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DEVELOPMENT OF THE VOCABULARY  
KNOWLEDGE AND USE OF CHINESE TERTIARY  
LEARNERS

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Ph.D

The Hong Kong Polytechnic University

2018

THE HONG KONG POLYTECHNIC UNIVERSITY

DEPARTMENT OF ENGLISH

Development of the Vocabulary Knowledge and Use of Chinese  
Tertiary Learners

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A thesis submitted in partial fulfilment of the requirements  
for the degree of Doctor of Philosophy

July 2017

# CERTIFICATE OF ORIGINALITY

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\_\_\_\_\_ (Signed)

Wang Chen (Name of student)

## Dedication

This thesis is dedicated to my beloved family, including my parents, Wang Changyun, Gui Shuyuan, Deng Xiaolan and Yang Xialin, my husband, Yang Jingjing, and my lovely son, Yang Feiran. Their love, sacrifice and understanding are boundless.

## Abstract

This thesis explores the development of vocabulary knowledge and use for Chinese tertiary learners. It addresses three main questions. First, it explores the relationship between vocabulary knowledge (knowledge of collocations) and the quality of lexical use in writing. The results indicate a weak correlation between the vocabulary knowledge and use. This part also examines the contribution of the communicative use of language to the quality of lexical use in writing. The correlation analysis indicates that there is a weak correlation between the communicative use of language and the quality of lexical use. The findings raise the needs to investigate the use of collocations in writing. The second question examines the extent to which learners use collocations in their writing at different levels of study. It also explores the learning sources of the collocations in learner writing and learners' confidence in collocational use. Results suggest that learners show similar patterns in their use of collocations regardless of the level of their study. The findings indicate that learners lack the awareness of collocations with high associate strength, and the resources that could contribute to learner's collocational use are quite limited. The third question intends to address the issues in the learning of collocations. It investigates the efficiency of collocations in new item learning. At the same time, it examines the intralexical factors, i.e., association strength and collocate-node relationship, in the acquisition of collocations. Results provide empirical evidence to support the advantage of collocations in new item learning. It also suggests that association strength is conducive to collocational learning. Although the findings show that collocate-node relationship affects the retention of collocations, this effect could be neutralized by explicit teaching of collocations.

## Accepted Journal Articles

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# Chapter One Introduction

## 1.1 Aims of the thesis

The importance of vocabulary knowledge in second language learning has been well recognized in the past three decades in applied linguistic research. Vocabulary is gaining increasing prominent position in applied linguistics research and has risen as an independent research strand. Vocabulary learning (including single words and formulaic language) has been viewed as an essential element in achieving the goal of language learning. Its prominent position in second language learning has witnessed the emergence of abundant teaching and learning materials that have centered around vocabulary learning (e.g., Boers, Demecheleer, Coxhead & Webb, 2014). However, the understanding of the vocabulary knowledge and how it could be effectively learned are still quite limited. The wealth of research into vocabulary knowledge has revealed its rich and complex nature (e.g., Nation, 2001, 2013; Schmitt, 2014). To give due recognition to the complex nature of the vocabulary knowledge requires more insights into the interactive development of the dimensions of the L2 lexicon.

The present thesis aims to address the question of the development of vocabulary knowledge and use of Chinese EFL learners at tertiary level. I narrow my quest to one aspect of the vocabulary knowledge, i.e., the knowledge of collocations. The selection of the collocations as the target of the research is based on both previous research that has developed well-established methods for the identification and analysis of the collocations and my empirical research (see Chapter three and four) that has yielded

the needs to explore the knowledge and use of collocations of EFL learners.

The thesis will address three main questions. The first question is the fundamental one which explores the interaction between the knowledge and use of vocabulary. Previous research has shown that the vocabulary knowledge is related closely to the quality of performance (measured by the holistic scores of oral and written production) (e.g., Crossley, Salsbury & McNamara, 2014). However, the extent to which the vocabulary knowledge is related to the quality of word use in language production remains to be seen. The investigation of this relation and the changes of it over time could inform us on the contribution of the vocabulary knowledge to word use. Another important factor in the development of vocabulary knowledge and use, i.e., the exposure to English, will also be investigated and examined empirically. This part will include a preliminary study that helps to choose from a range of sub-dimensions in vocabulary knowledge and lexical richness for the focus of the thesis. This part will aim to explore the developmental path that vocabulary knowledge and use follow in three years of tertiary study and how these two aspects interact at each stage of learning.

The second question concerns how learners use collocations in their writing. It shall be seen from chapter three that there is a low correlation between the knowledge of collocations and lexical variation. The second question follows up on the first question to identify the possible reasons that might contribute to the low correlation. Previous studies have revealed learners' difficulties in using collocations productively in writing (e.g., Bestgen & Granger, 2014; Durrant & Schmitt, 2009; Nesselbauf,

2003). However, the diverse ways of identifying collocations make it hard to generalize the results to other contexts. Also, as most studies of this type use writing from corpora at one time interval, it is hard to understand how learners' use of collocations develops at different stages of learning. The quantitative analysis of the collocations could shed light on the profile of collocational use; however, it is limited in revealing factors that are relevant to the use of collocations, i.e., the sources of the collocations and learners' confidence in the use. The second aim of this part will be to combine quantitative and qualitative methods to reveal learners' use of collocations at different stages of learning.

The third question is concerned with how collocations could be best learned. This part draws on the results of the second question and aims to tackle with two issues concerning the learning of collocations. The first issue is whether learning new vocabulary items in collocations is conducive to word learning. It is quite common in language classrooms for teachers to present the collocates for new vocabulary item at first encounter. However, it needs empirical evidence to explore whether learning new items in collocations is beneficial for word learning (e.g., Kasahara, 2011; Peters, 2015). The second issue is how collocations could be best learned. Durrant (2014) has suggested that it is the lack of awareness of the association strength instead of the frequency of collocations that has undermined learners' developing the nativelike use of collocations. However, as Eyckmans, Boers, and Lindstromberg (2016) have commented, although association strength has now been widely used in studies as a way of identifying collocations, it is not yet clear how it affects teaching and learning



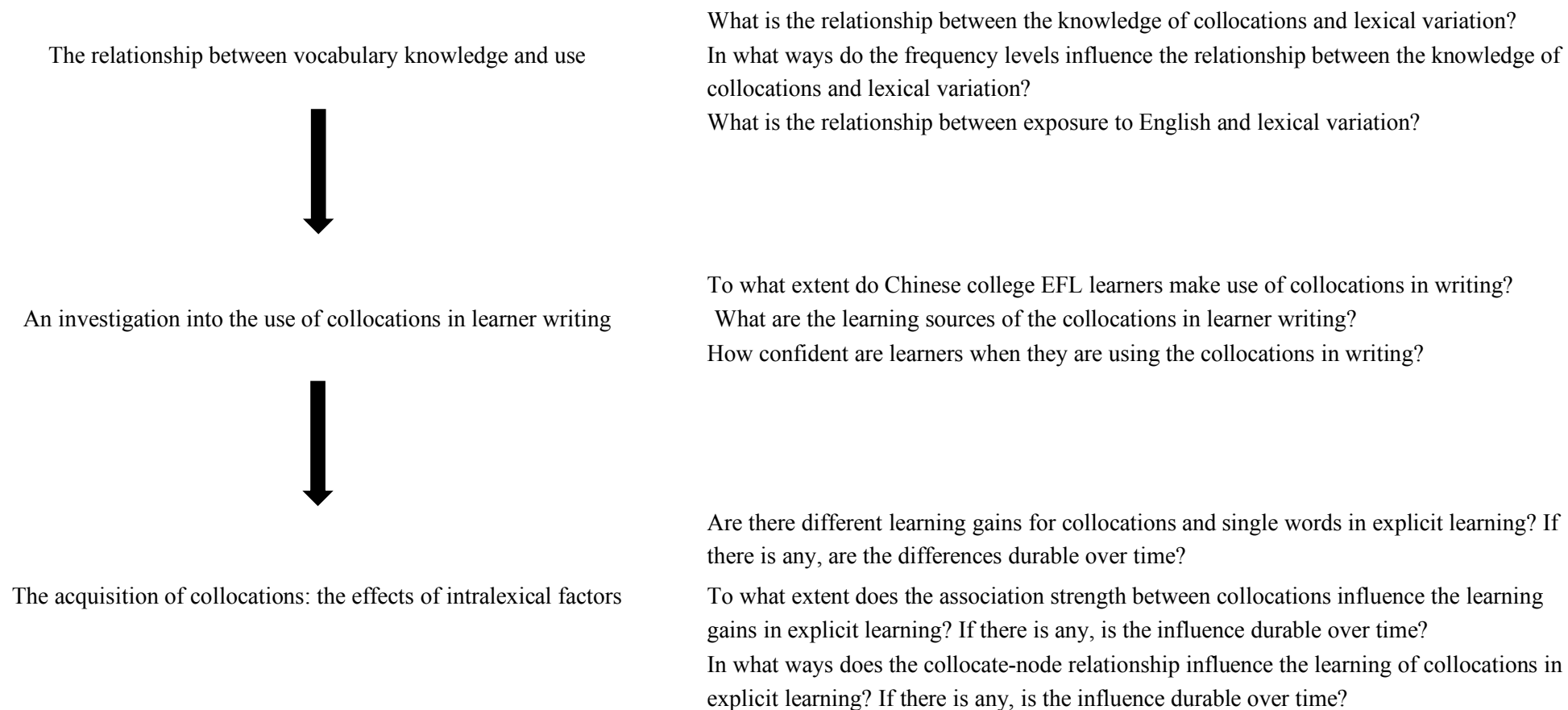
of collocations.

## 1.2 The structure of the thesis

This thesis has five central chapters. Chapter two introduces the theoretical frameworks of vocabulary knowledge. It presents two major frameworks that clarify the concepts underpinning the study and help to elucidate how vocabulary knowledge is defined in the research literature. The chapter indicates the broad category where the knowledge of collocations situates. Chapter three, four, and five address the three main questions mentioned above. Each chapter has more detailed literature review pertinent to the questions of the study. Chapter three explores the correlation between vocabulary knowledge (knowledge of collocation) and quality of lexical use in writing. It examines how this correlation develops at different stages of learning, and how this relation changes for words at different frequency levels. It also investigates how exposure to English influences the lexical use in writing. Chapter four looks at the extent to which learners use collocations in writing. It examines learners' use of three types of collocations at different stages of learning to profile the collocational use across time. It also explores the way learners acquire these collocations and how learners perceive the collocations in their writing. Chapter five investigates possible ways of enhancing collocational learning. It first empirically examines the advantage of collocations in new item learning. Then, it explores two possible factors that could influence the learning of collocations: association strength and collocate-node relationship. Chapter six consists of a general discussion based on the findings of the

three questions and explores the significance of these studies in applied linguistic research and second language learning

Figure 1.1 *The Overall Structure of the Thesis*



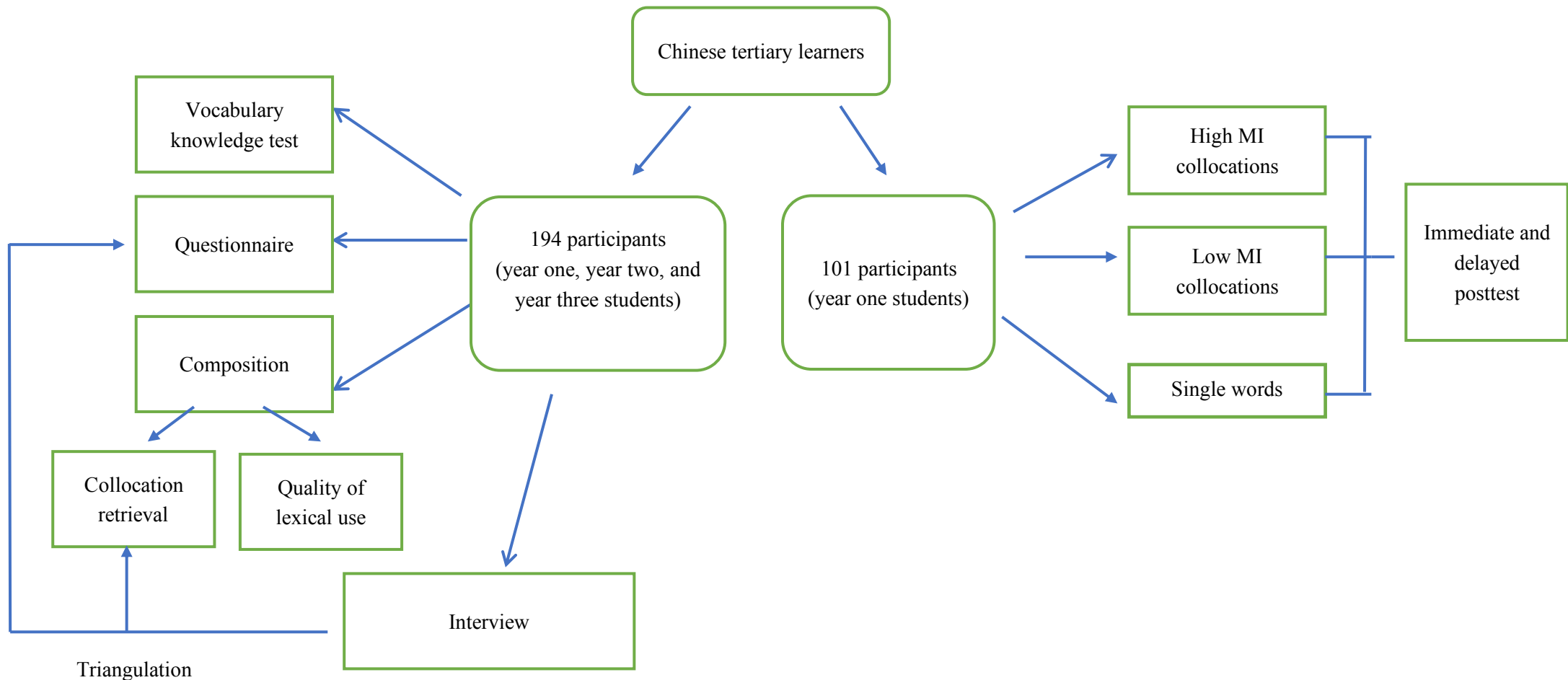


Figure 1.2 Summary of the Research Methodology of Three Studies

## Chapter Two Theoretical Framework

Due to the rich and complex nature of vocabulary knowledge, it has been interpreted in a magnitude of ways (for a review, see Schmitt, 2014) to reflect the multi-faced nature of the construct, and therefore, research on this construct has operationalized vocabulary knowledge in different ways. Although vocabulary knowledge has been interpreted in a variety of ways, a basic distinction of breaking down the construct to the two dimensions of size and depth. The two dimensions have been widely accepted since its introduction by Anderson and Freebody (1981), and has been proven to be quite useful in understanding and conducting empirical studies into this construct (e.g. Dellar, et al., 2007; Qian, 2002).

This section will introduce two important models of vocabulary knowledge, which serves as the theoretical underpinning of the present study, and helps to clarify the operationalization of the variables in the empirical study. The first model is Henriksen's model (1999) of lexical competence, which provides a broad and comprehensive explanation of the construct of vocabulary knowledge. The second model is Nation (2001), which helps to break down the conceptual description of vocabulary knowledge into manageable aspects, which could be operationalized and empirically examined in studies.

### 2.1 Henriksen's model of lexical competence

Henriksen's model of lexical competence is an attempt to balance between a

global description and the more specific dimensional approach of lexical competence. In this model, lexical competence is categorized as three interrelated continua: 1) the partial to precise knowledge; 2) the depth of vocabulary knowledge; 3) the receptive to productive knowledge.

The first dimension involves item learning, in which, learning the meaning of a word moves along the continuum from only partial understanding to precise comprehension. It starts from the mere recognition of words, and makes the slow progression to precise comprehension, if possible. For most learners, their knowledge of words may be anywhere on the continuum, but precise comprehension of all words remains as an idealization. When the process of mapping meaning onto form starts, the knowledge of words starts to progress on both horizontal dimension, i.e., item learning, and vertical dimension, i.e., system changing.

The second continuum equates the depth of vocabulary knowledge with the lexical network, in which, the knowledge of words starts to develop links with existing words in the mental lexicon. This process involves “learners’ ongoing process of constructing and reorganizing their interlanguage semantic network” (Henriksen, 1999: 307). Learners starts to reorganize and extend the newly learned words by establishing link with other semantically related words in the lexicon, like synonym, antonym, hyponym, etc. (Aitchison, 2012).

The last dimension deals with the receptive and productive knowledge of a word. Henriksen emphasized that there is a difference between the mastery of words and the ability to use the words. However, she also acknowledged the difficulty in drawing a

definite line or a threshold when a word becomes productive. Instead, she regards this receptive and productive knowledge as a continuum, where it is possible that some aspects of the vocabulary knowledge are productive while other aspects remain receptive (Melka, 1997).

Henriksen's model focuses on the complex nature of lexical development in the mental lexicon and emphasizes the interdependence of the three dimensions. In her model, once the process of word learning starts, it moves along a multidimensional path on which the learners organize, categorize, and generalize the meaning of the words, and develop the intensional link in the lexical network. However, one notable issue is that, for the second language learner, this idealized process may never reach the ultimate goal of developing a full mastery of words and a lexical network as native speakers. Instead, considering the complexity of the lexical competence, the process may move back and forth on the continua. The learning process shows a variability in the development for different words as described in the three-step developmental process of second language word learning in Jiang (2000, 2002), and a theoretical model of attrition by Meara (2004). Another important issue in this model is, as Henriksen addressed, though the model is quite comprehensive in understanding the semanticization process of vocabulary learning, it is limited in “monitor actual processes and factors that influence vocabulary acquisition” (Henriksen, 1999: 315). The model provides abstraction of concepts that could not be empirically examined easily, and therefore, remains at a conceptual level. For researchers that are looking into the vocabulary knowledge, more concrete and manageable definition of the

construct is needed to be empirically examined to shed light on the development of word learning.

## 2.2 Nation's framework of vocabulary knowledge

To understand the learning burden of words and provide guidance for effective teaching, Nation (2001, 2013) proposed a quite exhaustive model that has been widely adopted in studies in vocabulary acquisition. He classified vocabulary knowledge into nine sub-dimensions that can be empirically examined, and therefore, has remained as an important framework for understanding and assessing vocabulary knowledge.

Nation's framework of vocabulary knowledge consists of three categories, which are form, meaning and use (Nation, 2013:49) (Table 2.1). The form part includes the spoken form, written form, and the word parts. The knowledge of form refers to the ability to recognize a word when hear or read it and to produce the words in speech and writing when necessary. This ability is affected strongly by learners' mental representation of the phonological system of the target language. The knowledge of word parts involves the understanding of the affixes and roots in words. This knowledge plays an important role in the development of vocabulary size, as grouping words according to word family reduce the burden of learning new words. Research into the native speakers of English found the evidence to support the notion of word family (Anderson, et al. 1985), and, suggest that, in most cases, knowing a word involves knowing all the words in the same family. Different affixes have a degree of



variability in their learning burdens, and with the increase in proficiency, learners would expand their knowledge of different words in the same family, starting from basic inflections of the stem to higher level affixes with lower transparency and frequency (Bauer & Nation, 1993).

Table 2.1 *Nation's Framework of Vocabulary Knowledge*

Form	spoken	R	What does the word sound like?	
		P	How is the word pronounced?	
	written	R	What does the word look like?	
		P	How is the word written and spelled?	
	word parts	R	What parts are the recognisable in this word?	
		P	What word parts are needed to express the meaning?	
Meaning	form and meaning	R	What meaning does this word form signal?	
		p	What word form can be used to express this meaning?	
	concept and referents	R	What is included in the concept?	
		P	What items can the concept refer to?	
	associations	R	What other words does this make us think of?	
		P	What other words could we use instead of this one?	
	Use	grammatical functions	R	In what patterns does the word occur?
			P	In what patterns must we use this word?
collocations		R	What words or types of words occur with this one?	
		p	What words or types of words must we use with this one?	
constraints on use (register, frequency...)		R	Where, when, and how often would we expect to meet this word?	
		P	Where, when and how often can we use this word?	

Note: In column 3, R=receptive knowledge, P=productive knowledge

The meaning part refers to the knowledge of mapping meaning onto forms of words and the understanding of the semantic connection between words. Since most English words are polysemous, especially the high frequency words, Nagy (1997) suggested that learners use their underlying concepts of a word to ease the learning burden of words with multiple meanings when they use the language. The process of form- meaning mapping is an ongoing one, and as Nation suggested, the strength of

form- meaning link would determine the speed of words retrieval in the use of the language. The association in Nation's definition is similar to the idea of the lexical network in Henriksen's model (1999). Both frameworks recognized the importance of association in describing the organizational structure of the lexicon. By listing 26 categories for nouns and fourteen categories for verbs, Miller and Fellbaum (1991) illustrated the hierarchies in the semantic relationship in words. This description of semantic relationship is used by Nation to provide a practical guideline for classroom teachers when illustrating semantic connections between words. Nation also mentioned the contribution of association to lexicography by identifying the keywords necessary in word definition and simplification of texts for reading training.

The use part refers to a grammatical function, collocation, and constraints on the use of words. The knowledge of grammatical functions includes the understanding of the part of speech of the words and the grammatical pattern it usually follows. Instead of separating vocabulary from grammar, Nation argued that the lexicon played an important role in grammar. The knowledge of collocation of a word refers to the knowledge of those words that usually are used together with that word. Considering the variability in the definition of collocation, Nation suggested to use a set of ten scales to identify the classification of collocation, i.e., the frequency of co-occurrence, the adjacency, grammatically connected, grammatically structured, grammatical uniqueness, grammatical fossilization and collocational specialization. The constraints on the use of words in Nation's definition do not include a sociolinguistic factor, but center on linguistic features of the words themselves. Addressing pedagogical values

of the framework, Nation suggested that learners should pay attention to the dictionary indication of the usage constraints, the frequency level and the possible transfer of constraints from the first language to the second language.

Nation's framework shows a balance between theoretical interests in vocabulary learning and pedagogical needs of classroom teachers. The classification of vocabulary knowledge is grounded in relevant research findings, and yet, provides a clear guideline for teachers to focus on teaching explicitly. As Nation (2001: 24) addressed:

“Teachers should be able to estimate the learning burden of words for each of the aspects of what is involved in knowing a word, so that they can direct their teaching towards aspects that will need attention and towards aspects that will reveal underlying patterns so that later learning is easier.”

This framework has two important applications for the present study. The first is that it provides valuable insights on different aspects in vocabulary depth. It helps to elucidate the relationship between vocabulary knowledge and use in that specific aspect in vocabulary knowledge can be chosen and assessed in length to unravel their unique contribution to lexical use. Schmitt (2014: 944) suggested concentrating on “more specific measures of the quality of vocabulary knowledge.” This dimensional approach in analyzing vocabulary knowledge has been used to find out the contribution of vocabulary knowledge to language skills. At the same time, it is a useful tool to assess gains in different aspects of knowledge in vocabulary instruction (e.g. Baba, 2009; Koizumi & In'nami, 2013; Lemmouh, 2011; Webb, 2005; 2007).

The second is that this framework helps to design the tests into different aspects of knowledge in empirical studies of chapter 3 and chapter 5. It could apply easily to both single words and multi- word units including collocations. The original framework was designed by Nation for understanding the knowledge of single words. However, it was later adapted by Nation and Webb (2011) to extend to multi-word units and Webb, Newton and Chang (2013) to collocations. The adapted framework on collocations could distinguish between the receptive and productive knowledge of collocations and elucidates the types of knowledge that are tested in vocabulary knowledge tests.

Table 2.2 *What is Involved in Knowing Collocations?*

Form	spoken	R	What does the collocation sound like?
		P	How is the collocation pronounced?
	written	R	What does the collocation look like?
		P	How is the collocation written and spelled?
	word parts	R	What words are the recognizable in this collocation?
		P	What word are needed to express the meaning?
Meaning	form and meaning	R	What meaning does this collocation signal?
		p	What collocation can be used to express this meaning?
	concept and referents	R	What is included in the concept?
		P	What items can the concept refer to?
	associations	R	What other words or collocations does this make us think of?
		P	What other words or collocations could we used instead of this one?
Use	grammatical functions	R	In what patterns does the collocation occur?
		P	In what patterns must we use this collocation?
	collocations	R	What other words, collocations, or types of collocations must we use with this one?
		p	What words, collocations, or types of collocations must we use with this one?
	constraints on use (register, frequency...)	R	Where, when, and how often would we expect to meet this collocation?
		P	Where, when and how often can we use this collocation?

Note: R=receptive; P=productive. (Webb, Newton and Chang, 2013:97).

## Chapter Three The Relationship Between Vocabulary Knowledge and Use

### 3.1 Introduction

The importance of vocabulary knowledge in learning a second language is well-established in existing studies in second language acquisition (e.g., Alderson, 2005; Albrechtsen, Haastrup & Henrisken, 2008; Laufer & Goldstein, 2004; Milton, 2009). Vocabulary knowledge is found to be a reliable predictor of the performance of reading, writing, speaking and listening, and the language proficiency. The research interests in vocabulary knowledge are fueled by the complexity in its nature, and the potential factors that affect its acquisition and assessment (e.g. Nation, 2001, 2013; Read, 2000; Schmitt, 2010).

To shed light on the development of learners' vocabulary knowledge and use, it is necessary to understand the relationship between the two constructs. It could help learners and teachers make informed choices when they are facing the need to allocate classroom time on explicit teaching of words. However, there are very few existing studies that have explored this relationship (Lemmouh, 2011). Also, studies are needed to explore the dynamic changes in this relationship with learners from different levels of study to observe the growth in the knowledge and make proper changes in the teaching plan to target the needs of learners from different proficiency levels.

The dimensional approach views vocabulary knowledge as the umbrella term for

different interrelated sub-dimensions. In this approach, different aspects demonstrate different rates of development, while showing variability in its relationship between language performance (Baba, 2009; Crossley & McNamara, 2012; Fernandez & Schmitt, 2015). Consequently, Schmitt (2014) called for research that looks at specific aspects of vocabulary knowledge in greater depth instead of examining vocabulary knowledge as a construct.

This chapter intends to explore the relationship between vocabulary knowledge and the quality of lexical use in writing. In this chapter, one aspect of the vocabulary knowledge was studied, i.e., the knowledge of collocations. And, the quality of lexical use was examined regarding the range of words used in writing. Also, the present study also explored the variability of the relationship across different levels of study and different frequency levels of words. An equally important factor that may influence the development of vocabulary knowledge and use is the exposure to the language outside classroom contexts. The exposure could be in the receptive form as reading books, and watching movies or the active engagement in using the language to communicate (Fernandez & Schmitt, 2015). This study also investigated how the exposure to language related to the quality of lexical use among learners from different levels of study.

Section 3.2 provides an overview of the literature that has explored the two constructs of vocabulary knowledge and lexical variation and the possible relation between the two constructs. We will see, though the two constructs have been well explored, the possible relationship between the constructs remains unclear. At the

same time, it is not yet clear how frequency has affected this relationship. What also needs to be explored is the contribution of the communicative use of English to the lexical variation in writing. Section 3.3 presents the preliminary study which aimed to identify one aspect in vocabulary knowledge to be explored in the main study. It is the purpose of this thesis to explore one aspect of vocabulary knowledge in depth, and the preliminary study served this purpose to identify this aspect. Section 3.4 overviews the methods that were used to explore the relationship between vocabulary knowledge and lexical variation in writing. Around 190 learners from three levels in the tertiary study participated in the study and finished both vocabulary test for knowledge and a composition for analysis of lexical variation. They also reported the average amount of time of communicative use of English outside the classroom. Section 3.5 summarizes the results of the study and section 3.6 will discuss the major findings.

## 3.2 Literature review

### 3.2.1 The measurements of vocabulary knowledge

A variety of measurements of vocabulary knowledge has been proposed based on the different operationalizations of the construct. There are two types of tests currently used in the applied linguistics research. The first type investigates the vocabulary knowledge as an integrated construct (e.g., Nation, 1983, 1990; Nation & Beglar, 2007; Paribahkt & Wesche, 1996; Read, 1998; Qian, 2002; Schmitt, Schmitt & Clapham, 2001). The second type examines different aspects of vocabulary knowledge using a battery of tests, each tapping into one aspect of the knowledge

(e.g., Webb, 2007; Peters, 2015).

In the first strand, several vocabulary knowledge tests have been proposed for the classification of the size and depth of the vocabulary knowledge. The Vocabulary Level Test (VLT) was proposed by Paul Nation to measure the vocabulary size. Learners were required to match the words with the English meaning provided. The test tapped into the learners' receptive knowledge of form-meaning link of the target words from 2000, 3000, 5000 and 10000 word levels. The test was later revised by Schmitt, Schmitt, and Clapham (2001) using a slightly different format (multiple choices instead of matching test) and replaced the University Word List (Xue & Nation, 1984) with Academic Word List developed by Coxhead (2000).

The most widely used tests for depth of vocabulary knowledge are Word Association Test (WAT) developed by Read (1998) and Qian (2002) and Vocabulary Knowledge Scale (VKS) developed by Paribahkt and Wesche (1996). The two tests were designed to measure multiple aspects of receptive knowledge of vocabulary knowledge, such as form-meaning link, association, collocation and grammatical knowledge. The two tests were designed under the conceptual framework of the "network" of vocabulary knowledge. Instead of treating each aspect as a different dimension, the network of vocabulary knowledge regarded the depth of vocabulary knowledge as the integrated construct of multiple aspects.

The second strand of the tests into the vocabulary knowledge examined each aspect separately to increase the sensibility of the measurement and reflect the dynamic changes in different aspects of the knowledge. Webb (2005; 2007; 2009)



designed a battery of tests tapping into the receptive and productive knowledge of vocabulary under the theoretical framework of Nation (1990; 2001; 2013). Webb (2007) used a battery of ten tests to measure the effect of repetition on the receptive and productive knowledge of spelling, form-meaning link, association, collocations and grammatical knowledge. He explained the adoption of multiple tests as “it was important to have tests at different sensitivities to measure the depth of knowledge” (2007: 54). The results showed that the knowledge of spelling precedes the development of other aspects of knowledge, followed by a form-meaning link and grammatical knowledge. While knowledge of collocations lagged all other aspects, the similar trend held true for all encounters in the experiment. This study echoed the call from Schmitt (2014) to fine-tune the tests to test specific aspects of vocabulary knowledge. After reviewing the literature on the size and depth of vocabulary knowledge, Schmitt acknowledged the elusive nature of the concepts of the depth of vocabulary knowledge. He commented that “It may be time to dispense with the general notion of depth altogether and concentrate on more specific measures of the quality of vocabulary knowledge that are tuned more finely to specific research questions” (2014: 944).

Gonzalez-Fernandez (2016) illustrated the needs to explore the different aspects separately in her study on the order of acquisition of vocabulary knowledge dimensions. She rated the level of difficulty of various aspects of vocabulary knowledge using a battery of eight tests tapping into the receptive and productive knowledge of form- meaning link, collocations, polysemy, and morphology. The

results of the structural equation analysis showed that the different components in the vocabulary knowledge developed in a parallel fashion at different rates. The knowledge of form-meaning link preceded the knowledge of other aspects. And the level of difficulty varied among different components for receptive and productive knowledge.

Hence, I might conclude that isolating different aspects of vocabulary knowledge in measurement could increase the sensitivity of the study. Also, it could shed light on the systematic pattern of acquisition. Measuring different aspects one at a time could unravel the differentiated strength in the relationship between vocabulary knowledge and use. The present study intended to examine the receptive knowledge of vocabulary using a battery of tests to increase the sensitivity of the measurement.

### 3.2.2 Measurement of vocabulary use

The indices of lexical richness can be used to measure the effectiveness of vocabulary used in spoken and written contexts in a “quantitative and objective” way (Read, 2000:197). It measures how well words have been used in language production (Webb & Nation, 2012). Researchers have analyzed the lexical richness in writing in different ways, like probing into the range of words used in the texts, the percentage of content words used, the frequency of words used and counting the number of errors made in the texts.

The definition of lexical richness has gone through changes in the decades of research. It has expanded from its original definition of the total number of words in

the mental lexicon (Yule, 1944) to a more specific term reflecting lexical statistics in writing (Read, 2000). Read (2000) classified the lexical richness measurements into the qualitative and quantitative approach. The qualitative approach involves the use of rating scales by raters who provides holistic or analytic scores to speech or writing. The latter approach, which has specific reference to lexical quality, measures the lexical use in speech and writing with specific lexical statistics focusing on different aspects of lexical use.

One major framework of measuring objective lexical richness was Linnarud's classification (1986) covering the number of different words used in a text (lexical variation), the percentage of advanced words used (lexical sophistication), the ratio of content words (lexical density) and the ratio of unique words used by individuals (lexical originality). With the development of corpus and the availability of word lists, Laufer and Nation (1995) proposed the Lexical Frequency Profile (LFP) which could measure and document the frequency of words in writing at one time and its changes over time. This measure has proved to be quite effective in capturing vocabulary growth in profiling the word frequency; however, it was limited in scope in measuring other aspects in lexical use. Emphasizing the effective use of words, Read (2000) followed the tradition of multi-facets classification of the lexical richness of Linnarud, and replaced the lexical originality with the number of error in writing. Of all the measurements in lexical richness, perhaps the one that has received the most attention is lexical variation.

Lexical variation is a measurement that quantifies the range of different words

used in a text (Malvern, Richards, Chipere & Dur'an, 2004; Jarvis, 2013). The measure has been used extensively in a wide range of fields with linguistic interests (e.g., Malvern, Richards, Chipere & Dur'an, 2004; Friginal, Li & Weigle, 2014). To test the validity of the automated lexical indices, Crossley, Salsbury, and McNamara (2014) conducted an empirical study to examine the extent to which the automated lexical indices could predict the human judgment of the lexical proficiency of native speakers and L2 learners. They used the self-constructed corpus of 240 written texts from learners of nine language backgrounds. A wide range of lexical indices in Coh-Metrix was included in the study, i.e., word concreteness, word specificity, semantic co-referentiality, collocation accuracy, sense relations, sense frequency, word frequency and lexical diversity. The results of the correlation and multiple regression analysis showed that lexical variation demonstrated the strongest correlation with human judgment ( $r = .668$ ) among all the lexical indices. Also, the lexical variation could explain the greatest variance (25%) in the lexical proficiency scores assigned by human raters.

Regarding the measurement of lexical variation, the most influential and traditional measure is the type-token ratio (TTR). It counts the number of different types of words used comparing to the total number of words in the text (Templin, 1957). This method has been found to be highly sensitive to text length. The type/token ratio drops with the increase of the length of the text since longer texts have greater instances of the repetition of words. And therefore, this traditional TTR analysis can be problematic in comparing texts of different lengths. Some measures

have been proposed to address this sensitivity of text length as the transformation of TTR, among which are Mean segmental TTR (Johnson, 1944), Carroll's corrected type/token ratio (1964), and advanced Guiraud (Daller, van Hout & Treffers-Dallers, 2003).

A recent improvement on the measure of lexical variation is the D (Malvern, Richards, Chipere & Dur'an, 2004; McCarthy and Jarvis, 2010), which has been standardized measured by the program vocd (MacWhinney, 2000). The D has been found to be a "robust measure of lexical diversity which is not a function of sample size in the way of raw TTR" (Malvern, Richards, Chipere & Dur'an, 2004: 60). vocd uses 100 random samples of 35 tokens from the text to measure its mean TTR, the same process is repeated with 36 token, 37 tokens, and all the way up to 50 tokens. The same text is run for three times to choose the best-fitting curve of TTR, and use it to calculate the TTR of the text. The higher of the value of D the text has, the greater diversity the text is. The application of D in measuring the speech and written texts of both adult and children has proved its advantage (Crossley, Salsbury & McNamara, 2014; Duran, Malvern, Richards & Chipere, 2004; Lu, 2011; Yu, 2009).

Lu (2011) conducted a large-scale study into 404 oral narratives from the Spoken English Corpus of Chinese Learners (Wen, Wang & Liang, 2005). He examined the extent to which the 25 indices of lexical richness, i.e., lexical density, lexical sophistication and lexical variation, related to the quality of oral narratives. It was the most comprehensive study into the differentiated relationship between the different measurements of the lexical richness and oral performance. His study revealed three

important findings. Firstly, the lexical variation was the most robust factor correlating with the overall rating of oral performance. The other two measures, lexical density ( $\rho = .011$ ,  $p = .836$ ) and lexical sophistication ( $\rho = .048$ ,  $p < .355$ ) did not show significant correlation with the quality of the oral performance. Secondly, D measure was the most robust measurement of the lexical variation in its potential to distinguishing the proficiency levels of writing by showing the significant between-group difference ( $F(3, 404) = 16.205$ ,  $p < .001$ ). Also, D measure showed the strongest correlation between lexical variation and the quality of oral performance in all transformed measurements of the type-token ratio ( $\rho = 7.088$ ,  $p = .000$ ).

In another study examining the usefulness of D measures for lexical variation, Treffers-Daller (2013) investigated the predicting power of D measures for proficiency levels. She used cloze test and oral narratives of the native speakers and L2 learners of French at two different proficiency levels. One important contribution of his study was the inclusion of the D measures for texts at different length. The results indicated that the D measure derived from the narratives of the native speakers and L2 learners correlated strongly and significantly to the scores of the cloze test. The relationship was stable in texts of various length ( $r = .763$ ,  $R^2 = .575$  for all the narratives and  $r = .712$ ,  $R^2 = .494$  for texts with words between 200 and 666). The study supported the predicting power of the lexical variation for the language proficiency of learners. She also found that D measure was a reliable discriminator for learners at different proficiency levels ( $\eta^2 = .659$  for all the narratives and  $\eta^2 = .563$  for texts with words between 200 and 666).

The importance of lexical variation in the quality of language production can be approached from two perspectives. The first one takes the more qualitative approach in delving into the teachers and learners' perception of lexical richness and the quality of writing. Studies into the teachers' ratings of writings revealed that teachers favored those compositions with greater lexical variation and sophistication (Dellar & Phelan, 2007). Not only have the researchers and teachers recognized the importance of lexical proficiency in writing, but learners themselves have also long regarded lexical proficiency as a crucial factor in their writing. Vocabulary has been ranked as the most pressing need by the learners for better achievements in writing in a survey into EAP program (Leki & Carson, 1994).

