

## **Chapter Two**

### **Literature Review**

This chapter gives a general review of the literature related to lexical knowledge, vocabulary learning strategies, and the cognitive theories applied in vocabulary learning.

#### **2.1 Lexical Knowledge**

Human beings communicate with each other by language. In addition, the word is the simplest form of language to express ideas or concepts (Parker & Riley, 1994). It is important that any learners, native, or foreign, have enough lexical knowledge in order to function well in that language. Therefore, research has identified different dimensions of lexical knowledge, e.g., the breadth and depth of lexical knowledge, receptive/productive lexical abilities.

##### **2.1.1 The Breadth and Depth of Lexical Knowledge**

What is lexical knowledge? Many researchers look upon it as having two dimensions-- quantitative and qualitative or the breadth and depth of vocabulary knowledge. The breadth of lexical knowledge is concerned with the question “How much vocabulary does a second language learner need?” (Nation and Waring, 1997), and the depth of lexical knowledge concerns itself with the kind of lexical knowledge which is regarded necessary to mastering a word.

##### **2.1.2 The Breadth of Lexical Knowledge**

To estimate the number of lexical items EFL learners need, firstly, it is necessary to have some ideas of “how many words does native speakers know” and “how many words are there in the target language?” (Nation & Waring, 1997)

*Webster's Third Dictionary*, the largest non-historical dictionary of English, has around 54,000 word families, including base words, inflected forms, and regular derived forms (Nation & Waring, 1997). Nagy and Anderson (1984, as cited in Nagy, Anderson & Herman, 1987) found that 88,500 word families, which have more than 100,000 distinct meanings, are contained in printed school English. This is almost an unattainable learning goal for most native speakers, let alone second language learners.

Concerning the number of words native speakers know, some studies of vocabulary size have quite diverse results. A most conservative vocabulary size that university graduates will master is a vocabulary size of around 20,000 word families with 1,000 word families a year adding to their vocabulary size (Nation & Waring, 1997).

Many EFL adult learners have a vocabulary size of much less than 5,000 word families albeit they have studied English for several years. However, only a small number of words occur very frequently in a written or spoken text. It has been found that EFL learners can comprehend 80 percent of a written text, if they know about 2,000 word families (Kucera, 1982, as cited in Nation & Waring, 1997). But, this is an insufficient vocabulary size for reasonable text comprehension or learning words from text (Liu & Nation, 1985, as cited in Nation and Waring, 1997). Liu and Nation (1985) further suggest that a vocabulary size around 3,000 word families can provide coverage of at least 95 percent of a text. In other words, learners with a size of 3,000 below can not do well on the reading test (Laufer, 1997; Fox, 2002). EFL learners have to focus on approximately 3,000 high frequency words as their immediate vocabulary learning priority (Liu & Nation, 1985).

### 2.1.3 Depth of Lexical Knowledge

Due to the complex and dynamic nature of vocabulary knowledge, there are many views on the depth of word knowledge, i.e., “the quality of the learner’s lexical knowledge” (Read, 1993). The first and often-quoted view of lexical knowledge is proposed by Richards (1976). He suggests the following aspects as composing lexical knowledge:

1. **Frequency:** Knowledge about the degree of probability of meeting that word in speech or text
2. **Register:** Knowledge about knowing the limitation imposed on the use of the word according to function or situation
3. **Position:** Knowledge about the syntactic structures associated with the word
4. **Form:** Knowledge about underlying form and derivatives
5. **Associations:** Knowledge about the semantic-related association between the word and other words in the language
6. **Meaning Concept:** Knowledge about the word’s semantic value
7. **Meaning Associations:** Knowledge about a variety of meanings involved in the word

Nation (1990) adds a receptive/productive distinction of lexical competence to elaborate on Richards’s assumptions. According to Nation (1990), knowing a word involves receptive word knowledge and productive word knowledge. Receptive knowledge refers to the ability to recognize a word when it is heard or when it is seen, to expect the grammatical pattern the word will occur, to know the proper collocation of the word, and to know whether it is a frequently occurring one or a rare one and to recall the meaning when the learner sees it. On the other hand, the productive knowledge of a word includes the receptive knowledge and the extension of the receptive knowledge. If a learner owns the productive knowledge of a word, he or she

must also know how to pronounce it, how to use it in correct grammatical patterns as well as the words it usually collocates with.

Even though the assumptions offered by Richards (1976) and Nation (1990) are often quoted and used to describe lexical knowledge, they are purely descriptive (Segler, 2001). Henriksen (1999) criticizes that they only try to cluster different knowledge components and learning processes, neglecting the nature and interrelationship among various aspects of lexical competence. Although it is impossible “to design a study that could capture all of the word knowledge categories,” (Schmitt & Meara, 1997) it is still urgent for learners to explore and understand the links and interrelationships between different kinds of lexical knowledge to facilitate language learning.

