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The Impact of Vocabulary Instruction Methods (T-Coding vs. Picture Presentation) on Iranian EFL Learners' Vocabulary Gain and Retention [In English]

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ABSTRACT

The acquisition of vocabulary has been recognized for a long time as a major component of second and foreign language learning and is crucial for learners' communicative competence and academic achievement. Even though vocabulary instruction is important, questions remain regarding the most effective methods for instructional techniques in EFL contexts. The current study aimed to explore the influences of two vocabulary presentation methods to investigate their effects on vocabulary gain and retention compared to a traditional word-list lesson - T-Coding and Picture Presentation. The study's evidence used a two-way within-between subjects' design. A pre-test was administered to assess the participants' prior vocabulary knowledge and to provide assurance of group homogeneity prior to the treatment. The duration of the treatment lasted for 10 weeks, during which time each group received instruction using one of the methods. The T-Coding group received instruction using a mnemonic approach where new English words were associated with similar-sounding Persian words using a series of coded sentences in which the same phrase was repeated each week. The Picture group, on the other hand, learned vocabulary using pictures. The control group used standard word lists of English words with their Persian equivalents. Immediately following the treatment, a post-test developed by the researcher was used to assess short-term vocabulary gain. Two weeks after the post-test a delayed post-test was used to assess retention. A total of 54 third-grade high school students participated in the study (T-Coding = 21, Picture = 17, Control = 16). The data were evaluated by using a multilevel model of repeated measures ANOVA, and the results disclosed

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a significant difference between the three groups across time. The T-Coding and the Picture Presentation moderately enhanced learners' vocabulary gain and retention compared to the traditional word-list method, with the T-Coding group achieving the highest mean score among groups. These findings demonstrate the efficacy of mnemonic and imaging techniques to promote deeper cognitive processes and long-term retention of new vocabulary. It is, therefore, suggested that EFL teachers and material developers consider techniques such as T-Coding and Picture Presentation incorporate these strategies in classroom contexts to foster a more effective and pleasurable vocabulary learning experience.

Keywords: *EFL Learners, Picture Presentation, T-Coding, Vocabulary Gain and Retention, Vocabulary Instruction Methods*

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1. Introduction

Vocabulary is regarded as one of the most important aspects in the area of teaching and learning a second or foreign language. Richards and Renandya (2002, p. 255) define vocabulary as "a core component of language proficiency" which "provides much of the basis for how well learners speak, listen, read, and write."

It is a fact that "No matter how well a student learns grammar, no matter how successfully the sounds of L2 are mastered, without words to express a wider range of meanings, communication in an L2 just cannot happen in any meaningful way" (McCarthy, 1990, p. 58). Similarly, Susanto (2017, p. 153) emphasized on the students' inability to say what they want to say in communication without the adequate vocabulary knowledge. Fan (Fan, 2009, p. 222) explained that "vocabulary forms the biggest part of the meaning of any language, and vocabulary is the biggest problem for most learners". Language learners identify the vocabulary acquisition as a great source of problem which makes them encounter considerable difficulty even when they upgrade from an initial stage of acquiring a second language to a much more advanced level (Meara, 1998, p. 109). Regarding the importance of vocabulary acquisition and its complexity due to the potential lexicon size, investigating factors related to vocabulary learning might be vital.

One of the main challenges that EFL learners typically encounter is attributed to the realm of vocabulary learning including difficulties involved in broadening and enriching the vocabulary repertoire which specifically includes storing newly learnt words, retrieving the previously restored words, and ultimately recalling the appropriate ones in proper contexts.

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There are many reasons why second language vocabulary learning and teaching is still a crucial issue for students, teachers, and researchers in the field of language teaching (Bogaards & Laufer, 2004; Folse, 2014; Nation, 2001; Schmitt, 2000). The importance of teaching vocabulary is mentioned that "without grammar very little can be conveyed, without vocabulary nothing can be conveyed" (Wilkins, 1972, p. 19). According to Carter and McCarthy (2014) the mastery of vocabulary is central in the process of second/foreign language learning because it facilitates comprehension. Richards and Rodgers (2014, p. 37) stated that the role of vocabulary is "one of the first aspects of method design to receive attention in second language teaching programs." Besides, Krashen (1989, p.73) (as cited in Rodriguez & Sadoski, 2000, p. 85) believes that learning the vocabulary of a language is an essential step toward the mastery of that language, and lack of the knowledge of vocabulary is something that the language learners mostly complain about. Moreover, you can say very little with grammar, but you can say almost anything with words! (Thornbury, 2002, p. 13). Moreover, without words speakers will not be able to communicate with each other. Learners need large vocabularies to successfully use a second language, and so high vocabulary targets need to be set and pursued (Schmitt, 2008, p. 353).

