDowell, a photographer and professor in Texas) is a text of nearly 950 words, divided into 12 paragraphs. The text is written in the first person point of view and through an account of muddled cross-cultural communication due to the narrator's imperfect Mandarin and inexperience with Taiwanese customs tries to promote learners' inferencing skill in reading. It also introduces the application of verbs in the subjunctive mood used in noun clauses following English verbs such as *advise*, *insist*, *propose*, *suggest*, etc.

To minimize the impact of topic familiarity, the researchers advertently chose the above four readings which Iranian EFL learners presumably would identify least with and have the least background knowledge on.

Perceptual Learning Style Preference Questionnaire (PLSPQ)

To identify the perceptual modalities of the participants in the experimental group, an adapted version of the Reid's (1987) Perceptual Learning Style Preference Questionnaire (PLSPQ) was used. PLSPQ has been the central instrument for many studies in EFL contexts and validated by several researchers (e.g. Peacock, 2001; Wintergerst, DeCapua, & Itzen, 2001). For the purpose of the present study, categories that were relevant to perceptual modality were needed. Thus, in line with many researchers who do not acknowledge a difference between tactile and kinesthetic modalities (e.g. Doyle & Rutherford, 1984; Oxford, 1993; Kinsella, 1993), the tactile category was excluded from the test. Thus, in the present study, the three major

perceptual styles of visual, auditory, and kinesthetic (VAK) were identified using Reid's (1987) questionnaire. Those learners that demonstrated a significant inclination towards two or all perceptual modalities were categorized as multisensory.

Vocabulary Posttest

In order to measure how much learning had taken place in both the experimental and control groups, a test of vocabulary was devised by the researchers. Originally, it consisted of 70 questions testing all the previously learned target vocabulary items. This test was piloted with a group of 20 students and later reviewed both by two language testing researchers judging the workability, appropriacy, and accuracy of the items and also item analysis. As a result, 10 items which were considered to be non-fit were removed. The final version consisted of 60 test items. The target vocabulary items were tested using a matching, gap-filling, and multiple-choice test format.

Procedure

Initially, the SVLT (described above) was administered to choose a homogeneous group of participants in terms of vocabulary knowledge to join the study. As explained earlier, 196 learners whose scores fell one standard deviation above and below the mean were selected as the participants of the study, while the excluded 68 attended the instructional sessions for the experimental or the control groups and were given the tests and allowed to participate in classroom activities just like the 196 participants in order not to impede the regular language learning process, and given the administrative regulations in place by the language schools. The test results for those 68 learners were naturally excluded from the final data.

In order to determine the perceptual modalities of the participants, the PLSPQ was administered. Based on the participants' performance on this questionnaire, they were divided into the four groups of auditory, visual, kinesthetic, and multisensory learners.

Next, the instructors of the nine experimental classes – who were all experienced English teachers – were briefed through two gatherings on how to use semantic maps to teach vocabulary and were equipped with the

organizers. Prior to the briefing sessions, the instructors were asked to study the selected sources provided by the researchers about the application of semantic maps in vocabulary instruction. Then sample maps were completed during these two briefing sessions.

The following timeframe was set: a 45-minute portion of the standard 90-minute class time was devoted to usual class activities and covering the textbook; the remaining 45 minutes were dedicated to grouping vocabulary items using graphic organizers for the experimental group and the usual vocabulary instruction techniques for the control group (e.g. providing English synonyms and definitions, referring the learners to their dictionaries, giving Farsi equivalents, etc.). Both groups discussed the reading passages and their content and vocabulary.

Eight sessions of treatment were held over an eight-week period in all classes. The treatment involved a reading passage with commonplace reading instruction practices, including a warm-up, introduction of a reading skill, and reading the text while applying the newly learned skill to answer the comprehension questions that follow each text in the original format of the textbook. In the second half of the class time, however, learners in the control and experimental group followed different paths. The control group received the usual vocabulary instruction whereas the experimental group participated in semantic elaboration activities.