McLaughlin (2002) states that “the depth of lexical knowledge itself has several dimensions, related to the various components of any lexical representation,” including (a) the relationship between the representation of phonology of the word and its representation of orthography, (b) word classes, (c) its possibility for collocation, (d) word formation and deviatonal processes, (d) richness of the semantic representation of the word, (e) its pragmatic rules for using the word.

The first dimension of lexical knowledge the learner has to understand is about the correspondence between the orthography and the sounds. English is an alphabetic language. There are twenty-six English letters to form English words. Forty-four phonemes are included in the phonological system. Of these phonemes, twenty-four are consonants (e.g., [p] and [b]); twelve are simple vowels (e.g., [a] and [u]); and eight are diphthongs (e.g., [ai] and [au]). There is roughly a one-to-one correspondence between a single graphemic unit (e.g., *c* and *s*) and a single phoneme, the smallest sound unit (e.g., [s] and [z]). However, the regularity is sometimes violated. First, one phoneme can be assigned to two letters. For example, the letters,

*gh*, correspond to one sound, [f], in the word *laugh*; and *ck* correspond to [k] in the word *check*. Secondly, one letter can serve several phonemic realizations. For instance, the letter, *b*, is pronounced differently in the words *boy* ([b]) and *debt* (silent); the letter *i* is pronounced [ɪ] in *give* but [ai] in *five*. Thirdly, different letters may represent the same phoneme. For example, the [s] sound can be represented by two letters, *c* and *s*, in the words *cite* and *site*. Fourthly, the spelling doesn't represent some sounds. In many words the letter *u* represents a y sound followed by a u sound. For example, the letter *u* in the words *cute*, *futile*, and *utility* is pronounced [ju], so the letter *u* doesn't represent the [j] sound (Fromkin & Rodman, 1974).

Each word can convey its meaning and be listed in our mental lexicon by means of its sound or its orthography (spelling). To acquire vocabulary items, EFL learners have to familiarize themselves with the representation of orthography and sound and the interrelationship between them; however, some exceptions to the correspondence between sounds and spelling should be taken into consideration (Koda, 1990; Fromkin & Rodman, 1974).

The second dimension of knowing a word better is to understand its interrelationship between form and meaning from the perspective of semantic properties. Generally, each lexical item (form) is associated with more than a semantic property, which can help to define the appropriate meaning of a word and to distinguish one word from another. For example, the word *father* has the properties "male" and "adult." The words *uncle* and *bachelor* have the same properties as the word *father*. However, the word *father* has the property "parent" which distinguishes it from the other two words. On the other hand, different classes of words may share the same semantic property. "Female," for instance, is part of the meaning of the noun *mother*, of the verb *breast-feed*, and of the adjective *pregnant*. With a better understanding of semantic properties of words, language learners can catch and

distinguish the word meaning easily and deeply (Fromkin & Rodman, 1974).

Besides, researchers also feel that the mapping between form and meaning is important in acquiring lexical meaning. Each vocabulary item (form) is associated with a concept or more than one concept. By means of concepts, form and meaning is being communicated (Ogden & Richards, 1936, as cited in Singleton, 1999). Many ways can help to acquire lexical concepts, for example, hyponymy (e.g., *scarlet* and *vermilion* are included in *red*), synonymy (e.g., *autumn* and *fall*), and antonymy (e.g., *big* and *small*) etc. However, a word item may be equipped with more than one concept, i.e., polysemy. The meanings of each word item may vary according to different contexts. It would be difficult for language users to understand the appropriate meanings of a word in different contexts in just one situation, let alone EFL learners (Ramscar & Yarlett, 1999). Therefore, in teaching and learning vocabulary, an L2 learner should learn the core of the meaning of a word, i.e., the marker (liquid for *water*, color for *red*, gas for *argon*) and the stereotype (stripes for *tiger*, tasteless for *water*, etc.), part or chunk of meaning (Putnam, 1975, as cited in Melka, 1997).

Thirdly, noting the interrelationship between the sounds and the meanings of a word is another aspect in knowing a word as well as in determining whether words are the same or different. Words are different if they are pronounced identically but have different meanings, e.g., *tale* and *tail* (homonyms) or if they have the same meaning but with different pronunciation, e.g., *sofa* and *couch* (synonyms). Even if words are pronounced the same and spelled identically, they are still different words. For example, *bat* the animal and the *bat* for hitting baseballs are different words because they have different references (homograph). Thus, it is better to define the meanings of all words according to different kinds of context besides the pronunciation and spelling (Fromkin & Rodman, 1974; Todd, 2000).