The second perspective is more quantitative in nature and is derived from the evidence of empirical research in applied linguistics. There has been a long tradition of examining the relationship between lexical variation and overall quality of oral and written performance. Earlier studies were conducted to justify the importance of lexical richness in measuring the quality of written texts (Engber, 1995; Jarvis, 2002). In recent years, there has been a new interest in examining the relationship between lexical variation and L2 learners' oral and written performance in response to the recent trend of using automated evaluation system (e.g., Crossley, Salsbury & McNamara, 2011; Crossley, Salsbury & McNamara, 2014; Iwashita, Brown, McNamara & Hagan, 2007; Saito, Webb, Trofimovich & Issacs, 2016; Yu, 2009).

Earlier studies were concerned about proving the effectiveness of lexical variation as a measurement of lexical richness through correlating it with oral and written

performance. Engber (1995) conducted one of the first studies into the relationship between lexical variation and the quality of writing. She explored the extent to which the lexical factors could be the predictors of the quality of the essays in raters' judgment. Sixty-six essays were collected from L2 learners of various L1 backgrounds enrolled in the intensive English program at a U.S. university. She analyzed two types of lexical variations, i.e., lexical variations with errors and without errors, and found that both were correlated significantly with the holistic scores of the written texts ( $r = .45, p < .01$  and  $r = .57, p < .01$ ). She concluded that raters were sensitive to the range of words used by learners in writing, and would assign higher scores if that wide range of words were used correctly.

Jarvis (2002) conducted a study to explore the extent to which lexical variation was related to participants' background, i.e., age, second language instruction, L2 proficiency, first language background, and linguistics knowledge, i.e., writing quality and vocabulary knowledge. His study collected written narratives of a movie from three groups of participants, 140 Finnish learners of English, 70 Swedish learners of English and 66 native English speakers. The results of the spearman's rank-order correlation showed that the lexical variation was moderately correlated to a holistic rating of the written narratives (ranging from  $r = .55, p < .05$  for native speakers to  $r = .758, p < .05$  for Swedish learners). The results showed that the relationship between the lexical variation and the holistic rating of the written narratives were influenced by participant's background, like the first language background and proficiency levels.



Yu (2009) conducted a validation study to examine the relationship between lexical variation and quality of oral and written performance. The study filled in the gap of the existing literature by collecting oral and written samples from the same participants from the MELAB test. He found that lexical variation was related to the overall quality of the writing samples ( $r = .33, p < .001, N = 200$ ) and oral narratives ( $r = .48, p < .01, N = 25$ ). It could explain about 10% and 23% of the variance in the oral and written performance.

These studies have shown that lexical variation has medium to strong correlation ( $r = .33$  to  $r = .758$ ) with oral and written performance with learners at different proficiency levels and language backgrounds. Recent studies have steered their attention to the important role of lexical variation in language assessment, especially automated evaluating system using online platforms and software. The lexical variation could effectively discriminate written output from learners from different proficiency levels. Lexical variation has now been acknowledged as an essential evaluation index for lexical use in written performance and has been included in major automated evaluating system, such as Coh-metrix. Crossley and McNamara (2014) concluded that some linguistic measures were related to the writing development, and a different group of measures contributed to the improved writing quality. This has not proven to be the case for lexical variation. In addition to demonstrating a close relationship with oral and written proficiency, the lexical variation has been identified as a sensitive discriminator of proficiency levels (Yoon, & Polio, 2016).

Iwashita, Brown, McNamara, and Hagan (2008) conducted a large-scale study to examine the relationship between specific features of L2 learners' spoken language to the holistic ratings of native raters. The study analyzed the grammatical accuracy, grammatical complexity, lexical sophistication, lexical variation and phonology of 200 oral narratives using pilot TOEFL iBT test. The results demonstrated that lexical variation was a strong discriminator among these variables on the proficiency levels of the learners ( $F(4, 190) = 47.88, p = .001, \eta^2 = .50$ ). It could effectively discriminate learners of all five proficiency levels.

Verspoor, Schmid, and Xu (2012) examined the changes in syntactic and lexical aspects in learner writing across different proficiency levels from the dynamic usage-based perspective. They collected 437 written texts from Dutch secondary learners in two instructional conditions. The study analyzed a wide range of variables at the syntactic level, i.e., t-unit measures, type of sentences, types of dependent clauses, verb phrase constructions, types of schematic chunks, and word level, including lexical sophistication, lexical variation analysis, and error analysis. Based on the results of the statistical analysis, they found out that lexical variation was the strongest predictor of the proficiency levels since it could effectively discriminate all five levels of proficiency in the study ( $F(4, 432) = 111.28, p < .001, \eta^2 = .51$ ). It was a more robust discriminator than lexical sophistication ( $F(20, 1706) = 4.22, p < .001, \eta^2 = .04$ ).

Saito, Webb, Trofimovich, and Issacs (2016) collected the oral narratives of 40 French learners of English in a recent study to examine the contribution of lexical

factors to the comprehensibility of the oral narratives. The study covered a wide range of lexical factors, including appropriateness, fluency, variation, sophistication, and abstractness. The study found that lexical variation showed a high correlation with native speakers' rating of comprehensibility of oral narratives ( $r = .72, p < .001$ ). In addition, lexical variation was also a strong discriminator of proficiency levels. It was the only variable that could effectively discriminate the three proficiency levels (beginning, intermediate and advanced) in the study ( $F(2,37) = 17.31, p < .001$ ).

Crossley, Salsbury, and McNamara (2011) conducted a study to examine the extent to which the lexical indices measured by Coh-Metrix could be useful predictors of the proficiency levels of L2 learners. The study used 100 texts written by learners at various proficiency levels and analyzed lexical sophistication, lexical variation, hypernymy, polysemy, semantic co-referentiality and word imageability of the writing samples. They found that lexical variation was one of the strongest predictors of proficiency levels ( $F(2,66) = 10.658, \eta^2 = .25$ ).

These studies suggested that lexical variation is closely associated with the holistic scores, and raters are quite sensitive to the range of words used by learners in the oral narratives. In addition, the results of the abovementioned studies suggested that lexical variation is a strong predictor of proficiency levels ( $r = .33$  to  $r = .72$ ), learners at advanced levels could use a wider range of words in oral and written production. The present study intends to adopt lexical variation as the measurement of lexical use in writing. It is also in line with the assessment implication of the study since lexical variation measured by  $D$  has received great attention recently in the

automated analysis of writing quality.

### 3.2.3 The relationship between vocabulary knowledge and use

Ellis (1995) proposed the basic distinction between competence and performance in second language acquisition, in which competence is regarded as the knowledge of a second language and performance as the use of that language. Chapelle's model of vocabulary ability illustrated the non-direct relationship between language ability (competence) and use (performance) (Chapelle, 1994). In this model, task performance is under the influence of three factors, i.e. the context of use, the vocabulary knowledge and fundamental process, and the metacognitive strategies for vocabulary use. The context of use refers to the "context" under which the words are used. The set of words used would be quite different in different contexts, as in the case of informal settings, like reading newspaper, and formal settings, like hearing an academic lecture. The vocabulary knowledge and process refer to vocabulary size and depth, and the ability to retrieve a word from mental lexicon. The metacognitive strategies entail the control of vocabulary use to achieve communicative purposes, like paraphrase, change of topic, etc. (Blum-Kulka & Levenson, 1983). From this model, it could be seen that the direct link between knowledge and natural language use could not be assumed, considering the complexity of mediating factors that might influence the use of knowledge in different contexts (Lemmouh, 2011).

Understanding the relationship between vocabulary knowledge and use can provide valuable insights. Theoretically speaking, exploring this relationship could

enlighten us on the developmental pattern of the vocabulary knowledge and use and the extent to which these two dimensions relate to each other at different stages of learning. For language assessment, it could provide us with confidence in learner's vocabulary knowledge based on the score of lexical variation as part of the automated assessment tool of the oral and written texts. Pedagogically speaking, it could inform us on the aspects of vocabulary knowledge that could be the predictors of effective language use and aspects that required explicit learning. Using a word requires more than merely understanding the form-meaning link. Learners face great challenges when they're learning new words, and producing the words in speech and writing. Understanding the aspects of vocabulary knowledge that have unique contributions to vocabulary use in free production can help learners and teachers make informed choices of the foci of study when learning new words and consolidating the knowledge of known words.

Current research into the relationship between vocabulary knowledge and use primarily focuses on the link between vocabulary size and different aspects of lexical richness. Two studies exploring the relationship between vocabulary size and lexical sophistication, measured by LFP, have found modest to high correlation for ESL and EFL learners (Laufer and Paribakht, 1998; Laufer and Nation, 1995). To the best of our knowledge, there are very few existing studies on the relationship between vocabulary depth and lexical variation. As could be seen from both Henrisken (1999) and Nation (2001)'s model of vocabulary knowledge, knowing a word and using a word involve much more aspects than the form-meaning link, which is what

vocabulary size tests measure. To use a word properly in speech and writing, it involves the knowledge of form-meaning link, i.e. the knowledge of an item, and also, the retrieval of the information of related words both paradigmatically and syntagmatically, i.e. the knowledge of the system.

Lemmouh (2011) carried out a longitudinal study to explore the relationship between vocabulary knowledge (operationalized as derivations, association, polysemy, and collocation) and vocabulary use in academic writing (operationalized as lexical sophistication). He followed 34 Swedish tertiary learners of English over one academic year and administered self-designed vocabulary knowledge tests at four time intervals. The productive knowledge of collocations was measured in fill-in-the-gap format where the participants were asked to choose from a list of choices the correct collocate for the given word. The written texts were take-home essays that the participants had written over the two semesters. The lexical sophistication was measured using B2000, a ratio of word families beyond the most frequent 2000 word families in the texts. His study demonstrated that different aspects of vocabulary knowledge showed a variability of relationship with lexical sophistication at different time. At the end of the first term of study, collocation, derivations and synonyms showed moderate correlation with lexical sophistication ( $r = .36$ ,  $r = .42$ ,  $r = .37$ ,  $p < .05$  respectively). At the end of the second term of study, a significant correlation was found between the association and lexical sophistication ( $r = .61$ ,  $p < .05$ ), while no such correlation was found between collocation, derivation, and lexical sophistication.

The study has two important implications. The first one is the need to examine different aspects of vocabulary knowledge. The research findings reiterate the need for examining vocabulary knowledge in specific aspects (Read, 2004; Milton, 2009; Schmitt, 2014). It shows that different aspects of vocabulary knowledge vary regarding developmental progress, and the contribution to the use of words. The second implication is to explore the relationship between vocabulary knowledge and use with learners at different proficiency levels. It would be important to observe the knowledge and use from learners at different proficiency levels to explore the developmental pattern of the construct.

Studies into vocabulary knowledge with participants from various proficiency levels have revealed interesting findings about the relationship between vocabulary size and depth, and the pattern of development in the knowledge of word form, derivation, meaning, collocation, etc. (e.g. Bonk, 2001; Milton & Riordan, 2006; Milton & Hopkins, 2009; Nizonkiza, 2012; Van Zeeland, 2013). As part of the project to compare the development of lexical knowledge in L1 and L2 writing, Henrisken (2008) compared the size and depth of vocabulary knowledge of Danish learners of English from three different proficiency levels in middle school, grade 7, grade 10 and grade

The depth of vocabulary knowledge was measured with WAT to test the underlying lexical network of the L2 mental lexicon. The findings suggest that not only does learners' vocabulary size fall behind the 5000 word goal, but the vocabulary depth, measured as the score of association test, greatly lags behind the

development of size at all three levels. Incorporating learners of different proficiency levels in one schooling system has the advantage of documenting the progress in L2 learning, and providing the teachers and syllabus developers with valuable information on the improvement of instruction.

In light of these implications, the present study intends to fill in the gap of the research into the relationship between vocabulary knowledge and use by focusing on the specific aspects of vocabulary knowledge on tertiary learners from three different levels of proficiency. I could follow the development in the vocabulary knowledge and use of learners from different levels of study in college to explore the pattern of acquisition. At the same time, the interaction between knowledge and use across different years of study could be revealed. This study would have potential implications for Chinese tertiary English education. It helps syllabus designers, teachers and learners alike to understand the rate of learning across years and make effective adjustments on teaching and learning at different stages to enhance the learning gain.

#### 3.2.4 The role of frequency in the knowledge of words

Another important factor that needs to be considered in the discussion of the relationship between vocabulary knowledge and use is the frequency level of words. Frequency level of words influences all aspects of vocabulary learning, such as the exposure through input, the order of learning, the speed of processing, categorization and generalization in the mental lexicon, and the subsequent use in speech and writing



(e.g., Ellis, 2012; Kuperman, Stadthagen-Gonzales & Brysbaert, 2012; Schmitt, 2010). The frequency of words is also a useful predictor of language performance (e.g., Crossley, Cobb & McNamara, 2013). It has been the research focus of a large body of applied linguistic studies, and a helpful tool for analyzing research data (e.g., Durrant, 2014; Fernandez & Schmitt, 2015; Laufer & Nation, 1995; Siyanova-Chanturia & Spina, 2015; Wolter & Gyllastad, 2013; Zerera, 2012).

On learners' end, past literature has shown that L2 learners demonstrated comparable intuition on frequency levels to native speakers. Schmitt and Dunham (1999) carried out research into the intuition of the frequency level of single words among native and advanced non-native speakers. They found that advanced non-native speakers had comparable performance in intuition with native speakers. Later studies like Siyanova-Chanturia and Spina (2015) showed that the intuition of the frequency level among non-native learners of English could be extended to greater units of words. It is assumed that more frequent words in natural language are more likely to be learned first and used earlier, while less frequent words are learned later (Milton, 2009). This assumption has fueled the research into the frequency level of words and the compilation of word lists that categorize words into different frequency levels for explicit learning (e.g., Coxhead, 2000; Nation & Beglar, 2006). Another implication of this assumption is the potential relationship between frequency level of words and the knowledge of that word. Milton (2006) conducted a study to test the frequency profile hypothesis specifically. 227 L2 speakers of English in a Greek language school from a range of proficiency levels participated in the study. They

took the yes/no word recognition test with 100 target words from the first 5,000 word families. The results have supported the frequency profile hypothesis and demonstrated that learners' knowledge of words associated closely with the frequency levels. The command of the knowledge was high for the high frequency words and tailed off with the increase of the frequency levels. The Greek learners were found to know 60% of the words in the first 1000 word families, and this ratio decreased to about 22% for the words at the 5000 frequency level. The close relationship between the frequency level and knowledge of word could also be reflected in the statistically significant correlation between frequency level and vocabulary size in the study ( $F = 93.727, p < .001$ ).

Milton (2009) compared the results of Milton (2006) with two other studies, i.e., Richards and Malvern (2007) and Aizawa (2006), to test the frequency profile hypothesis. These other two studies collected the test results of X-Lex (Meara & Milton, 2003) from English learners of French and Japanese learners of English. The frequency profiles from the three studies were strikingly similar. It suggested that, for the first 5000 words, learners tended to know more of the high frequency words and less of the infrequent words. However, the frequency profile would show more variance with words beyond the 5000 word families. Milton explained that this variance was due to the fact that low frequency words were more closely bound with the themes.

The frequency profile hypothesis could also be supported by research using vocabulary tests on learners from different L1 backgrounds and proficiency levels.

Zareva (2012) investigated the interplay between vocabulary knowledge, frequency level of words and proficiency level of learners. Intermediate, advanced L2 learners and native speakers of English participated in the study and finished the vocabulary knowledge test with a self-report vocabulary knowledge scale. The 25 target words fell into the mid- and low-frequency level based on the frequency information in The Educator's Word Frequency Guide (Zeno, Ivens, Millard, & Duvvuri, 1995). The result of the study supported the general assumption that more advanced learners have greater knowledge of words at lower frequency levels. In her study, the intermediated learners have reported that they had little knowledge of the 72% of the words at mid- and low- frequency levels. This ratio fell consistently from 55% of the advanced learners to 51% of the native speakers.

Another line of studies explored the ratio of receptive and productive knowledge of words at different frequency levels. These studies indicate that greater ratio of high frequency words can be used productively than the ratio of low frequency words (Laufer&Paribakht, 1998; Nemati, 2010; Tschirner, 2004; Webb, 2008). According to the findings of the abovementioned studies, for the most 2000 word level, about 55.7% to 93.5% of the words could be used productively. And, this ratio drops consistently as the frequency level of words decreases. At 5000 word level, only 15.5% to 62% of words could be used productively.

Webb (2008) investigated the relationship between receptive vocabulary size and productive vocabulary size. A vocabulary test was administered on 83 Japanese tertiary learners of English. The vocabulary test was translation test with 180 target

words chosen from the COBUILD dictionary with frequency information provided by Bank of English Corpus. His study led to two findings. The first finding was that there were significant differences in receptive and productive vocabulary size across three word bands (from the first 1000 words to the 6th 1000 words) ( $F(1,82) = 105.77$ ,  $p < .001$  for band 1;  $F(1,82) = 244.21$ ,  $p < .001$  for band 2;  $F(1,82) = 206.26$ ,  $p < .001$  for band 3).

The second finding was that the ratio of receptive and productive scores decreased with frequency levels. The ratio dropped from 88% for the most frequent 2000 words to the 65% for the mid-frequency words.

These studies suggested that it is necessary to investigate the role of frequency in the discussion of the development of vocabulary knowledge and use. What can be concluded from the current play is that learners' knowledge of words decreases with the increase of frequency levels. Learners would know more words and more of words at high frequency levels than low frequency levels. What is unclear now is the role of frequency in the use of words. This relationship could only be partly deduced from the studies that measure both receptive and productive knowledge of words (e.g., Webb, 2008). However, there is a clear distinction between the productive knowledge of words and the use of words in language production (Chapelle, 1994; Lemmouh, 2011). Using a word in free writing involves much more complex processing than in controlled productive knowledge tests like translation and sentence completion. One possible way to explore the role of frequency in vocabulary knowledge and use is to examine the extent to which the knowledge of word at specific frequency levels

contributes to the use of that word in writing. This would enrich the understanding of the current relationship between frequency and knowledge of words by adding evidence from another perspective.

### 3.2.5 The role of communicative use of language in the learning of words

The role of the communicative use of language in the learning of words has emerged from second language acquisition. It has important implication for the acquisition of words and developing autonomous learning ability of L2 learners. Past literature has suggested that communicative use of language in activities like extensive reading, listening to music, watching movies, and interaction with peers and native speakers, are all related to vocabulary learning (Nunan & Richards, 2015). Lin (2014) investigated the validity of internet television as a potential source of language learning. She examined the extent to which the use of language in internet television reflects the everyday speech of English. To achieve this end, she compared the formulaic sequences in the 7.68-million-word corpus of internet television (iTV) with the spoken sector of the British National Corpus. The overlap between the most frequent formulaic sequences in iTV and BNC ranged from 13% to 90% depending on the genre of the TV show. The results suggested that popular media offers a good representation of everyday speech of English.

The focus of most literature into the exposure to language and language growth was a mixture of vocabulary items including both single words and formulaic sequences. Lin and Siyanova (2015) reported the successful learning of vocabulary

from internet television by two L2 learners in Hong Kong. Both learners have reported the facilitative effect of watching English TV programs and series on their learning, measured in terms of fluency in spoken English and vocabulary size. Lin and Siyanova (2015) explained the reasons for the facilitative effect of watching internet television on language learning as: “Learners receive extensive exposure to English from watching Internet television; Learners have the opportunity to observe authentic, everyday speech in English-speaking communities via Internet television; Internet television facilitates contextual vocabulary acquisition” (2015:151-152). The extensive, authentic, contextual and repetitive exposure to the language is essential for language learning and especially, for vocabulary learning (Schmitt, 2010). The exposure is essential for language learning to take place for learners in the EFL environment as well as in English speaking countries.

There are studies that have empirically examined the contribution of communicative engagement of language to the learning of vocabulary items. Fernandez and Schmitt (2015) measured the productive knowledge of collocations of 108 Spanish learners of English and investigated the correlation between everyday engagement with English and the knowledge of collocations. The productive knowledge of collocations was measured in the fill-in-the-gap format in which the participants were required to fill in the correct English collocations in the given sentences with Spanish translation provided. A questionnaire was distributed to participants to measure the communicative engagement of the English. The participants had to tick the number of hours they spend on using English per week.

They have included four types of engagement in the study, which were “reading books, magazines and newspapers in English, or visiting English websites; watching films, videos or TV in English; listening to music in English; using English to keep in contact with people? (Facebook, Myspace, Twitter, Skype, email, SMS, etc.)” (2015: 126). In addition, they have inquired into learners’ prior experience of staying in English-speaking countries. The results suggested that exposure to English correlate with English at a medium level ( $r = .56$ ) and would explain 31.4% of the variance in the productive knowledge of collocations. Immersing in English speaking countries showed the strongest correlation with the productive knowledge of collocations ( $r = .61$ ), followed by reading ( $r = .61$ ), watching movies ( $r = .38$ ), social networking ( $r = .33$ ). Listening to music did not correlate significantly to the productive knowledge of collocations.

Their study has two important implications. The results supported the usage-based theories and showed that the “acquisition is essentially linked to the amount of language exposure” (2015: 113). In addition, it showed that there was a range of engagements that were effective for learning of vocabulary items. However, the researchers noted that there were distinct differences between the knowledge of words and the use of them. To understand the contribution of engagement to the use of the words, it needs studies that directly measure the use of words.

Adolphs and Durrow (2004) have investigated the contribution of social-cultural integration in the immersion environment to the learning of formulaic sequences. They have conducted five interviews with two learners. One learner represented the

high involvement learner and the other the low involvement learner. The transcripts of the interviews were analyzed to retrieve three-word sequences. They have retrieved the three-word sequences of the 15 most frequent lexical items in English (based on the frequency list of CANCODE). The use of sequences in learners' interview were measured in the overlap with CANCODE. The greater overlap indicated the approximation of learners' use of sequences to native speakers of English. They found that the high involvement learner showed consistent improvement in the use of sequences of all frequency levels. In other words, she could use more sequences in CANCODE at the three frequency levels in the study (42.28% to 59.13%). On the contrary, the low involvement learner showed regression during the study in the UK. She used fewer sequences in the fifth interview than the first one (55.72 % to 52.99%).

In a recent study, Lin (2016) examined the development of three-word formulaic sequences used by Taiwanese students at a beginning level during four months of online interaction with native speakers of English. He retrieved the formulaic sequences from online posts of Taiwanese learners and native English speakers from the UK. At the beginning of the online interaction, there were significant differences between the infrequent formulaic sequences used by learners and native speakers (15.51%). However, this difference dropped to 4.87% at the end of four months. This decline in the differences indicated the convergence in the formulaic sequences used by learners and native speakers. The results supported the role of social interaction in promoting vocabulary learning.



These empirical studies suggest that exposure to English is a useful source for vocabulary learning for learners from beginning level to advanced level. It is closely related to the development of the knowledge of the single words and collocations. It could promote the approximation in the use of formulaic sequences to native speakers' in speech and writing. Another possible angle to explore the pedagogical potential of communicative engagement of English is to examine the extent to which it is related to the lexical quality in language production. It could empirically investigate the contribution of communicative engagement of English to the lexical quality in writing.

### 3.3 Preliminary study

#### 3.3.1 Research questions

The purpose of the preliminary study is two-fold. Firstly, I intend to identify the aspect of vocabulary knowledge that would be the interesting to explore in larger scale in the main study. Secondly, I measure lexical use in four aspects of lexical richness to identify a potential relationship between knowledge and use. The preliminary study intends to test different aspects of vocabulary knowledge individually to shed light on the relationship between vocabulary knowledge and use. The preliminary study intends to answer the following research question:

“What is the relationship between the receptive depth of vocabulary knowledge and lexical richness in writing?”

### 3.3.2 Methodology

#### 3.3.2.1 Participants

This study included 51 participants from two levels of study, first-year undergraduate and first-year postgraduate. Thirty-one of the participants were first-year undergraduate students, and the rest were first-year postgraduate students. All of them were English major students, aged from 17 to 39 years old. Five of the participants were male, while the other 46 were female. Their history of learning English ranged from 6.5 years to 25 years. All of them have received English instruction from standard Chinese schooling, and none of them have any prior experience of learning English in English-speaking countries.

#### 3.3.2.2 Instruments

Each aspect was tested individually to capture the vocabulary knowledge of the six aspects of vocabulary depth. The six tests were developed based on previous studies measuring a diverse dimension of vocabulary knowledge. This form of assessment has been adopted by a series of studies in testing vocabulary knowledge and task performance to reveal the receptive knowledge (e.g. Kasahara, 2011; Peters, 2016; Szudarski & Cater, 2013; Webb, 2005, 2007, 2009). It has been found to be sensitive in testing even minimal understanding of individual aspects.

Table 3.1 *The Six Tests into Different Aspects of Vocabulary Depth*

Test of form	Multiple choice
Test of word parts	Multiple choice
Test of meaning	Translation
Test of association	Multiple choice
Test of collocation	Multiple choice
Test of grammatical function	Multiple choice

### Target words

The selection of the target words followed several criteria. First, the word class of the target words should be the same for each level. In other words, in each level, there was one noun, one adjective, and one verb. Because the study tested grammatical function, all of the chosen words had only one part of speech to avoid confusion. Second, all target words should have derivational forms to allow the morphological test tapping into participants' knowledge of word parts. Third, all chosen words should not be homographs. Otherwise, it would be confusing for the test of the form-meaning link, association, and collocation. Twelve target words have been chosen from BNC frequency list. Three words were semi-randomly chosen from each of the four levels, 2000, 3000, 5000 and 10000.

Table 3.2 *List of Target Words for Vocabulary Depth Test*

frequency level	target words
2000 level	efficient, fashion, occupy
3000 level	tragic, error, relieve
5000 level	cosy, noise, prolong
10000 level	turbulent, exuberance, intoxicate

### Test of written form

The test intended to see whether participants could recognize the correct spelling of target words. It was tested in multiple-choice format. Participants had to choose one correct answer out of the four choices. None of the controlling items were real words in English.

Example: a) fessian    b) fashion    c) fasion    d) fesion

### Test of morphological knowledge

The test saw whether participants could recognize the derivational form of target words. All affixes were chosen from derivation affix list of Bauer and Nation (1995) (Table 3.3). Affixes were chosen from five levels from the list, excluding level one and two. Level one is individual words, in other words, the root of the word. Level 2 includes inflections, like -s, -ed, -ing, which are viewed as part of the grammatical knowledge of a target word, and therefore is not included in this test. All of the correct words and controlling items were of the same part of speech.

Example:    error    a) errorful    b) erroneous    c) errorish    d) erroral

Table 3.3 *Affix of Word Families*

Affix of Word Families (Bauer & Nation, 1993)	
Level 1	A different form is a different word.
Level 2	Regularly inflected words are part of the same family.
Level 3	-able, -er, -ish, -less, -ly, -ness, -th, -y, non-, un-;
Level 4	-al, -aion, -ess, -ful, -ism, -ist, -ity, -ize, -ment, -ous, in-;
Level 5	-age, -al, -ally, -an, -ance, -ant, -ary, -atory, -dom, -eer, -en, -ence, -ent, -ery, -ese, -esque, -ette, -hood, -I, -ian, -ite, -let, -ling, -ly, -most, -ory, -ship, -ward, -ways, -wise, ante-, anti-, arch-, bi-, circum-, counter-, en-, ex-, fore-, hyper-, inter-, mid-, mis-, neo-, post-, pro-, semi-, sub-, un-;
Level 6	-able, -ee, -ic, -ify, -ion, -ist, -ition, -ive, -th, -y, pre-, re-;
Level 7	Classical roots and affixes.

### Test of meaning

The knowledge of meaning tapped into the strength of form-meaning link of the word. Participants were required to provide the English translation of the Chinese words. The initial of the English words were given to avoid confusion.

Example:        错误、差错     er\_\_\_\_\_

### Test of association

The knowledge of association revealed the lexical network in the mental lexicon. Association includes words that are coordinates, synonyms, antonyms, super-ordinations of target words (Aitchison, 2012). In her definition, collocation is grouped under association; however, in this study, I categorized it separately.

Example:        cosy    a) informal    b) adorable    c) delicious    d) corridor

All correct answers and controlling items were of the same or lower frequency level as the prompts to reduce the possibility of unknown words on choice-making. The correct answers were taken from Collins Thesaurus of the English Language in Color 3rd edition (2008). To avoid guessing, every word in four options was of similar length and same word class. Out of the four options, one option was a word with similar spelling as the prompts. This measure was taken to avoid the clang association, which is based on spelling similarity with little understanding of the meaning of the words.

### Test of collocation

The knowledge of collocation identified words that could be used together in a sentence. Similar precautions of selecting control items in the test of the association have been applied in designing the control items in the collocation test. All correct answers were taken from Oxford Collocations Dictionary for Students of English, 2nd edition (2009).

Example: tragic a) glass b) girl c) piano d) story

### Test of grammatical function

This test examined participants' knowledge of the correct grammatical function of the target words. In this test, only three choices were given representing the grammatical function of noun, verb, and adjective.

Example: a) It is a tragic. b) It is tragic. c) It tragics.

### Sequence of tests

The sequence of the test is important in that learning effect might happen through completing the tests with a similar set of target words. Therefore, the tests were arranged to minimize learning from previous tests. The battery of tests started from basic understanding of form to higher level knowledge of meaning and use (Webb, 2007; Webb, Newton & Chang, 2013; Peters, 2015). The test of written form was given on a separate piece of paper to avoid copying from latter tests and gathered

when participants finished before moving on to the remaining tests. All of the tests have a total point of 12, and each correct answer would be awarded one point.

### 3.3.2.3 Pilot test of the tests on vocabulary depth

The six tests of vocabulary depth were given to three native speakers of English and five native speakers of Chinese for a pilot test to fine-tune the design of the test items, clarity of instructions, the effectiveness of examples and arrangement of the tests. Changes were made according to their feedbacks. For example, the example for collocation test used to be *baby drink* to demonstrate noun-verb collocation. However, the participants in the pilot test found this example confusing. And therefore, the example was later changed to *hot drink* in the main study. The test of the form-meaning link was on the same paper with the rest of the vocabulary depth tests, and participants suggested that it should be provided on a separate piece of paper to avoid copying.

### 3.3.2.4 Writing topic

A pilot study was conducted to select writing topics out of a pool of possible topics to ensure the participants' ability to demonstrate their lexical proficiency. The pilot study required the participants to choose three topics that they believed to be the easiest out of 24 topics. These topics were selected from Test for English Majors (TEM-4), College English Test (CET-4, CET-6), and IELTS, three of which are compulsory national English tests for college students in China, and IELTS is a

mandatory English test for students who want to study in English speaking countries. Therefore, the students are quite familiar with the test requirement of the writing part.

Twenty-five third-year undergraduate students joined the process to choose writing topics. There were twenty-one female and four male students. They were asked to read through the topics and choose three topics easiest for them if they have to write. The pilot study was conducted in regular classroom sessions and took about 10 minutes. The most frequently chosen topics were used as the topics of writing in the preliminary study.

For the preliminary study, the participants were asked to choose one topic out of the three and wrote a composition of at least 250 words (Table 3.4). However, the composition with the fewest words was 224 tokens, and therefore, this token was used for all compositions in the analysis of type-token ratio (TTR) (for more information, see the next section).

Table 3.4 *Writing Topics*

- 
- |   |
|---|
| 1. What is the importance of keeping a good mood? Please provide your reasons. (19) |
| 2. Is it wise to make friends online? Please provide your reasons. (16)             |
| 3. Will tourism bring harm to the environment? Please provide your reasons. (16)    |
- 

Note: the number of students chosen the topic has been provided in the brackets.

### 3.3.2.5 Measurement of lexical richness Lexical variation

Lexical variation was measured as TTR (type-token ratio) using  $D$  (vocd) in Coh-Metrix (McNamara, et al., 2014). Coh-Metrix is a computational tool capable of analyzing texts and producing a magnitude of linguistic and textual indices.

In preparing the text for analysis, words in the same word family, including both



inflections and derivations, were counted individually. The present study is to find out the lexical use of the participants, and the use of inflections and derivations of a headword is the demonstration of depth of knowing a word. Also, lexical errors were not corrected or deleted. This measure was taken because errors seemed to affect the correlation between lexical variation and writing (Engber, 1985). If a word had been spelled wrong in many ways, only one erroneous form was kept and used to replace all the others. Counting several erroneous spellings of the same words has the potential to inflate the value of lexical variation.

#### Lexical sophistication (LS)

Lexical sophistication was calculated using VocabProfile (Laufer & Nation, 1995)([www.lextutor.ca](http://www.lextutor.ca)). The version uses BNC 20 developed by Nation (2004) as the baseline word list to identify word families at each frequency level. One controversial issue in the measurement of lexical sophistication is the definition of advanced words. The 2000 word level is the usual cut-off point of high-frequency words as proposed by Nation (2001). However, based on the coverage of reading texts and word repetition for incidental learning, Schmitt and Schmitt (2012) proposed to redraw the cut-off line to 3000 word level. Considering both arguments, the present study included lexical sophistication at both 2000 (LS2) and 3000 (LS3) frequency level.

#### Lexical density (LD)

Lexical density is the ratio of the total number of content words to the total number of words in writing. Past studies have used slightly different definitions of content words in measuring lexical density (O'Loughlin, 1995; Engber, 1995). In the present study, I adopted the definition of content words in Lu (2012), which classifies noun, verb, adjective, and adverbs with the adjective base as content words.

#### Number of errors

One major issue in identifying the lexical errors in writing is to determine what constitutes lexical errors in writing. Based on Nation's (2001) definition of lexical knowledge, knowing a word is to understand its form, meaning and use, and therefore, all three aspects were included to identify errors. Minor spelling errors were ignored for the reason that the errors might be the product of stress under timed writing instead of the lack of lexical knowledge. However, major spelling errors were included in error counting. Identical errors were only counted once. The number of errors in writing was counted as the ratio of a total number of erroneous words to the total number of words. Examples of errors are listed in Table 3.5.

#### 3.3.2.6 Procedures

The tests were carried out in three normal class sessions. On the first day, the participants were asked to write a composition within an hour. On the second day, depth tests were conducted. The participants were not notified before the sessions of the tests, and therefore, there was little chance for them to prepare for the tests.

### 3.3.2.7 Analysis

Pearson correlation analysis was used to investigate the relationship between the independent variables (six aspects of vocabulary knowledge) and dependent variables (four aspects of lexical richness). Once correlation was found to be significant, a series of regression analysis was carried out to determine the predictability of independent variables on dependent variables. Structural Equation Modelling (SEM) was used to analyze the correlation between different aspects of vocabulary knowledge and lexical variation. The benefit of using structural equation modeling is its control on possible correlation between variables in conducting regression analysis.

Table 3.5 *Lexical Errors in Compositions*

Spelling	So the <i>langs</i> that can be grown are becoming less and less. (minor mistake) A <i>moderen</i> -style city filled with commercial element has been taking .... (minor mistake) I was in low <i>spit</i> , ... (major mistake) The fire burns high when everybody adds <i>flues</i> to it. (major mistake)
Morphology	Along with the development of <i>economic</i> , ... It is not good that our environment is so <i>disgust</i> .
Meaning	Making friends online is a little <i>inauthentic</i> and dangerous.
Association	Many people are very <i>fatigue</i> . (tired)
Collocation	1.form      ...burst into <i>cry</i> (tears)... Last but not least <i>thing</i> , ... The waste gas <i>contributes to</i> the air pollution.
Grammatical function	2.prosody    The local government <i>takes advantage of</i> the environment excessively. As we all <i>known</i> , ... It will make our environment <i>looks</i> terrible.

### 3.3.3 Results

A series of correlation and regression analysis were conducted to identify the contribution of vocabulary knowledge to the quality of writing. The contribution was evaluated through examining the relationship between vocabulary knowledge and lexical richness.

Table 3.6 shows the results of the relationship between different aspects of vocabulary depth and lexical richness. Overall, vocabulary depth was significantly related with lexical variation, the ratio of errors and lexical sophistication at 2000 word level. A series of regression were conducted to understand the predictability of vocabulary depth on lexical richness. One pair of aspects, i.e., spelling and morphology, in the vocabulary depth showed high correlation ( $r = .71, p < .001$ ). Correlation between variables above .70 means that there is multicollinearity between the variable (Crossley, Salsbury & McNamara, 2010; Tabachnick & Fidell, 2007; Yu, 2009). Therefore, in the following regression analysis, the two variables were entered into the linear regression separately. The results were presented in the same table.

For lexical variation, four aspects of vocabulary depth, i.e., spelling, meaning, association, and collocation, were significantly correlated with vocd. A follow-up regression analysis showed that all four aspects contributed to the 15% of the variance (Table 3.7). Among the four aspects, meaning was the strongest predictor of the variance of vocd ( $R^2 = .18, p < .01$ ), while collocation showed the least predicting power for variance in vocd ( $R^2 = .15, p < .05$ ). For ratio of errors, all six aspects of vocabulary depth had negative significant relationship with it. Regression analysis

showed that, among six aspects, morphology had the greatest explaining power to the variance in errors ( $R^2 = .17, p < .01$ ), while collocation had the least predictability in ratio of errors ( $R^2 = .10, p < .05$ ). Grammar accounted for 15% of the variance of the changes in errors (Table 3.7). It indicates that a fair part of the errors in the writing is on the lack of proper grammatical knowledge. It corroborates the necessity of including grammatical knowledge in the error analysis of lexicon. The two aspects of spelling and association showed significant predictability of variance in lexical sophistication at 2000 word level. Spelling had a slightly higher correlation with sophistication ( $r = .35, p < .05$ ) than association ( $r = .33, p < .05$ ).

The correlation and regression analysis showed that lexical variation was a more sensitive measurement regarding the relationship between vocabulary and use than lexical sophistication, which failed to demonstrate significant correlation with most aspects of vocabulary knowledge. Therefore, a maximum likelihood modeling of the structural equation modeling (SEM) was conducted to explore the correlation between different aspects of vocabulary knowledge and lexical variation.