As the status of vocabulary has improved in language teaching and learning, more attention is being paid to research on vocabulary acquisition as well (Hamzah, Kafipour, & Abdullah, 2009; Nakata, 2014; Pigada & Schmitt, 2006), encouraging both ESL/EFL teachers and learners to find ways of promoting vocabulary acquisition.

1.1 Statement of the Problem

Vocabulary learning constitutes a very important part of language development, "vocabulary learning is central to language acquisition whether the language is first, second, or foreign"(Decarrico, 2001, p. 285). It's also believed that If language structures make up the skeleton of language, then it is vocabulary that provides the vital organs and the flesh (Harmer, 1993, p. 153). In spite of the importance of vocabulary acquisition in language development, it was given little priority in the past, but recently there has been a renewed interest in this area (Richards & Renandya, 2002).

In second language vocabulary acquisition, which is a sub-discipline of second language acquisition, researchers have focused their attention on the need for learners to utilize their vocabulary knowledge (Schmitt, 2000). Vocabulary learning has always been found to be the biggest problem for language learners (Miller & Gildea, 1987). Considering the

learners' difficulties in learning new words, Vocabulary Learning Strategies (VLS) seems to be a useful way. There are many factors influencing the strategies that second language learners may choose to apply.

According to Johnson (2008, p. 81) advanced learners usually succeed in communicating in the L2 context without making grammatical mistakes, but their lexical code often remains limited. In learning a foreign language, vocabulary plays an important role. Therefore, to communicate successfully in a foreign language, EFL learners need to acquire vocabulary and use it appropriately. Most EFL learners fail to remember the words learnt through different methods of vocabulary learning (Gu, 2003, p. 6). They also do not know how to use L2 words in an appropriate context. This explains why L2 vocabulary needs to be accounted for in EFL classroom and curriculum.

The importance of vocabulary teaching methods specifically in the field of foreign /second language learning should be examined seriously. Although a lot of studies have been conducted in recent years focusing on the vocabulary learning and teaching strategies used by native language learners, little attention has been given to EFL. Moreover, a clear guideline on how to present vocabulary effectively is still lacking. The current investigation is going to explore the effect of two instruction methods on vocabulary learning of Iranian EFL learners.

1.2 Research Questions

For the purpose of this study, the following research question is formulated:

Is there any significant difference between T-Coding, Picture (i.e., experimental methods) and Wordlist (i.e., control method) vocabulary presentation methods on Iranian high school students' vocabulary gain and retention of new words?

1.3 Research Hypotheses

Based on the above research question, the following null hypothesis is proposed:

There is no significant difference between T-Coding, Picture (i.e., experimental methods) and Wordlist (i.e., control method) vocabulary presentation methods on Iranian high school students' vocabulary gain and retention of new words.

2. Literature Review

2.1 What is Vocabulary?

According to Hirsch (2003) vocabulary is knowledge of words and word meanings. However, vocabulary is more complex than this

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definition suggests. First, words come in two forms: oral and print. According to Farkas and Beron (2004, p. 469) oral vocabulary includes those words that we recognize and use in listening and speaking. Print vocabulary includes those words that we recognize and use in reading and writing (Hiebert & Kamil, 2005). Second, word knowledge also comes in two forms, receptive and productive (Webb, 2005, p. 40). Receptive vocabulary includes words that we recognize when we hear or see them. Productive vocabulary includes words that we use when we speak or write. Receptive vocabulary is typically larger than productive vocabulary, and may include many words to which we assign some meaning, even if we don't know their full definitions and connotations – or ever use them ourselves as we speak and write (Kamil & Hiebert, in press).

Adding further complexity, in education, the word "vocabulary" is used with varying meanings. For example, for beginning reading teachers, the word might be synonymous with "sight vocabulary," by which they mean a set of the most common words in English that young students need to be able to recognize quickly as they see them in print (Lehr, Osborn & Hiebert, 2004). However, for teachers of upper elementary and secondary school students, vocabulary usually means the "hard "words that students encounter in content area textbook and literature selections (Lehr, Osborn, & Hiebert, 2004).

For purposes of this study, we define *vocabulary* as knowledge of words and word meanings in both oral and print language and in productive and receptive forms. More specifically, we use *vocabulary* to refer to the kind of words that students must know to read increasingly demanding text with comprehension.

2.2 Vocabulary Knowledge

One of the most persistent findings in vocabulary research, is that the extent of students' vocabulary knowledge relates strongly to their comprehension and overall academic success (see Baumann, Kame 'enui, & Ash, 2003; Becker, 2007).