The fourth dimension about lexical knowledge is “word classes.” Words enter the array of syntactic structures according to word classes. In other words, words are sorted into different classes according to the way they function in a sentence. Some common word classes include nouns, determiners, pronouns, adjectives, verbs, adverbs, prepositions, conjunctions, and exclamation:

1. A noun: the name of a person, animal, place, concept or thing such as *Michael*, *tiger*, etc.
2. A determiner: an adjective-like word which precedes both adjectives and nouns such as *a*, *an*, *the*, *that*, *some*, *any*.
3. A pronoun: to take the place of a noun or a noun phrase such as *he*, *she*, *I*.
4. An adjective: to describe or qualify nouns such as *cold* in “a *cold* day.”
5. A verb: an action, e.g., John *climbed* a tree.
6. An adverb: to modify a verb, an adjective, a sentence, or another adverb, e.g., John talked *strangely*.
7. A preposition: a function word followed by a noun, a noun phrase, or a pronoun, e.g., He did it *for* me.
8. Conjunctions: to combine words, phrases, or sentences, e.g., He bought a table *and* two chairs; *if* you study hard, you will succeed.
9. An interjection: to express fear, pain, surprise, e.g., *Good lord!* *Oh dear!*

To make grammatically correct sentences, the role of word classes should be understood thoroughly (Todd, 2000).

The fifth dimension about lexical knowledge is word-formation. It plays an important part in helping to increase the learner’s vocabulary. Word formation may generally include derivatives, compounding, coinages, backformation, blends, and acronym:

1. Derivatives: Adding derivational morphemes (e.g., *un-*, *-ist*) to a root morpheme or

a stem (a root morpheme with affixes morphemes) would not only form new words but change the syntactic word class and/or the meaning of the word. For example, adding *-ish* to the noun *child* derives an adjective *childish*, and prefixing *un-* to *happy* forms a new word *unhappy* and changes its original meaning to a negative meaning.

2. Compounding: to join two words together to form a third word.

noun+noun	book+case	bookcase
noun+verb	hair+do	hairdo
adj+noun	blue+bell	bluebell
adj.+verb	easy+going	easygoing
verb+noun	lock+jaw	lockjaw
verb+adv.	come+back	comeback
adv.+verb	down+fall	downfall

3. Coinages are the words recently invented such as “kleenex” (tissues).
4. Backformations: Words are created by using analogy. That is, new words are derived from the ones that have already existed in the language. For example, the word “pop” is from the word “popular.”
5. Blends: The process involves taking out parts of two words and combining the parts into a new one.

breakfast + lunch      brunch      motor + hotel      motel

6. Acronyms: The process involves taking the initial letters of well-known organizations out and combining the letters together to form a new word, e.g., Laser from Light Amplification by Stimulated Emission of Radiation and UNESCO from United Nations Educational Scientific and Cultural Organization (Fromkin & Rodman, 1974; Todd, 2000).

Language learners need to acquire enough vocabulary and know words well and deeply to successfully process language learning receptively and productively. To help EFL learners achieve these aims, teachers have to introduce the most frequently used words, a vocabulary size around 3,000 word families as the first priority. Besides, in

introducing those words, the teachers have to cover some aspects concerning the depth of lexical knowledge in class such as word formation, word classes, different meanings of a word, and the relationship between sounds and letters, etc., to facilitate EFL learning.

## **2.2 Language Learning Strategies**

Learning strategies are steps for students to take to enhance their learning. In language learning, strategies are especially crucial because they function as the tools for active, self-directed involvement. With appropriate language learning strategies, language learners will gain improved proficiency as well as greater self-confidence (Oxford, 1990).

Vocabulary learning strategies constitute a subclass of language learning strategies. More and more language teachers and learners pay attention to the importance of how to acquire vocabulary successfully, which causes the researchers and instructors begin to think of using strategies to help learners to acquire vocabulary effectively. In this section, researchers propose possible definitions as well as taxonomy of the language and vocabulary learning strategies. Besides, some studies on vocabulary learning strategies are also discussed.

### **2.2.1 Definition and Categorization of Language Learning Strategies**

Despite the fact that research on learning strategies has gained increasing popularity in the SLA field, there is no consensus about the definition of learning strategies. Rubin (1987) defines learning strategies as any set of operations, steps, plans, routines affecting this learning process by which information is obtained, stored, retrieved and used. However, the most popular and often adopted one is from Oxford (1990). According to Oxford (1990), learning strategies are “specific actions taken by

the learner to make learning easier, faster, more enjoyable, more self-directed, more affective, and more transferable to new situations” (p. 8). Besides giving definitions of learning strategies, Oxford (1990) also identifies some features of language learning strategies as shown in Table 2.1.