The results indicate that different variables have a variation of predicting power on the lexical variation (Figure 3.1). Spelling had the strongest predicting power of the lexical variation, i.e., the coefficient between the two variables was  $\beta = .40$  ( $p < .001$ ), followed by association and meaning ( $\beta = .30$  for the association and  $\beta = .25$  for meaning). Morphology and grammar showed negative coefficient with lexical variation ( $\beta = -.57$  for morphology and  $\beta = -.01$  for grammar). The negative coefficient seems to that learners with greater knowledge of morphology and

grammar are more likely to be cautious in word usage, and in turn, use a more limited range of words in writing.

What is interesting in the linear regression analysis and structural modeling analysis is the weak correlation and predicting power between collocation and lexical variation. The correlation between collocation and lexical variation is the weakest ( $r = .34, p < .01$ ) among the four aspects that have shown significant correlation with lexical variation, i.e., spelling, meaning, association and collocation. Additionally, the predicting power of collocation on lexical variation is minimal ( $\beta = .04, p = .49$ ), i.e., the weakest among the six aspects of vocabulary depth. Considering the important of collocations in language use, the low correlation between the collocations and the quality of lexical use is quite surprising.

Table 3.6 *Correlation between Vocabulary Depth and Lexical Richness*

Correlations											
	Spelling	Morphology	Meaning	Association	Collocation	Grammar	LV	LD	Errors	LS2	LS3
Spelling	1	.71**	.64**	.48**	.61**	.40**	.40**	.10	-.37**	.35*	.01
Morphology		1	.61**	.54**	.41**	.38**	.22	-.12	-.41**	.11	-.24
Meaning			1	.47**	.64**	.52**	.42**	.11	-.37**	.21	-.21
Association				1	.27	.31*	.38**	.06	-.34*	.33*	-.21
Collocation					1	.55**	.34*	.12	-.31*	.16	-.17
Grammar						1	0.23	-.06	-.39**	.16	-.13
TTR							1	.16	-.31*	.49**	.19
LD								1	-.03	.04	-.17
Errors									1	-.18	-.16
LS2										1	.39**
LS3											1

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).

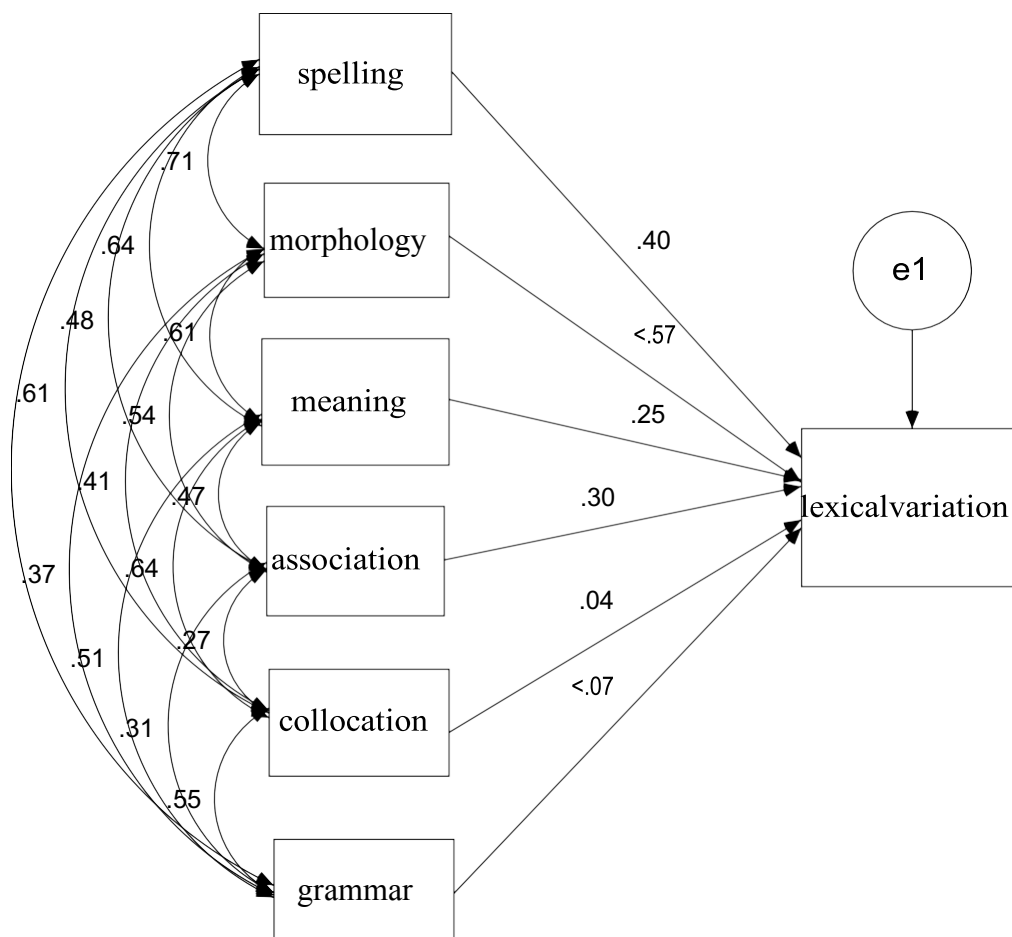
Note: LV stands for lexical variation; LD stands for lexical density; Errors stand for lexical error; LS2 stands for Lexical sophistication at 2000 word level; LS3 stands for lexical sophistication at 3000 word level.

Table 3.7 Regression Results with Lexical Richness as Dependent Variables

Regression			
	LV	Errors	LS2
Spelling	.16**	.14**	.13*
Morphology		.17**	
Meaning	.18**	.14**	.11*
Association	.15**	.12*	
Collocation	.15*	.10*	
Grammar		.16**	

\*\* . significant at the 0.01 level  
 \* . significant at the 0.05 level

Figure 3.1 Structural Model of the Correlation Between Vocabulary Depth and Lexical Variation





### 3.3.4 Implications for the main project

Including multiple dimensions of vocabulary depth into the study has allowed us to have a fine-grained and in-depth understanding of the relationship between vocabulary knowledge and use. The lexical error was the only index in the lexical richness that shows significant correlation with all aspects in vocabulary depth. It shows the high demand for vocabulary knowledge to write accurately. Learners would have to spell the word correctly, use proper affix, choose the right word with the proper meaning, demonstrate an adequate understanding of its associations and collocations and use it in a grammatically correct way. The five aspects of spelling, morphology, meaning, association, and collocation correlated with lexical variation. Collocation had the lowest correlation with both lexical variation, and it did not have significant predicting power on the range of words used in writing.

The preliminary study has two important implications for the main project. First, there is a need to explore the relationship between the knowledge of collocations and lexical variation with larger sample size and learners from stratified proficiency levels. I intend to include participants from three levels of study in a Chinese tertiary study to increase the sample size to explore this relation in the main study. I could observe the developmental pattern of vocabulary knowledge and use with learners from different proficiency levels.

Second, there is the need to examining the aspects of the knowledge of collocation in detail. It is now generally agreed that collocations are pervasive in language and essential for realizing social communicative needs. The results of the preliminary

study add to this observation with empirical evidence which suggests that learners' knowledge of collocation has little contribution to the use of words in writing.

From the preliminary study, it can be seen that collocations had low correlation with lexical variation and lexical errors. There are two possible explanations for the low correlation between the knowledge of collocations and lexical errors in writing. One possible explanation for the low correlation is that learners produce errors in using collocation despite the increase in knowledge. This assumption is supported by research on non-native speakers' use of collocations. Laufer and Waldman (2011) suggested that errors in the use of collocation persist with the improvement in proficiency. Even at the advanced level of study, one-third of all the verb-noun collocations used by the learners were deviant from typical use. Their results suggested that the level of study has an inverse relationship with the correctness of errors. In other words, the increase in proficiency leads to a higher ratio of errors in the production of collocation.

Another explanation for the low relationship between the knowledge of collocation and lexical errors in writing could be that learners have avoided the use of collocations, and therefore, the improvement in the knowledge has a small contribution to correctness in language. Previous studies on non-native speakers' use of collocation have found out the heavy reliance on high frequency collocations, and underuse of other salient lower frequency collocations (e.g. Cobb, 2006; De cock, 2000; Durrant & Schmitt, 2009; Laufer & Waldman, 2011; Li & Schmitt, 2009). In this study, the overuse of same high frequency collocations (have, make, etc.) with

core verbs was also found. For example,

Example 1: It will make our environment looks terrible.

Example 2: Internet not only makes communications more free and convenient...

Example 3: Tourism makes this progress more significant.

Both explanations need empirical evidence to support. I would examine the extent to which learners use collocations in their writing in chapter four.

### 3.4 Research questions

Based on the observations of the literature review and the empirical results of the preliminary study, the present study proposes the following research questions:

- 1) What is the relationship between the knowledge of collocations and lexical variation?
- 2) In what ways do the frequency levels of collocations influence the relationship between the knowledge of collocations and lexical variation?
- 3) What is the relationship between communicative use of English and lexical variation?

In this study, the knowledge of collocations is operationalized as the receptive knowledge of the form and meaning of collocations. Lexical variation is operationalized as the type-token ratio of the words in the compositions. The communicative use of English refers to the receptive and productive use of English outside classrooms.

### 3.5 Methodology

This part introduces the methodology to explore the relation between receptive knowledge of collocation and lexical quality in writing and the contribution of the communicative use of English to lexical quality in writing. The participants finished a pen-and-paper test of the knowledge of collocation and a questionnaire including the questions for communicative engagement. Then, they wrote a short article on the given topic for the analysis of lexical variation.

#### 3.5.1 Participants

One hundred and ninety-four participants were chosen from Jiangxi Normal University from three levels of study, i.e. first-year, second-years and third-year undergraduate. This university is located in central China funded by both Ministry of Education and the provincial government. The university's ranking is the 16th in the normal universities in China.

For each level of study, I chose two natural classes for the study. Group comparisons using t-test were used to measure whether there were significant differences between the academic performance of the students from the two classes in the same grade. The academic performance of the first-year students were based on the score on English test in the national entrance exam for university. The academic performance of the second-year and third-year students were based on the weighted scores of the final examination of the previous semester. The weighted scores included the scores for intensive reading class, extensive reading class, English oral

speaking, English writing and English listening class. The results of the t-test showed that there were no significant between the students of the two classes from three levels of study ( $t = .130, p = .897$  for year 1 students;  $t = .129, p = .897$  for year two students;  $t = 1.279, p = .205$  for year three students).

This study collected cross-sectional data instead of longitudinal. However, since learners move along these three years of study consecutively in tertiary study, these levels of study could be representative of the stages in L2 writing (Verspoor, Schmid & Xu, 2012). The demographic information of the participants is shown in the following table.

Table 3.8 *Summary of Learner Writing*

	No. of participants	Gender (F/M)	Average age	English learning (year)
Year one	65	61/4	18.16	8.37
Year two	64	62/2	19.23	8.46
Year three	65	64/1	20.47	9.98

The participants were all English-major students enrolled in the foreign language college. They received intensive training on all aspects of English skills during the four years of tertiary study. For the first two years of study, the focus of instruction was the development of knowledge in four skills of reading, writing, listening and speaking in English. On average, students were required to spend 16 hours per week in class for instruction on English-related courses of intensive reading, extensive reading, writing, listening, speaking. In the third year, along with the courses for English skills, academic courses on linguistics, applied linguistics and literature were

introduced, and learners were required to choose one course out of three to study for a year. No participants in the present study were from the fourth year of study since there were no courses for this group of learners. They were assigned to go to different workplaces for pre-graduation practice on professional skills. For all the courses, the medium of instruction was mixed, with Chinese being the major means.

By the time of the data collection, year one students' vocabulary size was around 3,000 words, since the Ministry of Education has set vocabulary size of 3,000 as the requirement for the national entrance exam for college. Year two students' vocabulary size was around 5,000. This estimation is based on the vocabulary size required for CET-6 by the Ministry. They have all passed the test by the time of the study. The vocabulary size for year three students was around 6,500, based on the requirement OF vocabulary size for the TEM-4.

The learners were informed before study that their participation in the research was voluntary and they could opt out any time in the process.

### 3.5.2 Data collection

#### Test of collocation

The present research used pen-and-paper tests to examine the receptive knowledge of collocations. The test was in the format of multiple choices. Several issues were important in the process of the development of the tests. These issues will be discussed in the following part.

## Target words

I would like to develop a sample of keywords that could be representative of the words from a variation of frequency levels. A well-recognized word list of single words developed from a corpus which is representative of authentic language use was needed. Also, I would like to choose words from different frequency levels to observe the change in the knowledge of words at distinct frequency levels with the progression of language learning. Eighty keywords that met the criteria of both frequency levels and word class were chosen.

Both high frequency level and mid-frequency level were chosen for present study. All target words were chosen from the frequency list based on Nation's study of 20 frequency levels in British National Corpus (BNC) (Nation, 2006). The first level of the tests is 2000 word level which constitutes the high frequency word level. Three mid-frequency levels were chosen to test the knowledge of collocation, i.e. 3000, 5000 and 8000. The rationale for choosing the frequency levels of target words were two- fold: academic studies into the lexical coverage and comprehension of different discourse types; and the Teaching English Syllabus for English Majors (Syllabus) of the Ministry of Education in China, which is the guideline for curriculum and textbook development of Chinese colleges. The studies into lexical coverage and vocabulary learning requirement have great implications for both explicit and incidental vocabulary learning through comprehension input (Schmitt and Schmitt, 2015). According to Nation (2001), 3000 word families were the threshold for mid-frequency words. Meanwhile, this amount of vocabulary size can assure adequate

understanding of listening texts, academic spoken texts and movies (Dang & Webb 2014; Webb & Rodger, 2009; van Zeeland & Schmitt, 2012). The next frequency level chosen was 5000 word families. This frequency level has been found to provide an adequate understanding of written texts (Laufer & Ravenhorst-Kalovski, 2010). The last frequency level was 8000 word families. Studies into written and academic texts suggested that 8000 word families are the vocabulary size required for unassisted reading and optimal comprehension (Dang & Webb, 2014; Laufer & Ravenhorst-Kalovski, 2010). The 8000 word level was also within the requirement of the Syllabus on the vocabulary size of English majors in the third year of study.

The test of collocation was developed in the following steps. The first step was to gather the pool of words from the four frequency levels. The word list of each frequency level was pulled from Nation's frequency list which could be freely accessed from his website (available from <http://www.victoria.ac.nz/lals/about/staff/paul-nation>). Twenty content words, including noun, verb, and adjective, were chosen from each frequency level with the total number of 80 words for all four levels.

Then, one established dictionary and one corpora were used to choose the correct items for each question. Some of the correct answers for the collocation text were chosen from Oxford Collocations Dictionary for Students of English, 2nd edition (2009), which included 9000 entries developed based on the Oxford English Corpus. One problem with the collocation entries in the Oxford Collocations Dictionary was that a large number of collocates shown in the dictionary were modifiers. For example,



collocates for appreciate were really, truly, deeply, highly, sincerely, etc. Likewise, fairly, pretty, rather, very, quite were identified as collocates for ordinary by the dictionary. Collocates, like these modifiers, could apply to a great number of target words in the tests. Using these modifiers as correct items could very likely tap into the knowledge of word class rather than collocational knowledge of words. And therefore, in these cases, the reference corpus Corpus of Contemporary American English (COCA) was used to retrieve the correct items for target words. (<http://corpus.byu.edu>). To identify the correct answers for collocations, those collocates with Mutual Information (MI) score higher than 3 were selected as correct collocates (Huston, 2002; Stubbs, 1995). MI score of 3 or above is the indicator of significant collocation. There were two considerations during the process of choosing correct items based on MI score. The first one was that the correct items should have the same or lower frequency than the target words. Also, the correct item should not be used as proper nouns in the corpus.

The next step was to create control items for each question. Guessing is a problem in the multiple-choice tests (Stewart & White, 2011). The word length and frequency levels of the four choices in the tests were matched to address this concern. And, the frequency levels of the four choices were the same or lower than the target words. VocabProfile (available from [www.lextutor.ca](http://www.lextutor.ca)) were used to check the frequency level of control items and match them with correct items.

The test included 80 questions with keywords from four frequency levels. Each frequency level has 20 test items. One point was given to correct answer and zero

point to incorrect answers. The full scores for collocation tests were 80 points.

#### Pilot test of test items

After compilation, the 80 test items were given to both proficient learners of English and a group of college learners for two rounds of pilot tests. The purposes of the pilot test were three-fold: 1) to check the clarity of the instruction, appropriateness of the layout and the duration of the tests; 2) to check the appropriateness of the correct items and control items; 3) to test the validity and reliability of the two tests.

In the first round, three proficient learners of English were invited to sit the test. One proficient learner was currently enrolled in the doctoral study of linguistics at a Hong Kong University, and the other two were working as research assistant and visiting scholar at a Hong Kong University. All three of them have proficient English skills, and extensive experience in learning and teaching English with 16 to 26 years of experience in English learning. Upon completion of the tests, the three proficient learners were interviewed for their comments on the design of the tests. Also, all items which they failed to score correctly were clarified to see if some questions were too ambiguous. Four items in the tests were revised according to their feedbacks. For example, one control item for *derelict*, i.e., *computer*, was replaced by *discovery*, since participants found it being confusing with the correct answer *building*. *Reminder* replaced *battle* as the correct answer for constant since participants found *battery* and *battle* similar in form when presented together.

The revised tests were then given to 41 students in the third year of study in a

Chinese college for the second round of the pilot test. These participants were from the same college with the participants of the main study with similar experience and background of English learning. The pilot test was conducted during normal classroom session and took around 30 minutes. The descriptive statistics of their performance on the two tests are shown in the following table. The Cronbach's  $\alpha$  of the test was .708, which showed that the test was reliable.

Table 3.9 *Descriptive Statistics of Preliminary Test*

	N	Minimum	Maximum	Mean (SD)	95% confidence interval
collocation	41	21	52	37(8.68)	34.6 40.08

### 3.5.3 Questionnaires

The questionnaires were designed to collect the background information of the participants and their communicative engagement of English outside classrooms. The section of communicative use of English was designed in the similar format as Fernandez and Schmitt (2015). The input of the language was categorized into three sub-sections: reading, listening to music and watching movies, films, and videos. Reading is the effective way of learning both single words and collocations (Webb & Chang, 2012; Schmitt & Redwood, 2011). The abundance of both online and off-line reading materials would inevitably benefit language learners. Another important source of language input is watching movies, films, and videos. Its effectiveness in word learning has well been explored in a series of study into the contribution of watching internet videos to use of collocations (e.g., Lin, 2014; Lin & Siyanova, 2015). The recent surge in the use of social media has also been included in the

questionnaire to explore the use of online tools and applications. The present study has changed the types of social media to adapt to the current use in China. It has included the widely used online communicative tools, such as QQ, Wechat, in addition to the applications in Fernandez and Schmitt (2015). We asked the participants to choose the hours that they have spent on these activities every week (0-1, 1-2, and more than 2 hours).

#### 3.5.4 Composition

The compositions were used to analyze the quality of lexical use of participants, i.e. lexical variation. Coh-metrix was used to analyze the test and retrieve the index of the lexical variation of the writings.

#### Writing topic

Topic selection is a key issue in writing research, as topics influence important aspects in writing from the choice of words, syntax complexity to the overall performance of writing of young learners to advanced learners (Gillespie, 2014; Yang, Lu & Weigle, 2015; Weigle & Friginal, 2015). Four issues arose in the selection of topics of the present study, which were the level of topic familiarity, genre, Chinese learners' habit of recitation of writing samples, and the language for the writing prompt. Topic familiarity plays an important role in learners' writing performance (Coxhead, 2011; Lee & Anderson, 2007). The participants' perceptions of the familiarity of the topic have a certain effect on the words they use in writing (He &

Shi, 2012). The purpose of the present study is to examine the vocabulary use of learners. And therefore, familiar writing topics were chosen to encourage them to use a wide range of words.

The next issue was the genre of the compositions. Genre influences the discourse, syntactic and lexical level of the language in writing. Argumentation and narration differ significantly in lexical indices as the word length, word frequency and lexical variation (Yoon & Polio, 2016). The present study used argumentation since it is the writing style for major English examinations in China. Hence, it is a familiar genre for Chinese students.

One potential problem in topic selection for Chinese students was that Chinese learners are known to be prone to memorize writing samples as the habit of rote learning (Li, 2004). They often apply this strategy in learning writing. They memorize the language used in the model writing pieces and copy that in their writing. In light of this learning pattern, the topic of the present study was a familiar topic with a certain degree of originality of minimizing the use of words and sentences in the model compositions. The topic was related to recent heated discussions in the news, and therefore, there would be interests in the topic, while, at the same time, little model writing samples available for the participants to copy.

The last issue in the topic was the language used for writing up the topic and prompt. The focus of the present study was on the words and collocations used by learners, and therefore, it is likely that learners would copy the words on the topic and writing prompt if these were presented in English. With this concern in mind, the

study used Chinese in present topic and writing prompt.

The writing topic and prompt are as follows:

黃曉明和楊穎最近大婚。奢華的儀式讓很多人羨慕不已。但也有人認為這種奢華的儀讓  
大家覺得金錢堆積起來的東西才是好的。你認為是奢侈的生活方式好，還是簡樸的生活  
方式好？

(English translation: Huang Xiaomin and Yang Ying have married in a luxurious way recently. The luxurious ceremony attracted great attention. However, at the same time, some people believe that this type of luxurious wedding would send the wrong message to the society that only money can bring good things. In your idea, luxurious lifestyle and simple lifestyle, which one is better?)

The participants were asked to write a composition of around 250 words, which was within the valid word limits of lexical variation index and also the required length of their exams. McCarthy and Jarvis (2007) suggested that *D* is valid for speech and writing within the word limits of 100 to 400 words (Webb & Nation, 2011)。

## Procedure

The test of collocation and compositions were conducted in two normal classroom sessions without giving participants prior notice of the tasks. In the first session, the participants were asked to go through the vocabulary test and choose one correct item out of the four items. They were given 15 minutes to finish the test with clear instruction of not using a dictionary. Along with the test paper, they were also asked to finish a questionnaire. In the second session, they were asked to write a composition within 50 minutes without the help of a dictionary. Both the test paper and the compositions were in pen-and-pencil format. Three levels of participants

finished both the test paper and the compositions within the same week since their class schedules made it impossible to conduct the experiment on the same day.

### 3.5.5 Preparing data for analysis

This part introduces the crucial step in preparing the raw data of test papers and compositions for further statistical analysis. It includes the scoring of the papers and editing the writing texts for running Coh-Metrix to obtain an index of lexical variation.

#### Scoring

The test paper of collocations included 80 multiple-choice questions, with each question worth one point for correct choice and no point for incorrect choices. In total, the full grade of all the items in the test paper was 80 points, and the full grade of each frequency level was 20 points. Three experienced teachers were asked to grade the test and assign scores according to participants' performance.

For each participant, there were five scores. The first score is the holistic score for the overall performance, which stood for the overall vocabulary knowledge of collocation of the participants. In addition to the holistic score, there was one score assigned to each frequency level, which demonstrated the vocabulary knowledge of the collocation of 2000 word level, 3000 word level, 5000 word level, and 8000 word level respectively. All scores were used for correlation analysis to examine the relation between vocabulary knowledge of collocation and quality of lexical use in

writing.

#### Preparing the compositions for Coh-metrix

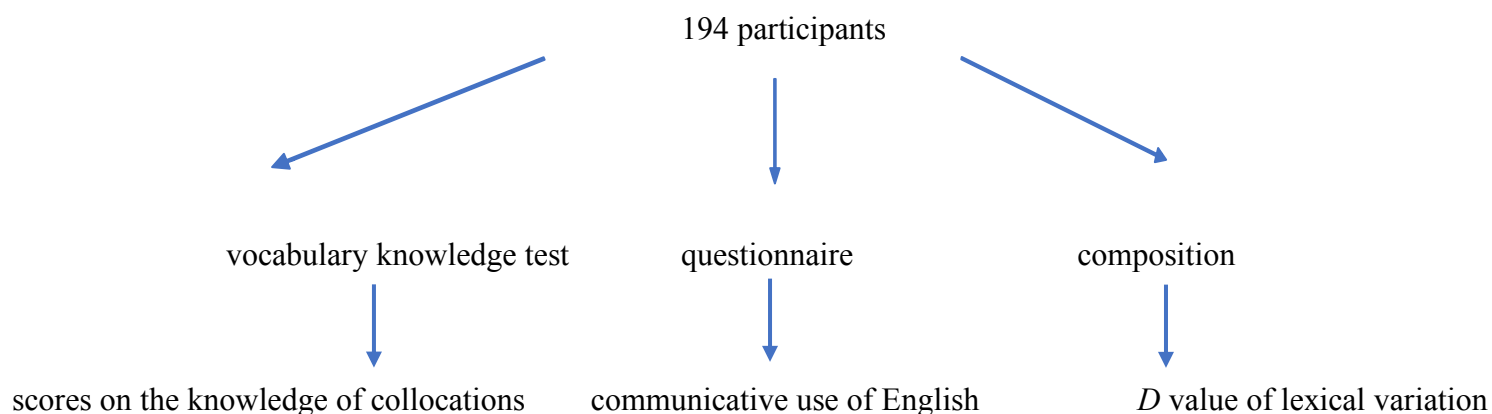
The compositions written by the 194 participants were in pen-and-pencil format. For further data analysis, all these written texts needed to be typed into computers as word and text files. Seven third-year English major students were asked to help with this task. They were asked explicitly to type the original copy of compositions into word files in the exact way as the compositions were written. Upon completion, the author and another experienced English teacher worked together to double-check the original copy and the e-copies of compositions make sure that the e-copies were identical to the original pen-and-pencil version.

After obtaining the e-copies of the compositions, all the files were edited for further analysis using Coh-metrix. Grammatical errors were unchanged because the primary focus of the study was on vocabulary use. For lexical errors, similar precautions for dealing with spelling mistakes were taken similarly as Yu (2009). If a word was spelled erroneously in some places but correct in other places, a correct form was used to replace mistakes. However, if a word was spelled erroneously whenever it appeared, it would not be corrected. Meanwhile, if a word was spelled erroneously in many ways in a text, one erroneous form was used to replace all the other misspelled forms, since using different forms had the potential to increase lexical variation. After editing, the e-copies of the compositions were converted to plain text files to be processed by Cohmetrix to obtain the index of lexical variation.



Figure 3.2 provides a summary of the procedures of data collection.

Figure 3.2 *Summary of Research Methodology*



### 3.6 Results and discussion

This part presents the results of the present study pertinent to the three research questions. It would first explain the extent to which the receptive knowledge of collocations of learners from the three proficiency groups relates to the quality of lexical use measured by lexical variation. Then, it reveals the detailed picture of the relationship between knowledge at different frequency levels and the lexical variation in writing. The final part presents the findings on the relation between the communicative use of English and the range of words in writing.

#### 3.6.1 Relationship between knowledge of collocations and lexical variation

The first research question intends to examine the relationship between receptive knowledge of collocations of learners from three years of study and the lexical

variation of their writing. Based on the results of the Kolmogorov-Smirnov analysis, the null hypothesis that the scores are normally distributed cannot be rejected. Pearson Correlation was used to analyze the relationship between the two variables.

The descriptive statistics (mean and standard deviation) of the variables for the three groups of learners are provided in the following table. The descriptive statistics provides a rough picture of the knowledge of collocations and the percentage of different words used in writing for learners across three years of study. It seems that the two variables moved in opposite directions. While the learners seemed to score higher on the test of the knowledge of collocations, they tended to use a fewer percentage of different words in the writing.

This finding is different from the studies that have shown that lexical variation is a reliable discriminator of the proficiency levels (Crossley, Salsbury & McNamara, 2011; Iwashita, Brown, McNamara & Hagan, 2008; Saito, Webb, Trofimovich & Issacs, 2016; Versppor, Schmid & Xu, 2012). It could be possible that, with the increase in the text length, the percentage of different words used decreases. However, on the one hand,  $D$  is the adjusted measurement of the type-token ratio which means that the text length does not affect the calculation of the lexical variation in this measurement. On the other hand, the mean number of the words in the writing for the three groups of learners are 268 (year 1), 231 (year 2) and 242 (year 3). Based on these two considerations, the possible effect of text length on the percentage of different words used in the texts could be excluded. It seems that learners' knowledge and use of vocabulary improves on some aspects (attested by knowledge of

collocations) and not on other aspects (attested by lexical variation).

Table 3.10 *Descriptive Statistics on Test Scores of Knowledge of Collocations and Lexical Variation*

	Scores on knowledge of collocations	Lexical variation ( <i>D</i> )
Year 1	37.4(5.3)	86.6(19.8)
Year 2	41.1(7.7)	84.6(20.5)
Year 3	49.4(8.8)	78.1(16.3)

Note: The mean of the scores and *D* are provided in the table with standard deviation in the bracelets. The maximum score on the collocation test is 80 points.

Pearson correlation was used to measure the extent to which the knowledge of collocations and quality of lexical use are related across the three years of study (Table 3.11). It could be seen from the table that, for year one learners, there was no significant correlation between knowledge of collocation and variety of words in writing. The increase in the knowledge of collocations would not witness the corresponding improvement in the variety of words in writing. For year two learners, there was a medium correlation between knowledge of collocation and lexical variation in writing ( $r = .33$ ,  $p = .01$ ). In other words, the improvement in the knowledge of collocations would accompany with the increased variety of words used in writing. The knowledge of collocation could explain 11% of the variation in the lexical variation. This correlation declined for learners in their third year of study ( $r = .25$ ,  $p = .04$ ). This means that the knowledge of the collocations would still move in the same direction with the variety of words used in the text. However, the knowledge of collocation could only explain around 6% of the variation in the variety of words used in the text.

The strength of the correlation between the two variables was weaker than expected, considering the importance of collocations in vocabulary knowledge, writing and language proficiency, and also the importance of lexical variation in the writing proficiency. In addition, the increase in the years of studying English would not contribute to the strength of the relation between the two variables. The low correlation is quite against common sense that, if learners possess greater knowledge of collocations, they would be able to use a greater variety of collocations in writing, which in turn, would improve the lexical variation of writing texts.

Table 3.11 *Pearson Correlation Between the Knowledge of Collocation and Lexical Variation*

	Collocation (Year 1)	Collocation (Year 2)	Collocation (Year 3)
Lexical variation (D)	0.05 (0.726)	0.33** (0.009)	0.25* (0.043)

Note: The  $r$  value of correlation analysis is provided in the table with  $p$  value in the bracelets. \*stands for significance at 0.05 level. \*\* stands for significance at 0.01 level.

The second research question concerns the knowledge of collocations at a variability of frequency levels. It intends to find out the variation of correlation between knowledge of collocation at different frequency levels and lexical variation. The results of the Kolmogorov-Smirnov analysis showed that the null hypothesis of normal distribution was rejected. Spearman's rho was conducted to analyze the relationship between the knowledge of collocations at different frequency levels and lexical variation.

Table 3.12 *Descriptive Statistics of Knowledge of Collocations at Four Frequency Levels and Lexical Variation*

	2000 level	3000 level	5000 level	8000 level	Lexical variation( <i>D</i> )
Year 1	14.92(1.99)	10.62(2.52)	6.32(2.23)	5.54(2.27)	86.6(19.8)
Year 2	15.61(1.91)	11.93(2.99)	8.58(3.34)	4.96(2.52)	84.6(20.5)
Year 3	16.59(1.92)	13.92(2.89)	10.93(3.82)	8.05(3.07)	78.1(16.3)

Notes: the means of test scores at each frequency level and *D* value of lexical variation are presented in the table with standard deviation in the bracelet. The maximum score at each level is 20 points.

The descriptive statistics showed an overall picture of learners' knowledge of collocations at four frequency levels (Table 3.12). Generally speaking, the results were in line with the previous study on the role of frequency in vocabulary learning. More advanced students need more less frequent words to improve the quality of wiring. Since, they have gradually moved beyond the learning of high frequency words (2000 word level), the mid-frequency words (5000 word level and 8000 word level) would be of higher importance for them.

Learners were making consistent improvement across years of study at almost all four frequency levels with learners at year one study scored the least in tests at all four levels, learners at year two study being in the middle, and learners at year three study score was highest. The only exception is the 8000 word level, where a little regression was shown between learners from the first year study and second year study. However, the sizeable improvement was shown between second year learners and third year learners on collocations at this level. Judging from the score of the collocation test, I infer that learners at the third year of study have not mastered

knowledge of collocations at 8000 word levels (Mean = 8.05, SD = 3.07).

The second-year learners lagged behind the requirement of the tertiary syllabus in their development of vocabulary knowledge. By the time of the data collection, they have finished the tertiary English proficiency test, CET-6 test. The test has explicitly required the mastery of at least 5,000 word families. The present study showed that they might not have achieved the requirement. They scored on average 8.58 out of 20 at the 5,000 word level.

Nation (2006) commented that learners might need to have a vocabulary size of 8000 to 9000 to study postgraduate degrees in English-speaking countries. The third-year learners have a long way to go in the last year based on their current rate of improvement if they want to have a smooth beginning in pursuing postgraduate study in an English-speaking university. However, on the positive side, it could be possible that learners have possessed greater knowledge of form and meaning, which is the key aspect measured in the vocabulary size test, at 8000 word level than what they have demonstrated in the knowledge of collocations, which is more demanding than the basic knowledge of form and meaning.

Table 3.13 *Results of Spearman Correlation Analysis of Knowledge of Collocations at Four Frequency Levels and Lexical Variation*

		2000 level	3000 level	5000 level	8000 level
Lexical variation (D)	Year 1	-0.04 (0.806)	0.24 (0.105)	0.34* (0.017)	0.04 (0.766)
	Year 2	0.24 (0.059)	0.30* (0.017)	0.32* (0.012)	0.08 (0.541)
	Year 3	0.15 (0.253)	0.21 (0.094)	0.26* (0.046)	0.25* (0.047)

Note: The Spearman's rho of the correlation is provided in the table with p value in the bracelet. \* stands for significance at 0.05 level.

The results of the Spearman Correlation analysis showed that the knowledge of collocation at four frequency levels correlated with lexical variation at different levels (Table 3.13). It can be seen from the results that knowledge of collocations at 2000 word level did not have a significant correlation with lexical variation. In one case of the year one study, it even had a slightly negative correlation with the lexical variation. It means that knowing more collocates of words at 2000 word level would not improve the variety of words used in writing. The learners of the present study are upper- intermediate to advanced learners who were quite familiar with the most frequent words.

For the remaining three levels, differentiated correlations were found between the knowledge at each level and lexical variations for different groups of learners. For first year learners, only knowledge of collocations at 5000 word level was correlated significantly with lexical variation ( $r = .34, p = .02$ ). It means that learner with greater collocational knowledge of words at 5000 word level would be able to use a greater variety of words in writing, while the improvement of knowledge of words at other frequency levels would not witness the corresponding improvement in the words used in writing. For second year learners, knowledge of collocations at 3000 word level and 5000 word level correlated positively and significantly with lexical variation ( $r = .30, p = .02; r = .32, p = .01$ ). It means that collocational knowledge of words at 3000 word level and 5000 word level would change in the same direction with the lexical variation. Possessing greater knowledge at these two levels would imply a greater variety of words used in writing. For third year learners, there were weaker

positive correlations between knowledge of collocations at 5000 word levels and 8000 word levels ( $r = .26, p = .046$ ;  $r = .25, p = .047$ ) than the correlations found in the previous two groups of learners. Nonetheless, these two correlations show that, with the improvement of proficiency, knowledge of more infrequent words would differentiate the range of words used in writing. One notable issue emerging from the results was that knowledge of collocations at 5000 word level was the only level that showed positive and significant correlation with lexical variation across three groups of learners. It means that collocational knowledge of words at this level is crucial in helping learners to improve their variety of words in writing. I will discuss more on this point in the following section of general discussion.

### 3.6.2 Relationship between communicative use of language and lexical variation

The third research question explores the degree to which the communicative use of language outside classrooms by learners relates to the variety of words in writing. The participants were asked to report the number of hours that they spent using English in daily lives in activities like reading books, newspapers, watching movies, videos and TV, communicating with friends and listening to music each week. Since the results of the questionnaire constituted non-parametric data, I used Kendall's tau to analyze the relationship between the use of language in daily lives and lexical variation in writing.

Table 3.14 *Descriptive Statistics on the Use of Language*



	Reading	Watching	Listening	Networking
Year 1	1.78(0.46)	1.87(0.62)	2.17(0.6)	1.35(0.47)
Year 2	2.1(0.4)	2.5(0.58)	2.43(0.62)	1.48(0.49)
Year 3	1.9(0.5)	2.25(0.63)	2.13(0.57)	1.45(0.57)

Note: the mean of hours is provided with standard deviations in the bracelets. *Reading* stands for reading books, newspapers, etc.; *watching* stands for watching movies, videos, etc.; *listening* stands for listening to music; *networking* stands for communicating with friends.

It can be seen from the descriptive statistics in table 3.14 that, on average, learners' exposure to English outside the classroom was around 7 hours each week through adding the four types of activities together. The communicative use of language outside the classroom is important for incidental learning to take place. I could roughly deduce the time that an EFL college English major learners in China spend on learning and using English from this data considering the time spent in classrooms on intentional learning and exposure to English for leisure together. That would be around 23 hours each week, including 16 hours in classrooms and 7 hours for leisure.

This is just a rough estimation as I do not have the data on the average time that learners spent on classrooms on intentional learning. Nonetheless, this amount of exposure to English might not be satisfactory for learning, since these are English major learners whose majority of learning load centered around language learning. Not to mention that the amount of time spent by non-English major learners would be much less considering the in-classroom hours on intentional learning of English would be around 4 hours each week. The calculation of the average hour's students spent on English learning has suggested that language learning has not received its due recognition in the tertiary learning.