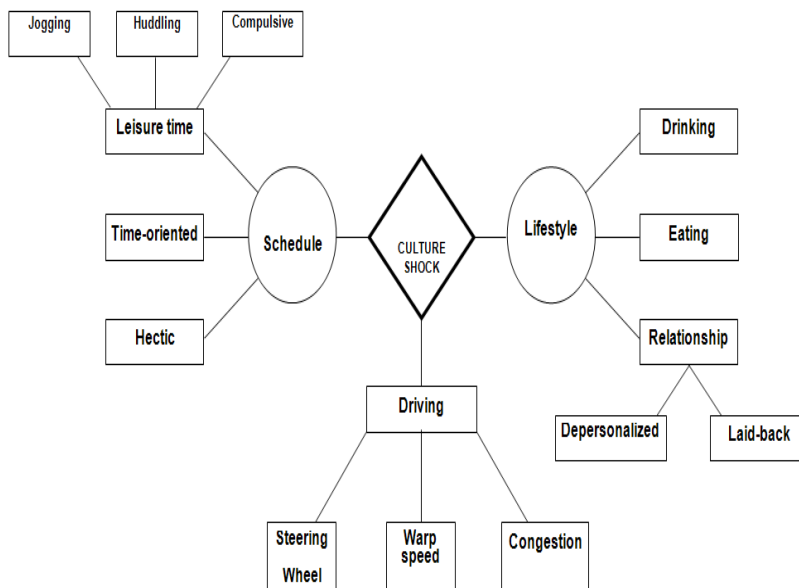
The semantic maps, which were used for the treatment in the experimental group, were descriptive or thematic maps, spider maps, problem and solution maps, and fishbone maps. The maps for the first two reading passages were filled by the learners with the teachers' assistance. For the last two passages, however, they were assigned to the learners to fill in groups of four or five people. The teachers only observed and provided help if needed in this phase. The resulting maps which were checked to ascertain whether they had accommodated all the target lexical items or not were finally approved by the teachers.

A brief outline of the lesson plan which was implemented in the experimental group is presented below:

1. A 10-to-15-minute classroom discussion based on the questions directed to the learners by the instructor and the learners' responses and comments on other learners' points of view constituted the warm-up phase of the instructional session. There seems to be a consensus between language theoreticians and practitioners on the value of this phase which serves to trigger the relevant schemata in learners' minds.

2. What followed the initial warm-up section was the introduction of a reading skill intended for each unit with an orientation towards preparing the learners for tackling the reading questions in standardized tests such as the TOEFL or the IELTS. This section was among the objectives of the textbook and was emphasized in order to increase the participants' motivation to attend the sessions regularly. It should be noted here that a good number of Iranian EFL learners, especially in the age range typical of this study, aim at eventually taking a standardized test for vocational or educational purposes.
3. The third part of each session was the time when the reading passage was actually read and the newly learned skill practiced. The learners went through a timed silent reading phase which was ensued by attempting the comprehension questions. In cases where there were detailed questions, the learners were asked to scan parts of the text for a second time. Subsequently, answers were peer-compared and eventually verified or corrected by the teacher through a class discussion.
4. The key aspect of the treatment in the experimental group which made it distinct from that of the control group was the process of using graphic organizers to teach vocabulary items. The following steps constitute this phase:
 - a. Introduction of semantic maps to the learners and providing guidelines on how they are used supported by completed examples of such maps.
 - b. In the initial session, the first map was completed by the instructor on the board using the words provided by the learners. By drawing a large circle on the board and writing the heading, the instructor started the brainstorming phase of the semantic mapping during which the learners provided as many words relevant to the topic as they could think of. The learners were encouraged at this stage to provide only those words that they could find in the text. For instance, they were asked to think of the main causes of culture shock and the differences between their country and the USA. The ultimate answers were timeliness, driving, and lifestyle, each of which was divided into other subcategories. The students were encouraged to see the relationship among their suggestions and add more words to each category that was already provided (e.g. eating, drinking, traffic, time oriented, congestion). An example of a map is shown in Figure 1 below.

Figure 1 – A completed semantic map for the first passage



c. In the time that followed, the learners were divided into groups and asked to create other maps. They agreed on which words to put in the map by negotiating with other group members. These maps were then collected and the instructor selected to copy on the board those which contained the target vocabulary items for that session. In cases where not all target vocabulary items were offered by the learners through class discussion, the instructor generated other maps to accommodate them.

d. Finally, the learners were asked to copy the maps on the board onto their vocabulary notebooks.

In the control group, the first three stages of instruction were identical to those of the experimental group. As for handling the new words, the following procedure was followed:

1. Subsequent to answering the comprehension questions following each text, taking turns, the learners were asked to read a paragraph of the text aloud for the class. They were referred to footnote definitions provided by the textbook for some words and expressions in each chapter. Then, they were invited to ask for the definition of any

unfamiliar or vague words in the paragraph just read. Whenever questions were posed, the instructor asked other learners to provide synonyms, definitions, or Farsi equivalents. Monolingual and bilingual dictionary use was allowed at this stage. The acceptable definitions or equivalents provided by the learners for each vocabulary item were put on the board by the instructor or a learner.