**Table 2.1 Features of Language Learning Strategies (Oxford, 1990)**

Language Learning Strategies
1. Contribute to the main goal, communicative competence.
2. Allow learners to become more self-directed.
3. Expand the role of teachers.
4. Are problem-oriented.
5. Are specific actions taken by the learner.
6. Involve many aspects of the learner, not just the cognitive.
7. Support learning both directly and indirectly.
8. Are not always observable.
9. Are often conscious.
10. Can be taught.
11. Are flexible.
<b>12. <u>Are influenced by a variety of factors.</u></b>

The features listed above are the background for Oxford to classify language learning strategies into two classes, direct and indirect strategies. There are three groups of direct strategies (e.g., Memory, Cognitive, and Compensation). All of them involve the target language directly and require mental processing. However, each group of direct strategies are processed for different purposes. For example, Memory Strategies such as making associations, using imagery, and using keywords, help students store and retrieve new information. Cognitive Strategies such as repeating and summarizing or reasoning deductively, make learners understand and produce new language in different ways. Compensation Strategies such as guessing intelligently are used to compensate for a lack of appropriate vocabulary and grammatical knowledge.

There are also three groups of indirect learning strategies, i.e., Metacognitive, Affective and Social Strategies. All these strategies support and manage language learning without directly involving the target language. For instance, Metacognitive Strategies use functions like centering, arranging, planning, and evaluation to control the learners' cognition. "Affective Strategies help to regulate emotions, motivations, and attitudes," (p.135) e.g., having the learners lower their anxiety by deep breathing and encouraging themselves by making positive statements. "Social Strategies help students learn through interactions with others," ( p.135) e.g., asking questions, cooperating with others, and empathizing with others. The part of Oxford's strategy system most useful for vocabulary learning is made up of four strategy groups: Social, Memory, Cognitive, and Metacognitive (Schmitt, 1997).

Partly based on the definition and categorization proposed by Oxford (1990) and partly based on the suggestions from Cook and Mayer (1983) and Nation (1990), Schmitt (1997) proposes a taxonomy of vocabulary learning strategies. He divides vocabulary learning strategies into two major components: (1) Discovery Strategies, which are used to determine the initial meanings of words when the learners first encounter them, e.g., Determination Strategies and Social Strategies. (2) Consolidation Strategies, which are used to consolidate the meanings when the learners encounter the words again, e.g., Social, Memory, Cognitive, or Metacognitive Strategy groups.

Schmitt (1997) defines each type of vocabulary learning strategies and gives examples as follows:

1. Determination Strategies are used "when faced with discovering a new word's meaning without recourse to another person's expertise" (p.205), e.g., bilingual dictionary, analyzing affixes and roots, and guessing from textual context, etc.
2. Social Strategies are used to understand a word "by asking someone who knows it"

(p.210), e.g., asking the teacher for an L1 translation and asking the teacher for a sentence including the new word, etc.

3. Memory Strategies are “approaches which relate new materials to existing knowledge” (p.205), e.g., image word’s meaning, using the keyword method, etc.
4. Cognitive Strategies, adopted from Oxford (1990) are defined as “manipulation or transformation of the target language by the learner” (p.43), e.g., verbal repetition, and written repetition, etc.
5. Metacognitive Strategies are defined as “a conscious overview of the learning process and making decisions about planning, monitoring, or evaluating the best ways to study” (p.205), e.g., using English-language media (songs and movies, etc.), and skipping or passing new words, etc.

Oxford (1990) introduced important features of language learning strategies and proposed a new strategy system covering six types of strategies, enabling students to become better learners. Part of her strategy system also seemed best to capture and organize a variety of identified vocabulary learning strategies such as Social, Memory, Cognitive and Metacognitive Strategies. However, her system seemed to be unable to classify vocabulary-specific strategies satisfactorily in some respects. Therefore, Schmitt proposed a specific taxonomy of vocabulary learning strategies, which is organized according to both the Oxford’s system and the Discovery/Consolidation distinction. In addition, Schmitt (1997) also conducted a survey study to examine the usage of those strategies.

### **2.2.2 Studies on Vocabulary Learning Strategies**

In one study, Schmitt (1997) asked a total of six hundred Japanese junior and senior high school students, university students, and adult learners about whether they have used the strategies and whether they think the strategies are helpful. The results

indicated that a bilingual dictionary was the most used and the most helpful strategy followed by verbal repetition, written repetition, studying the spelling, and guessing from context. In contrast, the least commonly used strategies were the use of physical action, L1 cognates, semantic maps, and the keyword method.

Another interesting issue was if strategy use changed over time. When the subjects became older, they tended to use strategies which were less popular with the young learners. In other words, as learners mature/grow older, the usage patterns of vocabulary learning strategies move away from shallow, mechanical repetition to deeper methods such as the keyword method and word association. According to Schmitt, "It may well be that some learning strategies are more beneficial at certain ages than others, and the learners naturally mature into using different strategies. If this is true, then we must take our learners' cognitive maturity and language proficiency into account while recommending strategies." However, the results may not necessarily explain the learners' patterns of strategy use worldwide due to culture-specific phenomenon (Schmitt, 1997).