According to Snow et al. (2000), this relationship seems logical; to get meaning from what they read, students need both a great many words in their vocabularies and the ability to use various strategies to establish the meanings of new words when they encounter them. Young students who don't have large vocabularies or effective word-learning strategies often struggle to achieve comprehension. Their bad experiences with comprehension set in motion a cycle of frustration and failure that

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continues throughout their schooling. (Hart &Risley, 2003; Snow, Barnes, Chandler, Goodman, & Hemphill, 2000).

Because these students don't have sufficient word knowledge to understand what they read, they typically avoid reading. According to Stanovich (2009) because they don't read very much, they don't have the opportunity to see and learn very many new words. This sets in motion the well-known "Matthew Effects". Stanovich (2009, p. 25) states that "the rich get richer and the poor get poorer." In terms of vocabulary development, good readers read more, become better readers, and learn more words; poor readers read less, become poorer readers, and learn fewer words.

According to Nagy and Herman (2007, p. 44) this particular relationship between vocabulary knowledge and learner's comprehension seems clear but vocabulary knowledge contributes to reading success in other important ways that are perhaps less obvious. For beginning readers, evidence indicates a link between word knowledge and phonological awareness (Lonigan, 2007, p. 18). Young children who have a large number of words in their oral vocabularies may more easily analyze the representation of the individual sounds of those words (Goswami, 2001, p. 653). In addition, Ehri (2014, p. 9) stated that vocabulary knowledge helps beginning readers decode, or map spoken sounds to words in print. If children have the printed words in their oral vocabulary, they can more easily and quickly sound out, read, and understand them, as well as comprehend (Hirsch, 2003, p. 11).

2.3 Importance of Vocabulary in EFL Learning

Teaching and learning vocabulary have always been a main issue in research on ESL/EFL teaching and learning (Choudhury,2010, p. 308). The importance of teaching vocabulary is stressed by Wilkins who believes that "without grammar very little can be conveyed, without vocabulary nothing can be conveyed". Besides, Krashen (as cited in Rodriguez & Sadoski, 2000) believes that learning the vocabulary of a language is an essential step toward the mastery of that language, and lack of the knowledge of vocabulary is something that the language learners mostly complain about. Of course, according to Allen (1997), the importance of vocabulary was ignored during the 1940 – 1970 period because first, some educationalists focused on grammar and how words work together in sentences. The second reason was put forward by researchers who believed that it was not possible to adequately teach the meanings of words so we had better avoid teaching them altogether. Finally, some scholars stated that exposing the learners to a lot of words will lead them to confusion and making mistakes in sentence

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construction. However, Allen (1997) continues, more research on the subject revealed that lack of emphasis on vocabulary would result in breakdowns in communication. Consequently, vocabulary is believed to be the essence of a language since the language learners' mastery of vocabulary determines to a great extent their second/foreign language proficiency. Moreover, without words speakers will not be able to communicate with each other. Learners need large vocabularies to successfully use a second language, and so high vocabulary targets need to be set and pursued (Schmitt et al., 2011, p. 33).

As the status of vocabulary has improved in language teaching and learning, more attention is being paid to research on vocabulary acquisition as well (Hamzah, Kafipour, and Abdullah, 2009; Nakata, 2015; Pigada& Schmitt, 2006), encouraging both ESL/EFL teachers and learners to find ways of promoting vocabulary acquisition.

Nation (1990) recognizes the major problem in teaching vocabulary being the small number of words language teachers can cope with at any given time. Teachers can deal with this limitation, he continues, by involving the learners in incidental vocabulary learning from listening or reading comprehension tasks. Hence, a distinction is made between incidental and intentional vocabulary learning. (Cameron, 2001).

2.4 Instruction for Vocabulary Development

Over the past two decades, research has revealed a great deal about the kind of vocabulary instruction that is most effective for helping students comprehend what they read (e.g., Audust, 2005; Baumann et al., 2003; Blachowicz& Fisher, 2000; Nagy & Scott, 2000; Vallotton, Mastergeorge, Foster, Decker & Ayoub, 2017). Based on its analysis of this research, Schmitt (2008, p. 335) concluded that no one single instructional method is sufficient for optimal vocabulary learning; Therefore, effective instruction must use a variety of methods to help students acquire new words and increase the depth of their word knowledge over time. Effective instruction includes opportunities for both incidental word learning and intentional word teaching.

2.5 Why is vocabulary instruction important?

Vocabulary is one of five core components of reading instruction that are essential to successfully teach children how to read. These core components include phonemic awareness, phonics and word study, fluency, vocabulary, and comprehension (Schmitt, 2008, p. 334).