2. Once the learners had no more questions, the class moved on to the next paragraph. The above process was repeated until the whole text was covered.
3. In the next stage, the instructor referred the learners to the vocabulary exercises provided by the textbook in a section titled *Building Vocabulary*. The crossword puzzle at the end of each chapter, which partially focused on vocabulary items introduced in the passage, was assigned as homework and checked first thing a week later in the succeeding session.

Subsequent to the completion of the treatment, the posttest was administered to both groups.

Results

Pretest

As already elaborated in detail, the SVLT was used as a homogenizing tool prior to the study to select the study participants. Table 2 presents the descriptive statistics for this test.

Table 2 – Descriptive statistics for the SVLT

SVLT	N	Minimum	Maximum	Mean	Std. Deviation
	264	24	96	57.64	14.081

The reliability of the test was also calculated using the KR-21 formula (0.88). Based on the mean and SD results, the 196 learners who scored one SD above and below the mean constituted the participants of the study and were randomly divided into the experimental and control groups with 98 in each.

PLSPQ

Next, the 196 participants took the PLSPQ and were accordingly divided into the four groups of auditory, visual, kinesthetic, and multisensory learners. The results are presented in Table 3.

Table 3 – Percentages of participants in terms of perceptual modalities

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Auditory	43	21.9	21.9	21.9
	Visual	50	25.5	25.5	47.4
	Kinesthetic	54	27.6	27.6	75.0
	Multisensory	49	25.0	25.0	100.0
	Total	196	100.0	100.0	

Vocabulary Posttest

Following piloting and a thorough revision (explained earlier), a 60-item achievement test measuring the participants' mastery over the target vocabulary was administered. The reliability of the test was calculated to be 0.81 (again through the KR-21 procedure) while the descriptive statistics of this administration appear in Table 4.

Table 4 – Descriptive statistics for the vocabulary posttest

	N	Min	Max	Mean	SD	Skewness ratio
Exp	98	27	58	46.18	6.994	-3.221
Cont	98	28	57	43.03	8.093	1.467

Answering the Research Questions

To answer the first question of the study, the mean performances of the participants in each of the two groups on the posttest had to be compared. Going back to Table 4, one realizes that while the distribution of scores in the control group was normal (with the skewness ratio falling between -1.96 and 1.96), this distribution was skewed in the experimental group (-3.221 < -1.96). Hence, running a *t*-test was not legitimized. The alternative was of course to employ a nonparametric test such as Mann-Whitney to compare the above means. Tables 5 and 6 show the results for this statistical procedure.

Table 5 – Mann-Whitney test: ranks

Group	N	Mean	Sum of ranks
Control	98	87.76	8600.00
Experimental	98	109.24	10706.00

Table 6 – Mann-Whitney test: test statistics

	Score
Mann-Whitney U	3749.000
Wilcoxon W	8600.000
Z	-2.657
Asymp. Sig. (2-tailed)	.008

According to Table 6, the results of the Mann-Whitney test indicated that at the 0.05 level of significance, there was a significant difference between the mean rank of the control group (87.76) and that of the experimental group (109.24) on the vocabulary posttest ($U = 3749$, $N_1 = 98$, $N_2 = 98$, $\rho = 0.008 < 0.05$). Therefore, the researchers concluded that there was a significant difference between the performances of the two groups, with the experimental group who underwent vocabulary instruction through semantic mapping, outperforming the control group, at the end of the instruction.

To answer the second research question, the participants' performances in the experimental group ($N = 98$) were analyzed. The descriptive data are presented in Table 7.

Table 7 – Vocabulary posttest performance for the experimental group

	N	Mean	Std. Deviation	Skewness ratio
Auditory	21	46.71	6.813	1.18
Visual	31	47.58	6.536	-2.57
Kinesthetic	26	46.12	7.268	-2.27
Multisensory	20	43.55	7.287	-1.10

As can be seen from the data, participants with a visual perceptual modality outperformed the other three groups. Auditory, kinesthetic, and multisensory participants came next in the ranking, respectively.

The next step was to compare the means of the four groups (in the experimental group) with different perceptual modalities to discover any statistically significant differences in their performance on the posttest. As the score distribution of two of the groups, i.e. visual and kinesthetic, fell outside the acceptable range (between ± 1.96), running a one-way ANOVA was not legitimized. Hence, again a nonparametric test was used for this procedure with the results being shown in Tables 8 and 9 below.