Kudo (1999) also measured the frequency use of vocabulary learning strategies. Three hundred and twenty-five Japanese senior high school students from three different schools participated in the study. A questionnaire was served as the instrument in the study. It consisted of two parts: questions to gain demographic information about the participants and questions related to the strategies that the participants might have used. In the study, Kudo (1999) adopted the definition of the category and strategy items from Schmitt (1997), choosing fifty-six strategy items in the questionnaire and dividing those items into four categories: social, memory, cognitive, and metacognitive. Therefore, each category has 14 strategy items.

In order to note how frequently each strategy was used, the *never* scale was important to distinguish whether a certain strategy was used, and the other five scales:

*seldom, occasionally, often, usually, and always* were used to indicate how often the strategy was used. The never scale would gain 0, and the other five scales would gain scores from 1 to 5 respectively. So, the full marks for each category, consisted of 14 strategies, were 70. The higher the mean scores for each category was, the more frequently the strategies in the category were used.

The results of the study showed that the mean scores of the four categories, i.e., social, memory, cognitive, and metacognitive, were all quite low compared to the full scores for each category, 70. The cognitive strategies, e.g., using the bilingual dictionary and rote learning, had the highest mean scores (26.59), and then the memory strategies (24.02), metacognitive strategies (18.59), and social strategies (8.25). The results indicated that senior high school students in Japan did not actively use vocabulary learning strategies. The comments from the students indicated that they did not know about so many strategies for learning vocabulary and said that they found some suitable for them to apply in the future in this study.

A study conducted by Jiang (2001) in Taiwan concerned itself about the effects of learning strategy instruction on senior high students with different English proficiencies. Seventy-four freshmen from Kaohsiung Senior High School and Kangshan Senior High School participated in the study. They were divided into high and low achievement groups (HA and LA) according to the result of an English proficiency test. Both groups were asked to memorize words selected from their English textbook and to write down the techniques they utilized to memorize the words. After the process, they had to take Word Quiz 1. Next, a teaching plan covered effective vocabulary learning strategies instruction (VLSI) such as acoustic method, the keyword method, and analyzing word parts, etc. was conducted in the class. The time spent on VLSI was 50 minutes. Then, the instructor distributed Word List 2 and asked the students to memorize the words and write down the techniques that they

adopted. At last, the students had to take Word Quiz 2 and fill out a questionnaire.

The results indicated that before VLSI, HA students tended to adopt more vocabulary learning strategies while LA students relied more on rote learning and the performance of both groups on Word Quiz 1 showed little difference. The reason might be that the quality (the spelling form of the word is short) and quantity of words (12 words) were within the capacity of students' memory. After VLSI, HA students adopted more vocabulary learning strategies other than rote rehearsal (44.35%) than did LA students (24.50%). LA students still utilized rote rehearsal (66.59%) more often than did HA (25%). Moreover, the mean scores of HA students on Word Quiz 2 were significantly higher than that of LA students. The results indicated that the frequency of strategy use seemed to be closely related to the students' performance on the vocabulary recall.

One weakness of the study might be that the instructor introduced so many vocabulary learning strategies in such a short time (50 minutes). Students would get confused, especially LA students. No wonder they still used rote learning to memorize words after VLSI. It would be better to instruct one vocabulary learning strategy at a time and have the students practice more. After the students get accustomed to using the strategy, the teacher can introduce another one.

A study conducted by Huang (2001) is also concerned with integrating vocabulary learning strategies in senior high school. A total of thirty-six students from the extra-curricular English club at a senior high school in Taipei participated in the study. Students were divided into two groups. Group A, i.e., the Control Group, was under instruction without specific strategies for learning vocabulary; while Group B, i.e., the Experimental Group, was taught with the treatment of the integrated way of vocabulary teaching, i.e., to instruct some learning strategies such as words parts, mnemonics, etc., for students to use in learning vocabulary. A pre-test was given to

measure subjects' prior knowledge about English vocabulary. A post-test was supplied to check if the subjects knew how to apply their newly learned skills and strategies in the study to the test. Other materials included a questionnaire to assess students' need in learning English, and suggestopedia music to help the students relax in the process of vocabulary learning.

In Group B, several steps were included in the teaching processes. First, the instructor introduced Short Term Memory, Long Term Memory, and Chunking theory. Secondly, creative pictures were provided to stimulate subjects' imagination. Thirdly, the instructor introduced the English history of some words. Fourthly, bilingual comic strips about English history and language were provided. During the fifth steps, the instructor provided an interpretation of semantic mapping such as 'living thing' and 'Thanksgiving' to expand vocabulary. The sixth step involved American body language. At last, a post-test was held.