The average time of exposure to English outside classrooms varied for the three groups of learners. Second year learners spent more time using English outside classrooms on all four activities than the other two groups of learners (Mean = 2.1 for reading, Mean = 2.5 for listening, Mean = 2.43 for watching and Mean = 1.48 for networking). For year two and year three learners, they spent the most time watching movies and videos, while the year one learners spent most time listening to music. For all three groups of learners, the amount of time spent networking, in other words, social communication with friends face to face or over social media, was the least among four types of activities (Mean = 1.35 for year 1 learners, Mean = 1.48 for year 2 learners and Mean = 1.45 for year 3 learners).

Table 3.15 *Results of Kendall's tau Analysis of Correlation Between Use of English and Lexical Variation*

		Reading	Watching	Listening	Networking
Lexical variation (D)	Year 1	-0.07 (0.95)	0.22* (0.031)	0.08 (0.387)	-0.05 (0.669)
	Year 2	0.16 (0.134)	0.02 (0.853)	0.21* (0.045)	0.12 (0.3)
	Year 3	0.19 (0.057)	-0.05 (0.625)	-0.01 (0.898)	-0.09 (0.392)

Note: the Kendall's tau is provided with *p* value in the bracelets. *Reading* stands for reading books, newspapers, etc.; *watching* stands for watching movies, videos, etc.; *listening* stands for listening to music; *networking* stands for communicating with friends.

The results of Kendall's tau analysis of the correlation between use of English and lexical variation are shown in the table 3.15. It is surprising to find that there was very few significant correlation between the communicative use of English and the variety of words used in writing. It seems to suggest that the exposure to English outside classrooms has little contribution to the use of wide range of words in writing. The

two cases where significant correlations lie were in the activities of watching movies and videos for year 1 learners ( $r = .22, p = .03$ ) and listening to music for year 2 learners ( $r = .21, p = .05$ ). These two significant correlations suggest that, for year one learners, more time spent on watching movies, videos or TV could contribute to increased range of words used in writing; for year two learners, increased exposure to English songs witnesses the increased variety of words used in writing.

The correlation between exposure to English outside the classroom and lexical variation seems to demonstrate a rather complex picture over the three years of study. For year 1 learners, reading books and newspaper and social communication with friends were negatively correlated with lexical variation, although these correlations were not significant ( $r = -.07, p = .95$  for reading;  $r = -.05, p = .67$  for networking). It is assumed that reading is the major way of acquiring words incidentally, and the increased vocabulary size would reflect the increased variety of words used in writing (e.g., Nation, 2015; Schmitt, 2010; Webb & Chang, 2012). I would expect a positive correlation between reading and lexical variation. However, this has not proven to be the case here. The results suggest that the more time spent on reading and communicative use of language would be associated, the fewer range of words were used in writing.

For year two learners, all four types of exposure to English are positively correlated with lexical variation. For these learners, the increased exposure to English outside classroom witnesses increased the range of words used in writing. For year three learners, the exposure to English outside classroom seems to have no correlation

with the variety of words used in writing. In three activities, i.e., watching movies and TV, listening to English songs and social interaction with friends in English, even have negative correlation with lexical variety, although these correlations were not significant ( $r = -.05$ ,  $p = .63$  for watching;  $r = -.01$ ,  $p = .9$  for listening;  $r = -.09$ ,  $p = .39$  for networking). It seems to suggest that for learners at the third year of study, the greater exposure to English in most ways that they have, the fewer range of words they could use in writing. It is against the common belief that the exposure to language use outside the classroom would contribute to the use of language. Especially in the case of social communication with friends in English, which involve the productive use of language.

### 3.7 General discussion

The purpose of the present study intends to explore both the relationship between the knowledge of collocation, and the quality of lexical use in writing, and the relationship between ways of exposure to English outside classroom and quality of lexical use in writing. It reflects the learners' trajectories of learning by reporting the knowledge of collocations based on test scores of 194 Chinese tertiary learners from three years of study and writing samples from the same groups of learners. The test scores in the knowledge of collocations were further analyzed based on the word frequency levels to reveal the variability of the strength of relationship across different levels between the knowledge of collocations and quality of lexical use in writing. The variability has usually been overlooked by focusing on the composite

scores of all levels. In addition to test scores and writing samples, learners filled in the questionnaires to report their weekly use of English outside classrooms.

In answer to the first research question, the results showed that the correlation between the knowledge of collocations and quality of lexical use in writing (measured regarding the lexical variation) changed in a non-linear manner across the three years of study. There was a positive correlation, albeit insignificant, between the two variables for year one learners, followed by a much stronger correlation for the year two learners. For year three learners, the correlation was weaker.

Generally speaking, the strength of the correlation in the present study is lower than the relation between collocations and other aspects of language proficiencies found in the previous relevant studies ( $r = .46$  to  $r = .68$ ) (for a review, see Boer and Lindstromberg, 2012). The gaps in the strength of the correlation between the present study and previous ones are possibly due to the methodological issues. For studies that have found a relatively high correlation between knowledge of collocations and language proficiency (measured by the holistic scoring of oral and writing tasks) included greater types of multi-word units as collocations than the present study. For example, Keshavarz and Salimi (2007) included both lexical collocations (which are identical to the present study) and grammatical collocations (including adjective-preposition, noun-preposition, and verb-preposition). Hsu (2007) included seven types of collocations, i.e., verb-noun collocations, adjective-noun collocations, noun-verb collocations, noun of noun collocations, adverb-adjective collocations, verb-adverb collocation and noun-noun collocation. He found that the use of collocations

correlated very high with the holistic writing scores ( $r = .81$ ).

The second methodological issue concerns the direction of knowledge of collocation measured in the study, i.e., receptive or productive, and the types of task used to measure the oral and writing proficiency. Stengers, Boers, Housen and Eyckmans (2011) measured the productive use of formulaic sequences in oral story retelling tasks and investigated the correlation between the number of formulaic sequences used in oral tasks to the range of words used in the oral presentation. They found a high correlation of  $r = .63$ . It is reasonable to expect a higher correlation between productive use of formulaic sequences and oral tasks. In the aforementioned study done by Keshavarz and Salimi (2007), they correlated the receptive knowledge of collocation to the receptive measurement of general language proficiency in the format of cloze tests where participants were supposed to choose among four choices. They found a correlation of  $r = .68$  between the two variables. The similarity between the direction of the test used would inevitably improve the strength of correlation between the variables.

The weak correlation between knowledge of collocations and lexical variation in writing is against the common assumption of a close relationship. Yoon and Polio (2016:18) commented that “low lexical variety in argumentative essays may be attributed to participants’ greater reliance on formulaic phrases that are common in argumentative essays.”. Given this observation, the knowledge of collocations should be closely associated with lexical variation in writing. There are three possible reasons to explain the relatively low correlation between knowledge of collocations

and lexical variation. The first reason is that learners experience difficulties in learning collocations. Learning collocations requires a much longer period to develop (Levitzky-Aviad & Laufer, 2013). The present study adds to this finding by revealing the improvement and regression in the correlation between knowledge of collocation and lexical variation. It is very likely that, although the receptive knowledge of collocation improved over years of study, learners were reluctant to use collocation in their writing (Liao & Fukuya, 2004; Zhong, 2016). In this scenario, even if the knowledge of collocation improves, it has a very limited contribution to the range of words used in writing. Even for advanced learners, as in the case of the tertiary English major students in the present study, the repertoire of the collocation does not have much contribution to improving their lexical variation.

The other possible reason is learners' high reliance on a set of high frequency collocations in writing (e.g., Durrant & Schmitt, 2009; Laufer & Waldman, 2011). Previous studies into the use of collocations by second language learners have found that learners, even at the advanced level of study, cling to a set of highly frequent collocations and use them repetitively in writing (e.g., Siyanova & Schmitt, 2008). Siyanova and Schmitt (2008) found out that around 51.5% of 810 adjective- noun collocations used by advanced Russian learner of English in writing in their study were frequent collocations based on the frequency information in the British National Corpus. It is very likely that, even if the learners' receptive knowledge of collocation improves, they will not draw on the newly acquired collocations to use them in writing. Therefore, the improved knowledge of collocation would have little

contribution to the range of words in writing.

This difficulty in using collocations may be an indication of how the collocations are represented in learners' mind. Stengers, Boers, Housen and Eyckmans (2011) raised the question that the difficulties for learners to use collocations in writing may be an evidence of the holistic storing of collocations in the mental lexicon. It is not clear whether learners may store the "canonical form" of the collocations in their mental lexicon instead of all the morphological variations of them. And therefore, when it comes to the time to use collocations in writing, the "canonical form" may have to be modified with variations to be correctly used. This modification would create an extra working load for learners. During the writing process, learners are under great demand for online processing resources on multiple levels, i.e., the content, the linguistic level and the discourse level. They would resort to what they are most familiar to release the processing burden. This tradeoff in processing would very likely lead learners to use the frequent collocations that are fully automatized to help them improve the fluency of writing.

The third plausible reason for the low correlation in writing could be L2 writer's repetitive use of words and phrases that appear in the writing prompt. This is a widely adopted coping strategy for writing among L2 learners (Yoon & Polio, 2016). There is a consistent improvement in the receptive knowledge of collocations among L2 learners in the present study. The mean scores for collocation test increased from 37.3 for year one learners to 49.4 for year three learners. However, there is no corresponding increase in the lexical variation. It regressed from 86.6 for year one



learners to 78.1 for year three learners. It is likely that learners repetitively use the expressions that appeared in writing prompts, such as luxury wedding, luxury ceremony, luxury life. The overuse of these expressions undermines the range of words in writing and results in the low correlation between the knowledge of collocations and lexical variation.

Based on these observations, I could conclude that the correlation between the receptive knowledge of collocations and lexical variation in writing is a positive yet weak one. And this correlation is mediated by other aspects of knowledge about collocations, especially the frequency of the collocations (which would influence on the level of automatization and the likelihood of being used in writing) and the knowledge of the morphological variations required to use the collocations properly in writing. Future research is needed to observe the use of the collocations in learner writing to clarify the picture and state the problems that stand between the receptive knowledge of collocations and the proper use of the collocations in writing.

The second research question reveals the dynamic and complex picture of the correlation between the knowledge of collocations of different frequency levels and lexical variation. It shows that, for learners at different levels of study, the strength of correlation between the two variables vary between frequency levels. For year one learners, the improvement in knowledge of collocations of words at 3000 word level is a useful contributor to the improvement of the range of words. For year two learners, knowledge at 3000 and 5000 word levels would be useful, and, for year three learners, knowledge at 5000 and 8000 word levels would be needed to witness

improvement in lexical variation.

This result is in line with the development trajectory of the learners. With the increase in the proficiency level, the learner would need the knowledge of more advanced words to improve the range of words used in writing. This result accentuates the importance of mid-frequency words for advanced learners. It is noteworthy that, for all three levels of learners, knowledge of collocations of words at 5,000 word level is a useful contributor to the improvement of the range of words in writing. 5,000 word level is a crucial vocabulary level for learners to achieve adequate comprehension of English text. Laufer and Ravenhorst-Kalovski (2010) investigated the lexical threshold needed to achieve adequate reading comprehension among their Israeli tertiary learners by analyzing the coverage of text and vocabulary size. They found that to achieve minimally adequate comprehension of reading the text (which equals to 95% coverage of text), learners should at least have a repertoire of 5000 word families.

In a new line of a study investigating the coverage and vocabulary size of academic language, a vocabulary size of 5000 word families has again suggested being an important lexical threshold for tertiary learners. Dang and Webb (2014) explored the multi-disciplinary academic corpus of BASE and four sub-disciplines, including arts and humanities, life and medical sciences, physical sciences and social science, to identify the lexical threshold for comprehending academic texts in these disciplines. They found that a vocabulary size of most frequent 5000 word families plus proper nouns were sufficient to reach an adequate comprehension of the corpus

and all four sub-disciplines. It would achieve optimal understanding (98.12%) for social science and adequate comprehension (96.95%) for arts and humanities. These disciplines are the academic major of the participants of the present study, which points out the necessity for learners to master the words at this level. Another two studies into the two disciplines of business and engineering yielded similar results. Hsu (2011) found out that the most frequent 5,000 word families would be sufficient for adequate comprehension (95.05%) of business textbooks. Likewise, Hsu (2014) found out that, to achieve adequate comprehension of the engineering textbooks (95.53%), the most frequent 5,000 word families would be sufficient.

The studies into the coverage and vocabulary size unanimously pointed out the 5,000 word families as the lexical threshold for L2 learners to properly understand English for general and academic purposes. The present study adds to these studies by showing that 5,000 word families are essential for all three years of tertiary L2 learners based on the correlation between knowledge of collocations and lexical variation. In China, the most frequent 2,000 to 3,000 word families are the learning target of the secondary education. Upon entering the college, learners are supposed to mastering words at these levels. Although, I do not argue for full mastery of the most frequent 2,000 and 3,000 word families. For example, evidence has shown that phrasal verbs made of highly frequent words could still post difficulties for advanced L2 learners (Garnier & Schmitt, 2016). I am stating that learning words beyond the most frequent 2,000 and 3,000 word families, in other words, the mid-frequency words, should be the primary goal to help learners enlarge their vocabulary size and

improve the usage of these words and collocations in productive ways.

The third research question intends to find out the contribution of the communicative use of English outside classrooms to improving the range of words in writing. The whole picture reveals the dynamic process of language learning when learners at different levels of the study demonstrate different traits. The study yielded rather surprising findings in showing that the correlation between various activities and the range of words in writing is positive yet quite weak. Even in some cases, there were negative correlations between the exposure to English for some activities and range of words in writing. This finding suggests that exposure to English outside classrooms for leisure purposes has very little contribution to the range of words used in writing by L2 tertiary learners. There are two points worthwhile for attention in this part. The first is the positive yet weak correlation between the activities outside classroom and range of words in writing, and the other one is the negative correlation between the two variables. There is extensive literature on learning vocabulary items through reading and watching movies and TV programs. Potential learning is expected to take place when the learners could comprehend the text or scripts (Zhou, 2012). Research into the lexical coverage of the text and scripts provides us with a clear indication of the lexical demands of the books and programs. Webb and Rogers (2009) investigated the vocabulary size needed to comprehend the authentic American and British movies. They analyzed the scripts of 318 movies with 2, 841, 887 running words in eleven genres. Their finding suggests that to achieve adequate comprehension of the scripts (95% of coverage) for 11 genres, learners would need a

vocabulary size of 3,000 words plus proper nouns and marginal words. This amount of vocabulary is well within the range of the learners in the present study. They should have mastered at least 3,000 words to pursue their undergraduate study.

However, the reasons of their poor intake of vocabulary items from activities outside classrooms might be the frequency of encounters, the quality of engagement and the learning strategies. The literature on the frequency of encounters and learning of vocabulary knowledge shows that it requires 6 to 20 times of repetition for a word to be fully mastered by the learners incidentally (for a review on repetition and single word learning, see Webb, 2007). Recent studies on collocations unravel the similar trend. Webb, Newton, and Chang (2013) explored the possibility to learn collocations incidentally from reading. Their findings suggest that a repetition of 5 times would witness gains in receptive knowledge of form and a repetition of 15 times is needed to witness sizable gains in both receptive and productive knowledge of form and meaning. It would need research to show if learners would be exposed to vocabulary items for enough repetition for durable gains to occur. Rogers and Webb (2011) analyzed the scripts of 288 television episodes to determine the learning potential of vocabulary items from TV episodes. They found out that watching the TV series of the same genre would offer greater potential of learning vocabulary items in ways of the range of words in the series and number of repetition. Their findings show that, in one TV series, *House*, 51% of the word families occur only once, and 6% of the word families occur for ten times and more. There is still room for potential learning to occur, especially for the 6% of words which appear for more than ten times. The

range of words that occur for more than ten times was much lower in unrelated TV series, which was 2%.

These studies suggest that, for learning to occur, learners should be aware of the necessity to stay on related movies or TV series if they regard watching movies and TV series as the potential sources of learning vocabulary items. Their selection of movies and TV series should be steered to more beneficial types. The quality of engagement also affects the extent to which the exposure to English outside classrooms contributes to the use of words in writing. The correlation between exposure to English outside classrooms and knowledge of collocations were quite high in Fernandez and Schmitt (2015). They found that taken together, the five types of exposure to English, i.e., reading, watching films, listening to music, social networking and immersion in English-speaking countries, had a strong and positive correlation with knowledge of collocations ( $r = .56$ ,  $p = .001$ ). Among the five activities, immersion in English speaking countries showed the strongest correlation with knowledge of collocations ( $r=0.64$ ,  $p=0.001$ ), followed by reading ( $r = .61$ ,  $p = .001$ ), watching films ( $r = .38$ ,  $p = .001$ ) and social networking ( $r = .33$ ,  $p = .001$ ). The strongest correlation between immersion and knowledge of collocations accentuated the importance of authentic linguistic environment in language learning (Adolphs & Durrow, 2004).

On the contrary, the participants in the present study had no prior experience of staying in English-speaking countries. Their exposure to English could hardly offer authentic socio-cultural integration that was essential for sizable gains in language

development. The primary part of the input they receive from outside classroom engagement was receptive learning mode. Informed by the research into the relation between the direction of learning and improvement of knowledge, it is very likely that the exposure may have a greater contribution to the receptive knowledge of vocabulary but quite limited to the productive use of them in writing (Webb, 2012).

Another factor that contributes to the quality of the engagement is the motivation of learners. Bardovi-Harlig (2012) reviewed the pragmatic studies into the use of formulaic sequences in socio-cultural communities and found that users' positive engagement in the interaction is crucial to the appropriate use of formulaic sequences. Using case studies of 7 international students enrolled in the postgraduate program at Nottingham University, Dornyei, Durow, and Zahran (2004) concluded that "success in acquiring formulaic sequences is strongly related to the learners' active involvement in some English-speaking community" (2004:102). One interesting result of the present study was that only in the second year of study when the positive correlation was found between activities outside classrooms and the range of words in writing. It was quite possible due to the level of motivation in language study that learners have demonstrated in this year of study. The data were collected four months before a high-stake national exam on English-major study. If students fail to pass the exam, they would not be able to graduate with an undergraduate degree. Students were under great pressure at the time of data collection, and they had the great extrinsic motivation to improve their knowledge of collocation and range of words in writing to help them pass the examination.

Learning strategy adopted by learners is also potential factor that contributes to the potential incidental learning of vocabulary items from exposure to English. Gu (2003) explored to successful Chinese learners of English in their use of vocabulary learning strategies using think-aloud protocol and interviews. He found out that the two learners used rote learning extensively regardless of their high achievement in language learning and style of using learning strategies. One of the learners, i.e., “active strategy user,” would treat new vocabulary items in reading meticulously and memorize them using rote learning strategies. Chinese learners’ dependence on rote learning is well documented in various research into learning strategies (e.g., Ding, 2007; Gan, Humphreys & Hamp-Lyons, 2004; Hu, 2002). It is possible that, without special attention on vocabulary items using rote learning, the exposure to English outside classrooms is rather inefficient in contributing to the vocabulary learning.

These three possible factors that affect the acquisition of vocabulary item through incidental learning reveal the complexity in vocabulary learning. To investigate the potential of vocabulary learning through exposure to English outside classrooms, it might need future research to explore the sources in which learners acquire the collocations they use in writing and the way they treat the vocabulary items encountered in sources like reading books and watching movies, etc.

### 3.8 Conclusion and pedagogical implications

The present study explored the correlation between receptive knowledge of collocations and the quality of lexical use in writing (measured regarding lexical



variation) and the correlation between exposure to English outside the classroom and the quality of lexical use in writing. In analyzing the correlation between receptive knowledge of collocations and lexical variation, the present study included participants from three levels of study at tertiary levels, i.e., year one, year two and year three, to unravel the dynamic changes of the correlation across different years of study. It further analyzed the correlation between receptive knowledge of collocations at four frequency levels, i.e., 2000 word level, 3000 word level, 5000 word level and 8000 word level to investigate the variability of the correlation between different frequency levels.

The results showed that the overall correlation between receptive knowledge of collocation and lexical variation changes across years of study. The correlation between the receptive knowledge of collocations and lexical variation was quite weak based on the results of the analysis. It suggests that the accumulation of knowledge of collocation seems to have little usefulness in improving the variety of words in writing. A significant correlation between the two variables was found among year two and year three learners. Instead of demonstrating stronger correlation with the improvement in proficiency, the present study showed that the strength of the correlation between the two variables does not follow a linear development with the progression of study. The correlation was strongest in the writing of the second-year learners and regressed in the writing of the third-year learners.

The analysis into the correlation between knowledge of words at four frequency levels and lexical variation showed that, with the improvement in the proficiency

levels, learners need knowledge of more infrequent words to improve the variety of words used in writing. Among the knowledge of words of four frequency levels, significant correlation with lexical variation across three years of study was only identified in the 5000 word level. This means that the knowledge of the words at this level is crucial for all three levels of learners if they intend to improve the range of words used in writing. Generally speaking, there were very weak correlations between the exposure to English outside classrooms and lexical variation in writing. The present study asked the participants to report the amount of time they spent outside classrooms on reading novels, watching movies and television programs, listening to music and social communication with friends. The results showed that watching movies and television programs and listening to music were correlated weakly to first year and second year learners. There were no correlations found between reading books and social communication with lexical variation for all three levels of learners. The results raised serious concern among EFL learners and teachers alike who intend to make a beeline for improving the use of language through incidental learning.

There are three important pedagogical implications of the present study. When learning or teaching the collocational knowledge of target words, it would be very useful to include information, i.e., morphological variation, that might help learners to use them productively in writing. The weak correlation between the receptive knowledge of collocation and lexical variation reveals the difficulties that learners have in translating the receptive knowledge into the productive use in free writing. Stengers, Boers, Housen and Eyckmans (2011) attributed this difficulty to the ways

that collocations are represented in mind. They argued that it would be important to elaborate on the variation of the “canonical form” that learners store in their mental lexicon. This would especially be the case for collocations with verbs, which are renowned for its multiple morphological variations (Laufer, 2011). Teachers and learners might use the dictionary entries of the node words to teach the collocates of the words to entrench the various morphological forms in learners’ memory. For example, when learners encounter the new word entrench, the morphological variations like entrenches, entrenched, entrenchment could be elaborated to help learners understand these forms to use them in writing with confidence.

The second pedagogical implication is the important to teach the mid-frequency words explicitly, especially the words at 5,000 word level, to tertiary learners. The present study showed that words at this level are quite useful for improving the variety of words in writing. The tertiary learners were at a stage when they have acquired the most frequent words at 2,000 and 3,000 word level and aspired to move on to academic study at postgraduate level. Mid-frequency words would be especially useful for them at this stage of learning. Zhang and Liu (2015) investigated the lexical coverage of the major textbooks for tertiary learners in China. They found out that, for the three textbooks that were used by the majority of Chinese universities, the target vocabulary size was 2,976, 4148 and 3501 respectively. These were well below the 5,000 word level. In addition, the frequency of occurrence of the vocabulary in the three textbooks was quite similar. Around 30% of the words only appeared twice in the two years of study. These findings suggest that the textbooks that learners use

could hardly satisfy their needs for vocabulary learning. Teachers and learners alike might need to put serious efforts on expanding their vocabulary size using supplementary materials from extra-curriculum resources.

The last pedagogical implication concerns the need for guidance on the English-medium activities outside classrooms to increase the possibility for incidental learning. Learners need to be aware of the possible factors that might influence incidental learning efficiency, for example, the frequency of occurrence, learning strategies and quality of engagement. In the selection of books for reading or TV series to watch, it would be beneficial to select the same author's book series, books of the same genre to improve the frequency of occurrence of vocabulary items (Chang, 2016). The same method applies to TV series. The related TV programs in the similar genre would have a greater likelihood of providing a greater frequency of repetition in word use (Webb, 2011). In addition, the total amount of exposure to English through reading and watching matters. Webb (2010) analyzed the coverage of words in 70 movies and found out that the percentage of vocabulary encountered for ten times for more would significantly increase for the composite 70 movies. To witness significant improvement in incidental learning takes much longer period considering the current amount of exposure to English outside classrooms indicated by the participants. Teachers might step in and guide tertiary learners in organizing the English-medium activities outside classrooms, at least at the initial stage, rather than let learners grope in the darkness.<sup>1</sup>

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<sup>1</sup> Part of this chapter has been revised and submitted as a journal article entitled "The relationship between vocabulary knowledge and use of Chinese tertiary learners".

## Chapter Four A Follow-up Investigation into the Use of Collocations in Learner Writing

### 4.1 Introduction

We saw in chapter 3 that the knowledge of collocations has little contribution to the quality of word use in writing. However, research in applied linguistics has found collocations, as part of the formulaic language, to be an important target of second language learning. There is a surge of studies into the research of collocations in L1 and L2 writing (for a review, see Wray, 2012). The growing interest into collocations rests on the belief that multi-word units are pervasive in language (Biber & Conrad, 1999; Erman & Warren, 2000; Foster, 2001). Being part of the formulaic sequences, collocations could ease the processing load of the interlocutors to facilitate the comprehension of conversations (Wray, 2002, 2012). Schmitt and Carter (2004) had an extensive elaboration on the functions of formulaic sequences as realizing communicative function, maintaining social interactions, realizing discourse organization, and facilitating the transaction of information in an efficient and precise manner. It is no wonder that collocations are of the central role for language learning since the purpose of the learning is to help learners become well-equipped with ample ability to communicate in the target language to be accepted as a member of the specific social communities.

The results in chapter three have raised a question on the possible reason for the low correlation between the knowledge of the collocation and lexical quality in

writing. It is likely that the improvement in the knowledge of collocations for learners could not witness corresponding improvement in the use of collocations in writing. Both cross-sectional and longitudinal studies into the use of collocations in second language learners' oral and written production have identified that even advanced learners encounter difficulties in using a wide range of lower-frequency collocations (Durrant & Schmitt, 2009; Levitzky-Aviad & Laufer, 2013; Qi & Ding, 2011). When they use collocations, they are prone to use erroneous collocations in native speakers' judgment (Laufer & Waldman, 2011). The diverse definitions of collocations and multiword units adopted in the studies into the use of collocations in learner writing made it hard to generalize the conclusions to the greater context. There are still many questions about how L2 learners use collocations in writing and how the use of collocations responds to the changes in proficiency levels. Although the quantitative analysis into the collocations in learner writing can reveal the pattern of the usage, it could not replicate the learning experience of individual learners. Perhaps an equally useful path is to enquire into the factors that have contributed to the use of collocations in writing.

In this chapter, I aim to answer the questions left by chapter 3 and explore the use of collocations in learner writing in detail. I used the learner writing collected in chapter 3 as the baseline data for analyzing the use of collocations. At the same time, I interviewed some of the learners who have written the compositions to reflect upon their use of the collocations during the writing process. It is hoped that, by combining quantitative and qualitative methods to investigate the use of collocations, we will

gain a clearer idea of what is in the corpus of learner writing and what the individual learners experience. Section 4.2 reviews existing studies that have explored the use of collocations in native speaker and learner writing. We will see that the development in the use of collocations for Chinese tertiary learners across years of study is not yet clear. Also, what individual learners experience and how they choose collocations to use in writing are not clear. Section 4.3 introduces the methods that are used to explore the use of collocations in the composition written by learners. I used the Corpus of Contemporary American English (COCA) to retrieve the frequency and mutual information of collocations in learner writing. Subsequently, I interviewed part of the learners to reflect upon the use of collocations in the writing process. Section 4.4 reports the findings of the study, and section 4.5 discusses the major findings of the study with special focus on the awareness of association strength among learners.

## 4.2 Literature review

### 4.2.1 Importance of collocations

The mastery of the knowledge of multi-word units has been seen as the benchmark for language proficiency and native-like language (Boers, et al. 2006; Keshavarz & Salimi, 2007; Laufer & Waldman, 2011; Stengers, Boers, Housen & Eyckmans, 2010). The importance of collocations has been manifested from a large body of research in the fields of applied linguistics and psycholinguistics. The two fields have explored the pervasiveness of collocations in language, its close relation

with language proficiency, the facilitation of comprehension of input and writing, and the processing advantage as opposed to non-formulaic language.

Conklin and Schmitt (2012) observed that one-third to one-half of the discourse is formulaic by reviewing the existing literature on the use of formulaic language in both spoken and written discourse in academic and non-academic corpus. Studies into the formulaic language have covered a wide range of multi-word units including collocations (e.g., Erman & Warren, 2000; Howarth, 1998; Rayson, 2008). Most of these studies that Conklin and Schmitt reviewed were based on the results in the discourse of native speakers' corpora.

Foster (2001) made a comparison between the occurrence of formulaic language in native speakers' and non-native speakers' planned and unplanned speech. The findings revealed that, in unplanned speech data, the occurrence of the formulaic language of non-native speakers was half as much as the native speakers (16% of the non-native speakers' discourse and 32% of the native speakers' discourse). Foster's study showed that the occurrence of formulaic language was remarkably fewer in non-native speakers' discourse than the native speakers. It is difficult to make an exact comparison between the coverage of collocations of native and non-native speakers in his study due to methodological issues. He analyzed formulaic language, which covers much wider categories beyond collocations. We could at least make an inference that the coverage of collocations in non-native speakers' speech discourse was much lower than the native speakers.

Being pervasive in language, the knowledge of collocations is related significantly



to language proficiency. Previous studies have found a significant correlation, ranging from  $r = .46$  to  $r = .65$ , between knowledge of collocations and language proficiency (Boers, et al. 2006; Dai & Ding, 2010; Hsu & Chiu, 2008; Keshavarz & Salimi, 2007; Stengers, Housen & Eyckmans, 2010, 2011). The differences in the strength of relation were due to the definition of formulaic sequences, type of test for the language proficiency, and the direction of the test. The correlation between the receptive knowledge of collocation and language proficiency is stronger than the correlation between the productive use of the collocation and language proficiency.

As part of the experimental test into the effectiveness of text memorization, Dai and Ding (2010) measured the relationship between the types and tokens of the formulaic language used in the writing of undergraduate Chinese learners of English and the holistic score of the writing given by experienced writing teachers. In their study, they retrieved idioms, phrases, and collocations in the students' writing. They found a moderate ( $r = .46$ ) correlation between the tokens of the formulaic languages and the holistic grade of the writing. Hsu and Chiu (2008) used fill-in-the-blank two-word collocation test to measure the knowledge of collocation of Taiwanese EFL learners and found the significant correlation between collocational knowledge and the speaking tests ( $r = -.561$ ). However, they found no significant correlation between the use of collocations in speaking tests and the overall score of the tests ( $r = .253$ ,  $p = .60$ ).

The difference in the strength of correlation between collocation and language proficiency in the findings of two studies is possibly due to the collocations selection

criteria. Dai and Ding included idioms, phrases, and collocations in the study, whereas, Hsu and Chiu only included two-word collocations. Although Hsu and Chiu didn't provide the information on the type and token of collocations in each talk, it is possible that the number of the collocations used in each talk was too small to establish a significant correlation (Levitzky-Aviad & Laufer, 2013). The low and insignificant correlation between the use of collocations and the holistic score of the tests consonated with learners' difficulties in using collocations in productive ways.

Using a lexical approach to observe the improvement in L2 learners' oral proficiency, Boers et al. (2006) examined the correlation between the formulaic sequences used in the oral production and the overall oral proficiency score provided by two blind judges (experienced EFL teachers of English) at the end of 22 hours' tuition. They found that the correlation between the use of formulaic sequences and oral proficiency scores were about 30% and 60% respectively for the control and experimental group. They concluded that using formulaic sequences (including combinations like collocations and idioms) could help learners improve the fluency in interviews and show greater "nativeness" in their language. Their results are rather encouraging in showing that, after the instruction of awareness-raising and exposure to authentic texts, the learners' use of formulaic sequences in language production could be greatly improved, and therefore, showed greater correlation with language proficiency.

The literature on the processing advantages of formulaic language is anchored in psycholinguistic and neurolinguistic research of young and adult native speakers. The

research uses a range of reading, speaking, listening, comprehension and recall tasks in controlled lab conditions with two words, three words and four words strings (Arnon & Snider, 2010; Bannard & Matthews, 2008; Bod, 2001,2002; Sosa & MacFarland, 2002; Tremblay & Baayen, 2010; Trembeley, Derwing, Libben & Westbury, 2011).

These studies have laid a solid proof of the processing advantage of formulaic language over non-formulaic language for native speakers. The literature on the processing advantage of formulaic language by L2 learners is rather scarce compared to the proliferate body of research on L1 speakers. Jiang and Nekrasova (2011) examined the representation and processing of formulaic language of both native and highly proficient non-native speakers, i.e., postgraduate students enrolled in an American university, using two online grammaticality judgment experiments. The results found that, although the response time of proficient non-native speakers was noticeably longer than that of the native speakers, both groups showed processing advantages for formulaic sequences.

While this study showed the processing advantage of formulaic sequence for proficient L2 learners, another study by Siyanova-Chanturia, Conklin, and Schmitt (2011) revealed a more complex picture. Using eye-tracking, Siyanova-Chanturia, Conklin, and Schmitt (2011) examined the processing speed for figurative meaning and literal meaning of idioms and novel phrases of native speakers and proficiency non-native speakers of English in an online story-reading task. The results revealed that not only did proficient non-native speakers process idioms much slower than

native speakers; they also demonstrated different patterns of processing. Although this study lent supports to the processing advantage of idioms for native speakers, they didn't find such advantage for proficient non-native speakers. Non-native speakers seemed to process idioms and novel phrases at a similar rate.

The difference results from the two studies could be very likely due to the differences in the target item selection and the complexity of tasks. While Jiang and Nekrasova (2007) chose three words to five words lexical bundles with transparent meanings, Siyanova, Conklin, and Schmitt (2011) chose idioms with figurative meaning. Non-native speakers have been found to have difficulties comprehending the figurative meaning in idioms and phrasal verbs (Cieslick, 2006; Matlock & Heredia, 2002). Also, Siyanova, Conklin, and Schmitt (2011) used reading tasks with idioms embedded for comprehension of the stories, which is more demanding than the grammaticality judgment experiment in Jiang and Nekrasova (2007). The results of the two studies suggest that the processing advantage is not so prominent for L2 learners and the degree of the advantage is subject to a great extent on the type of formulaic sequences chosen in the study. Even highly proficiency non-native speakers could not show consistent processing advantage of formulaic sequences. Since some of the items included in Jiang and Nekrasova were collocations, I could infer that there is some processing advantage for collocations for non-native speakers. However, the lack of item analysis in the study restricts the extent to which I could rely on this inference.

Formulaic sequences have been found to facilitate the comprehension of input and

learning writing (Boers & Lindstromberg, 2012; Bestgen & Granger, 2014). This advantage could be partially due to the processing advantage of formulaic sequences. Formulaic sequences could help readers with faster reading speed and better comprehension when greater psychological resources could be allocated to other online processing tasks. Coxhead and Byrd (2007:134-135) summarized two reasons that formulaic sequences should be included in teaching writing. The two reasons were based on findings using corpus data to highlight the facilitation effects of the sequences on writing for language learners: (1) using the ready-made sets of words is easier than creating every word in a sentence one by one; (2) using formulaic sequences can improve the fluency of writing, and it is a defining feature of native-like language.

The facilitative effect of collocations on writing could be supported by empirical evidence which showed that the improvement in the use of collocations could lead to better performance in writing (Li, 2014). Li (2014) used classroom experiment to compare the writing performance of two undergraduate classes after a semester' instruction. The experimental class received instruction with a clear highlight on formulaic sequences, while the control class received traditional instruction. The experimental group significantly outperformed the control group in the post-test of composition writing.

However, for second language learners, the facilitative effect may not always be assumed. Besides the difficulties in using collocations, another problem that learners face when reading is that they over-estimate their ability to comprehend the sequences

in the input. Martinez and Murphy (2011) has illustrated this problem in their study. They tested Brazilian learners of English on their reading comprehension of two edited reading texts. Participants were asked to read two passages that included the same most frequency 2000 words in English. One text included formulaic sequences made up of most frequent 2000 words. The results of the post-reading comprehension questions showed that the mean score of the comprehension questions on the text including the formulaic sequences was significantly lower. And the actual comprehension of the text with formulaic sequences was much lower than the participants' self-reported comprehension. The results of the study suggested that learners have problems understanding the formulaic sequences in the reading text, and at the same time, they overestimate their understanding of these sequences. Although the study didn't intentionally test the difficulties that collocations have created for learners in reading, it included both collocations with transparent and idiomatic meanings in the text. For example, know one's place was a collocation with idiomatic meanings, while buy nice things was transparent. It could be inferred that collocations with less transparent meanings could also be detrimental to the comprehension of input. And learners should be aware of these collocations with high frequency words but idiomatic meanings.

The research on the importance of collocations has shown that the well-grounded advantage of collocations in L1 literature could not be consistently found in L2 research. The coverage of collocations in L2 learners' speech and writing texts is much lower than the native speakers'. As such, there is a much weaker correlation

between collocations and language proficiency. The processing advantage of collocations shows inconsistent results depending on the degree of transparency of collocation, even for highly proficient L2 learners. The facilitative effect of collocation on reading is also subject to the type of collocations in the reading text. These results accentuate the need to look at the collocations in learners' language production to explore the extent to which they make use of collocations, and understand the problems that learners have when producing the collocations across different proficiency levels.

#### 4.2.2 The definition of collocations

The definition of collocations is a fundamental issue in studies into the use of collocations. It directly influences the identification and categorization of collocations. Collocations are regarded as one type in the broad category of formulaic sequences, and many studies posit it at the intermediate part of the continuum of formulaic sequences regarding flexibility, compositionality and productivity (Henrisken, 2013; Nattinger & DeCarrico, 1992). The studies into the use of collocations in the field of second language acquisitions fall into two taxonomies: the phraseological approach and the corpus-based frequency approach.

The phraseological approach defines collocations regarding the syntactic and semantic analysis of the node words and collocates. It is commonly adopted to analyze the collocations in written texts, using semantic opacity and form fixedness as criteria (Cowie, 1998; Howarth, 1998). This approach allows great room for freedom

in defining collocations. Nation (2001:56) defined collocation quite loosely as “words it typically occurs with,” covering a wide range of multi-word combination ranging from idioms, like kick the bucket, to a fixed sequence of words, like to and fro. What I learned from this definition is that collocation includes a node word and more than one collocates. There is not much information beyond this on the restriction of the collocates, the degree of transparency in the meaning and the syntactic structure of the collocational units. Nesselbauf (2003) narrowed down the definition and operationalized collocations as a node word and one collocate with the fixedness of the collocate and the restriction of specific contexts.