Vocabulary knowledge is important because it encompasses all the words we must know to access our background knowledge, express our ideas and communicate effectively, and learn about new concepts.

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"Vocabulary is the glue that holds stories, ideas and content together…making comprehension accessible for children." (Rupley, Logan & Nichols, 2003, p. 340).

Students' word knowledge is linked strongly to academic success because students who have large vocabularies can understand new ideas and concepts more quickly than students with limited vocabularies. The high correlation in the research literature of word knowledge with comprehension indicates that if students do not adequately and steadily grow their vocabulary knowledge, their comprehension will be affected (Chall& Jacobs, 2003, p. 16).

There is a tremendous need for more vocabulary instruction at all grade levels by all teachers. The number of words that students need to learn is exceedingly large; on average students should add 2,000 to 3,000 new words a year to their reading vocabularies (Beck, McKeown, 2007, p. 258). The usefulness of different vocabulary learning methods and techniques is known as a key factor in L1 and L2 learning. Gu (2003, p. 9) reviewed empirical researches on vocabulary learning strategies in second/foreign language. He focused on different strategies such as guessing meaning, use of dictionaries, note-taking, memorization and repetition, encoding and mnemonics. He stated that the choice, use, and effectiveness of vocabulary learning strategies depend on the task, learner, and learning context. In the following three different methods of vocabulary presentation (i.e., T-coding, Picture, and wordlist) which are the main concern of the present study are discussed. It is good to mention that T-coding and Picture methods were used for experimental groups and traditional wordlist was presented to the control group.

2.5.1. T-Coding Method

T-Coding method is the new version of Key Word method (Taraghi Gashti, 2015). According to Shapiro and Waters (2005, p. 137), Key Word method is one of the mnemonic techniques which can facilitate learning foreign vocabulary. Key word is a word in one's mother tongue which is similar in sound or appearance to the foreign language word (Hulstijn, 1997, p. 210). As the name of the method suggests, it is all important and plays a key role as a retrieval cue (Bellezza, 1996; Van Hell &Mahn, 1997). Wyra, Lawson, and Hungi (2007, p. 366) stated that for those learners who have little or no experience in learning a particular foreign language, the keyword method is an influential and effective method for the intentional learning of foreign language vocabulary.

According to Hauptman (2004), the process of learning vocabulary through the keyword method includes the three Rs (i.e., reconstructing, relating, and retrieving). Sadoski and Rodrigues (2000) contended that

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the keyword method has two stages: in the first stage which is called acoustic link, the learner selects an appropriate keyword and learns how to create an association or acoustic link between the keyword and the new foreign language word. In the second stage which is called imagery link, the learner develops an interactive image which involves both the keyword and the meaning of the foreign language word. From the psychological and cognitive points of view, the effectiveness of the keyword method is a function of providing visual imagery (Shapiro & Waters, 2005). Throughout the keyword method, students are able to transform the new information and create links between the new word and its definition. These links are strong and can be retrieved later and as a result the learner's attention is focused on the most essential part of learning a new word, that is, the relationship between the new unfamiliar word and its meaning (Wyra, Lawson, &Hungi, 2007, p. 368).

In T-Coding method, the foreign language word form is linked to a first language word which sounds like it and this is linked to the meaning by a sentence involving the first language coded word and the meaning of the second language word (see the method section for the example). According to Taraghi Gashti (2015) T-Coding method includes three phases: first for a new word a link is identified and created in the learners first language, in the second phase for this link a universal code is provided which include both the link and the new word, in the final phase the code is used in a sentences so as to create more connections in the learners' memory. T-Coding method provides much more elaboration in the verbal system and creates more referential connection between verbal and imaginal systems. This method is superior to Keyword method. In this method the concept of the new words is created through explanations and examples, while in the keyword method, an image was needed to be created which was sometimes impossible in abstract words. T-Coding method can be used not only for the concrete words which are the integral parts in keyword method but also for the abstract words as well. Taraghi Gashti stated that T-Coding method is based on the dual informational coding system, dual process theory of memory, connectionism theory, and concept making.

2.5.2 Picture Method

Visual literacy has been defined as the use of visible or mental visuals for learning, communication, conveying meaning, and having aesthetic effect (Brill, Kim, & Branch, 2007). A picture is included within the scope of visible visuals. Johnson (2008, p. 184) believes that the main part of research in visual literacy is concerned with its relation with

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education and pedagogy. The educational significance of visual learning can be justified through the fact that the process of learning has a strong relationship with human senses. The demonstration and use of visual aids to show the meaning of a new vocabulary provide physical foci for student learning and also create memorable images to facilitate student recall" (Richards and Rodgers, 2014, p. 86). They believe that visual aids are associative mediators which show the relationship between form and meaning, and contribute to learning and recall of new words. As said by Harmer (2001, p. 132) pictures are very important tools in classrooms, because teachers can use them as ways for vocabulary presentation and meaning checking.