The results showed that the mean scores of the pre-test between two groups showed no significant difference (Group A, the control group =58.3; Group B, the experimental group =59.3), but the mean scores of the post-test of Group B (=72.92) were obviously higher than those of Group A (=59.33). On the other hand, there was slight difference between pre-test and post-test in Group A (the average score of pre-test = 58.3; post-test = 59.33). However, Group B, the experimental group showed significant improvement in the post-test (the average score of pre-test = 59.13; post-test = 72.92). Moreover, the subjects took positive attitudes towards most of the experimental treatments. The majority of the students thought they could utilize the integrated teaching strategies to help them memorize vocabulary more effectively.

According to Schmitt (1997) and Kudo (1999), students in Japan seldom actively use vocabulary learning strategies for vocabulary learning. It might be that they are seldom introduced to VLSI. Therefore, they have a tendency to rely on rote

learning only. However, in Jiang's (2001) and Huang's (2001) research, vocabulary learning strategies have proved to be helpful in vocabulary acquisition through practical classroom teaching activities. In order to help students to successfully acquire more vocabulary, researchers need to do more actual experimental teaching for VLSI and then teachers can confidently apply them to real classroom activities.

## **2.3 Cognitive Theories in Vocabulary Learning**

Cognitive psychologists have explored earnestly the application of cognitive theory to vocabulary learning. Several theories including the memory system, levels of processing theory and elaboration, and dual coding theory have received much attention.

### **2.3.1 The Memory System**

Memory is the means for people to find out answers to questions, and to remember daily used information. In other words, people depend on memory to draw on past experiences to recall information and use this information in the present.

Generally speaking, there are three processes involved in memory: sensory registers, short-term store, and long-term store. Input information is received by sensory register and stored for no more than a second or two. Forgetting in the sensory store is due to spontaneous decay. Part of the information in sensory registers will be selected for further processing in the STM (Short-Term Memory), but with limited capacity. Old information in STM will be replaced by new items of information. Researchers consider that the capacity of short-term store is limited by processing constraints (the allocation of attention). Because of the limited capacity in STM, some of the old items in short term store either can be lost or be transferred to LTM (Long-Term Memory). Nevertheless, it depends on how much work the learner

does on the new information.

Baddeley and Hitch (1974) and Hitch and Baddely (1976) proposed an active working memory system to illustrate the system of short-term storage. The working memory system is composed of a modality-free *central executive*, an *articulatory loop*, a *visuo-spatial scratch pad*, and a *primary acoustic store*. The central executive allocates attention to inputs and directs the operation of the other components. Moreover, it is very flexible in processing information and it can store information over brief periods. The articulatory loop can be looked upon as a verbal rehearsal loop. For example, when people are preparing to speak aloud, it is the articulatory loop that they use to hold the words. Besides, when people want to remember a telephone number, and they mutter it to themselves, it is the articulatory loop that helps them to keep the information in mind for a short while. It can be regarded as an inner voice. The visuo-spatial scratch pad can deal with more than one stimulus at a time and is able to rehearse information. Unlike the articulatory loop, it deals with visual and spatial information, not the phonemic information. It can be regarded as an inner eye. Auditory input reaches the primary acoustic store directly, while visual input has to be converted to phonological form to enter it indirectly. The acoustic store can be referred to as an inner ear.

### **2.3.2 Levels of Processing Theory**

Both STM and the working memory only serve to receive information successfully, but one important issue in learning is to transfer information to LTM, leading to longer retention.

A crucial assumption put forward by Craik and Lockhart (1972) is that a memory trace can persist in LTM if it involves a deep level of processing. They feel that, “trace persistence is a function of depth of analysis, with deeper levels of analysis associated

with more elaborate, longer lasting, and stronger traces” (p. 675). To analyze meaning is important for long-term retention because the more meaningful the information is, the longer it will stay in LTM. For instance, a person who does not understand English would not understand what a foreigner says if there is no interpreter to translate the words.

Craik and Lockhart (1972) further make a distinction between two types of processing or rehearsal. Type I processing, i.e., maintenance rehearsal, involves the processing of rote repetition. It sometimes enhances LTM, but sometimes it does not. Type II processing, namely elaborate rehearsal, is more beneficial than maintenance rehearsal in terms of enhancing LTM. In a word, how well the information is retained is determined by depth of processing.

While the theory of levels of processing seems to be simple, and is used to describe how semantic processing leads to better memory than non-semantic processing, it does not explain why it is so effective (Cohen, Eysenck, & Le Voi, 1986). Anderson and Render (1979) have attempted to include ‘elaboration’ to extend levels of processing theory. They attempt to explain the reason why more information is stored in memory after deep processing. The assumption is that deep or semantic encodings tend to be more elaborate than shallow or non-semantic ones. Moreover, precise and distinctive elaborations or encodings are more likely to be remembered. For example, most people remember the marriage of Prince Charles and Lady Diana quite well because it is a distinctive event. In other words, if the learner can process a simple event or printed words through elaborately semantic processing, he or she would remember well because it becomes distinctive to the learner.