Laufer and Waldman (2011:648) offered a more clearly stated definition of collocations as: ...habitually occurring lexical combinations that are characterized by restricted co-occurrence of elements and relative transparency of meaning. Restricted co-occurrence distinguishes collocations from free combinations in which the individual words are easily replaceable following the rules of grammar. Relative semantic transparency of collocations, on the other hand, distinguishes them from idioms whose meaning is much less transparent...”. In this definition, multiword units like transfer money are regarded as collocation, while, pay money is not. Since, although the latter one is grammatically correct, it is not usually used together. Regarding semantic transparency, kick the ball is much clearer in meaning than kick the bucket, which is an idiom that means pass away.

Another approach to defining collocations based on the probability of frequency of co-occurrence of collocates in corpus (e.g. Durrant & Schmitt, 2009; Lorenz, 1999;



Siyanova & Schmitt, 2008). In this line of research, collocation is defined as “the relationship a lexical item has with items that appear with greater than random probability in its (textual) context” (Hoey, 1991:7). The two words can be considered as collocates if they occur together more frequent than chance could predict (Jones & Sinclair, 1974). This frequency-based definition of collocations is more objective than the phraseological approach in that it “makes fewer theoretical assumptions” (Biber, 2009:276) by using objective frequency information to identify collocations. Studies in this line of research often use the frequency-based measurement of collocations (t-score) and associate strength (MI score) to investigate the collocations. A purely quantitative criterion in this line of research is to extract n-grams (with the minimum of 2 words) to measure the collocations, in many cases multi-word units, used in learner writing (Chen & Baker, 2010; Granger & Bestgen, 2014; Ping, 2009).

These two major approaches to defining collocations both have advantages and disadvantages. As mentioned in the review of the definitions, the phraseological approach is a subjective kind of definition while the frequency-based approach offers a more objective way of defining collocations regarding frequency and span. Being quite subjective in identifying the collocations, the phraseological approach runs the danger of identifying collocations that have semantic relatedness yet being too infrequent to be useful for second language learners (Henrisken, 2013). Howarth (1998) cautioned that defining collocations purely based on frequency information would only look at the performance and ignore the importance of competence in the process of using collocations. He cautioned that the memory storage and mental

processing of the collocations are worthwhile of attention. It is very likely that the frequency-based approach, especially the purely quantitative approach of n-grams may identify collocations that are not accepted by native speakers, such as that of and is not.

There are a few studies that have used combined approaches in defining collocations with native speaker's judgment. Hsu and Chiu (2008) provided a very vague and brief description on their definition of collocations. The definition was based on the appearance in the online corpora and the acceptance of two native speakers' judgment. Levitzky-Aviad and Laufer (2013) used dictionary as reference for identifying collocations. In their procedures, they followed Nesselbauf (2003) in using phraseological approach to defining collocations when retrieving verb-noun and adjective-noun collocations from learner writing. After retrieval, they used British and American English dictionaries to screen the pool of collocations and only retain those appeared in the dictionaries. They claimed that the collocations in these dictionaries were based on native speakers' corpora, and therefore, could reflect the real use of language. However, native speakers' judgment can be inconsistent and not always reliable (Foster, 2001; Siyanova & Spina, 2015). The reliability could be improved by matching the academic background of the native speakers' and the study, yet, it could always subject to reliability issues.

In light of these disadvantages, there are recent studies now that adopt a midway between the phraseological approach and frequency-based approach and take a hybrid approach in defining collocations. Szudarski and Carter (2014:7) defined the

collocations as “word partnerships that frequently co-occur within a given word span and are characterized by specific degrees of fixedness.” They have chosen two-word verb-noun and adjective-noun collocations with different levels of frequency, measured by raw frequency of collocates and the mutual information of the collocations. The target items were infrequent nouns based on the frequency information in BNC, and the collocates were highly frequency verb and adjective. The mutual information of these collocations identified that there were strong collocations (>3).

#### 4.2.3 The use of collocations in learner speech and writing

The recent introduction of learner corpus has contributed to our understanding of L2 learners’ use of collocation with larger language samples collected from learners from various L1 backgrounds and proficiency levels (Paquot & Granger, 2012). The emergence of corpora has benefited research into collocations in some ways. The concordance extracted from the corpora could be used to facilitate learning of collocations (Chan & Liu, 2005; Sun & Wang, 2003); and the availability of large native speakers’ corpora could be used to retrieve frequency lists of collocations to provide pedagogical support for L2 learners (Gardner & Davies, 2007; Shin & Nation, 2008). The concordance of collocates sheds light on the linguistic features and properties of collocations that could inform the L2 learning (Walker, 2011). Learner corpus open door for error analysis and the observation on the usage pattern of collocations among L2 learners (Laufer&Waldman, 2011; Nesselhauf, 2005; Wei &

Lei, 2011).

Our understanding of the use of collocations by learners from diverse L1 backgrounds has improved greatly recently thanks to the introduction of learner corpus into applied linguistic research (e.g., Altenberg & Granger, 2001; Cobb, 2003; Cross & Papp, 2008; Durrant & Schmitt, 2009; Howarth, 1996; Laufer & Waldman, 2011; Nesselbauf, 2003). However, a direct comparison of the results of the abovementioned studies may not be possible due to the diverse methodology used in the studies, for example, the collocational type studied, the retrieval methods of the collocations and the analysis of collocations. In this part, I will discuss these major factors that play essential roles in the studies into the use of collocations in learner writing and the major findings of previous studies.

#### 4.2.3.1 Grammatical combinations of collocations

Verb-noun, adjective-noun and noun-noun collocations are the three types of collocations that are most frequently studied in applied linguistic research (e.g., Altenberg & Granger, 2001; Durrant & Schmitt, 2009; Lennon, 1996; Nesselhauf, 2005). The underlying reasons for exploring collocations with these three grammatical combinations are two folds. First, the majority of the collocations in learners writing falls into these three categories (Hsu, 2007; Levitzky-Aviad & Laufer, 2013). Second, extracting directly adjacent collocations of these three categories make it easier to make comparisons between studies (Durrant & Schmitt, 2009). The target of the quest includes both combinations that are rated as strong collocations

based on the native speakers' reference corpus, like swimming pool, human being, alcoholic beverage, raining season (Bestgen & Granger, 2014), and creative combinations, which is often not accepted by native speakers, yet are quite often found in learner writing, like manage life, enlarge opinion, learn children (Laufer & Waldman, 2011). Although studies investigate multiple types of collocations in research, they report the merged findings (Durrant & Schmitt, 2009; Levitzky-Avid & Laufer, 2013). Treating the different combinations as separate categories could reveal the fine differences in the use of collocations of distinct categories.

In a small-scale study, Hsu (2007) collected the online writing of 62 Taiwanese English learners on a given topic and retrieved five types of collocations from the learner writing, including verb-noun, adjective-noun, noun-noun, adverb-adjective, and verb-adverb. He found that three categories (verb-noun, adjective-noun, noun-noun) showed a variance in the strength of correlation with overall writing performance measured by holistic scores of the writing ( $r = .749$  for verb-noun,  $r = .701$  for adjective-noun and  $r = .327$  for noun-noun).

Granger and Bestgen (2014) examined four kinds of directly adjacent two-words sequences (bi-grams), i.e., premodifier-noun, noun-noun, adjective-noun and adverb-adjective, based on 223 graded texts written by intermediate and advanced learners of English retrieved from International Corpus of Learner English (ICLE). They reported that, when comparing the use of collocations in intermediate learner texts and advanced learner texts, the results for noun-noun and adjective-noun were quite different. The results showed that advanced learners were able to use significantly

more highly associated collocations (attested by MI score, higher than 7), fewer lowly associated adjective-noun collocations (attested by MI score, higher than 3 and lower than 5) and fewer non-collocational combinations (MI score lower than 3) than the intermediate learners. There was only one significant difference found between the two groups of learners regarding noun-noun collocations. The advanced learners used more highly associated noun-noun collocations (MI score higher than 7) than intermediate learners. They concluded by stating that merging the categories would run the risk of overlooking the fine differences in the development of collocation use.

There are two implications based on the findings of the two studies. Firstly, the three types of collocations (verb-noun, adjective-noun, noun-noun) demonstrated close and positive relationship with the overall writing performance. Exploring the use of these types of collocations in learner writing could have significant implications on the writing performance of learners. The present study intends to examine the use of these types of collocations in learner writing at different proficiency levels. Secondly, research should investigate and analyze different types of collocations separately. Granger and Bestgen (2014) have shown that intermediate and advanced learners demonstrated different use patterns depending on the grammatical combinations of collocations. It could be explained by previous studies which showed that different grammatical combinations pose different levels of difficulties in learning (Laufer & Waldman, 2011; Nesselbauf, 2003; Peters, 2016; Waibel, 2007). It seems that verb- noun collocations, especially collocations with phrasal verbs, poses great difficulties for learners during the learning process. It is

quite possible that other types of collocations, i.e., noun-noun, and adjective-noun, also pose different levels of learning burden. Therefore, studies need to explore the use of collocations in learner writing with separate analysis for different types of collocations to improve the sensitivity of the results.

#### 4.2.3.2 Methods of retrieving collocations

The methods used to retrieve collocations from learner production is another major difference in existing studies. The first one is the top-down approach, in which a list of high-frequency node words, or specifically chosen node words, are retrieved from the corpus. Then, corpora are used to create a list of concordance of the node words (Deng & Xiao, 2005; Laufer & Waldman, 2011; Liu, 2010; Sun, 2006; Xia, Xia & Li, 2014; Wang & Zhou, 2009). The other approach is the bottom-up approach. In this approach, researchers retrieve collocations directly from learner speech and writing (Bestgen & Granger, 2014; Chen & Baker, 2010; Darvishi, 2011; He & Liang, 2010; Hsu, 2007; Namvar, Ibrahim & Mustafa, 2012; O'Donnell, Romer & Ellis, 2013; Siyanova-Chanturia, 2015a; Zheng & Xiao, 2015).

The top-down approach usually focuses on a few highly frequent keywords. It explores the types of collocates used by learners at different proficiency levels, and compares the collocates of learners to that of the native speakers to study the differences in the collocates qualitatively. The purpose of using the top-down approach is mostly to compare the use of collocations of the same node words between learners and native speakers, identify possible similarity and variance in the

collocates and find out the intra-linguistic and inter-linguistic factors that have caused the variance.

Laufer and Waldman (2011) compared the verb-noun collocations in the corpus of Israeli learners of English to collocations in the native speaker corpus of Louvain Corpus of Native English Essays (LOCNESS). The Israelis learner writing including argumentation and essays were written by learners from junior secondary school (basic level), high school (intermediate level) and college (advanced level). They retrieved 220 highly frequent nouns from the LOCNESS with the cut-off point at 20 occurrences, and built the concordance for each noun. Then, they verified the verb-noun collocations in English dictionary and retained those found in the dictionary. The similar procedure was carried out for collocations in learner writing and native speaker writing. The collocations which failed to be found in English dictionary were rated by Israeli teachers to identify the potential L1 influence. Their findings showed that the total number of verb-noun collocations in learner writing (basic, intermediate and advanced learners combined) were only half as many as the collocations used by native speakers. Although advanced learners used significantly more collocations in writing than the other two levels of learners, the erroneous collocations of the advanced learners were also significantly more. They concluded that “not only is there no decrease in the number of errors with a growth of proficiency, but also there is an inverse relationship between proficiency and correctness of collocations” (pp.663).

Most studies into collocations of Chinese learners use a more restricted list of



node words to explore the collocates and study the patterns in the collocations. In a study into Chinese learner writing, Sun (2006) analyzed the concordance of the node words problem, ability, and idea in Chinese Learners of English Corpus (CLEC), including three levels of learner writing from high school learners, year 1-2 college learners, and year 3-4 learners, and argumentations in LOCNESS. The study used frequency-based Z-score to identify significant collocations and analyze the verb-noun and adjective- noun collocates of the node words problem, ability and idea. She intended to identify the variety of the collocates used by learners at different proficiency levels and the degree of overlap in the collocates used in the CLEC and LOCNESS. Sun (2006) found out that, with the development of proficiency, there is greater overlap in the collocates of the problem between learners and native speakers. She concluded by stating that advanced learners could use collocations in a more native-like manner.

The top-down approach explores the collocates of the node words in great depth, especially in the case of studies like Sun (2006) in which there was a few nodes word chosen for the study. By examining the similarity and differences between the collocates used by language learners and native speakers, researchers could see the differences between learners of different proficiency and the differences between learners and native speakers.

The depth of the investigation of the top-down approach is where its weakness lies. The number of collocations examined in research using top-down approach is rather limited compared to that of the bottom-up approach. The majority of studies in top-

down approach are qualitative and cover the collocations of two to three keywords. For example, Liu (2010) examined qualitatively the collocates of three words, i.e., ability, work, and trip and identified about 60 collocations, based on which he carried out a detailed analysis of the difference between four delexicalized collocates (take, make, have, do) of the node word trip. The qualitative analysis in top-down approach could reveal valuable findings on the potential cause of the variance, in the collocates of the node words in the native and non-native writing. However, the findings of these research are limited in helping us understand the extent to which learners use collocations in their writing.

The bottom-up approach has been used by researchers to neutralize this weakness by retrieving different types of collocations from learner writing without the limitation of prescribed node words. Levitzky-Aviad and Laufer (2013) created a small corpus of Israeli learner writing with 290 compositions from eight different levels of proficiency (7 consecutive grades in secondary school and high school and the first year in college). They identified verb-noun and adjective-noun collocations in learners' written texts manually. Once a collocation was identified, it was screened using two dictionaries (Longman and Oxford) and Davis and Gardener's word frequency list of American English (2010). If the collocations were identified in either of the three sources, it would be considered as collocations. The study did not provide the information on the total number of the collocations retrieved from the written texts. Instead, it reported the mean number of collocation types in 200-word written texts. Israeli learners consistently increased the number of collocations used in their writing.

The mean number increased from the average of 15 collocation types per writing for grade 6 learners to 39 collocation types per writing for first-year English major learners. The study showed that it needed six years or longer to witness significant increase in the number of collocations used in learner writing. The number of collocation types used by first-year college learners was significantly more than those produced by learners in secondary schools and high schools.

Through retrieving greater numbers of collocations, bottom-up approach reflects the improvement in learners' use of collocations more objectively. However, there are two problems with the Levitzky-Aviad and Laufer's research. The first problem is that collocations in their study were identified based on dictionary and word lists. This procedure raises a question on the definitions and criteria that have been adopted by the dictionaries and word lists. It is possible that a large number of collocations in learner writing may not be included in the analysis if the collocations fail to meet the native speakers' standard. Analyzing this group of collocations with error analysis would enrich the understanding of the interlingual and intralingual problems that learners encounter when using collocations (Darvishi, 2011, Hong, Rahim, Hua & Salehuddin, 2012; Thewissen, 2013).

The second problem is that there is no further information in the collocations beside the mean number of collocational types in learner writing. The number of collocations used provides limited information on the quality of the collocations used in the written texts. There is not much information about the collocations used in the study other than that learners are using more of them. I discuss this issues in the next

part when we review the types of measures used to analyze the collocations retrieved from learner writing.

#### 4.2.3.4 Analysis of collocations in learner writing

The methods that research uses to analyze the collocations in learning writing contributes to the differences between existing studies. The vast body of research on collocational use has adopted different ways to analyze the collocations in learner speech and writing. The analysis is based on the number of collocations in writing (Chen & Baker, 2010; Levitzky-Aviad & Laufer, 2013), the native speakers' judgment (Foster, 2001; Laufer & Waldman, 2011), the frequency occurrence of collocations in learner corpus and native speaker corpus (Deng & Xiao, 2005; Groom, 2009; Ma, 2009; Siyanova & Schmitt, 2008; Wang & Zhang, 2006; Xu, 2010), and the associate strength between collocates in a reference corpus (Bestgen & Granger, 2014; Durrant & Schmitt, 2009; Granger & Bestgen, 2014; Lorenz, 1999; Siyanova & Schmitt, 2008; Siyanova- Chanturia, 2015a). The frequency-based data analysis was favored by researchers for both the objectivity in the analysis and the relevance of frequency of occurrence to the “naturalness” of the collocations in language (Hoey, 2005).

The frequency-based analysis has been used by researchers to compare the frequency of occurrence of collocations in learner corpus and native speaker corpus to identify the overuse and underuse of collocations. Xu (2010) retrieved 1079 lexical bundles from the 327 compositions (average number of words per writing is 492

words) written by first-year postgraduate students in a Chinese university. Among these 1079 lexical bundles, there were 356 two-words bundles, 610 three-words bundles, and 113 four-words bundles. The study provided the total frequency of lexical bundles tokens in the compositions and calculated the percentage of each type of lexical bundles (verb bundles, adjective bundles, adverbial bundles, prepositional bundles, noun bundles and bundles of function words). The study showed that the average frequency of occurrence of the lexical bundles is nine times. He also analyzed the appearance of lexical bundles in learner writing and found out that, of the 1079 lexical bundles, 36.4% were used by only one composition.

The study provided an ambiguous range of compositions to illustrate the appearance of lexical bundles. For example, he reported that 1068 lexical bundles were used by 1 to 99 compositions, which made up about 99% of all the lexical bundles retrieved from writing. Xu concluded that the lexical bundles were not pervasive in learner writing since the majority of the lexical bundles were only used by less than 100 writings. Learners underused lexical bundles and the variety of bundles were rather limited in the writings.

This study was helpful in enlightening us on how learners make use of lexical bundles in their writing. However, it is limited to the extent that it could reveal the frequency information of the lexical bundles used in English without the supplementary information of a native speaker's reference corpus. Also, there is very limited information on individual writing beyond the findings that the majority of the lexical bundle types were in less than 100 compositions. Without the proper

information provided on individual writing, we have very little knowledge on the extent to which lexical bundles were in the remaining 200 compositions.

The first problem was addressed to some extent by the other two studies on the use of lexical bundles of Chinese learner writing (Ma, 2009; Wang & Zhang, 2006). The two studies compared the frequency information on the use of lexical bundles between learner writing and native speaker corpus. The analysis was based on counting the number of lexical bundles in each frequency band in learner writing and compare that to native speaker corpus. For example, Ma (2009) compared the number of lexical bundles used by Chinese learners which were used for more than 50 times per million words in native speaker writing (including sample writing piece of exposition in English writing textbooks). She found out that 83.85% of lexical bundles in native speaker writing occurred more than 50 times per 1 million words. However, only 30% of lexical bundles in learner writing fall into this band. The second issue has remained to be explored.

More recently, frequency information measuring the association strength between collocates in a large reference corpus has been used by a new line of study. These studies move beyond the overuse and underuse of collocations to examine the proportion of the low frequency and high-frequency collocations used by learners. Lorenz (1999) was the first study to use the frequency-based information on association strength (attested by t-score and MI score) to measure the use of collocations in learner writing. However, the calculation of association strength in his study was based solely on learner writing. Lorenz (1999) reflected that the association

strength in his study could only reveal how learners use collocations in their writing.

Later studies improved at this point to use native speaker corpus as reference corpus to retrieve frequency information. Siyanova and Schmitt (2008) analyzed the frequency of occurrence and association strength (attested by MI score) of adjective-noun collocations in Russian sub-corpus the International Corpus of Learner English (ICLE) and native speaker corpus of the LOCNESS. They retrieved 810 adjective-noun collocations manually from Russian sub-corpus and 806 adjective-noun collocations from native essays. They found that learner writing and native speakers essays were comparable regarding the distribution of the frequency of the collocation in the reference corpus of British National Corpus (BNC) and the proportion of strongly correlated collocations that are above the threshold of MI score. They concluded that the Russian learners used collocations in a manner comparable to that of the native speakers. The results of this small-scale study differed from previous studies which illustrated learners' difficulties in using collocations regarding the number of collocations in writing. However, the results of their study should be interpreted with caution since the sample size is rather small (810 adjective-noun collocations from writings of 31 Russian learners).

There are three possible improvements on Siyanova and Schmitt (2008). The first one is to examine more types of collocations than adjective-noun collocations. As I have discussed in the previous parts, different types of collocations pose variant learning burdens on learners. The second one is to explore learner writing with learners from stratified proficiency levels. The third improvement is that the

distribution of strong collocations in Siyanova and Schmitt could be collapsed into different bands of MI scores to make a more detailed comparison between native and non-native speaker essays.

Durrant and Schmitt (2009) analyzed 10,839 word combinations from 96 academic writing from both native speakers and learners at two word lengths (long and short essays). Compared to previous studies, there were two improvements in their study. The first improvement was that the strong collocations (with MI score higher than three) were categorized into different bands (e.g., 3-3.99, 4-4.99). The categorization allowed them to provide a clearer profile of the collocations in learner writing than the previous studies which provided a dichotomy of collocations (collocations that are above the threshold of 3 of MI score and below the threshold). In addition, they included analysis on the association strength of both individual writing and groups of learners. Analyzing individual writing could reflect the idiosyncratic use of collocations that are overlooked by the studies that explores groups of learners together. The results showed that native speakers could use more collocations with low frequency than L2 learners. In addition, they could use more collocations with stronger association strength (attested by the mutual information score). The study corroborated the findings of the previous studies on learners' underuse of collocations and provided more specific information on the type of collocations, i.e., collocations that are less frequent but strongly associated.

Summary



The wealth of studies into the use of collocations have enriched our understanding of the topic despite the variance in the methodologies between the studies. The differences in the methodology could testify whether similar conclusions could be made from studies using different methods. The results of the existing studies have pointed out two important issues. The first issue is the overuse of high frequent collocations by learners in writing compared to native speakers. The second issue is the underuse of less frequent and strongly associated collocations by learners in writing. It takes years for the significant improvement to take place in the use of collocations among learners (Levitzky-Aviad & Laufer, 2011), and even advanced learners are prone to make mistakes when using collocations (Laufer & Waldman, 2011). Although some studies (e.g., Sun, 2008) showed that advanced learners had developed a more native-like manner in using collocations, it is really hard to make conclusive remarks on the findings of these research since the scale of the studies were too small. For example, in Sun's case, the findings were based on the collocates of three chosen node words.

Several issues have arisen from the existing studies on the use of collocations in learner writing. First, it is necessary to investigate different types of collocations in learner writing, as I commented in the section of the grammatical combination of collocations retrieved in the studies. Granger and Bestgen (2014) have analyzed the use of bigrams (two-word combinations) of two levels of learner writing (intermediate level and advanced level) and showed that different types of collocations showed a variance rate of development.

Also, we could analyze learner writing from different proficiency levels to chart the developmental patterns in the collocational use (Granger & Bestgen, 2014). There are very few existing studies that have included learner writing from stratified proficiency levels. Sun (2008) used learner writing from three levels in the CLEC (high school student, 1-2 years college students and 3-4 years college students). He has chosen to take a qualitative approach and analyzed the collocates of three node words instead of examining the use of different types of collocations in learning writing quantitatively.

The third issue is that the lack of study into the collocations use of Chinese L2 learners of English from different proficiency levels with a quantitative analysis of the collocations based on frequency information. The qualitative studies into the use of lexical bundles and collocations of Chinese learner writing intended to compare the collocates of a few node words in learner writing and native speaker writing. These studies examined the resemblance and differences between the collocates as the evidence of development in the collocational use (Liu, 2010; Sun, 2006; Xia, Xia & Li, 2014; Wang & Zhou, 2009). The quantitative studies into the use of lexical bundles and collocations were primarily concerned with the number of combinations used in each frequency band of the native speaker reference corpus. The findings lend support to the overuse and underuse of collocations of a variance of frequency levels in learner writing (Ma, 2009; Wang & Zhang, 2006; Xu, 2010). It is necessary to explore the use of collocations of Chinese tertiary learners from another angle. I intend to profile the collocations in Chinese learner writing to document the

frequency and association strength of collocations. The present study covers a variety of collocations with learners from stratified proficiency levels to reflect the development of the use of collocations across years of study.

The fourth issue is the lack of study that delves into the learning sources of the collocations in learner writing and the confidence level of the learners in collocational use. Exploring these two learner-related factors in collocational use could reflect important factors in learning and producing collocations that could not be deduced from quantitative information on the collocations. Teachers and syllabus developers could benefit from the studies on the learning sources of collocations (intentional vs. incidental). The findings could inform them on the potential resources which could facilitate the acquisition of collocations and potential problems that could hamper such process. There is a prolific body of research into the effectiveness of intentional learning and incidental learning on vocabulary learning in both L1 and L2 literature in experimental settings (e.g., Nelson, 1973; Laufer, 2005; Schmitt, 2008; Webb & Kagimoto, 2011 from Peters, 2014; Barcroft& Sommer, 2005; Vidal, 2003; Eckert& Tavakoli, 2012 from Eckert& Tavakoli; Yamamoto, 2014; Freebody & Anderson, 2013; Nagy, Herman & Anderson, 1995; Zahar, Cobb & Spada, 2001). The results of these studies show that, in experimental settings, intentional and incidental learning (including mostly studies on word learning from reading) are both facilitative regarding vocabulary learning.

Another source leads to a potential gain in vocabulary in the communicative use of language in authentic language environment. Studies on children and older L2

learners have lend support to the importance of the real use of language on the learning of formulaic sequences (Adolphs & Durow, 2004; Burdelski & Cook, 2012; Fernadez & Schmitt, 2015; Li & Schmitt, 2009; Schmitt & Redwood, 2011; Siyanova & Schmitt, 2007, 2008). However, there is very little research into identifying the learning sources of the collocations used in writing. Without the knowledge on this point, understanding is quite limited on the possible sources in ordinary classroom settings in a schooling system that could very directly lead to the use of collocations in writing.

Li and Schmitt (2009) used the longitudinal design to observe the use of academic lexical bundles in the academic writing of one Chinese postgraduate student in a British university over a period of one year. They explored the changes in the lexical bundles used in writing, the sources that the learner acquired the bundles, and the confidence level of the learner when using the bundles. Through analyzing the eight essays and the dissertation written over one year, Li and Schmitt found that the coverage of lexical bundles in learner writing (an average of 4%) was much smaller compared to the percentage in native speaker writing. The learner has identified a wide variety of learning sources, i.e., intentional, incidental learning and communicative use of language, of the 319 lexical bundles type in her writing. These learning sources consisted of academic reading, feedback from native judges, peers and dictionary from her previous learning experience in China, and the academic language learning program in the UK. Over the one-year study in UK, the learner has demonstrated increasing confidence in using the lexical bundles in writing. At the end

of the study, she was confident about the 70% of the lexical bundles in her writing, while at the same time, the percentage of lexical bundles that she was not confident to use dropped to less than 1%. Li and Schmitt portrayed the gain in academic lexical bundles under the advanced learning program in the UK where there were ample academic resources for input and authentic language environment. It is still not clear about the changes of the learning sources and learner-related factors such as the confidence level in EFL learning settings. Given the importance of collocations in L2 learning and lack of studies investigating the use of collocations in writing of Chinese EFL learners, this study sets out to investigate the extent to which Chinese EFL learners from different levels of study use collocations in free writing. Research into the use of collocations of L2 learners is important because it allows us to determine the pattern of collocational use and explore the problems that learners may have to make an adjustment in teaching plan. In light of the research reviewed in this part, the study addresses the following questions:

- 1) To what extent do Chinese EFL learners use different types of collocations at different levels of study in writing?
- 3) What are the learning sources of the collocations in learner writing?
- 4) How confident are learners when they are using the collocations in writing?

#### 4.3 Methodology

Both quantitative and qualitative methods were adopted to explore the use of collocations in English learner writing, the learning source of the collocations and

learners' confidence. Learner writing from three levels of study were collected as the baseline data for analyzing the first research question. The collocations used in learner writing were manually identified, and categorized into different grammatical combinations. Corpus of Contemporary American English (COCA) was used as the reference corpus to calculate the frequency-based information of the collocations, i.e., frequency of occurrence and associate strength, retrieved from the learner writing. The second and third research questions were addressed by conducting post-writing interviews to explore the learning sources of the collocations and learners' confidence when using the collocations.

#### 4.3.1 Learner writing

The study compared the use of collocation in learner writing from three different proficiency levels. The writing was all argumentations written in usual classroom sessions. Chinese college students are familiar with this genre. Argumentation is required for all major national English proficiency examinations which are a prerequisite for college graduation. Also, it is more likely that learners would assign more attentional resources to vocabulary when they are writing in a style that they are familiar with (for detailed information on the genre and topic selection, refer to the methodology section of part one). And therefore, a fair number of collocations could be identified in writing. All of the compositions were written under the same topic, which is:

黄晓明和杨颖最近大婚。奢华的仪式让很多我羡慕不已。但也有人认为这种奢

华的仪式让大家觉得金钱堆积起来的东西才是好的。你认为是奢侈的生活方式好还是简朴的生活方式好？

(English translation: Huang Xiaomin and Yang Ying have married luxuriously recently. The luxurious ceremony attracted great attention. However, at the same time, some people believe that this type of luxurious wedding would send the wrong message to the society that only money can bring good things. In your idea, luxurious lifestyle and simple lifestyle, which one is better?)

The compositions were written by three groups of learners: first-year undergraduate students, second-year undergraduate students, and third-year undergraduate students. Since the last year of study in college was spent on working practicum, the writing of the first three years of study could be representative of the progress in English learning under formal instruction.

In total, 194 learner compositions were collected and analyzed including 65 compositions from year one students, 64 compositions from year two students and 65 compositions from year three students. Table 4.1 provides a detailed description of the learner writing.

Table 4.1 *Summary of Learner Writing*

Year	No. of texts	No. of writers	Total no. of words	Mean words/text
One	65	65	15,719	241
Two	64	64	14,758	230
three	65	65	17,413	267

#### 4.3.2 Measurement of collocation use

##### Identification of collocations

Collocations were defined in line with the “frequency-based” tradition as “the relationship a lexical item has with items that appear with greater than random probability in its (textual) context” (Hoey 1991:7). In other words, the two words were considered as collocations if they co-occurred within a given span more frequently than their individual frequencies could predict (Johnes & Sinclair, 1972). This definition aimed to identify word combinations with a frequency that indicated a “genuine collocational relationship between words” (Durrant & Schmitt, 2009: 161). Using statistical information as the sole criteria can help us to quickly identify collocations and maintain objectivity that does not rely on native speakers’ judgment and intuition. Also, I can pass over the word sequences that carry out grammatical functions with little lexical value (*in of, that of*).

When the texts were collected, I cleaned the texts by editing the spelling errors. Minor spelling errors were corrected. Minor spelling errors referred to those misspelled forms which did not interfere with the intention of the writers. For example, in a sentence, *A moderne-style city filled with commercial element*, the spelling mistake was corrected.

Three types of collocations were analyzed in the present study, i.e., verb + noun, adjective + noun, and noun + noun. These three types of collocations were chosen for three reasons. Previous studies have found out that the majority of the collocations in written texts belong to these three grammatical combinations (e.g., Durrant & Schmitt,



2009; Hsu, 2007; Levitzky-Aviad & Laufer, 2013). Focusing on these types of collocations could provide ample source of data, while at the same time, make a fair representation of learners' collocational use. Also, previous studies into non-native learners' learning and production of collocation have found that learners demonstrated unsatisfactory competence in collocations both in number and quality (e.g., Durrant & Schmitt, 2009; Levitzky-Aviad & Laufer, 2013; Peters, 2014). Lastly, studies like Granger and Bestgen (2014) have demonstrated that the developmental pattern of collocations varied with the type of collocations. Focusing on different types of collocations provides a better opportunity to examine the nuances in the developmental pattern.

The collocations of the three types were identified and retrieved manually. If the collocations were found to fall into any of the following categories, they were excluded from further analysis. There are five categories: 1) the collocations including numerical words were excluded, for example, one people; 2) the collocations including proper nouns were excluded from the study, for example, Chinese people; 3) the collocations including personal pronouns were excluded, for example, his idea; 4) the collocations which were part of the idioms were excluded, for example, old saying; 5) the collocations including direct translation from Chinese were excluded, for example, Xiao Kang society.

This study attempted to retrieve the collocations that reflected the performance of learners, and therefore, collocations that fell into the abovementioned categories were excluded from analysis. In cases when learners used literal translation to translate

idioms from Chinese to English, the idioms were excluded from analysis. This study also excluded direction quotation from analysis.

To reduce the redundancy in the data, several steps were taken to avoid including multiple collocations from one sequence. These retrieval criteria could allow us to make a comparison with the results of previous major studies into collocations (Bestgen & Granger, 2014; Durrant & Schmitt, 2009; Siyanova & Schmitt, 2008; Yoon, 2016). For nouns with more than more modifiers, I chose the adjacent modifier. For example, in *plain and warm thing*, *warm things* was chosen for analysis. For verbs with more than one nouns as subjective, I chose the adjacent noun. In cases where there were more than one nouns used as the subjective for the verb, only the directly adjacent one was chosen. For example, in *bring happiness and satisfaction*, *bring happiness* was chosen for analysis. For nouns modified by an adjective while being the premodifier for a subsequent noun, I chose two collocations. For example, in *luxurious wedding ceremony*, *luxurious wedding and wedding ceremony* were chosen for analysis.

The issue of lemmatization appeared in the process of collocation retrieval. For verbs, different morphological variations of the verb form were lemmatized to retain the base forms. This study would consider the different morphological variations of the verb- noun collocations as one collocation (e.g., *visited friend* and *visit friend* as one collocation). The plural form of the noun was also lemmatized to the singular form. This measure was taken because the singular form and plural form of the noun affect the calculation of mutual information score.

This study retrieved 6,431 collocations. In these 6,431 word pairs, 1,981 word pairs were produced by year one learners, 2,121 word pairs by year two learners and 2,329 word pairs by year three learners. Table 4.2 gives a detailed description of the total number of word pairs, the number of word pairs of the three types and an average number of word pairs in the texts of the three groups of learners.

Table 4.2 *Summary of Collocations*

Year	Total no. of collocations	Average no. of collocation per text	Total no. of VN collocations	Total no. of AdjN collocations	Total no. of NN collocations
one	1,981	31	701	1,146	134
two	2,121	33	814	1,152	155
three	2,329	37	855	1,305	169

#### 4.3.3 Calculation of frequency of occurrence and association strength

The reference corpus of Corpus of Contemporary American English (COCA) was adopted to retrieve the frequency information of collocations including frequency of occurrence and mutual information score. COCA is one of the largest and representative corpora of current English use. It includes both written and spoken texts from a wide variety of domains, and the most recent texts was collected in 2015.

The frequency of occurrence refers to the total number of times the word pairs appear together in the reference corpora. It was chosen for two reasons. First, it is an index which could objectively reflect the use of collocations in learner writing (Siyanova & Schmitt, 2008). The second reason is that this measurement was adopted widely by previous Chinese studies (e.g., Ma, 2009). And therefore, using it in this study would allow a fair comparison with previous studies.

Another measure, i.e., the association strength, was measured based on the mutual information score of the two collocates. There are several different measurements of association strength of collocations which identify collocation that co-occur more frequent than random probability (Manning & Schutze, 1999; O'Donnell, Romer & Ellis, 2013). T-score and MI score are the two most widely adopted the measure in corpus studies. However, t-score favors highly frequent word pairs, which are more closely related to the frequency measure that has been adopted in this study. While, MI score gives more weight to those word combinations that are less frequent in corpus but having a greater probability of co-occurrence (Evert, 2004). Previous studies found that

MI score was a pronounced indicator of the collocation competence (Bestgen & Granger, 2014; O'Donnell, Romer & Ellis, 2013). With these concerns in mind, this study used frequency and MI score to measure the collocations use in learner writing for complementary information provided by the two indices.

The frequency of occurrence and MI scores were obtained through the online interface ([corpus.byu.edu](http://corpus.byu.edu)) developed by Mark Davies. For verb-noun collocations, I set the verb as the node word and noun as the collocates. For adjective-noun collocations, I set the noun as the node word and adjective as the collocate. For noun-noun collocations, one noun was set as the node word and the other as the collocate. I adopted the 4:4 span (four words to the left and right of the node word), which was the default span in the online interface and the widely adopted one in collocational research. As described by Jones and Sinclair (1974), most collocates (95%) were likely to be found within this span. Once a collocation was entered in the dialogue box, the online interface could automatically provide the results of the two indices.

Past literature has suggested that collocations with mutual information score higher than three are accepted as the reliable collocations (Huston, 2002). It would be straightforward to categorize collocation below and above this threshold as “acceptable” or “unacceptable” collocations. However, two issues arose in this study that made such dichotomy unsuitable for categorizing collocations. First, there was a large number of collocations that were well below the threshold of MI score. In one extreme, this study had a fair number of collocations with negative MI scores. For example, have food, shock country. These collocations should be categorized in its

groups rather than being assigned to those collocations with a low yet positive MI score to address the subtle differences in the data. Second, there were also collocations that could not be found in the reference corpus and could not be assigned with an MI score, such as oppose wedding, chase happiness. In the same vein, these collocations should be categorized independently instead of being grouped with other collocations of different value of MI score. For these reasons, this study adopted the graded MI score categorization to address the subtle differences in the data and present the results with greater sensitivity (Evert & Krenn, 2001; Durrant & Schmitt, 2009).

Previous studies that used graded categories of MI score have adopted different categorization in term of the strong collocations (higher than 3) when profiling the collocations in learner writing. Durrant and Schmitt (2009) categorized the strong collocations into 8 groups (MI = 3-3.99, MI = 4-4.99, MI = 5-5.99, MI = 6-6.99, MI = 7-7.99, MI = 8-8.99, MI = 9-9.99, MI > 10). Granger and Bestgen (2014) categorized the strong collocations into three groups ( $3 < MI < 5$ ,  $5 < MI < 7$  and  $MI > 7$ ). However, a detailed analysis of the MI score of the collocations in this study showed a different story. There were very few collocations with MI score high than 5. It would not be enough instances of categories beyond MI score higher than 6. This study proposed three categories of MI scores, which are  $MI < 3$ ,  $3 < MI < 5$ , and  $MI > 5$ . This categorization was suitable for the data set to include enough word pairs in each category for analysis and reflect differences in respective categories.