Teachers can get them from a variety of different sources such as books, magazines, and the internet. Teachers have always used pictures or graphics -whether drawn, taken from books, newspapers and magazines, or photographs- to facilitate learning (Harmer, 2001, p.134). They are usually flexible that is they can be used for different types of class activities. Finally, they can be presented in a variety of different forms and shapes which can motivate learners.

According to Johnson (2008) word-picture activity as a technique of second language vocabulary acquisition, can form a mental link at the early stages of second language learning, especially if it is created by learners themselves. Bush (2007, p. 730) refers to the advantages of using pictures in the vocabulary classroom as a means for learning new vocabulary (linguistic aspect), a means for introducing culture (cultural aspect) and as an advance organizer providing learners with a context for language learning.

In a study conducted by Tonzar, Lotto, and Job (2009, p. 628), the effect of picture-learning and word-mediated learning techniques on the students' vocabulary development in English and German was examined. The results indicated that there was a significant difference between these two techniques. They concluded that picture-learning technique was more effective than word-mediated technique in vocabulary learning.

2.6 Previous Studies or Related Studies

In a study conducted by Tonzar, Lotto, and Job (2009, p. 630), the effect of picture-learning and word-mediated learning techniques on the students' vocabulary development in English and German was examined. The results indicated that there was a significant difference between these two techniques. They concluded that picture-learning technique was more effective than word-mediated technique in vocabulary learning.

Nation (2013) in a study compared the effectiveness of vocabulary learning through context and word-list and concluded that learning

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vocabulary through word-lists is more effective than other contextualized techniques. Moreover, Hulstijn (2001, p. 261) concludes that words which are learnt through word-lists can better remain in the long term memory of the learners and can be retrieved easily.

3. Methodology

3.1 Participants

The participants of this study were 54 third grade high school students at Shahid Rajaei high school in Famenin. Their age range was approximately between16 to 17. The sampling method was convenient one and the participants were assigned to three groups and received different treatments including: teaching vocabulary through T-coding method (N=21), teaching vocabulary through picture method (N=17) and the control group which was taught through traditional wordlists (N=16).The treatments were given in students' classroom during the regular 90 minutes English language teaching period for 13 sessions.

3.2. Materials

3.2.1 Text book

The textbook of senior students of Iranian high schools (Vision 3) was used as the instructional material. The teaching materials were the same in three groups but the manner of vocabulary presentation in each group was different.

3.2.2 Coded Words, Pictures, and Wordlists

120 words were chosen from the students' textbook to be taught during the treatment sessions. These words were prepared in a wordlist, codes, and pictures. In the following the word "call up" is provided as an example:

T-Coding:

Call up = کلوپ گفتم بیا **زنگ زدم** به دوستم

Word-list:

Call up = تلفن زدن

Picture:

call up

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3.3 Instruments

3.3.1 Vocabulary Tests

Three achievement vocabulary tests were prepared by the researcher (i.e. Self-made test) to measure students' vocabulary ability. The three tests were used as pre-test, post-test and delayed post-test respectively. Each test consisted of 20 multiple choice vocabulary items which measured the knowledge of the words taught in the study. The words were chosen from students' text book and the tests were the same across three groups. In order to validate the test, its face validity and content validity were confirmed by five experts in the field including the supervisor. Moreover, the reliability index three achievement vocabulary test (i.e. Pretest, posttest, and delayed posttest) were calculated using Cronbach-Alpha and they were 0.72,0.78, and 0.72 respectively.

3.4 Procedure

As mentioned before there were three groups in this study as T-Coding and Picture methods (i.e. Experimental groups) and word list (i.e. Control group). Below, the procedure is explain.

On the first session three groups provided data on the pre-test. Then for two weeks the two groups received the treatment which involved teaching 120 words and one control group received traditional word list which involved teaching this 120 words. These words were presented differently for each group. The participants were divided into three groups which T-Coding group was 21 students and Picture Presentation group was 17 students and also control group or traditional Word List group was 16 students. This 120 words were taught to them in 10 sessions and in each session 12 new words were presented to them.

In group one the teacher taught the words by using T-coding method. Through T-Coding method each of English word was linked to a word in their mother tongue which sounds like the English word and the coded word was linked to the meaning by sentence involving the first language (Persian) coded word and the meaning of the English word.

In group two, the instruction of new words was through pictures which in 10 sessions, 120 pictures were covered. Attempt was made to choose the best and the clearest pictures in which the focus was on the new words only. Each word was presented along with a picture. In order for participants to be familiar with the spelling of the words, it was considered appropriate to write the words on each picture.