Table 8 – Kruskal-Wallis test: ranks

	Sensory Preference	N	Mean Rank
Vocabulary Posttest	Auditory	43	94.23
	Visual	50	115.19
	Kinesthetic	54	98.24
	Multisensory	49	85.50
	Total	196	

Table 9 – Kruskal-Wallis test: test statistics

	Vocabulary Posttest
Chi-Square	7.175
Df	3
Asymp. Sig.	.067

As the results of the Kruskal-Wallis test indicate, at the 0.05 level of significance, there was no significant difference between the mean rank of the four sensory groups on the vocabulary posttest ($p = 0.067 > 0.05$). Thus, no significant differences were found among learners with the four different perceptual modalities aforementioned in learning vocabulary through semantic maps.

Conclusion

Statistical analyses of the first research question indicated that utilizing semantic maps in vocabulary instruction enhances word learning and vocabulary retention among EFL learners. In other words, the results were in favor of employing semantic maps in teaching words. This means that employing semantic maps in adult EFL classes is worthwhile and the extent

of gain is considerable and more effective than employing the traditional vocabulary teaching techniques.

This finding is in line with previous research findings concerning the effect of semantic mapping in enhancing vocabulary learning (Anders, Bos, & Filip, 1984; Stahl & Kapinus, 1991; Margosein, Pascarella, & Pflaum, 1982). This positive impact of semantic elaboration techniques can be attributed to the fact that in semantic mapping the relationships between words are explored and thus more ties among them are made in the lexical knowledge network of the learner. Establishing such a semantic network in the cognitive repertoire of the learner can lead to stronger comprehension of texts that use the target words (Bravo & Cervetti, 2008, p. 136): "Taken together, ... research suggests that approaches that provide more information about the words, particularly about the relationships among words, result in increased word learning and often in stronger comprehension of texts that use the target words".

On another note, a number of both the instructors and the learners confirmed in this study through informal feedback the time-costliness of semantic mapping activities. A few even expressed their doubt regarding the worthiness of employing semantic maps to teach vocabulary due to this time impediment. They claimed that the traditional methods would take much less time in comparison, and thus they would have more time to concentrate on the texts themselves and the reading skills. These views, however, are at least partially rooted in their super-ordination of the reading skill to lexical wealth. Contrary to their feelings, the results explicitly demonstrate that although semantic mapping is costly in terms of both the teachers' and learners' in-class time, it can be very beneficial in that students learn a great deal about new words and the interrelationships of the concepts associated with the words in their long-term memory.

On the whole, nonetheless, the instructors and also the researchers' observation during the treatment phase in the experimental group was that the learners were very interested in the semantic mapping activities. Direct feedback collected from a random group of learners confirmed this observation. This is in line with the comments of Graves (1986) in which the participants enjoyed the procedure, and it spurred their interest in words and the relationships among words in the texts.

Concerning the second research question, Reid (1987) maintains that the learners' different perceptual modalities can describe why the students learn differently, hence highlighting the importance of taking these preferences into account in the language classroom. In fact, the researchers

believe the second phase of the study was relatively more central than the first, particularly when the fact that no previous work (at least those that were known to the researchers) had addressed the question.

Results for the second question of the study revealed that learners with any perceptual modality benefited from vocabulary instruction which incorporates semantic maps almost equally. Visually-oriented learners, however, demonstrated a slight advantage over other perceptual modality groups. This might be attributable to the visual nature of semantic maps. Learners who have a visual strength or preference would like the teacher to provide demonstrations. They often use lists to sustain and organize thoughts and recognize words by sight. It should be stressed, however, that all the learners were intermediate learners. Therefore, one may come up with a different pattern of results with other learner groups.

One interesting finding in the posttest for different types of learners in terms of perceptual modality was the above-average performance of the auditory learners. Considering the characteristics of auditory learners who prefer a class in which the teacher provides verbal instructions, this finding was slightly surprising. A second thought about the preferences of auditory learners, however, makes this incident more understandable. Auditory learners find it easy to learn by listening. They enjoy dialogues, discussions, and plays. Based on the fact that initially the semantic maps were completed through class discussions and that later they were assigned to groups, the collaborative nature of completing semantic maps necessitated a fair amount of contribution by such learners. In other words, the activities involved a significant amount of learner talk. This might be a justification for an overall advantage of the auditory learners compared to kinesthetic and multisensory learners.

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