#### 4.3.4 Interview

##### 4.3.4.1 Participants

The participants of the interview were selected from the students who wrote the compositions. The original design was to include 48 students. However, some of them did not show up for the interview. Therefore, this study included 42 participants. An equal number of participants were chosen from the three groups of students, with 16 students from each level of study.

This study has intentionally selected participants with different levels of performance from each year of study. Their performance was based on the weighted scores of the final examination of the previous semester, including the five courses of intensive reading, extensive reading, oral English, listening, and writing. For each year of study, this study selected eight students with the highest scores and eight students with the lowest scores to join the interview. Selecting participants with different levels of performance is a usual practice in second language acquisition research (e.g. Gu, 2003). The original design was to include the same number of participants for high performance and low performance for each year of study. However, some of the low- performance students failed to show up for interview. As a result, for each year of study, there were eight high-performance students and six low-performance students.

The 42 participants were full-time English major students studying in a Chinese university. They were homogeneous in terms of their age, language background, and English learning experience. Their prior experience of English learning ranged from 6



to 16 years, with an average of 9 years of English learning. The age of the participants ranged from 18 to 21, with an average of 19. All of them had no prior experience of learning English in a first-language environment, and therefore, could be referred to as learners in EFL setting.

#### 4.3.4.2 Procedure

Interviews have been adopted in applied linguistic research to delve into learners' thought process, language attitude, language believes, and recollection of past learning events (Talmy & Richards, 2010). The interviews intended to obtain detailed information on the writing process, and more specifically, to understand covert issues that could not be elicited by writing alone, like the learning source of the collocations used in the writings. The interviews were conducted within two weeks after the completion of the writing. The duration of the interviews were 10 to 15 minutes. The interviews were conducted in Chinese so as to let the participants express their ideas freely. The interview data was later transcribed and translated into English for analysis. The participants were informed that the interviews were being recorded and analyzed for research purposes.

The Interviews followed a semi-structured format, with several fixed questions and on-site elaborations and extensions. The interviews began with some general questions about the writing topic, for example, *What do you think of the topic? Do you like it? Do it think it is easy or hard to write on?*. These questions served as the opening casual remarks to ease the tension of the participants, and their anxiety for

being recorded. Also, some general question about the collocation learning were used for an opening as well, such as *Do you know what collocations is? Do you think that it is important for writing?*. After the opening questions, participants were asked to read their own writing to facilitate the recall of the writing process. Then, a piece of paper was presented to the participants including the three types of collocations in their writing. Pre- determined questions were raised for learners to reflect upon the learning sources, their intuition on the collocations and learners' confidence on collocational use. The questions about the learning sources were designed to help the participants recollect the scenarios when they had acquired the collocations. They were also asked to identify those collocations that they regarded as fixed collocations or a random combination of words. The pre-determined questions on the confidence of using the collocations required the participants to express their level of confidence when using the collocation and recollect on the type of knowledge of collocation needed to use the collocations. Although they were supposed to answer fixed questions, the participants were encouraged to elaborate on their thoughts and understanding of the collocational learning.

Although there was some time lapse between the writing and the interview, the participants were quite clear about their writing process. When the participants were asked about the learning source of the collocations, they were also clear about most of the collocations, for example, *"I am pretty sure that I learned it in high school because teachers pushed me to recite the collocation over and over. So, it was hard to forget. When I was thinking of the Chinese meaning, the collocation instantly came to*

*my mind.*”. Especially when asked about their confidence in using the collocations, they were fluent in replying their word selection process. For example, *“I have to make sure that it is grammatically correct before I use it in my writing. When I was sure that I got the right meaning of the collocations, and the right word class of the collocates, I wrote it down in my writing.”*

#### 4.3.5 Analysis

To answer the first research question, statistical analysis, i.e., Kruskal-Wallis H with Mann-Whitney U as the post-hoc analysis, was used to detect group differences among three types of collocations and three levels of study. Descriptive statistics of the interview data were used to answer the second and third research questions.

#### 4.4 Results and discussion

It first reports the development in the use of collocations in terms of frequency and association strength (MI) of the three groups of learners. Then, it presents the analysis of the low-frequency collocations and collocation with low and negative MI score. It provides the qualitative analysis of the collocations used by the three groups. The results obtained from the interviews of the learners are presented to explain the learning source of collocations and levels of confidence of learners.

##### 4.4.1 Development in the use of the collocation

The first question attempted to delineate three levels of learner’s use of

collocations, measured in terms of frequency of occurrence and mutual information score. This part first presents the results of the collocations used at the groups level, and then, more specifically, at the individual level.

#### 4.4.1.1 Frequency and MI score of the three groups

Table 4.3 provides an overview of the comparison in the use of collocations in terms of frequency and MI score of the three groups of learners. Both the frequency of occurrence and MI score of all three types of collocations in the three groups of learners did not meet the requirement of normal distribution using Kolmogorov-Smirnov analysis. The analysis used Kruskal-Wallis H to detect group differences with post-hoc analysis Mann-Whitney U using Bonferroni corrected probability value, i.e.,  $\alpha/k$  ( $0.05/3 = 0.0167$ ). All analysis of the collocations was based on tokens. Table 4.3 and table 4.4 provide the statistical results of the Kruskal-Wallis H and Mann-Whitney U tests.

As can be seen from the table, the frequency of collocations used by the three groups of learners has demonstrated small changes as the function of the type of collocations. For VN collocations, learner writing from year 2 students had collocations with higher frequency of occurrence than writing from year 1 and year 3 students ( $z = -2.65, p = .008, r = .03$ ;  $z = -3.48, p = .001, r = .05$ ). Although the differences between the groups have achieved statistical differences, the effect size was rather small (Cohen, 1988). For AdjN collocations, year 2 students used more collocations with lower frequency levels than year 1 students ( $z = -3.44, p = .001, r = .07$ ). In a similar vein, year 3 students used more collocations with lower frequency

level than year 2 students ( $z = 3.49, p = .000, r = .07$ ). For NN collocations, there are no significant differences between the three year groups according to Kruskal-Wallis H analysis. No post hoc analysis was conducted ( $\chi^2=1.55, df = 2, p = .46$ ).

The MI scores of the three types of collocations have remained rather constant in learner writing of the three groups of students. Significant differences were only found in the VN category. The findings from both Durrant and Schmitt (2009) and Granger and Bestgen (2014) suggested that more advanced learners use a greater number of strongly associated collocations. However, this study shows a rather different picture. The mean MI scores of the VN collocations of the year two learner writing were significantly higher than the writing from year 1 group ( $z = -2.75, p = .006, r = .07$ ). The effect size shows that the difference between the two groups was rather small. However, this improvement is not found in the collocations used by third-year learners. Instead, the association strength of the collocations used by the third-year learners has regressed to the similar level of the year one learners ( $z = -0.27, p = .791$ ). The associate strength of the AdjN collocations and NN collocations have remained at a similar level from the writing of all three year groups ( $\chi^2=2.84, df = 2, p = .841; \chi^2= 5.94, df = 2, p = .051$ ).

Combined together, the results suggest that the three types of collocations have demonstrated a variance of developmental rates throughout the three years of study. For the frequency of collocations, learners could use more collocations of lower frequency in the combinations of AdjN. On the contrary, the learners tend to use collocations with the higher frequency with the improvement in proficiency level in

VN collocations. However, even after two years of study, the learners could not use a greater number of collocations with lower frequency and strong association strength, except in the category of VN collocations. The finding is rather discouraging since collocations with strong association strength are an important feature for advanced learners and native speakers writing. Although different levels of variance are found in the frequency and MI score of the collocations among three groups of students, the effect size of the results of Mann-Whitney U analysis was rather small.

Table 4.3 *Statistical Results of Kruskal-Wallis H Analysis of Frequency and MI Score of the Three Types of Collocations of the Whole Group*

	Chi-Square	df	Sig.		Chi-square	df	Sig.
Frequency (VN)	13.58	2	0.001	MI (VN)	9.78	2	0.008
Frequency (AdjN)	15.84	2	0.000	MI (AdjN)	2.84	2	0.24
Frequency (NN)	1.55	2	0.46	MI (NN)	5.95	2	0.05

Table 4.4 Statistical Results of Mann-Whitney U test of Frequency and MI Score of the Three Types of Collocations of Whole Group

		Year 1	Year 2	Year 3			Year 1	Year 2	Year 3
Frequency (VN)	Year 1		-2.65 (0.008)	-0.94 (0.349)	MI (VN)	Year 1		-2.75 (0.006)	-0.27 (0.791)
	Year 2			-3.48 (0.001)		Year 2			-2.64 (0.008)
		Year 1	Year 2	Year 3			Year 1	Year 2	Year 3
Frequency (AdjN)	Year 1		-3.44 (0.001)	-3.49 (0.000)	MI (AdjN)	Year 1			
	Year 2			-0.17 (0.869)		Year 2			
		Year 1	Year 2	Year 3			Year 1	Year 2	Year 3
Frequency (NN)	Year 1				MI (NN)	Year 1			
	Year 2					Year 2			

Note: Z value followed by probability value (sig.) in the brackets.

#### 4.4.1.2 Frequency and MI score of the individual writing

Every writing was assigned with two scores for frequency and MI value respectively to reflect the variance in the use of collocations for individual learners. The inferential statistics could reflect the variance within and between the three groups of learners. The results of the Kolmogorov-Smirnoz analysis indicated that the two indices of frequency of occurrence and MI score were not normally distributed ( $p < .05$ ). A similar procedure of statistical analysis was conducted in the same manner as the analysis of group variance. Table 4.5 and table 4.6 present a summary of the results of the Kruskal-Wallis H test and Mann-Whitney U test of individual writing.

The findings of the frequency of collocations of individual writing are quite similar to the groups. There were significant differences between the first and second year of learner writing in terms of the mean frequency of occurrence of VN collocations ( $z = - 2.55, p = .011, r = .22$ ). The average frequency of the VN collocations was significantly higher in the writings from students in the second years of study than the first year. The effect size, although being small, was much larger than in the analysis of group variance. Although there were significant differences between second year and third year students in group analysis, the differences between the individual learners of the two year groups did not achieve significant level. Learners used more lower frequency AdjN collocations as the function of proficiency, although there were only significant differences between year one and year two learners ( $z = -2.51, p = .011, r = .27$ ). This finding was similar to the group analysis. Similar results with group analysis were also found in the analysis of NN



collocations. The frequency level of the NN collocations did not show significant variance among three levels of writing ( $\chi^2= 6.184, df= 2, p = .045$ ). Although the result of the Kruskal-Wallis H test on NN collocations was significant, the post hoc Mann-Whitney U test with Bonferroni corrected probability value did not show significant differences among the three levels of writing.

There was greater variance in the use of collocations in terms of MI score than the frequency in individual writings of learners from the three levels. In group analysis, significant differences were only found in VN collocations between year two learners and learners at the other two years of study. In the analysis of individual writing, learners have improved and backslid in the use of VN collocations across the three years. The average MI score of VN collocations in second year learner writing was significantly higher than mean MI scores in year one and year three learner writing with medium effect size ( $z = -4.09, p = .000, r = .37$ ;  $z = -3.44, p = .001, r = .31$ ). However, significant differences were not found between year one and year three learner writing. For AdjN word pairs, third year learners used significantly more collocations with higher MI score than first year learners ( $z = -3.44, p = .001, r = .57$ ) and second year learners ( $z = -4.09, p = .000, r = .47$ ) with medium to large effect size. The mean MI score of NN collocations did not show significant variance among three levels of writing ( $\chi^2= 1.084, df= 2, p = .582$ ). The effect size of the variance between the groups were much larger at the individual level than at the group level and thereby underlined the importance of analyzing the writing of individual writing.

Table 4.5 *Statistical Results of Kruskal-Wallis H Analysis of Frequency and MI Score of the Three Types of Collocations of Individual Writing*

	Chi-Square	df	Sig.		Chi-square	df	Sig.
Frequency (VN)	6.71	2	0.035	MI (VN)	19.78	2	0.000
Frequency (AdjN)	7.29	2	0.026	MI (AdjN)	31.77	2	0.000
Frequency (NN)	6.18	2	0.045	MI (NN)	1.08	2	0.582

### Summary

The results of the development in the use of collocations of learners from three levels of study at the group level and individual writing have revealed several interesting findings. First, the results have shown a comprehensive profile of the use of collocations in writing of Chinese tertiary learners. Even at the third year of study, the average MI scores at both the group level and individual level remained around 2, which was below the threshold of 3. Profiles of the collocations in different ranges of MI score used in writing would add more depth to the statistical analysis. Second, it corroborates the findings of Granger and Bestgen (2014) and Nesselbauf (2005) that different combinations of collocations revealed a variance in the rate of development. The three types of collocations, VN, AdjN, and NN, have shown different rates of development regarding frequency of collocations and association strength between the collocates. Third, it supports Durrant and Schmitt (2009) in that only use the mean score at group level would conceal the variance of individual writings in the groups. This study shows that the differences between the learner writing from the three levels

were more pronounced when analyzed with the individual writing. It would be more beneficial to calculate the development at both the group and individual level.

Table 4.6 *Statistical Results of Mann-Whitney U Test of Frequency and MI Score of the Three Types of Collocations of Individual Writing*

		Year 1	Year 2	Year 3			Year 1	Year 2	Year 3
Frequency (VN)	Year 1		-2.55 (0.011)	-1.89 (0.058)	MI (VN)	Year 1		-4.09 (0.000)	-3.44 (0.001)
	Year 2			-0.19 (0.847)		Year 2			-1.00 (0.316)
Frequency (AdjN)	Year 1	Year 1	Year 2	Year 3	MI (AdjN)	Year 1	Year 1	Year 2	Year 3
	Year 2		-2.51 (0.012)	-0.79 (0.427)		Year 1		-4.09 (0.000)	-3.44 (0.001)
Frequency (NN)	Year 1	Year 1	Year 2	Year 3	MI (NN)	Year 1	Year 1	Year 2	Year 3
	Year 2		-2.15 (0.031)	-2.16 (0.031)		Year 1			
				-0.03 (0.977)		Year 2			

Note: Z value followed by probability value (sig.) in the brackets.

#### 4.4.1.3 Categories of collocations

Another way to enlighten on the use of collocations in learner writing was to categorize the word pairs into different bands based on the frequency of occurrence and association strength. In this way, I intended to zoom in on the constituents of the collocations for a detailed picture of the use of collocations beside the quantitative analysis of the developmental trends. First, the percentage of the low frequency, including frequency lower than ten times and non-in-the-corpus collocations, of learner writing are presented. These combinations were removed from further categorization of MI score. MI scores of low-frequency collocations (occurred less than ten times together in the reference corpus of COCA) are not reliable (Stubbs, 2001). Then, the percentages of the MI scores of the remaining combinations are shown.

#### Low-frequency collocations

Table 4.7 presents the raw number and percentage of low-frequency collocations in learner writing. For VN combinations, a higher percentage of low-frequency combinations was found in year three writing (14%), while the year 1 and year two writing remained at a similar level of 10 percent. As for AdjN combination, year two writing produced the greatest number of low-frequency collocations (11%), which was slightly more than the ones in the year 1 (10%) and year 3 (9%). A similar pattern is found in the NN combinations, where the highest percentage of low-frequency collocations falls into the year 2 writing (11%).

Table 4.7 Raw Number and Percentage of Low-frequency Collocations in Learner Writing

Type of collocations	VN	AdjN	NN
Year 1	92/705(0.1)	110/1145(0.1)	11/136(0.08)
Year 2	84/815(0.1)	123/1158(0.11)	17/155(0.11)
Year 3	124/856(0.14)	120/1312(0.09)	10/170(0.06)

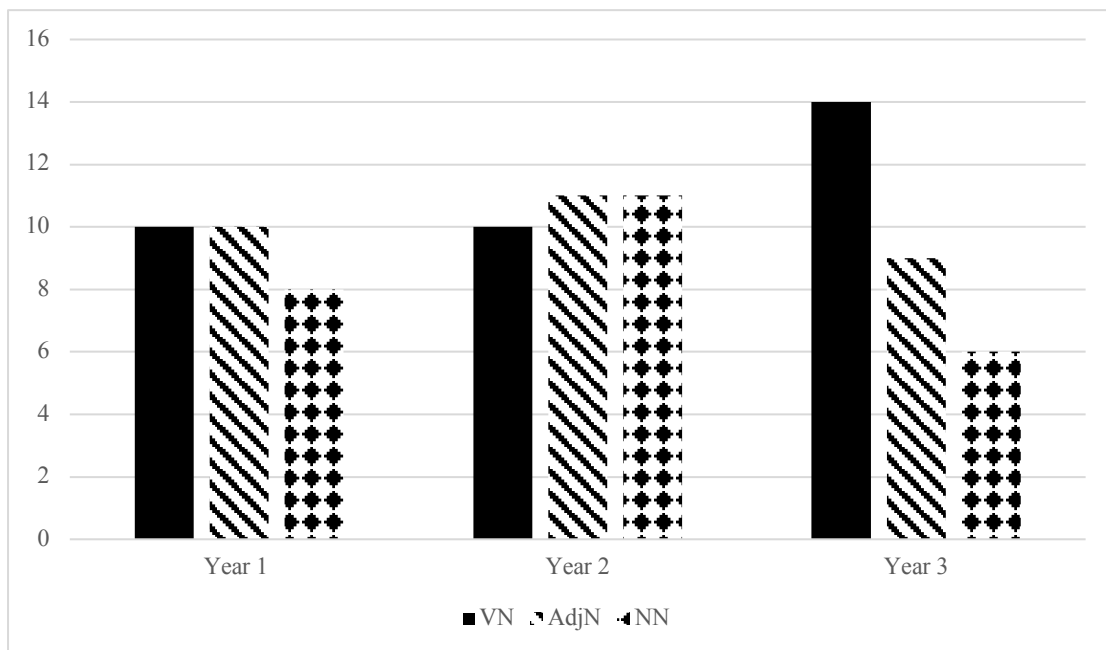


Figure 4.1 The Percentage of the Low-frequency Collocations in Learner Writing

#### Collocations above the low-frequency threshold

The remaining collocations were categorized into different bands based on the MI scores. The purpose of categorization collocations into different bands was to explore the extent to which the collocations of different association strength were used in writing. It could allow us to have a clear understanding of the proportion of strong collocations vs. non-collocations in writing. At the same time, it showed the

proportion of strong collocations at different levels of association strength. Table 4.8 and Figure 4.2 provide a summary of the raw number and percentage of the remaining collocations and the categorization of these collocations.

I can first look at the percentage of the collocations that were below the threshold of MI score. This category included both combinations with positive MI score lower than 3 and combinations with negative MI score. Over 80% of the collocations in learner writing were below the threshold of MI scores of 3. This held true for three types of collocations in all three levels of writing with only one exception. Around 75% of the NN collocations in year one learner writing were below the MI score threshold. AdjN collocations had the largest ratio of collocations that are below the MI score threshold (88% in year one writing and 84% in year three writing). The large ratio of collocations below the MI score threshold indicated that learners had the habit of using freely combined two words as collocations in their writing. In other words, around 80% of the VN, AdjN and NN collocations in learner writing were either erroneous or created by learners. It is well acknowledged that L2 learners use a small range of high frequency collocations repetitively in writing (e.g., Laufer and Waldman, 2001; Nesselbauf, 2005).

This study reveals that, in addition to relying on the high frequency collocations, L2 learners have a quite liberal attitude in collocational use. They use collocations which may not be identified as the strong collocations. This problem has been overlooked by previous studies into learners' collocational use based on the frequency of occurrence in the corpus. Those studies fail to analyze the association strength of

collocations that occurs more than ten times in the corpus. It needs further analysis into this type of collocation to identify the actual problems in these freely combined collocations.

The large proportion of low MI collocations has accentuated the “underuse” of strong collocations. It can be seen from the table that the percentage of the collocations at the band of < 3 and > 5 ranged from 5% in AdjN collocations of year 2 writing to 18% of NN collocation in year one writing. For the writing texts of all three groups of learners, VN collocations have the biggest ratio of combinations at this band (10% at year 1, 14% at year 2 and 13% at year 3). Compared to the first two bands, the number and percentage of collocations with MI score higher than five are minimal, taking up less than 10% of all the collocations in each group of writing. The NN collocations outperformed the other two types of collocations in this band of all three levels of writing.

Table 4.8 *Summary of the Raw Number and Percentage of the Collocations of the Three Groups*

		< 3	> 3 and < 5	> 5
VN	Year 1	538/633(0.85)	64/633(0.1)	31/633(0.05)
	Year 2	594/731(0.81)	103/731(0.14)	34/731(0.05)
	Year 3	613/734(0.84)	98/734(0.13)	23/734(0.03)
AdjN	Year 1	909/1035 (0.88)	87/1035(0.08)	39/1035(0.04)
	Year 2	924/1035(0.89)	48/1035(0.05)	63/1035(0.06)
	Year 3	1007/1194(0.84)	123/1194(0.1)	64/1194(0.06)
NN	Year 1	94/125(0.75)	23/125(0.18)	8/125(0.06)
	Year 2	114/138(0.83)	12/138(0.09)	12/138(0.09)
	Year 3	143/162(0.88)	9/162(0.06)	10/162(0.06)



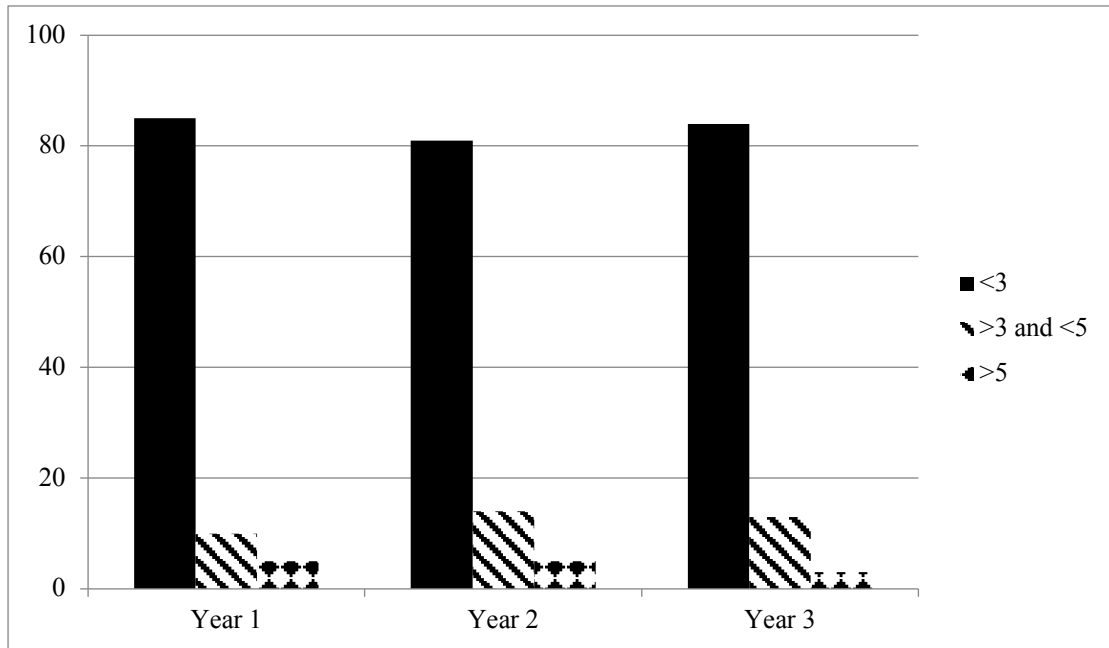


Figure 4.2 *The Percentage of Collocations of Three Bands of MI Scores of VN*

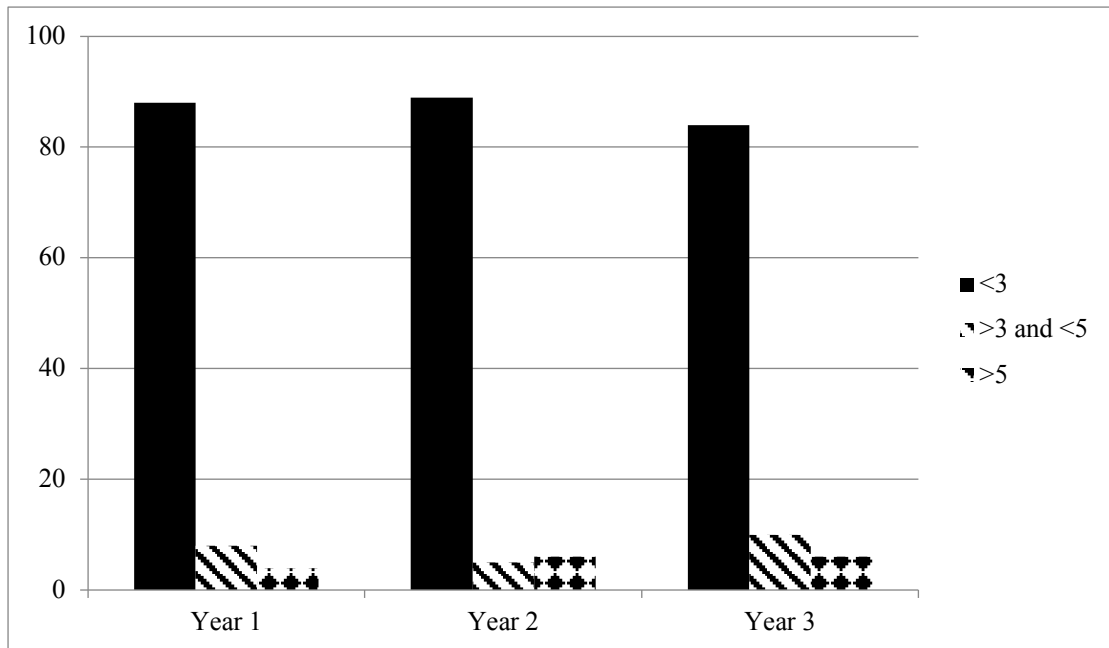


Figure 4.3 *The Percentage of Collocations of Four Bands of MI Scores of AdjN*

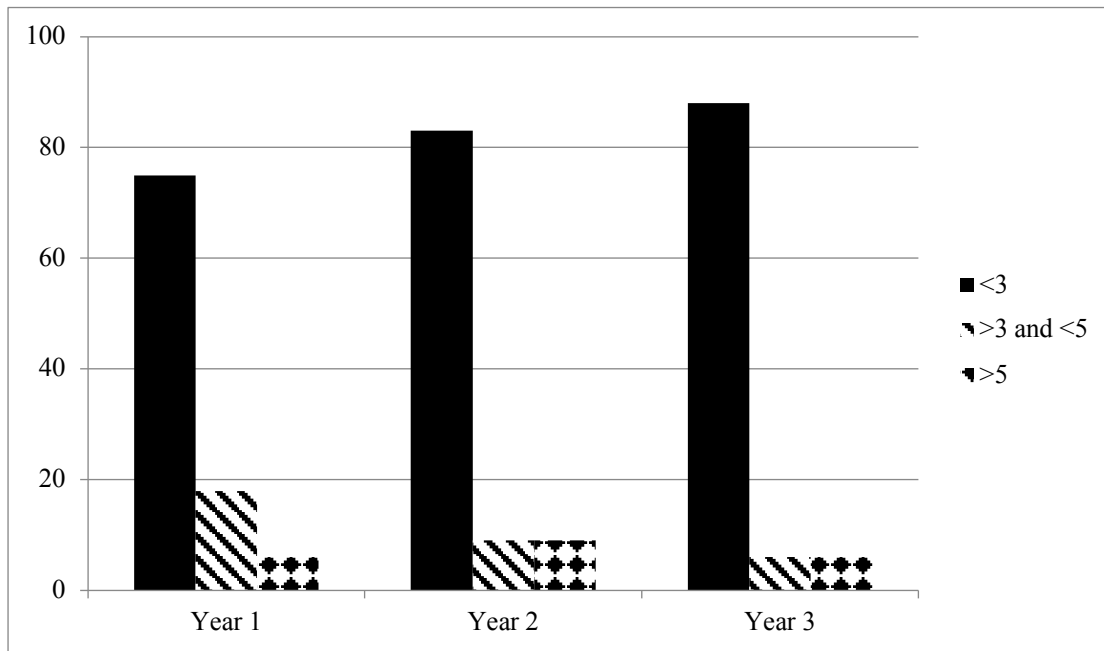


Figure 4.4 *The Percentage of Collocations of Four Bands of MI Scores of NN*

#### Absent category and below MI threshold category

One notable result of this study is the high ratio of the absent category and combinations with MI score lower than 3. The absent category included two types of collocations, which were collocations that appeared less than ten times in the reference corpus (COCA) and those that could not be found in the reference corpus. For association strength, the combinations with MI score lower than 3 included those combinations that co-occurred less than chance could predict. It included both combinations with positive MI scores lower than 3 and negative MI scores. Collocations of these two categories could either be erroneous (display virtue and dream marry) and creative combinations (face a choice and seek things). It would be worthwhile to explore the type of errors in these two categories and examine how these types of errors changed between learners from different proficiency levels. The table4.9 presents the summary of the error types and number of occurrence of each

error types of the absent category. And, table 4.10 follows the similar pattern to present the results of the MI category.

Table 4.9 *Summary of the Type of Errors in Absent Category*

	Type of errors	No. of errors		
		VN	AdjN	NN
Year 1	Spelling		5(111)	
	Morphology	8(73)	2(111)	7(12)
	Word coinage		3(111)	
	Random combination	65(73)	101(111)	5(12)
Year 2	Spelling	8(85)	19(124)	5(18)
	Morphology	6(85)	3(124)	
	Word coinage	4(85)	7(124)	
	Random combination	67(85)	88(124)	13(18)
Year 3	Spelling	3(125)	1(121)	
	Morphology	4(125)	4(121)	2(10)
	Word coinage		6(121)	2(10)
	Random combination		110(121)	6(10)

Table 4.10 *Summary of the Type of Errors in the Collocations Below the MI Threshold*

	Type of errors	No. of errors		
		VN	AdjN	NN
Year 1	Spelling			
	Morphology	3(581)	1(158)	34(94)
	Random combination	578(581)	157(158)	60(94)
Year 2	Spelling	1(652)		28(114)
	Morphology	1(652)		
	Random combination	650(652)	1133(1133)	86(114)
Year 3	Spelling			
	Morphology	4(700)		40(143)
	Random combination	696(700)	1087(1087)	103(143)

There were four types of errors in these two categories, which was much fewer compared to the error analysis conducted by Thewissen (2013) on the text level and Bestgen and Granger (2014) on the bigrams. This study focused on two-word collocations of pre-determined grammatical combinations, and therefore, it greatly reduced the occurrence of possible grammatical errors at text level.

The results showed that the overwhelming majority of the combinations that fell into these two categories were creative combinations, which was one of the features of the advanced learners' writing (Bestgen & Granger, 2014). In addition, word coinage was found in the absent category, mostly in the AdjN combinations, as in case of the conversation-minded society, over-expensive life and worry-free environment. It seems that learners would use two familiar words to randomly create a new word as an adjective to modify the following noun to replace an unknown adjective or a more complicated attributive clause. This could be their coping strategy for replacing unknown words and avoiding complex grammatical structure in writing. Another notable error was the morphological mistakes in collocations, especially in NN combinations. Learners were prone to morphological derivations of noun and adjective. They seem to use these two types of word class interchangeably in some collocations, as in the case of luxurious lifestyle and luxury lifestyle. Table 4.11 provides a list of examples of the three types of errors and creative combinations in learner writing.

Table 4.11 *List of Examples of the Errors and Creative Combinations*

Type	Example	Context
Spelling	luxious wedding	This luxurious wedding made many people envy...
	unnecessary dangers	Maybe you will be surrounded by some unnecessary dangers...
	despensible staff	It's a kind of wasting resources for dispensable staff.
Morphology	pursuit money	Many people pursue money...
	find excite	So they often find new excitement (often illegal) to keep...
	luxury life	Luxury life like a mask which covers our eyes...
Word coinage	simple-pure life	Simple-pure life helps us to form more good habits.
	earn middle-income	Most of us earn middle-income...
Creative combination	fulfil mind	Simple life can fulfill mind.
	provoke concept	The luxurious one provokes wrong concept around society.
	heat topic	There are always all kinds of hot topics from the internet...

### Most frequently occurred collocations and strong collocations

The previous analysis of the categorization of collocations has identified learners' heavy reliance on collocations that were either created or erroneous. And it seems that this trend remained at a constant level regardless of the level of study and the type of collocations. Additionally, the error analysis showed that the types of errors in the three levels of study were quite similar. A question arose from these results whether the learners at three levels of the study demonstrated a similar manner of using most frequent collocations and strong collocations in their writing. I first looked at the type of most frequent collocations in learner writing, and then, moved on to the strong collocations (collocations with MI score higher than 3) to conduct a qualitative analysis of these collocations and follow their changes across different levels of study.

### Most frequent collocations

An obvious way to observe the use of most frequent collocations was to list the collocations with the highest frequency of the three types of combinations (Table 4.12). It was quite clear that there was great convergence in the type of VN and AdjN collocations used by learners from all three levels of students. For example, in VN collocations, learners used a rather similar set of highly frequent verbs, like have, do, see, spend, play, make, take, all of which collocated with highly frequent nouns (time, thing, people, money, place, work). NN collocations demonstrated a different trend. The collocations in this category were of much lower frequency than the collocations of the other two types, while at the same time, showed greater variance across

different levels of study. Three collocations, human being, life quality and life way were used by two levels of learners. Apart from these three collocations, the remaining collocations were distinct of each level. This finding showed that learners used similar types of highly frequent VN and AdjN collocations across three levels of study, but can used a range of different NN collocations.

Table 4.12 *List of the Most Frequency VN Collocations*

Year 1	Frequency	Year 2	Frequency	Year 3	Frequency
have time	43445	have will	60891	have time	43445
do thing	27914	have time	43445	do thing	27914
see people	14935	do thing	27914	have right	26870
spend time	13973	see people	14935	do work	21921
have money	12177	spend time	13973	spend time	13973
play role	11580	have money	12177	have idea	13210
have life	11561	make people	12096	have money	12177
have thing	10860	have life	11561	play role	11580
have chance	9752	have thing	10860	have life	11561
make money	9729	make sense	10759	have thing	10860
have power	9205	have place	10512	take place	10735
help people	8580	have chance	10380	have chance	10380
have use	8441	have family	10235	have impact	9845
pay attention	7956	make money	9729	make money	9729
like life	7262	need people	8971	help people	8580
spend money	5983	help people	8580	need help	8380
keep mind	5800	get things	8462	have job	8011
have trouble	5371	have house	8154	have mind	8011
live life	4403	pay attention	7956	pay attention	7956
save money	4366	have friend	7640	have reason	6392

Table 4.13 *List of the Most Frequency AdjN Collocations*

Year 1	Frequency	Year 2	Frequency	Year 3	Frequency
same time	42020	same time	42020	same time	42020
some people	39182	some people	39182	some people	39182
many people	38435	many people	38435	many people	38435
more people	34804	more people	34804	more people	34804
long time	34595	other people	31570	long time	34595
other people	31570	all people	30987	other people	31570
most people	27441	most people	27441	most people	27441
all things	26495	other hand	25400	other hand	25400
other hand	25400	more time	24726	more time	24726
more time	24726	every time	20138	every time	20138
every time	20138	other side	20133	young people	18006
many years	20057	no will	19708	next day	16950
other thing	17062	other words	18206	no doubt	16928
no doubt	16928	young people	18006	no time	15725
last month	16125	other thing	17062	much time	14601
no time	15725	no doubt	16928	more money	13803
only way	14889	much time	14601	only thing	13324
much time	14601	every year	14583	great deal	12590
more money	13803	more money	13803	no reason	12182
no reason	12182	some way	12208	hard work	12094



Table 4.14 *List of the Most Frequency NN Collocations*

Year 1	Frequency	Year 2	Frequency	Year 3	Frequency
city life	13235	human being	9034	human being	9034
college student	10804	life quality	4962	day time	6573
life quality	4962	government official	4950	family member	4244
human nature	3758	human health	4797	children education	3427
human history	1960	college student	3752	swimming pool	2482
food safety	1942	role model	2873	news report	2064
food supply	1381	media coverage	1642	life meaning	1266
poverty line	772	earth mother	1455	public attention	1249
garbage can	770	mother earth	1455	life way	1053
wedding dress	665	basketball player	1244	vanity fair	989
life style	538	life way	1053	human society	889

#### Strong collocations

There were two ways of exploring the use of strong collocations in learner writing. The first was to work out the type/token ratio of the strong collocations and make a comparison between the groups. Another way to explore the use of the strong collocations in writing was to list the type of VN, AdjN and NN collocations of three levels of learner writing. The following tables present the type and token ratio of collocations in each level of learner writing.