In group three (i.e., the control group), the teacher taught new words by word-lists which is traditional and common vocabulary presentation in classes. The teacher provides students with 10 word-list each containing

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12 English words along with the Persian equivalent of each word. Each session one word-list was covered during the class session. Through this method each English word was presented along with its Persian translation in a list of words and in each session one-word list was presented to the participants. Similar to the other two groups, in this group 12 new words were presented each session.

At the end of the experimental period (10 sessions), in order to assess the participants' vocabulary learning, the post-test was given to each of the three groups. In order to check the stability of learning two weeks later the delayed post-test was administered to the groups. The administration and grading were the same across the three groups.

3.5 Design of the Study

It's a three by three design.

3.6 Data Analysis

After collecting all data on participants' pretest, post- and the delayed post-test, all of the scores of each test were given to the SPSS 22 (statistical package for statistical analysis) and the data were analyzed through multilevel model of repeated measures ANOVA.

4. Results and Discussion

4.1 Results

Before proceeding with ANOVA report, a brief account of the results is presented. The descriptive data is presented in Table1 below. There is a mean gap among all three groups across the test conditions making the comparison among them look cumbersome. To get over this problem, a repeated measures analysis of covariance in which the pretest is taken as the covariate is carried out. The results are displayed in Table 4.1.

Table 4.1

Descriptive Statistics for the Three Groups

Type of treatment		Mean	Std. Deviation	N
Pretest	T-Coding	4.9524	3.05739	21
	word-list (control group)	3.1250	1.20416	16
	Picture	5.2353	1.56243	17
	Total	4.5000	2.34521	54
Post-test	T-Coding	15.9524	2.03657	21
	word-list (control group)	12.1875	1.93972	16
	Picture	14.2941	1.92888	17
	Total	14.3148	2.48637	54
Delayed post-test	T-Coding	15.9048	2.36442	21
	word-list (control group)	12.1250	2.09364	16
	Picture	13.9412	2.43594	17

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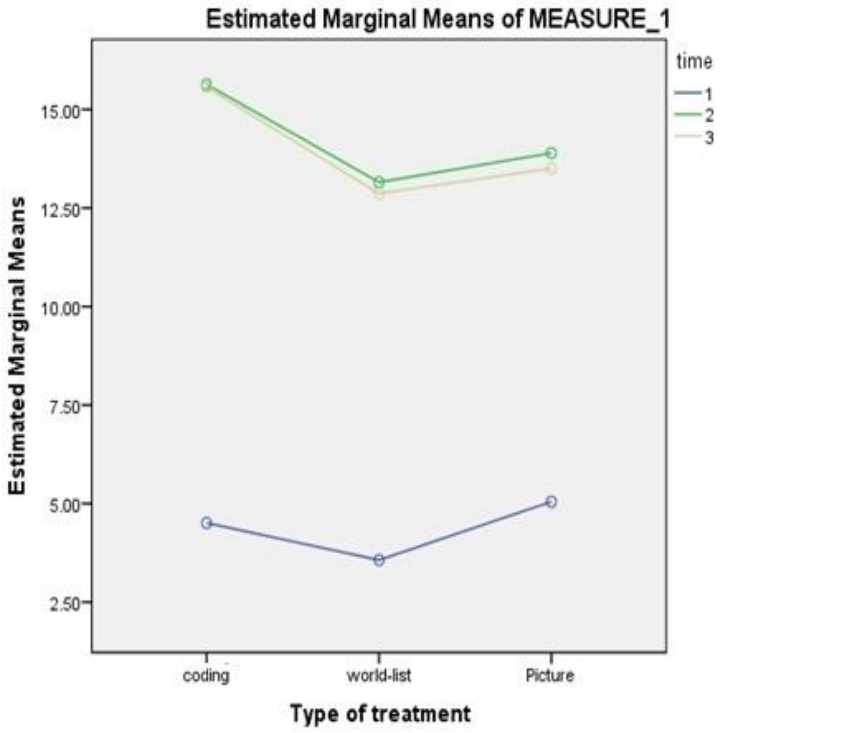
Total	14.1667	2.75920	54

To present a clearer picture of the data, a profile plot of the means of the three groups is provided below. The profile helps us see that the slope of the distribution at the time of posttest and delayed posttest is sharp as compared to the pretest. It may follow that the treatments did make a



Covariates appearing in the model are evaluated at the following values: proficiency test = 15.3519

difference among the groups.

Figure.1 *Means of all groups at three test conditions*

The mean of 'T-coding group in posttest and delayed posttest is higher than the other two groups indicating that this treatment has proved helpful.