Much of the experimental evidence has supported the basic assumptions of levels of processing theory. For example, vocabulary learning strategies such as word association (Cohen & Aphek, 1981; Taylor & Taylor, 1990) and the keyword method

(Cramer & College, 1981; Pressley, Levin, & Miller, 1982; Ellis, N. & Beaton, A., 1993), require deeper processing of word meaning, and have been shown to enhance retention of target words. Those strategies based on levels of processing emphasize that processing activities at the time of learning can have a major impact on subsequent learning (Cohen, Eysenck, & Le Voi, 1986). To put it in another way, the application of the theory to vocabulary learning is very fruitful.

### **2.3.3 Dual Coding Theory**

Another cognitive learning theory is called dual coding theory. The dual coding theory has been applied in mnemonics, problem-solving, concept learning and language. Its role in memory is unique. For example, Najjar(1995) especially took it as an explanation for the effects of multimedia information on learning. Accordingly, a brief description of the assumptions and components of the theory is needed, especially when we want to examine its effectiveness in EFL vocabulary learning.

According to Paivio (1986), memory is composed of two subsystems, taking the responsibility of processing different information. One subsystem, also called verbal system, mainly takes charge of dealing with the linguistic input and output (words, sentences, etc.,) whereas the other subsystem, visual system, specializes in handling and storing mental images and picture-like representations.

The relations between the two subsystems are independent functionally but interconnected structurally. Functionally, the verbal and nonverbal systems are independent. Each of them can process information without the other. In other words, people can perceive, remember and think about nonverbal objects and events without the intervention of the verbal system and vice versa. For example, when a person has been to Paris, the beauty of the scenery will come to the person's mind naturally once in a while without any words to express.

However, those two systems are also sometimes interconnected functionally. The activity in one system can trigger activity in the other. A simple case for the interconnection between systems is naming objects and pointing to named objects. For example, when a person is asked to describe how his girlfriend looks like, an image of his girlfriend occurs first and then he will describe her eyes, nose, mouth, and so on. The interconnections between verbal and nonverbal systems are supposed to be one-to-many. One given word such as ‘boy’ can evoke different images. On the contrary, a given picture can evoke different descriptions (Paivio, 1986).

Paivio (1986) also postulates two different types of representational units for the two systems. The units in the verbal system are called ‘logogens’ and those in the nonverbal system called ‘imagens.’ The structure of logogens is an associative network as well as a hierarchical structure. Small units are organized into larger units sequentially and successively. For example, phonemic units are organized in syllables, syllables into words, words into sentences, and so on, up to an entire play. On the other hand, the structure of imagens can be viewed as the relationships between part and whole. For instance, when people see the elements of a face such as eyes, nose, lips, etc., those features can be seen separately or can be seen as a whole part, a face.

If learners can process two kinds of information—words and pictures--- simultaneously, they can create more cognitive paths to retrieve the information. Information processed through both ways has an additive effect on recall. In other words, to present a pictorial item and a verbal item of the same concept at the same time leads to improved learning. This happens, for instance, when a person sees a picture of a ‘cat’, and processes the word ‘cat.’ An elaborative dual coding is thus formed, which deepens the connections between the word and the image, thus enhancing the learners’ memory toward the target word.

Wang & Yeh (2001) conducted a study based on the concept of dual

presentation of vocabulary annotation. They compared the effect of text annotation, text plus picture annotation, and text plus picture plus audio annotation. They randomly assigned 82 freshmen in National Tsing-Hua University in Taiwan to three different groups, reading one of the three versions. “Thanksgiving” was chosen as the text in the courseware and vocabulary was annotated with three different types of glossary.

Version 1 was annotated by text only-Chinese translation and English explanation. Version Two was annotated by text and a still image associated with the target word. Version Three was annotated by text, image, and audio representation--a native speaker reading first the word, then spelling the word, and finally reading the sentence in which the target word was embedded.

The results showed that participants reading version two--text plus a picture had the best performance. Thus, the study proved that text plus picture annotation is the most effective on vocabulary acquisition.

### **2.3.4 The Keyword Method**

Atkinson (1975) developed a mnemonic technique, the keyword method, based on the dual coding theory. The first step of the method is to find a keyword in the mother tongue based on acoustic similarities. Second, the learner has to produce an imaginal link between the target word and the keyword. For example, the Spanish word “carta” means “postal” or “letter” in English. The learner uses the English word “cart” as the keyword and generates a visual image of a giant postal letter inside a shopping cart (Nation, 1990). Through the deep cognitive process, the learner can recall the meaning and the pronunciation of the word easily by means of the image formed as well as its acoustic similarities (Nation, 1990).

Thompson (1987) indicates that the keyword method has been used for many

centuries. It is one of the most extensively researched mnemonic strategies. Besides, some researchers have proved it effective in improving both immediate and delayed recall of L2/FL vocabulary (e.g., Atkinson & Raugh, 1975; Pressley, & Levin, & McDaniel, 1987).