Table 4.15 *Summary of the Type/token Ratio of the Strong Collocations in Learner Writing*

	VN	AdjN	NN
Year 1	43/95 (0.45)	77/133 (0.58)	13/31 (0.42)
Year 2	61/140 (0.44)	60/119 (0.5)	18/30 (0.6)
Year 3	58/127 (0.46)	90/193 (0.47)	16/19 (0.84)

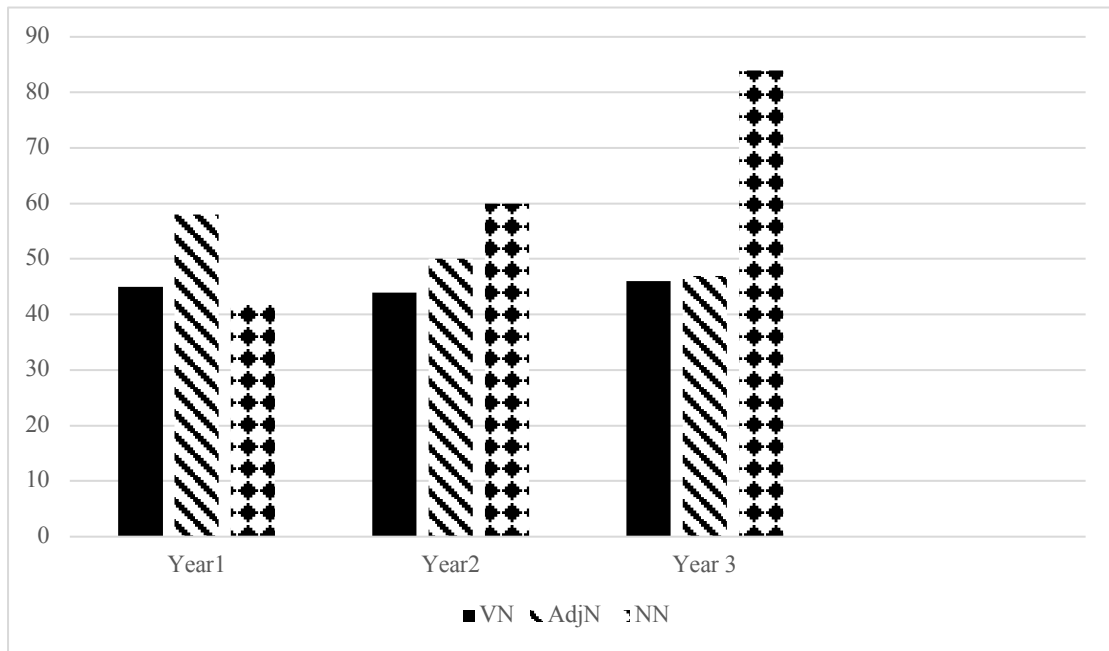


Figure 4.5 *Type/token Ratio of the Strong Collocations in Learner Writing*

The type/token ratio of the NN strong collocations showed the greatest difference between the three groups of learners. It demonstrates steady increase with the improvement of proficiency. On the contrary, the type/token ratio of AdjN strong collocations showed steady backslide as the function of proficiency. The type/token ratio of the VN collocations remained at the similar level among three levels of writings. It confirms again that different types of collocations demonstrated different patterns of changes as the function of proficiency. It can be concluded that learners use a relatively high level of repetition of collocations at each level of study since the type/token ratio remained around 50% of all three types of collocations at three levels of study. The only exception lay in the NN collocation at the year three study (80%). It seems that learners at the third year of study would use a wide range of different NN collocations, while at the same time, relied on a similar set of VN and AdjN

collocations throughout the three years of study.

Another way to look at this issue was from a more dynamic perspective to make a comparison of the types of collocations of the three groups of learner writing. This would help us identify whether there were any changes in the collocations used by different levels of learners, or whether learners used a similar set of collocations regardless of their proficiency levels. Table 4.16 and Table 4.17 present the top 20 VN and AdjN collocations of the highest MI score. Table 4.18 presents all the strong NN collocations with MI scores higher than 3. It is quite clear from these tables that there were pronounced differences between the collocations used by learners at different levels of study. This held true both all three types of collocations. For example, in the VN collocations, except three highly frequency collocations like earn money, spend money, pay attention, all the other collocations were different in the three levels of learner writing. The only AdjN collocations found in all three levels of writing was a positive attitude. The three levels of writing shared two similar NN collocations that are wedding ceremony and life quality. The marked differences suggest that learners can use quite different kinds of collocations at different levels of study.

Taken the results of these two analyses together, it seemed that, although learners relied heavily on a range of collocations in their writing, they could use different sets of collocations at different levels of study. These results are quite encouraging since it has revealed the dynamic changes in the collocations used by learners at different levels of proficiency. This finding adds an important missing part to the present

conclusion that learner writing has demonstrated a high level of repetition (Granger, 1998; Lorenz, 1999; Durrant & Schmitt, 2009) by showing that there are dynamic changes hidden in the repetition of collocations.

### Summary

The qualitative analysis of the most frequency collocations and strong collocations reveals several interesting findings. First, the collocations identified as most frequent and strong are rather different. It suggests that the index of frequency and MI score reflect rather different quality in collocations. Second, although learners were found to rely on a similar range of high-frequency collocations, they can use a greater variety of strong collocations at different proficiency levels. This finding showed that MI score could be a pronounced discriminator of the proficiency level of study. It could identify different sets of collocations used by learners of different proficiency levels. Third, this study reveals that, even if learners are found to rely on a small set of collocations in their writing, they can use different types of strong collocations at different levels of study.

Table 4.16 20 VN Collocations (Type) with the Highest MI Score

Year 1	MI	Year 2	MI	Year 3	MI
sing song	6.91	ride bike	6.85	broaden horizon	7.2
wash dish	6.67	relieve burden	6.42	achieve goal	6.8
attract attention	6.05	attract attention	6.05	stimulate economy	6.54
wear clothes	5.83	derive benefit	5.87	pave way	5.9
drink beer	5.59	wear clothes	5.83	wear clothes	5.83
pay attention	5.57	pay attention	5.57	obey rule	5.79
play role	5.44	improve quality	5.51	pay attention	5.57
wear shoes	5.38	attach importance	5.46	improve quality	5.51
wear earrings	5.34	acquire knowledge	5.41	play role	5.44
earn money	5.31	borrow money	5.41	satisfy need	5.4
narrow gap	5.3	reduce pollution	5.37	draw attention	5.32
attach significance	5.27	eat food	5.31	reduce consumption	5.25
win prize	5.2	narrow gap	5.3	recycle litter	5.18
create wealth	5.1	take advantage	4.99	deprive enjoyment	5.09
drink wine	5.08	draw conclusion	4.97	pursue happiness	4.92
arouse controversy	5.04	write poem	4.97	spend money	4.9
wear dress	5.04	spend money	4.9	cherish memory	4.77
consume energy	5.01	clean air	4.72	surf internet	4.75
occupy space	4.91	earn income	4.71	reach destination	4.74
spend money	4.9	earn money	4.71	earn money	4.71
donate money	4.87	satisfy desire	4.7	satisfy desire	4.7

Table 4.17 20 AdjN Collocations with the Highest MI Score

Year 1	MI	Year 2	MI	Year 3	MI
dire strait	12.1	optical illusion	8.26	lavish lifestyle	7.79
prime minister	9.76	environmental protection	7	paramount importance	6.75
lavish lifestyle	7.79	plastic bag	6.83	interpersonal communication	6.65
sincere gratitude	6.85	extravagant lifestyle	6.52	extravagant lifestyle	6.52
rapid growth	6.69	heated debate	6.51	heated debate	6.45
sustainable development	6.55	unhealthy lifestyle	6.1	metropolitan area	6.35
extravagant lifestyle	6.52	enormous amount	5.73	heavier burden	5.96
hard-earned money	6.07	luxurious lifestyle	5.68	luxurious lifestyle	5.68
fresh fruit	5.7	positive attitude	5.49	younger generation	5.67
luxurious lifestyle	5.68	royal wedding	5.44	positive attitude	5.49
younger generation	5.67	endless cycle	5.16	royal wedding	5.44
middle class	5.65	white-collar worker	5.02	deeper understanding	5.43
natural resource	5.53	limited resource	4.86	mountainous area	5.37
positive attitude	5.49	economic development	4.85	empty stomach	5.15
royal wedding	5.44	heated discussion	4.8	good luck	5.11
fresh air	5.31	rainy day	4.79	various aspect	5.04
low profile	5.27	common sense	4.67	bad habit	4.95
royal crown	5.24	no doubt	4.63	different type	4.88
fake masks	5.11	different kind	4.59	economic development	4.85
negative effect	5.11	hot topic	4.57	serious consideration	4.85
silver-spoon kid	5.11	unbalanced diet	4.51	great deal	4.73

Table 4.18 NN Collocations with the Highest MI Scores

Year 1	MI	Year 2	MI	Year 3	MI
wedding dress	5.78	human being	8.17	swimming pool	8.68
wedding ceremony	5.88	luxury goods	6.13	vanity fair	8.68
wedding cake	6.29	wedding ceremony	5.88	human being	8.17
soul mate	7.15	basketball player	5.87	mobile phone	8.07
poverty line	3.89	media coverage	5.52	win-win situation	7.95
marriage ceremony	3.91	topic discussion	5.18	wedding ceremony	5.88
luxury goods	6.13	shopping list	4.34	part-time job	5.22
life quality	3.58	role model	4.26	remedy situation	4.91
human nature	4.28	college student	3.98	family member	4.2
food supply	4.45	poverty line	3.89	poverty line	3.89
food safety	4.12	government officials	3.8	news reports	3.69
college students	3.98	life quality	3.58	leisure time	3.54
chocolate ice-cream	5.62	simplicity lifestyle	3.52	wedding day	3.45

#### 4.4.2 Learning sources of the collocations

The second research question intended to explore the learning sources of collocations in learner writing. Both high-performance learners and low-performance learners of the three levels of study were interviewed on the learning sources of the collocations in their writing. They were asked to go through the list of collocations retrieved from their writing one by one and identify the source of learning of each collocation to the best of their memory. It can be seen from the three figures that, learners of three levels of study relied heavily on the collocations learned from high school in their writing. Both second-year and third-year learners of high-performance group and low-performance group have shown improvement in the ratio of the college learnt collocations. Even for third-year learners, the ratio of the high-school collocations remains more than 60 percent in their writing.

A close look at the percentage of learners that used only high-school learned collocations in writing could reveal a clearer picture of the sources of collocation. For year one students, eight out ten students failed to use collocations learned from college in their writing. This is quite understandable, since, at the time of data collection, they have received only two months instruction in college. Collocations learned from high school still were their main sources in vocabulary repertoire. For year two students, seven out of fourteen used solely collocations learned from high school. It means that, after a year and a half's instruction, learners still relied heavily on the collocations learned from high school. However, there was a considerable improvement compared to year one students. For year three learners, five out fourteen

third-year learners reported that all of the collocations in their writing were learned in the high school. Only one high-performance learner at the third year of study identified that all of the collocations in her writing were learned through three years of study college.

These results suggest that the learning outcomes produced by intensive instruction in English (these learners are all English major students) were far from satisfactory regarding the collocations. Even after more than two years of instruction, learners still restrained from using the collocations that they have acquired in college. The collocations learned from high school have left a strong impression on their mind. As such, they clung to these collocations in writing tasks when their minds were performing multiple tasks simultaneously, and limited resources were allocated to the choice of words.

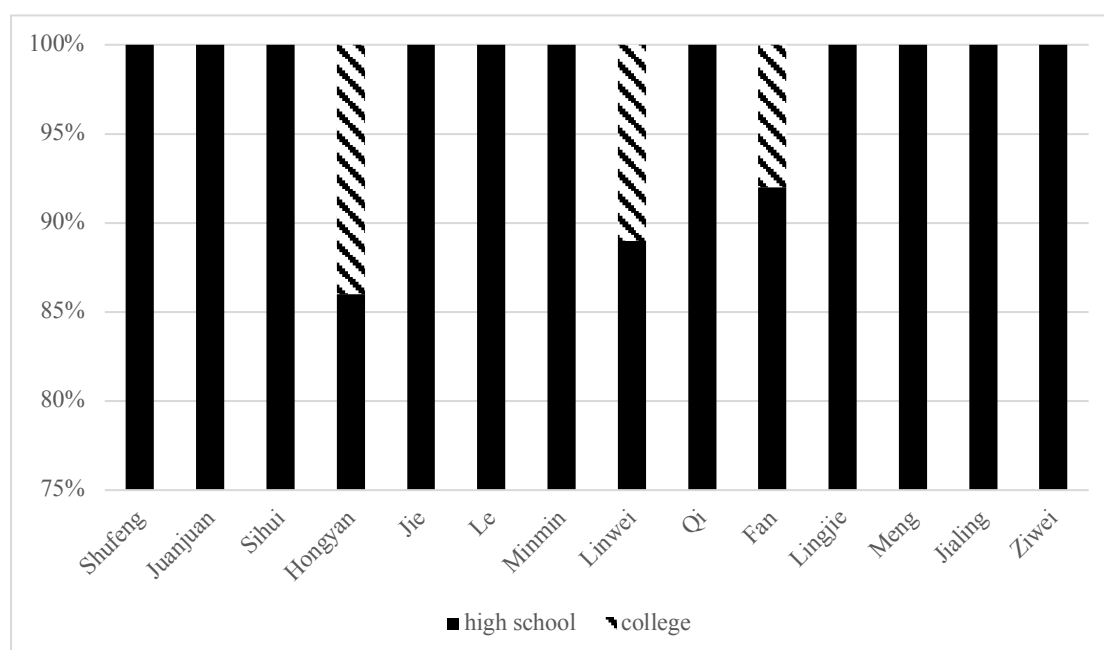


Figure 4.6 *The Percentage of Collocation Learnt in High School and College (Year 1)*



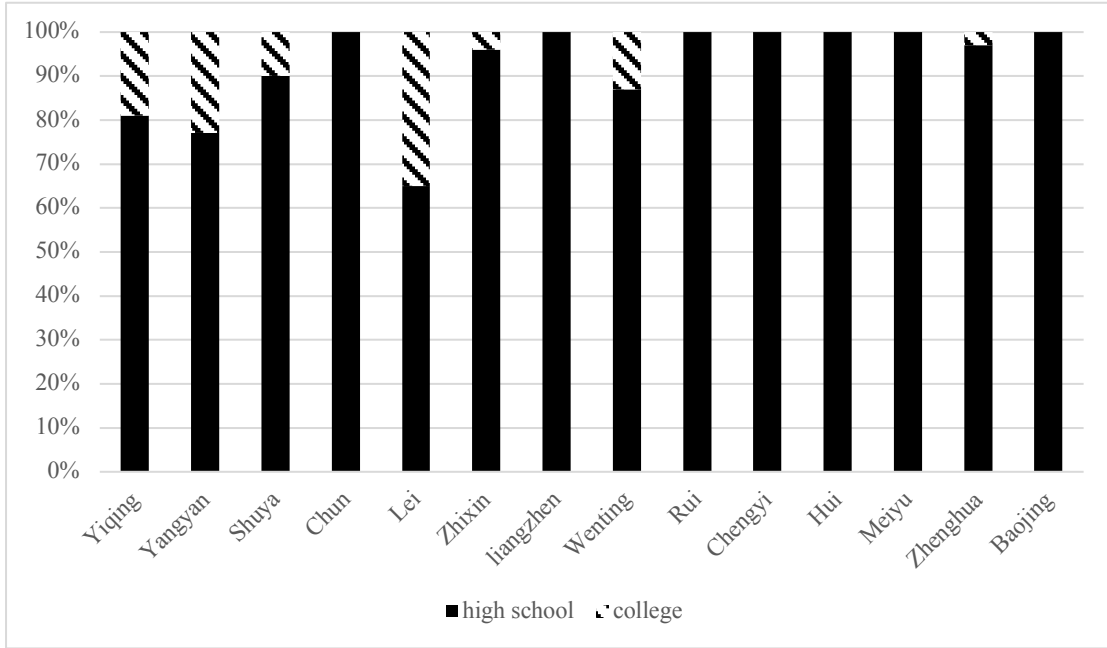


Figure 4.7 The Percentage of Collocation Learnt in High School and College (Year 2)

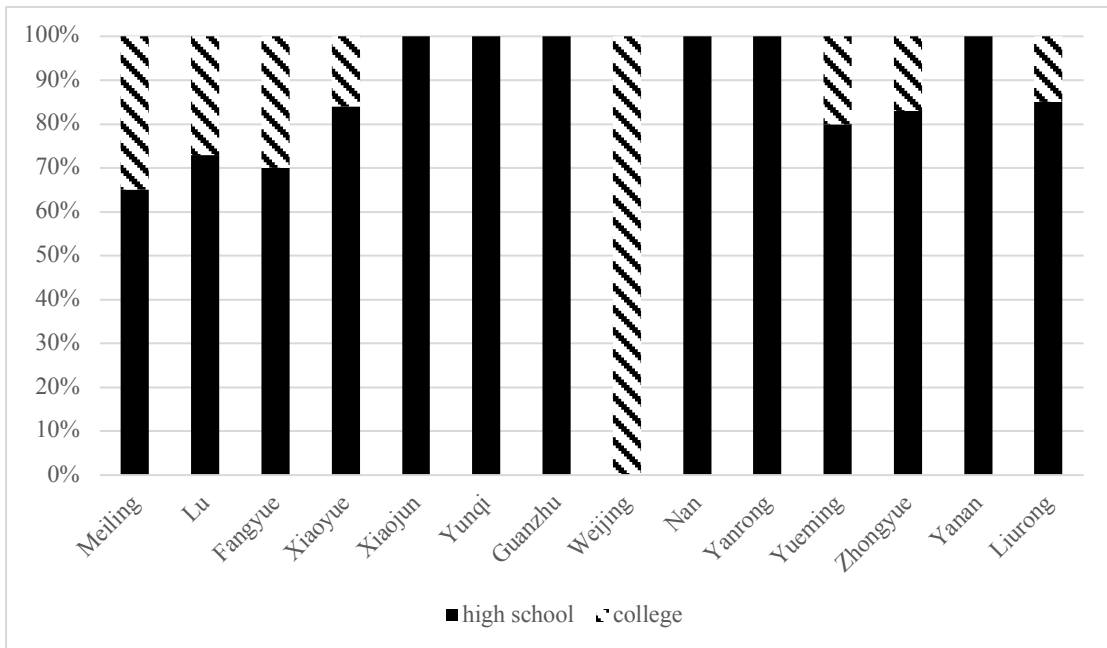


Figure 4.8 The Percentage of Collocation Learnt in High School and College (Year 3)

Another way to explore the sources of collocations was to find out whether

learners acquired the collocation from in-class intentional learning or out-of-class incidental learning. This observation is quite important in that this study tended to explore the possible means of acquiring collocations of EFL learners whose natural exposure to English is quite limited. Through identifying the learning sources, we could understand the possible means for reinforcing the collocations learned in class in college and enhancing the efficiency of collocation learning.

The major learning sources of the collocations in learner writing was classroom instruction. 88% of the students identified that they learnt the collocations in classrooms. The remaining students, including three high-performance learners (Xulei, Liangzheng, Weijing) and two low-performance learners (Lanrong, Zhongyue) expressed that some of the collocations in their writing came from incidental learning. Among the five learners, four of them were second-year and third-year learners, with only one from the first year of study in college. The interview has revealed an interesting feature of Chinese learners' incidental learning. They tended to perceive incidental learning as an extension in-class intentional learning. Xulei, the high-performance student explained her learning sources as

*"I write down the words in my notebook, especially the complicated and beautiful words from novels portraying landscape and events. I choose the words out of these words in the notebook in my writing."*

Another low-performance learner Zhongyue explained his out-of-class learning as in

the following words

*“I learnt the collocation ‘witness accumulation’ when I was reciting the texts in ‘New Concept English 3’. And there are also some which I learnt during doing drills for the national English proficiency test for college students”.*

High-performance learners could benefit from incidental learning in the acquisition of collocations through reading novels, newspapers and online materials. One of the high-performance learner Wenting expressed her learning sources as

*“The complicated collocations in my writing, like ultimate nightmare...I learnt that from reading English newspapers in the mobile phones, in the texts in CNN and BBC.”*

Another high performing learners Weijing, recalled her sources of learning as

*“I have seen these collocations, I remembered seeing these collocations, like lavish lifestyle, still waters, from reading online texts. Some of them are from the listening texts that I have listened. I like listening to celebrity talks, for example in TED. There are many good words and expressions in the talks.”*

There was only one first-year learner (Yanrong) who have identified the major learning sources as from out-of-class incidental learning. She has expressed her learning sources as

*“I never spend much time on memorizing words. Many these collocations that I have learned from high school were picked up while reading the newspaper. We have all subscribed to English learning newspapers designed for high school students.”*

Learners’ reflections on learning sources has clearly indicated that the primary source of language learning, in some cases being the only source, was intentional learning in classroom instruction. Even if some of the collocations were identified by learners as learnt from incidental learning activities, the collocations were learnt essentially through intentional learning. Although most of the learners expressed that they regard watching movies and listen to TED talk as potential sources for vocabulary learning, very few collocations in their writing came from such sources. Interestingly, no collocations were reported to be learned while conducting social interaction using English.

#### 4.4.3 Confidence level in collocation use

To investigate the collocations in writing also involves the confidence of learners when they are using the collocations. Research Question 3 explores the confidence level of the learners in collocational use and the kind of knowledge they have for obtaining confidence. During the interview, learners were asked about whether they were confident using the collocations in writing. Learners were not asked to choose from the dichotomy of “confident” or “not confident”. Instead, they were encouraged

to elaborate on confidence in their own language and reflect upon the collocational knowledge that could help them gain confidence. Also, another way to approach the issue of confidence was to find out whether learners regarded the collocations they produce as real collocations or a random creative combination. They were asked to identify the collocations used in their writing which they believed to be recited collocations or a creative combination based on their knowledge of single words.

Most learners reported that they were confident in collocational use (16 high-performance learners and 13 low performance learners). These learners expressed that they only used familiar collocations to avoid errors and seldom stepped out of their comfort zone. The group of learners who reported being confident in collocations were further enquired on the type of knowledge they needed. Spelling, meaning and grammatical knowledge were unanimously acknowledged by all the learners as the knowledge that helped them gain confidence. These types of knowledge helped to avoid errors in writing. Learners considered them as indispensable during word selection. Learners made the following comments when asked about their confidence in collocational use:

*“I am quite confidence in the collocations in my writing as long as it is correct in grammar.”* (Juanjuan, first-year high-performance learner)

*“I seldom use collocations that I have learnt in college. They are too complicated and I do not know them very well. I am quite careful in writing, I only use collocations that*

*are correct in spelling and grammar.”* (Guanzhu, third-year high-performance learner)

*“I use collocations which are without clear mistakes in it. ...The clear mistakes mean grammatical mistakes.”* (Fangli, third-year high-performance learner)

*“I use collocations in the writing after I have used them in other places for many times, like drills and exercises. I need to make sure that it is correct in grammar when I use them.”*(Yanan, third-year low-performance learner)

Compared to the cautiousness of the majority of learners, six learners have expressed that they would take risks when using newly learned collocations, and would not over-emphasize on the correctness of the collocations.

*“I am that kind of person... For example, if I have recited some words and collocations in the library, I would seize the first opportunity to use them in writing. The teacher has scolded me once. She said that I used the collocations I had just learned, but the collocations were wrong.”* (Lei, second-year high-performance learner)

*“I would not say confidently. I rely on intuition. Some of the collocations may seem correct, but if you read them, they do not sound right. I rely on this intuition.”* (Lingjie, first-year low-performance learner)

*“I do not consider ‘confidence’ in using collocations. I write down whatever comes to my mind.”* (Yicheng, second-year low-performance learners)

Learners were asked to identify the collocations in their writing as “recited collocations” or “creative combinations” to enlighten on their confidence in collocational use. This was where I find the greatest difference between high-performance learners and low-performance learners. This was where the biggest difference between the high-performance and low-performance learners lay.

High performance and low-performance learners used similar ratio of the two types of collocations in the first year of study with more creative combinations than recited ones. It was interesting to see that this contradicted learners’ own comments. They expressed that, facing the pressure of the coming entrance exam for universities, they recited vocabulary repetitively in high school. It is possible that, although learners were instructed to recite words, they had not developed the concept of collocations. Instead, learners regarded collocations as the free combination of grammatically correct words. Greater differences between the high-performance and low-performance learners started to emerge in the second year of study. High-performance learners stuck to recited collocations in their writing, while the low-performance learners continued their habit of freely combining two words into collocations. This trend held true for the year three learners. Over time, high-performance learners gradually developed the awareness of collocations as a single unit. This was evident in their reflection of learning collocations as single units

through reading. On the contrary, low-performance learners continued to regard collocations as free combinations of two words.

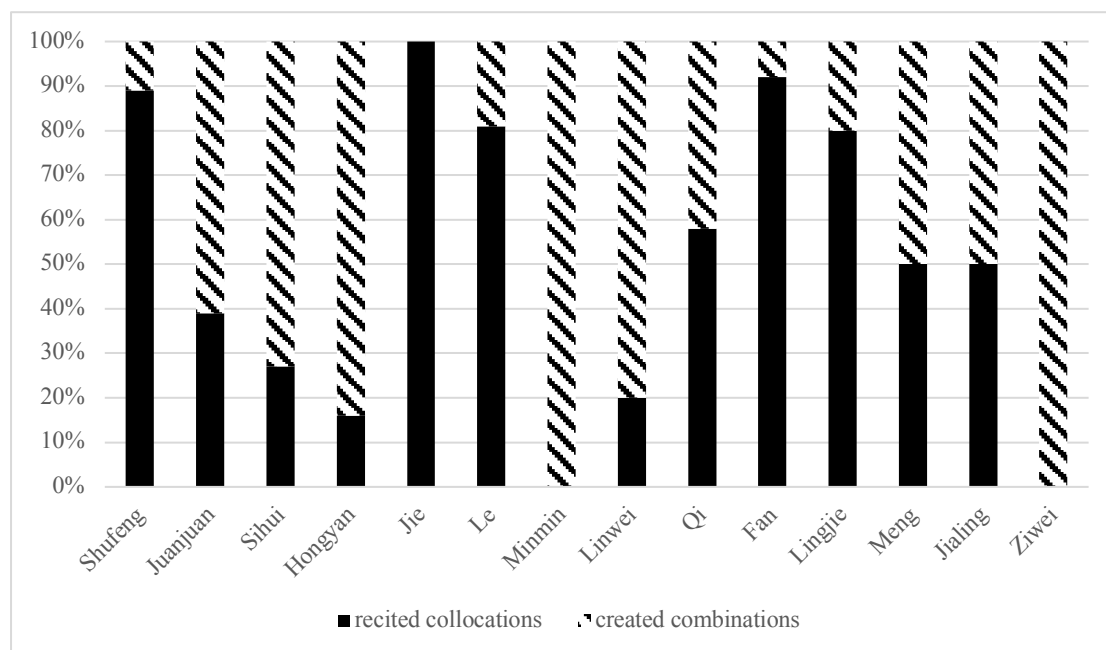


Figure 4.9 *The Percentage of Recited Collocation and Creative Combination (year 1)*

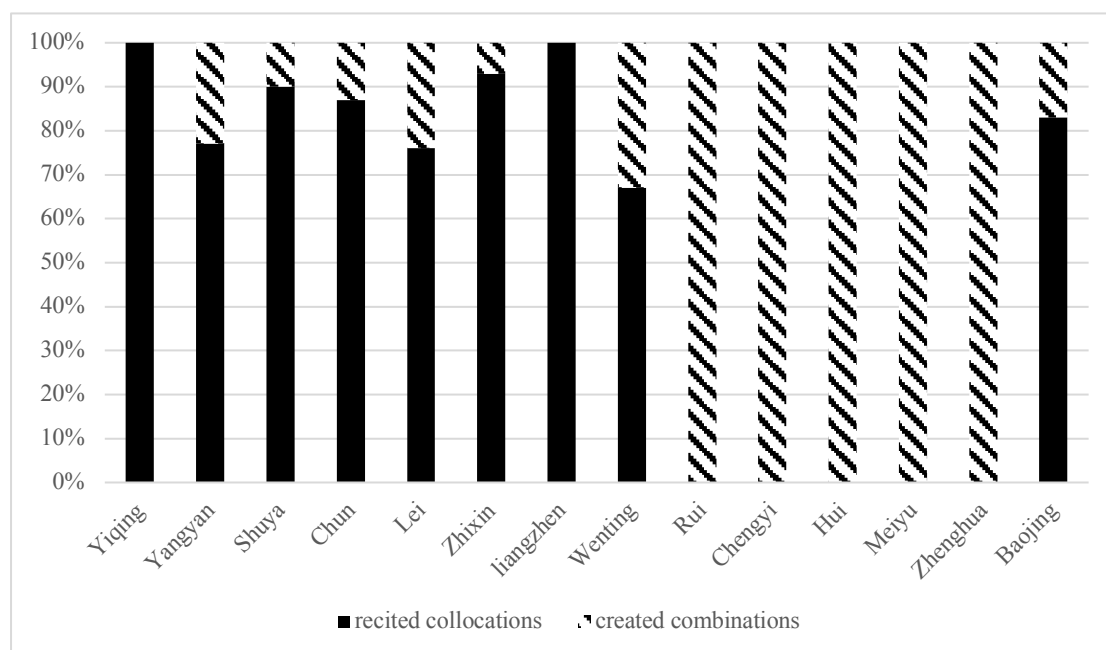


Figure 4.10 *The Percentage of Recited Collocation and Creative Combination (year 2)*



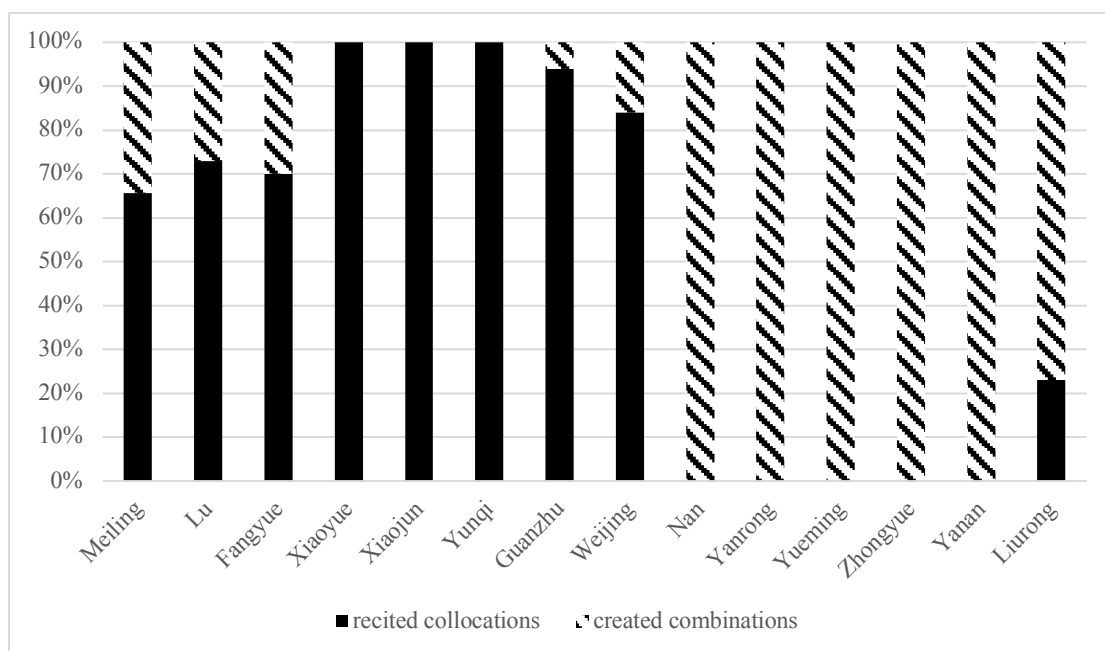


Figure 4.11 *The Percentage of Recited Collocations and Creative Combinations (year 3)*

#### 4.5 General discussion

This study presents a comprehensive profile of the collocations in learner writing of three levels of Chinese tertiary EFL learners. It delineates the developmental patterns of the collocational use of tertiary learners at group and individual levels. The quantitative data is complemented in depth by the insightful understanding of the learners' sources of learning and confidence level in using collocations through interviews.

There were three major findings. First, the results showed that learners demonstrated marginal improvement in the use of collocations in the three years of learning. The significant improvement in some types of the collocations, such as the

VN collocations between year one and year two learners, was offset by the significant decrease in the mutual information score between year two and year three learners. The only type of collocations that showed consistent improvement between groups was the AdjN collocations of individual writing.

Levitzky-Aviad and Laufer (2013) found that significant improvements in the use of collocations were witnessed in English major students at the beginning and the end of the year. English major students at the beginning of the study could use significantly more collocations than students from grade 6 to grade 11. Meanwhile, English major students at the end of the year could use significantly more collocations than students from grade 6 to grade 12. There was no significant difference in the number of collocations used by English major students from the beginning and the end of the years. The significant changes were found when learners progressed from high school to tertiary study. These findings led them to conclude that it required six years or longer to witness significant improvement in the use of collocations in writing. The findings of the present study present study revealed similar trend. During the three years of study in college, there were only marginal improvements in the use of collocations. However, Levitzky-Aviad and Laufer (2013) did not provide more information on the collocations except that they were using more of them. It was not clear whether there was any progress in the collocational use in terms of the frequency and association strength.

The marginal progress in the use of collocations in learn writing could be explained in two ways. First, it takes longer to witness significant improvement in

productive knowledge of vocabulary. The two studies have found that, although it is possible to identify improvement in receptive knowledge within a year or two, it takes much longer time for learners to transform this improvement to writing (Lemmouh, 2011; Levitzky- Aviad & Laufer, 2013). Another possible reason to explain this could be the lack of awareness of collocation among learners, which led to inefficiency in memorization of collocations. The lack of awareness could undermine the identification, uptake and retention of the collocations (Boers & Lindstromberg, 2012; Martinez & Murphy, 2011; Littlemore, Chen, Koester & Barden, 2011). This could be supported by learners' reflection on their confidence level. Learners have identified a large number of collocations in their writing as creative combination of two grammatically compatible words. High-performance learners have developed the awareness of collocations and could use more recited collocations in their writing. However, such awareness was not found in low-performance learners. Most of the collocations in their writing have been identified as creative combinations. Their judgment on the appropriateness of collocations was based on grammatical correctness of the two words. This lack of awareness of collocation has also led to another important finding of this study which will be reported later.

*“I use correct collocations with no clear grammatical mistakes, like make money. The collocation is correct grammatically. So I use it.”* (Baojin, second-year low-performance learner)

Second, the present study revealed a notable finding that overwhelming majority of the two-word combinations in learners writing were below the mutual information threshold. This finding indicated that learners relied on erroneous or creative combinations in their writing. Over 80% of the VN, AdjN and NN combinations in learner writing were either erroneous or created by learners. In other words, less than 20% of the three types of collocations occur together in the reference corpus of COCA more frequently than chance.

The mean mutual information scores of the collocations in individual writing also supported this finding. The mean MI scores of the collocations in 194 learner writing ranged from 0.94 to 2 with an average of 1. The average of mean score of the present study was half of the mean scores in Bestgen and Granger's study (2014). They found that the mean of the MI score for the 171 texts written by tertiary L2 learners was 2.16.

Two previous studies into the collocations in learner writing have indicated that around 50% of the collocations were creative combinations (below the MI threshold). Siyanova and Schmitt (2008) reported that 44.65% of the adjective-noun collocations used by the Russian tertiary learners have met the MI threshold. And therefore, those collocations could be identified as appropriate or strong collocations. They compared the ratio of appropriate collocations produced by learners with the ratio used by native speakers in the same corpus, and found that there were no significant differences ( $\chi^2 = 2.07, p > .05$ ).

In another study, Durrant and Schmitt (2009) yielded a similar profile of strong collocations for native speakers and L2 tertiary learners alike with the previous study. They found that, for long texts (running words around 30,000 words), around 45% of the collocations in native speakers' and L2 learners' writing were strong collocations. For short texts (running words around 9,000), 47% of the collocations were strong collocations in L2 learner writing which was four percent more than the native speaker writing. By categorizing collocations into different bands, Durrant and Schmitt (2009) found that the ratio of the collocations gradually increased from the first band (3-3.99) to the third band (5-5.99), and then, tailed off with the increase in the MI scores.

It could clearly be seen from the abovementioned two studies that the ratio of strong collocations in L2 learner writing and native speaker writing was consistently remained at around 45%. Comparatively, the ratio of the strong collocations of the present study was much lower.

In addition, the present study categorized the strong collocations into different bands. The percentage of the strong collocations in different bands in the present study showed a more diverse picture. For strong collocations, the present study categorized collocations into the first band ( $3 < \text{MI score} < 5$ ) and second band ( $\text{MI score} > 5$ ). For VN collocations, the present study demonstrated similar pattern with Durrant and Schmitt (2009) and showed that there were more collocations in the second band than in the first band. However, for AdjN and NN collocations, there were comparable percentage of collocations in two bands. This finding underlined the

necessity to examine collocations of different grammatical makeup separately to unravel the nuance.

Bestgen and Granger (2014) concluded that it is more likely to find creative combinations in advanced learners' speech and writing. The present study partially supported this conclusion. The reflections of the learners on writing indicated that high-performance learners have gradually developed the awareness of collocations and could use recited collocations as a single unit in their writing. However, such an awareness could not be found in low-performance even when they progressed into the second and third year of study.

The pronounced ratio of creative combinations in the present study is more likely due to the lack of awareness of collocations than the risk-taking endeavors of learners to create novel combinations. Learners seemed to have a rather liberal attitude towards collocations and regard them as a free combination of two grammatically possible words. The pervasiveness of creative combinations was also found in the writing of high-performance learners who showed awareness towards collocations. The mean of the MI score in their writing showed that there were more creative combinations in their writing rather than strong collocations as they identified. The six high-performance learners in the present study were confident in collocational use and have identified the collocations in their writing as recited collocations. However, the mean MI scores in their writing indicated a different picture. It ranged from 0.83 in Xiaoyue's composition to 2.3 in Yunqi's composition. The collocations in their writing indicated that they still relied heavily on the free combinations of high

frequency words, such as do things, have food, give money, most people. Only in very few cases could they use collocations that were less frequent, such as positive attitude, mountainous areas, and consume energy.

This finding reiterates the comment in Durrant (2014). What is more pressing for advanced learners is to development the awareness of collocations with high MI scores. Durrant (2014) found out that L2 learners lack the awareness for association strength of collocations based on the results of a meta-analysis of nineteen studies which yielded an insignificant and inconsistent relation between MI score and learner knowledge. Based on the analysis of the academic writing of advanced L2 learners, Durrant and Schmitt (2009) concluded that, even at advanced level, learners still have not developed the sensitivity to collocations that are less frequency yet “exclusive” to each other. From a psycholinguistics perspective, Ellis, Simpson-Vlach & Maynard (2008) found out that, learners’ accuracy and fluency of processing lexical bundles did not increase as the MI scores increased. It can be seen from these studies and the present study that the lack of awareness of association strength applied to learners of various L1 backgrounds and education levels. Also, it applies to lexical bundles and two-word collocations.