Next, the assumption of sphericity was checked. Sphericity refers to the equality of variances of the differences between treatment levels. As Table 2 suggests the assumption of sphericity is violated. In such cases, the researcher has different alternatives such as MANOVA, adjustment of

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the significance tests of Greenhouse- Geisser or Huynh-Feldt or multilevel modeling (Tabachnik&Fidell, 2007). Moreover, it seems reasonable that students in a given class would be more similar to each other than to students in another class. In some sense, students exposed to treatment A may be more similar to each other and those exposed to treatment B may be more similar to each other. The behavior of students in class A, for example, will be similar and different from students in class B. The classroom is seen as a contextual variable. In other words, students are clustered within classes. Additionally, the data gathered for the purpose of this study is both of within and between people type. As such, the person acts as a context within which knowledge and or ability is assessed. It follows that the measurements done on such classes are dependent. Hence, the assumption of independence of measurement behind ANOVA is not met (Field, 2009). Following Tabachnik&Fidell, and Field, multilevel model of repeated measures ANOVA is used here.

Table 4.2
Mauchly's Test of Sphericity

		Within Subjects Effect
		Time
Mauchly's W		.777
Approx. Chi-Square		11.885
Df		2
Sig.		**.003**
Epsilon	Greenhouse-Geisser	.817
	Huynh-Feldt	.930
	Lower-bound	.500

The dimensions of the model were assessed through estimation of fixed effects (experimental effect) and random effects (sample of possible treatment conditions) .One can test the dimensional adequacy of the model from the change in the −2 log-likelihood. Since there were three tests in the present study (pretest, posttest and delayed posttest) three model analyses were provided. In first model, the −2LL was 1295.490 based on a total of 11 parameters. In the second model, the −2Log Likelihood was 1217.087, based on 12 parameters. Therefore:

X^2_{change} = 1295.490 - 1217.087 = 78.4

DF_{change} = *12 - 11 =1*

If one looks at the critical values for the chi-square statistic with 1 degree of freedom inChi-square tables, they notice that the critical values is 3.84 ($p < .05$) and 6.63 ($p < .01$). Since the value of 78.4 is well above

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the critical values of X^2, it can be claimed that the change from time 1(pretest) and time 2 (posttest) is significant. We can conclude then that the intercepts for the relationship between the treatments of this study and quality of learning vary significantly across the classes.

To assess the difference between posttest and delayed posttest further analysis was performed on the scores. The -2LL obtained was 843.318 with 13 parameters. It is in order to compare this -2LL value with that of the previous one which was 1217.087. Therefore:

X^2_{change} = 1217.087 – 843.318 = 373.769

$DF_{change} = 13 - 12 = 1$

The chi-square test is again significant. It is, then, safe to hold that the difference among groups remains significant across time setting (delayed posttest). That is, the effect of the treatments of this study hold true in the long run.

Table 4.3

Type III Tests of Fixed Linear Effects for the treatments

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	216.004	396.096	.000
Treatment	2	216.270	6.005	.003
Time	1	215.861	4.489	.035

As it can be seen in Table 4.3, the treatment is significant: *F (1,216.27) = 6.005, p = .00*. Therefore, there is significant difference among 'T-coding', wordlist and picture presentation. The covariate variable (Time) is statistically significant: *F (1, 215.86) = 4.489, p = .03*. It can be maintained that time factor is important in all three groups. Since both the independent variable (treatment) and the covariate (time) are significant, one can conclude that the treatment has passed the test of time.

In studies related to time with post-tests and delayed post-tests, the researchers are interested in minute differences that may come about as the result of time lapse between post-tests. Since there are four post-tests in this study, the researcher is supposed to run n-1 analyses, namely linear, quadratic and cubic trend analyses. In other words, the researcher tests the growth model. To do so, first the linear trend of the two groups is examined. The linear trend of all groups is significant (Table 4.3).

The quadratic trend is significant: *F (1, 195) = 95.442, p=.00*. From Table 4.4, it can be said that the mean difference among the three groups further continues on the posttest.

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Table 4.4
Type III Tests of Fixed Quadratic Effects

Source	Numerator df	Denominator df	F	Sig.
Intercept	1	215.537	650.291	.000
Treatment	2	111.737	8.400	.000
Time	1	195.000	74.515	.000
Time * Time	**1**	**195.000**	**95.442**	**.000**

Pairwise comparisons (Table 4.5) help us see that the students in the 'T-coding' group do much better than the students in the 'wordlist' group do: mean difference with '2.287 (95% CI [.709, 3.865]) ; the mean difference between T-coding group and picture presentation group is not significantly different.It should be added that the students in 'picture presentation' group do better than the students in 'wordlist' group; mean difference = 1.985 (95% CI [.544, 3.427]). CI may also be understood as if the experiment is repeated an infinite number of times most likely it captures the same parameter (population mean/mean difference) we are estimating. In other words, the researcher is 95% confident that the mean/mean difference lies in the range reported here. It would be safe to say that the present samples are good representatives of the population. Hence, the study enjoys external validity.