However, some researchers hold different views on the effectiveness of the keyword method on vocabulary learning. Wang, Thomas, and Ouellette (1992) conducted a study of vocabulary learning in which college students were divided into two groups. One group made use of the keyword to learn new vocabulary while the other adopted the rote learning. The result showed that college students using the keyword method had better performance on immediate recall of French nouns and their English equivalents. However, learners using the keyword method could not perform better than those adopting the rote learning in long-term memory.

Wang & Thomas (1992) also conducted an experiment to explore the effect of the keyword method on the long-term retention of Chinese characters. They gave the subjects in the experimental group a brief description of each ideograph's etymological origin with respect to its visual components, but no pronunciation is instructed because it is hard to find a keyword in English corresponding to a Chinese character due to their different articulatory patterns. In the control group, they asked subjects to trace over the ideograph and write down its English equivalents as many as six times each. They just wanted the subjects to recall each character's meaning.

In Study 1, the total study time was the same in both groups. In addition, there was a cued recall held immediately and two days later. In Study 2, the learning time was increased for the rote-learning group. In addition, there was an immediate cued recall, and a one-week-delayed recall. The results showed that in Study 1, the subjects under the imagery-based instruction performed better on the immediate test of cued recall. Two days later, both groups had highly comparable performance. In Study 2,

the results indicated that “supplying learners with mnemonically devised images did not produce any long-term advantages for the retention of second-language vocabulary items.” Wang & Thomas (1992) came to the conclusion that maybe encodings generated by subjects were more effective than those supplied by the experimenters.

It should be concluded, from what has been said above, that the keyword method has better immediate effect on vocabulary acquisition than does the rote learning; however, some researchers doubt that it may not lead to long-term retention (Wang & Thomas, 1992; Wang, Thomas, & Ouellette, 1992). One reason may be that when the experimenter generates most images, the learners may not process much deeper and more complicated cognitive process and can just keep the images for a short period. The other reason may be that most learners are accustomed to using rote learning to memorize vocabulary and have used the strategy to reach high level of proficiency (Schmitt, 1997). This leads to a question whether it is more effective to combine the cognitive strategy, e.g., rote learning with the memory strategy, e.g., visual images in learning vocabulary than to adopt only the cognitive strategy or the memory strategy.

Those studies mentioned above are based on the dual coding theory or levels of processing, emphasizing the employment of pictures for enhancing vocabulary learning. As to the keyword method, it is a well-known and widely-experimented vocabulary learning strategy and has been proved greatly effective to facilitating vocabulary learning (Nation, 1990; Oxford, 1990; Wang & Thomas, 1992; Wang, Thomas, & Ouellette, 1992).

However, in spite of its effectiveness on vocabulary learning, the keyword method also draws some criticism in some ways (Segler, 2001):

- As the keyword is only an acoustically approximation of the L2 form, the learners tend to neglect the proper learning of correct L2 phonology and orthography.

- The keyword method can only be used for concrete nouns, rarely for abstract nouns.
- It may be effective in the laboratory condition, but it is seldom experimented in real classroom teaching situations.
- It may not provide essential grammatical information to correctly use the word.

Moreover, in most keyword method studies, pictures are provided by the instructors.

Wang & Thomas (1992) argue that pictures generated by the subjects, not by the instructors may provide learners with stronger trace to retrieve words successfully because pictures drawn by the learners would enable them to have personal feelings toward words, thus leading to longer retention (Allen, 1983). Although the keyword has some limitations, it still provides an important notion, i.e., the imagery part, for the researchers to examine its effect in the vocabulary learning and teaching field.

## **2.4 Summary**

In Chapter Two, some dimensions about vocabulary learning are discussed. The views on lexical knowledge are first brought up to help the learners understand how many words they need to know and the dimensions of the depth of lexical knowledge they need to acquire in language learning. Then, language learning strategies are discussed. Two parts are involved in this section: the definitions of language and vocabulary learning strategies and studies on vocabulary learning strategies. Schmitt (1997) and Kudo (1999) carry on studies on the frequency of vocabulary learning strategy use in Japan. On the other hand, Jiang (2001) and Huang (2001) both prove the effectiveness of vocabulary learning strategy instruction in class.

Finally, it has been found that the cognitive learning theories, i.e., levels of processing and the dual coding theory have played important roles in language learning. The effectiveness of the keyword method, based on the cognitive theories, has called some vocabulary learning researchers' attention. Moreover, based on the dual coding theory, the

study conducted by Wang and Yeh (2001) also proves the effectiveness of presenting texts and pictures on the computer simultaneously. The current study also favors the cognitive theories, levels of processing and the dual coding theory, wanting to explore the effectiveness of the visual images, i.e., pictures drawn by the subjects as well as the text in learning vocabulary.