Table 4.5
Pairwise Comparisons of the groups

(I) Type of treatment	(J) Type of treatment	Mean Difference (I-J)	Std. Error	Df	Sig.	95% Confidence Interval for Difference	
						Lower Bound	Upper Bound
T-Coding	Word-list	2.287*	.614	24.212	.003	.709	3.865
	Picture	.301	.607	24.794	1.000	-1.258	1.860
Word-list	T-Coding	-2.287*	.614	24.212	.003	-3.865	-.709
	Picture	-1.985*	.541	16.415	.006	-3.427	-.544
Picture	T-Coding	-.301	.607	24.794	1.000	-1.860	1.258
	Word-list	1.985*	.541	16.415	.006	.544	3.427

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To sum up, based on the mean differences and trend analysis, both T-coding and picture presentation seem effective and better than wordlist presentation promote vocabulary gain and retention.

4.2 Discussion

The present study examined the comparative effects of different methods of vocabulary presentation i.e., T-Coding, and Picture on the vocabulary gain and retention of English vocabulary by Iranian third grade high school students. The results indicated the effectiveness of both T-Coding and Picture methods of vocabulary presentation compared to control group which received the vocabularies through traditional wordlists.

In line with previous similar studies, this study confirms the powerful impact of both T-Coding method (e.g., Baleghizadeh&Ashoori, 2010; Beaton, Gruneberg, Hyde, Shufflebottom, & Sykes, 2005; Nemati, 2009), and Picture method (e.g., Bush, 2007; Sokeman, 1997; Tonzar, Lotto, & Job, 2009) on the learners' vocabulary gain.

Paivio's (1986) dual-coding theory can be a good source for interpreting the positive effects of both T-coding and picture method. According to this theory pictures are remembered better than words because they are more likely to be represented by both verbal and image codes i.e., information is provided through both visual and verbal channels while in word-list method words are arbitrary and they are presented only in verbal code, this can justify why participants in picture group performed better than those in word-list group. Moreover, T-Coding method involves activation in both verbal and imaginal system, and this way T-Coding method provides much more elaboration in the verbal system and more referential connection between the two systems and because of this reason those participants who were in this group outperformed those who were in control group.

5. Conclusion and Implications

5.1 Conclusion

The results of the present study can also be construed in terms of depth of information processing (Craik & Tulving, 1975, p. 273). Based on this theory, how well information is remembered is not a function of how long a person is exposed to that information, but instead depends on the nature of the cognitive processes that are employed to process that information so the more information is processed at deeper levels, the more retention is gained. When one reaches deeper levels, memory traces become more stable. In the Picture technique students make use of the combination of picture and a verbal code, and in T-Coding method they

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used acoustically familiar word in their L1, an example in their language, and a verbal code, so based on this theory it can be argued that these two methods i.e., T-Coding and Picture outperformed the word-list group, because in these methods more information is processed in deeper levels compared to the word list method in which students are merely provided with a list of new words and their definitions.

Moreover, there are a number of reasons for the success of those participants in T-Coding and Picture groups. The first explanation is that pictures provides a direct association between form and meaning (Richards & Rodgers, 2014) thereby making this relationship meaningful so whenever they see the word they have a vivid picture or an example of that word which can represent it in their mind. As it was mentioned, pictures and coded sentences give life to words which can promote depth of input processing and as a result leads to better learning. The second explanation would be the attractiveness of pictures and coded sentences for learners. The use of pictures and coded sentences makes the process of vocabulary learning more enjoyable and interesting. Moreover, pictures are motivating and draw students' attention and they make visual images of the words presented to them, as it's stated "pictures bring images of reality into the unnatural world of the language classroom" (Hill, 1990, p. 1).

5.2 Pedagogical Implications

The findings obtained in this study may lead to a number of implications which could possibly be beneficial for language practitioners, syllabus designers, teachers and students in an EFL context. Students can learn the procedure of T-coding technique and recall more definitions and vocabulary items compared to the rote learning. English teachers could use the findings of this study and organize their vocabulary instruction using picture and T-coding methods. Syllabus designers could infuse the findings into text-books and organize the vocabulary section of the books by using different pictures in accordance to the level of those students for whom the material is being designed.

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