Third, although learners cling to high-frequency collocations in their writing regardless of proficiency level, there are discernible differences strong collocations (MI score higher than 3) in their writing. Previous studies into the collocations in learner writing have reached a consensus that learners overuse highly frequent collocations (Altenberg & Granger, 2001; De cock, Granger, Leech & McEney, 2008;

Hasselgren, 1994; Laufer & Waldman, 2011). This study supports this finding by examining the type/token ratio of all the collocations in writing and comparing the collocations with the highest frequency of occurrence in the reference corpus. Learners used a similar set of high frequency collocations including highly frequency node word (i.e., make, have, help, keep, save, spend, pay) and a variety of collocates (i.e., time, thing, people, money, word, idea). However, what is hidden is this repetition is the dynamic changes in the strong collocation in learner writing of different proficiency levels. To my knowledge, this study is the first study that compares the types of strong collocations used by different proficiency groups. Even if this study has controlled the writing topic, there was great variance in the strong collocations across three levels of learner writing. It is quite likely that association strength between collocates is more sensitive in differentiating proficiency of learners than the frequency of occurrence.

Fourth, the learning sources of collocations have revealed the efficiency of the L2 vocabulary acquisition. There are two noteworthy points regarding the learning sources. First, the tertiary English instruction has a long way to go to provide learners with rich input for new item learning and ample opportunities to consolidate the newly acquired words. Learners of the three levels of study identified that the majority of the collocations in their writing were learnt in high school. The repeated memorization, drills and exams for the preparation of national examination for college admission have entrenched the collocations in learner's mind. Rote learning has been well documented in previous research as a favored learning method of



Chinese students. It's root deeply grounded in Chinese philosophy of learning (Ding, 2007; Li, 2004; Rao, 2002). Li (2004) found out that the 100 Chinese learners and teachers rated rote learning and memorization as two of their most favored way of learning English. As evidenced by the findings, rote learning has both positive and negative influences on the use of collocations. At early stage of learning, rote learning could help learners to acquire high frequency collocations to help them cope with learning tasks. However, with the improvement in proficiency, the negative effect of rote learning surfaces. One learners' reflection on writing has illustrated this backfire.

*“Frankly speaking, I think that all the collocations I use in writing are learnt in high school in the preparation for the national entrance exam. I seldom use the collocations that I have learnt in college. I am not sure how to use. But I know how to use the collocations learnt in high school. I practiced a lot with them in exercises.” (Guangzhou, third-year high-performance learner)”*

Compared with the highly intensive learning mode in high school, college English teaching has not provided sufficient input and repetition of lower frequency collocations to override the footprint of the high-frequency collocations and provide learners with the confidence to use low-frequency collocations in writing.

In addition, incidental learning and intentional learning are also important in the discussion of learning sources. Compared with Li and Schmitt's finding (2009), the EFL learners in this study has much narrower sources of learning words. The

advanced ESL learner in Li and Schmitt (2009) has identified various learning sources of collocations. The participant has identified 47.9% of the lexical phrases in her writing as learnt from previous learning experience in China. This means that over 50% of the lexical phrases were learnt during her one-year study in UK. She reported that the large amount of academic reading that she had been required to read has contributed 21.9% of the new lexical phrases used in writing, followed by intensive language learning program in UK (16%), the feedback from native speakers and peers (12.4%), dictionary (0.6%) and daily oral communication (0.6%).

Comparatively, learners in the present study has much fewer learning sources. 88% of the learners interviewed expressed that almost all the collocations in their writing came from textbooks. Very few collocations appeared in their writing were acquired through incidental learning, not to mention that they often confused incidental learning with intentional learning. Only three learners identified that some of the collocations in their writing were learnt during reading online news and listening to TED talk without special attention on words. There was sufficient consistency in the results to conclude that the overwhelming learning sources for learners were from in-class intentional learning.

The monotonous learning sources have laid great pressure on teachers and textbook compilers to design and organize meaningful tasks that will facilitate the retention of collocations. Teachers need to raise learner's awareness, help them search for the meaning of the collocations and evaluate on their own the appropriate meaning and occasions to use collocations in productive ways. Learners need to raise

awareness to identify collocations from input, memorize the collocations as holistic units and find opportunities to use them in productive ways. Collocations in textbooks need to appear at fixed intervals and provide sufficient repetitions to promote memorization and production (Peters, 2014; Webb, Newton, & Chang, 2013). It also necessary to design meaningful exercises to facilitate the retention of the receptive and productive knowledge (Boers, Demecheleer, Coxhead & Webb, 2014; Peters, 2012).

What was missing in the learning sources in learners' reflection could also shed light on the understanding of collocation learning. To my knowledge, there were few if any collocations used in writing learned from the interaction between peers and feedback from teachers. The interaction between peers in English has been regarded by learners as uncomfortable, inconvenient and inefficient in word learning. One of the learners reflected on her interaction with peers in English as:

*"We tried to talk to each other in English for three days, and then just gave up. Since there are so many words about daily life that we do not know, we couldn't communicate through language. For that three days, we normally use body language to get meanings across. That was so uncomfortable."* (Shufen, first-year high-performance learner).

Other than this, learners did not mention the contribution of peer feedbacks to the improvement of the language use in writing. Also, no collocations came from teachers'

feedback in writing. This finding contradicts the findings of the prolific research into the potential of written and oral feedback. These studies suggest that written and oral feedback is conducive to improving learners' performance (Bitchener & Knoch, 2009; Evans, Hartshorn & Strong-Krause, 2011; Li, 2010; Storch & Wigglesworth, 2010; Yilmaz, 2013; Zhang & Rahimi, 2014). In this study, learners reflected that the majority of the feedback from the teachers were in the format of indirect feedback with a red line drawn under certain sentences, words, and phrases. It was up to learners to find out the problems in these underlined parts if they spend time working on this. Unfortunately, most learners would ignore these feedbacks since the underlined parts were not directly corrected. Using extensive case studies with participants from diverse L1 backgrounds and disciplines, Storch and Wigglesworth (2010) explored the uptake and retention of corrective feedback on writing. They suggested that "learners' engagement" with corrective feedback was a crucial factor in understanding the effectiveness of it (Storch & Wigglesworth, 2010: 327). It seems that learners in the present study were not actively engaged in the corrective feedback, which undermined learning from this source.

The study also arouses a certain concern over the role of word learning in written feedback provided by teachers. The study provides discouraging evidence to show that word learning has been downplayed in written feedback and writing classes. Learners' reflections on writing class were rather consistent to show that the classes centered on sentence analysis which later extended to paragraph and text construction. They were given a great number of drills to work on the grammatical structure of

sentences. A Little time in class in spent on word learning. The following account is a typical reflection of word learning in writing class:

*“The only thing about words in class is a small booklet with a list of sentences embedded with great collocations. We are supposed to recite these collocations after class. The teacher would not comment on words and collocations in class.”* (Lei, second-year high-performance learner)

#### 4.6 Conclusion and pedagogical implications

This study aimed to explore the use of collocations of Chinese tertiary learners in writing. Three types of collocations were included in this study, i.e., verb-noun collocations, adjective-noun collocations and noun-noun collocations, to reflect the variance in the use of collocation. Also, learner writing from three levels of study was analyzed to chart the development of collocational use with the improvement in the proficiency levels. Learners were also interviewed on their learning sources of the collocations in writing and their confidence in collocational use.

Using the statistical analysis of group variance, the results showed that learners demonstrated marginal improvement in the use of collocations measured in terms of frequency and association strength across three years of tertiary study. Over 80% of the collocations in learner writing were below the MI threshold, which means they appeared together more likely due to chance and show low “exclusiveness” between collocates. The error analysis into this group of collocations showed that there were

very few errors of spelling, morphology, and word coinage, where most of which were creative combinations with no evident grammatical errors.

Learner's reflection on the learning sources of the collocations revealed that they relied on very limited resources on the acquisition of collocations. Their primary source of collocations was intentional learning in classroom instruction. Few if any collocations in writing were learnt through incidental learning activities, like reading and other learning sources, like interaction between teachers, peers and the feedback on writing from teachers. Their confidence in using collocations was greatly dependent on grammatical correctness than other aspects of collocational knowledge, which, to some extent, explained in their habit of combining two grammatically possible words together as collocations in writing.

However, there is one limitation in the present study that needs to be addressed. The present study uses Corpus of Contemporary American English (COCA) to retrieve the frequency-based information of the collocations in learner writing. The choice of reference corpus could help to compare the results of the present study from previous studies using similar corpus in the analysis of collocations. However, it is not clear the extent to which COCA could reflect the everyday contact with English of the learners in the present study. It is likely that the collocations used in learner writing in the present study reflect the everyday living experience of the participants. One possible improvement to address this limitation is to adopt a corpus that could reflect the use of English from wider contexts, such as the Corpus of Global Web-based English (GloWbE). It includes the use of English in Hong Kong contexts

which bears greater resemblance to the exposure to the language with Chinese mainland students.

This study has important pedagogical implications. First, it takes a much longer duration for the acquired collocations to be used productively in writing. Tasks should be designed carefully to promote productive knowledge of collocations. Earlier studies found that receptive tasks may lead to a better gain in receptive knowledge, while productive tasks may lead to a better gain in productive knowledge (Webb, 2007). This argument was attested by a recent study by Bao (2015), in which output tasks led to a greater gain in productive knowledge. More specifically, Boers, Dechemeleer, Coxhead and Webb (2014) have compared matching exercises and other popular collocation exercises in textbooks on the effectiveness of gains in knowledge. They found that matching exercises were prone to leaving traces of distractors in learner' mind at the first encounter of target collocations.

Second, it is useful to deliberately teach collocations with strong association strength for awareness-raising and efficient learning. The habit of randomly combining two grammatically possible words should be pointed out, and collocations with strong MI should be introduced instead. When introducing new words, it is helpful to provide learners with a list of strong collocates for learning. And during text analysis, it is also helpful to highlight the collocations with strong association strength. Learners could be encouraged to use convenient online corpus tool to explore the strong collocates of their target words, and gradually build awareness for the restriction on the interchangeability of collocates. Till now, the association

strength (MI score) has been used by studies as the criteria for choosing target collocations for vocabulary enhancement experiments (Szudarski & Carter, 2014). However, no experiments have examined the effectiveness of recall and retentions of collocates with high MI score. It could be a potential area for future research.

Third, learners in this study were also found to have a heavy reliance on intentional learning, especially in-class teaching, in acquiring collocations. Therefore, it is also important to create more opportunities for learners to expand their vocabulary repertoire from incidental learning sources. The proper use of helping tools like a dictionary will be a great help to learners if they want to explore opportunities to acquire words outside classes. The reliance on in-class intentional learning has created high demand for textbooks. However, till now, the research on the presentation of vocabulary in textbooks could in no way compared to those studies on learner production in size (e.g. Lu, Gamson & Eckert, 2014; Meunier & Gouverneur, 2007). The existing studies on lexical bundles in textbooks are an extension of research on single word use in textbooks. They measure the overlap between the collocations in the textbook and existing collocations list and reference corpus (Criado & Sanchez, 2009; Liu & Zhang, 2015; Matsuoka & Hirsh, 2010; Tsai, 2015; Ren, 2014). For example, Tsai (2015) have generated a list of verb+noun collocations based on single word frequency in British National Corpus (BNC) and identified the coverage of the generated list in the three textbooks in Taiwan. He found that only a small amount of collocations in the list were used in the textbooks, and also, the collocations were not recurred to sustain learning.



It is also interesting to examine the association strength of the collocations in textbooks, especially textbooks in colleges for advanced learners. One interesting piece of evidence in this study is that one of the learners used the collocations penetrating idea in her writing which she learned from a reading text in the second-year textbook of intensive English reading. However, a search in the reference corpus of COCA showed that MI score for this collocation is -1.96, i.e., the collocations is a creative combination rather than strong collocations. It is reasonable to explore the association strength of collocations in textbooks considering it being the major learning sources for learners.<sup>2</sup>

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<sup>2</sup> Part of this chapter has been revised and submitted as a journal article entitled “Profiling collocations in the EFL writing of Chinese tertiary learners”.

## Chapter Five The Acquisition of collocations: The Effect of Intralexical Factors

### 5.1 Introduction

Chapter 4 explored the use of collocations in learner writing. The results showed that learners of all three levels used very little collocations with high mutual information score. This finding suggests that learners lack awareness of association strength in collocations in the acquisition of the word sequences. This observation is in line with the literature that has found that the processing advantages of collocations and its pervasiveness in language were grounded in L1 literature but not witnessed in L2 literature (e.g., Arnold & Snider, 2010; Bestgen & Granger, 2014; Boers, Eyckmans & Kappel, 2006; Dai & Ding, 2010; Erman & Warren, 2000; Rayson, 2008; Stengers, Boers, Housen & Eyckmans, 2010).

The opposite picture could be seen in L2 literature. Research into L2 learners of English has found out that collocations have much lower coverage in learner writing than in L1 literature (Foster, 2001) with weaker correlation with proficiency (Hsu & Chiu, 2008). Also, it has been shown to have inconsistent results in processing advantage compared with single words and non-compositional units even for advanced L2 learners (Jiang & Nekrasova, 2007; Siyanova-Chanturia, Conklin & Schmitt, 2011). Collocations present potential threats to the comprehension of texts by being deceptively transparent (Martinez & Murphy, 2011).

As evidenced by research into learner writing, learners cling to a set of high frequent collocations that they know very well to use in speech and writing (Durrant

& Schmitt, 2009; Granger, 1998). They tend to use erroneous collocations, even at the advanced level of study (Laufer & Waldman, 2011). “This suggests that the difficulty learners have is not only that of learning which words go together but also learning how to employ the chunks they know” (Schmitt, 2010, p. 144). This observation has justified the growing body of research into the incidental and intentional learning of collocations from different levels of L2 learners.

Previous empirical studies have lent support to the effectiveness of explicit learning of collocations (e.g., Boers, Demecheleer, Coxhead & Webb, 2014; Peters, 2014, 2015, 2016; Webb & Kagimoto, 2009; 2011). As evidenced by Kasahara (2011), learning new items in collocations is more conducive to the retention of the meaning than in single words. Although more recent studies done by Peters (2012) has shed doubt on this advantage, the differences in the methodology make it hard to arrive at definite answers. So, the question remains whether learning new items in collocations is conducive to retention.

It is now well established that corpus is indispensable in the explicit learning of collocations. For example, in an earlier paper, Chan and Liou (2005) did a small scale experiment to examine the effect of web-based concordance in L2 verb-noun collocation learning. Recently, Szudarski and Carter (2014) used mutual information score as the criteria for selecting target collocations. However, there is limited empirical evidence available to examine the effect of corpus-based mutual information on collocation learning.

In addition, previous studies have pointed out that verb-noun collocations are

problematic for L2 learners and are harder to learn than other types of collocations, for example, the adjective-noun collocations (Chan & Liou, 2005; Peters, 2015). However, there is very limited empirical evidence that explores this assumption in experimental studies apart from Peters (2015). It needs more empirical studies to explore to what extent the different levels of learning burden of collocate-node relationship could apply to learners from different levels and background of study and whether the explicit teaching of collocations of different collocate-node relationship could ease of the learning burden.

Based on the findings of chapter 4 which have revealed learners' unsatisfactory use of collocations in writing, this chapter took the issue back to the beginning of the learning process. It aimed to investigate the factors that influenced the learning of collocations to explore the effective way of learning collocations. Section 5.2 reviews that relevant studies in the learning of collocations for L2 learners. We see that previous research has produced conflicting evidence on the acquisition of new vocabulary items in collocations and single words, and the effects of the types of collocations (collocate- node relationship) on the learning of new collocations. Also, previous research has not yet provided sound evidence for the role of association strength (measured by mutual information score) on the learning of collocations. Section 5.3 presents the methods that were employed to conduct the classroom experiment on the three groups of year one tertiary students. The three groups of learners were divided into two experimental groups who received the instruction on collocations and one control group who received instruction on single words. The

three groups of learners went through one immediate posttest and one delayed posttest two weeks after the treatment. Section 5.4 presents the results of the analysis and section 5.5 discusses the major findings of the study which have provided strong evidence for the learning benefit of collocations over single words in new item learning and the benefit of association strength in collocational learning.

## 5.2 Literature review

### 5.2.1 Knowledge of collocations in L2

The definition of the collocations would influence the design of the study and the generalization of results. It has consequences on the way that the target items were selected, and the extent to which the research could be generalized in other contexts. Considering this, I would first clear the ground at the start of the literature review. There are mainly two approaches to defining collocations, i.e., the frequency-based approach and phraseological approach. The phraseological approach identifies collocations based on the semantic properties of the collocates (Cowie, 1994; Howarth, 1998). Howarth further categorized the collocations as in a continuum starting from non-idiomatic combinations to pure idioms. At the non-idiomatic end of the continuum was the free combinations. It consisted of collocates in the literal sense and can be freely substituted with other words (*carry a trumpet, at the top of the table*). The second category was the restricted collocations where one collocate was used in figurative sense accompanying with a limited number of collocates (*blow a fuse*). The third category was the figurative idioms with both metaphorical meaning and literal

meaning (*blow your own trumpet*). The last one on the other end of the continuum was pure idioms with only have one opaque metaphorical meaning which could not be decomposed and understood from the meaning of the collocates (*blow the gaff*).

Identifying collocations in the phraseological approach would inevitably involve a degree of subjectivity. It relies on human judgment to rate the acceptability of the collocations and categorize them accordingly to the four sub-categories. Howarth (1998) acknowledged the phraseological approach as the proper complement of the frequency- based approach with automatic identification of collocations, especially in the cases of the low-frequency collocations.

The frequency based approach views collocations as two words that co-occur more frequently than chances could predict in a corpus. Hoey defined it as “the relationship between a lexical item with items that appear with greater than random probability in its context” (1991, p.7). This statistical approach uses frequency-based information like mutual information score and t-score to identify lexical items that occur within a given span more frequently than random probability. In most case, a span of 4 is adopted by studies, i.e., four words to the left of the node words and four words to the right of the node words. This span has been justified by John and Sinclair (1974:21) as the optimal span that 95% of the collocational influences might fall in.

The advantage of using statistical approach is that it provides a quick and objective judgment on the acceptance of collocations. Also, as stated by Webb, Newton, and Chang (2013), it provides a fast identification of proper collocates for the node words. The online platform of corpus like Corpus of Contemporary

American English (COCA) and British National Corpus (BNC) could provide the mutual information score of the collocate when the node word is provided. For example, a search for collocates for the node word *knowledge* could yield verbs like *acquire, apply, share and transfer* and adjectives like *basic, indigenous, pedagogical and intimate* as proper collocates that have mutual information score above the threshold of 3. The threshold indicates that these collocations occur in texts more frequently than the frequency of their constituents.

Since this study intended to examine the effect of association strength on collocational learning, I would adopt the frequency-based approach in defining collocations. In this study, the collocations were viewed as word combinations within a limited span that co-occurred more frequency than chance would predict. Wouden (1997) addressed that adopting the frequency-based approach has the potential to include idioms. The frequency-based approach does not take the semantic properties of the collocations into consideration, such as the congruency of the L1 and L2 collocations (Wolter & Gyllstad, 2013) and the semantic transparency of meaning of L2 collocations (Gyllstad & Wolter, 2016). However, the target node words of this study were infrequent words which have low potentials to be used as idioms. The study included highly transparent collocations such as *roam streets, bestselling memoir* and *modern metropolis*. In some cases, it contained collocations with node words used in its metaphorical sense like *unleash* in *unleash creativity* and *erode* in *erode confidence*. However, judging by Howarth's classification, it would be classified as restricted collocations posited at the middle of the continuum. I believe

that the inclusive approach of collocations with a degree of transparency would increase the ecological value than a tight control approach which only includes collocations as free combinations or restricted collocations. In real learning scenarios, the learners may come across collocations with different degrees of semantic transparency. Additionally, the compilation of textbooks nowadays is showing the trend of using frequency list of large native speaker corpora, using frequency-based approach would resemble the real- life scenario of collocational learning.

It is well known that L2 learners are prone to problems in the knowledge and use of collocations. Earlier research showed that L2 learner's knowledge of collocations lags behind their knowledge of single words (Bahn & Eldaw, 1993). And research into learner corpus has revealed the unanimous results that learners overuse high frequent collocations (e.g., Nesselhauf, 2003; 2005). And their use of collocations shows various kinds of mistakes and deviations from that of native speakers' (Laufer & Waldman, 2011). These results reveal the daunting picture of L2 collocation learning. On the good side, researchers are showing great interest in exploring the potential of using collocations to introduce new vocabulary items to promote the teaching and using of collocations. An equally important line of research is the possible ways that the learning of collocations could be enhanced and the potential factors that might influence the collocational learning. I will review the studies that have covered these three aspects by first discussing the potential that collocations have shown in new vocabulary learning and the role of associate strength in collocational learning. Then, I will review the literature on the collocate-node



relationship that might affect the learning of collocations. Lastly, I will discuss the incidental and intentional learning of collocation.

### 5.2.2 Collocations and single words in new item learning

Vocabulary research on word teaching has traditionally centered on learning single words (Schmitt, 2010) and improving the efficiency of teaching and learning of single words. However, realizing that words always appear together with other words, the recent research in second language acquisition has compared the learning efficiency of collocations and single words in new item learning to investigate the learning burden of collocations compared to single words and the potential of using collocations to facilitate the retention of new items. However, till now, there is conflicting evidence as to the teaching and learning new word items in collocations and single words.

Kasahara (2011) compared the retention of new word items when presented in two- word collocations and single words. The Japanese learners of English as a foreign language in his study were divided into two experimental groups and instructed to learn 20 two-word collocations and 20 single words. The node words of the study were all infrequent words. Both groups received brief instruction on the pronunciation of the collocations and single words for three minutes. Participants were told to memorize the Japanese meaning of each item. The participants took immediate and delayed posttest one week after the treatment on the receptive knowledge of meaning. The posttests were translation tests in pen-and-paper format.

The participants were asked to write down the Japanese equivalence of the L2 collocations and single words. The results showed that learners who have learned the new items in collocations scored significantly better in the immediate and delayed posttest than the learners in the single words group. Additionally, learners in the collocation condition showed a smaller amount of attrition between immediate and delayed posttest. Kasahara (2011) concluded that the known collocates in the two-word collocation served as effective cues in the encoding and decoding process of new item learning, and in turn, improved the retention of the new words.

Another piece of positive evidence comes from Laufer and Girsai (2008). They intended to examine the effectiveness of contrastive form-focused tasks on the acquisition of verb-noun collocations and single words. The study adopted the incidental learning mode in which the target words and collocations were embedded in a reading passage. After reading the text, the participants in different treatments received different types of tasks: the meaning-focused instruction, non-contrastive form-focused instruction and contrastive analysis and translation. The immediate and delayed posttest examined the receptive and productive knowledge of meaning. Although the primary goal of the study was not on a comparison of the learning efficacy of collocations vs. single words, the posttest scores of the two tests have consistently shown that the learning gains on collocations were higher than on single words for all three treatments.

The counter-evidence from these studies came from two studies done by Peters (2012, 2014). Peters (2012) examined the effectiveness of two awareness-raising

techniques (typological enhancement and instructional method) on the learning of new formulaic sequences (including collocations) and single words. FL college learners of German read a glossed text with 24 target items embedded in the text, after which they completed vocabulary exercise and summarization of text. The 24 target items included 12 single words and 12 formulaic sequences. The immediate and delayed posttest were the productive test of meaning in which the participants were required to translate the L1 words into German. The results on the immediate posttest showed that participant produced correct answers for single words than formulaic sequences. The delayed posttest showed floor effect and was not included in the inferential analysis.

In another study into the effects of repetition and time of posttest on the retention of collocations, Peters (2014) tested the retention of form on 24 target items with 12 single words and 12 collocations at different number of encounters (1 time, 3 times and 5 times). She used two form recall immediate and delayed posttest. The target words were presented in word list and followed by several vocabulary exercises working on the meaning, form and morphological knowledge of the target items. The posttests were in the format of translation task. The participants were required to supply the English target items based on the Dutch definition. The results on the posttest showed that, for the two experimental groups, the mean scores on the single words were higher than collocations in most cases. However, the results were not as consistent as the previous studies (Peters, 2012) which showed a one-sided advantage for single words. There were cases, albeit few, when learners produced correct

answers on collocations than single words.

Pellicer-Sanchez's study (2015) provided neutral evidence to the learning of collocation vs. single words. In the study exploring the potential of incidental learning of collocations from reading, Pellicer-Sanchez (2015) investigated whether learners could recognize and recall the meaning and form of the target words using a battery of delayed posttests one week after the reading session. The 12 target collocations in her study included six pseudowords and six adjective-pseudowords collocations. The posttests were conducted through interview using multiple choice tests and the translation tasks in which the participants were required to say the L1 or L2 words depending on the direction of the tests. The results of her study showed that there were comparable learning outcomes of the pseudowords and the adjective-pseudoword collocations in the five delayed posttests. The single words and collocations showed comparable results (regarding mean scores) in the recall of meaning. Although the mean scores on the recognition test of the meaning of collocations were higher than that of the single words, the differences did not achieve significant value.

These studies have shown a diverse picture on the learning gain of collocations and single words for new item learning. The studies have adopted different methodologies, in terms of proficiency level of participants (high school students and college learners), ways of identifying target items (based on wordlist, required reading texts, pseudowords and unspecified resources), target item types (same sets of node words for single words and collocations, different sets of node words for single words

and collocations, different collocates-node relationship), learning modes (intentional learning and explicit learning), treatment types (paired-associate learning, reading texts and vocabulary exercises) and test types (receptive knowledge and productive knowledge test of form and meaning). These discrepancies in the methodology are good things which help to address the variance regarding the different learning rates in collocations and single words in diverse scenarios. However, it is limited to clarify the understanding as to the rate of learning gains in L2 collocations and single words.

There are several key issues in the methodology in the abovementioned studies that should be viewed with caution. The first issue is the types of collocations and single words chosen for the study. Most studies mentioned above used different sets of node words for single words and collocations. For example, the different nodes words for collocations and single words in Laufer and Girsai (2008) may confound the reliability in the comparison of collocations and single words. Also, the frequency levels of single words and collocates in the collocations were quite different. Six out of ten single words were from the 7000 to the 10,000 levels in the BNC word list, i.e., *candid, distractor, glean, laudable, opulent and gregarious*. While only two collocates in the ten collocations were from the 4000 and 5000 word level (*reclaim, ambition*) with the remaining ones from the 1000 word level (*present a problem, hold a vote, place orders*). This pronounced differences between the words in the collocations and single words made it hard to conclude whether the results of the studies could be attributed to the innate quality of collocations or just that the collocations consisting of words that were easier to learn.

The same goes for the studies done by Peters (2014), in which no frequency information from corpus was used to match the frequency levels of single words and collocations. However, what is interesting in her study is that the frequency profile of the single words in the study was much lower than that of the collocations. One possible reason for this could be the nature of the target item used in the study. The items were academic words from the discipline of business. Participants were likely to be unfamiliar with the concepts of the single words and collocations. They had to establish new concepts before incorporating new items into the mental lexicon. Collocations would impose greater learning load regarding the greater number of words to memorize while establishing the concepts. It stressed the importance of clarifying the contexts of the study on this type of study to be a general use of language or academic language.

The second issue is the collocate-node relationship of the target items. Kasahara (2011) included only adjective-noun collocations in the study. Previous studies have shown that verb-noun collocations present greater learning burdens on L2 learners (more discussion about this will be in the section of collocate-node relationship on learning). It was not clear whether the advantage of collocations over single words could be extended to verb-noun collocations.

The third issue is the type of test used for the two studies. According to Laufer and Goldstein (2004)'s classifications of the levels of difficulties on the vocabulary test, they rated tests on the meaning of vocabulary items as easier than tests in the form of vocabulary items. Kasahara (2011) implemented one type of post-test, i.e., the

receptive test of meaning in his study, while, Laufer and Girsai (2008) included two tests of a receptive and productive test of meaning. Peters (2014) implemented one test of the productive knowledge of the form of the target items. It is interesting that the tests tapping into the recognition and recall of meaning of target items showed that the knowledge of single words lagged behind that of the collocations. Whereas, the studies that implemented the tests on the retention of the target items showed the opposite results. One exception was the only study that conducted tests on both form and meaning of the target item, which showed comparable results between the learning gains of single words and collocations (Pellicer-Sanchez, 2015). It needs further study to clarify the picture on the effectiveness of learning gains on single words and collocations in new item learning. The present study addressed the methodological discrepancies mentioned above by using the similar set of node words for single words and collocations, including collocations at two levels of difficulties (adjective-noun and verb-noun collocations) and including tests tapping into the receptive and productive knowledge of form and meaning.

### 5.2.3 Corpus and collocational learning

The advent of corpus opened the door for second language vocabulary teaching and learning in two aspects, i.e., the concordance of keywords and the frequency of occurrence. Empirical studies showed that teaching collocations with concordance of keywords yielded positive learning outcomes, and comparatively, better results than the traditional vocabulary exercises in textbooks (Chan & Liou, 2005; Daskalovska,

2016). The effectiveness of concordance was more salient in easy collocations using inductive teaching methods (Sun & Wang, 2003). In addition, concordance could provide conducive feedback to learners to reduce the lexical errors in writing and promote autonomous learning (Gaskell & Cobb, 2004).

Perhaps the greater contribution of the corpus in terms of teaching and learning collocations is the frequency information. It could be used to retrieve frequency-based word lists and collocation lists to provide practical guide to the textbook developers and learners for the items that deserve prioritized attention for academic purposes as well as general use of language (e.g., Coxhead, 2000; Martinez & Schmitt, 2012; Simpson-Vlach & Ellis, 2010). For single word learning, frequency information could provide practical guide in terms of target items selection in the experimental studies to ensure that the items present similar levels of difficulty to learners (e.g., Agustin-Llach & Alonso, 2014; Elgort, 2011; Fitzpatrick, Al-Qarni & Meara, 2008; Nguyen & Webb, 2016). For studies that look into the teaching and learning of collocations, recent experimental studies have used association strength to select target collocations for teaching to ensure that the collocates are strongly associated with each other (e.g., Eyckmans, Boers & Lindstromberg, 2016; Szudaski & Carter, 2014).

Szudaski and Carter (2014) selected collocations with mutual information score (as a measure of association strength) higher than 3 as the indicator that the collocates tended to co-occur and showed a collocational pattern. Eyckmans, Boers & Lindstromberg (2016) also provided mutual information score of the target



collocations as a verification of the collocations. They have noted in their study that there had been no existing studies on the effectiveness of mutual information score on the recall of the collocations. To the best of my knowledge, this observation still holds true now. Association strength has been found to be related to collocational knowledge of L2 learners. It is a reliable indicator of the collocational strength in identifying collocations. It has been adopted in the increasing number of studies to measure the use of collocations in learner writing. There is, till now, no experimental studies into the effect of association strength on the learning of collocations. Past research used it as a tool in target collocation selection without experimentally studying it as a possible variable influencing the learning of collocations.

Mutual information score (MI) is a statistical measurement of association strength. It is originated from information science analyzing a word string based on the frequency information of collocates. It could reveal whether the collocates possess high coherence to each other and high probability of co-occurrence in the corpus. Mutual information score favors collocations with relatively low frequency but a greater probability of appearing together within a given span of words (Schmitt, 2010). A high mutual information score would indicate that there is a strong association between collocates, whereas a low score would imply that the frequency of their co-occurrence is not greater than chance level.

In the literature review of chapter four, I have briefly reviewed three studies that have used mutual information to analyze collocations in writing and how the analysis has opened new perspectives in the analysis of learner writing (see pp. 123 for details

of the review). These studies have revealed the unsatisfactory picture on the use of collocation with high mutual information, which opened the avenue of studies into the role of association strength in the teaching and learning of collocations. Here, I would review studies that have established the psycholinguistic validity of mutual information in the L1 literature. Also, studies that have revealed the lack of awareness of mutual information for L2 Learners are also reviewed here. Combined, both lines of studies have pointed out the necessity of exploring the role of mutual information on the teaching and learning of collocations for L2 learners.

To verify the psycholinguistic validity of mutual information, Ellis, Simpson-Vlach and Maynard (2008) conducted three experiments using grammatical judgment tasks, voice onset and articulation time, and priming of the final word in the sequences to compare the performance of native speakers and advanced second language learners. The three experiments included 108 real phrases and 108 randomly combined non- phrases. The results showed that mutual information was the major determiner of the performance of native speakers in the three experiments. Native speakers demonstrated quicker judgment time on phrases with higher MI score. Their voice onset and the priming of the final words were influenced significantly by the MI score. The exclusive relation between the collocates in sequences could facilitate the processing of the collocations among native speakers. This finding was later corroborated in another small-scale study into the processability of formulaic sequences done by Ellis and Simpson-Vlach (2009). On the contrary, second language learners were more sensitive to the frequency of occurrence of the phrases in their

performance. These results led Ellis, Simpson-Vlach, and Maynard (2008) to comment that “Tuning the system according to the frequency of occurrence alone is not enough for nativelike accuracy and efficiency. What is additionally required is tuning the system for coherence for co- occurrence greater than chance” (2008: 391).

Literature in second language research has somewhat revealed findings that are in line with Ellis, Simpson-Vlach, and Maynard (2008) with learners from a wider range of L1 backgrounds and proficiency levels. The studies showed that learners lacked the awareness of mutual information between collocates. Fernandez and Schmitt (2015) investigated the productive knowledge of 50 collocations among 108 Spanish learners of English from a wide range of proficiency levels (beginners to advanced learners) and age groups (18 to 65 years old). They measured the correlation between learner’s productive knowledge of collocation and three types of statistical identification of collocations: raw frequency, t-score, and MI. The results revealed that raw frequency and t-score showed positive and significant correlation with productive knowledge of collocations. On the contrary, mutual information score between collocates showed negative and insignificant correlation with productive knowledge of collocations. These results suggest that collocations with higher frequency are easier to learn and the level of strength between collocates do not seem to relate to collocation learning. Even if it was not significant, the negative correlation between mutual information score and productive knowledge of collocation showed that collocations with higher associate strength presented greater learning burden.

Durrant (2014) carried out a meta-analysis study to explore the relation between

collocations knowledge and frequency of collocations in corpora based on the findings of 19 different studies. These 19 studies collected data from English and non-English majors from a variety of L1 backgrounds with a variability of task types. The calculation of mutual information score was based on the frequency information of COCA and BNC. The study failed to find a consistent correlation between mutual information score and collocational knowledge with correlation ranging from  $r = -.45$  to  $r = .51$  depending on the choice of reference corpus. In most of the cases, the size of the relationship was small. He concluded that L2 learners' lack of awareness of mutual information between the collocates was a general thing and was "applicable to two- word collocations, ..., to knowledge as it is tapped by traditional test methods, as well as to processing speed and accuracy; and to a wide range of L2 learners in EFL as well as ESL context" (2014:471).

A review of the relevant literature of psycholinguistics and second language acquisition showed that L2 learners from beginners to advanced learners lack the awareness of the association strength between collocates. Although association strength is the predominant predictor of the processability of the collocations, L2 learners are a lack of the awareness of the "exclusiveness" between the collocates. Ellis, Simpson- Vlach, and Maynard (2008) stated that it is the awareness of association strength not the raw frequency of the collocations that distinguishes between native speakers and L2 learners. However, the role of association strength in teaching and learning of collocation has remained rather limited as addressed by Eyckmans, Boers, and Lindstromberg (2016). Empirical studies are needed to

examine the effectiveness of association strength on the learning of collocations.

#### 5.2.4 Collocate-node relationship and collocational learning

Verb-noun collocations and adjective-noun collocations constitute the majority types of the collocations in language. The pervasiveness in language makes them the most frequently studied types of collocations in second language research into learners' production of language and experimental studies into the learning and teaching collocations (e.g., Barfield, 2003; Boers, Demecheleer, Coxhead and Webb, 2014; Gyllstad, 2007; Laufer & Waldman, 2011; Paquot & Granger, 2012; Szudaski, 2012; Wolter & Gyllstad, 2011). The literature has emphasized that verb-noun collocations are problematic for L2 learners. Barfield (2007) found out that learners had a good command of single nouns and verbs, and had difficulties when these single items were combined into verb-noun collocations. Based on corpus data, Laufer and Waldman (2011) found that learners produced far less verb-noun collocations than native speakers, and found it hard to select the correct verbs to collocate with the nouns.

Boers, Demecheleer, Coxhead, and Webb (2014) have identified two reasons to explain the problems in the learning of collocations. The first reason was the lack of semantic weight in delexicalized verbs, as in the example of *make mistakes*. They argued that, in the verb-noun collocations, learners were more likely to notice the nouns since it was more semantically salient. On the contrary, verbs were likely to go unnoticed in this type of combinations. The second reason was that the learners often

used synonyms of verbs to create erroneous substitution of the verbs in the verb-noun collocations (*do mistakes* were used instead of *make mistakes*). These two reasons emphasized the semantic qualities of the verbs that created difficulties for learners.

Peters (2015) added from the grammatical aspects of the verb-noun collocations to illustrate that the morphological variation of verbs in the collocations could be the third reason for the learning burden. Studies on the frequency of exposure and learning of the L2 items have revealed that the positive relation between the two. In other words, the frequency of the encounter increases the likelihood of the learning. However, the verbs in the verb-noun collocations could appear in different morphological forms (*build houses, builds houses, built houses, building houses*). These different forms could confound the retention of collocations in learners' memory, which in turn, lead to difficulties in retention.

Peters (2015) conducted an experimental study into the effect of collocate-node relationship on retention of collocations. 43 Dutch EFL learners were asked to learn 18 collocations (six verb-noun collocations, six adjective-noun collocations, and six phrasal verb-noun collocations) in word list format. The participants encountered the 18 collocations in word list in English with Dutch translations followed by a sample sentence. Along with the word list were four online vocabulary exercises of fill-in-the-gap activities. Participants received immediate feedbacks after the exercises with correct answers in cases when they have provided the incorrect ones. There were three tests administered immediately after the treatment, two form recall tests and one form recognition tests. In the form recall tests, participants were asked

to write down the L2 collocations of the L1 translation, and write down the verbs with the nouns as cues. The form recognition test was a matching task in which participants had to match the collocates of the target collocations. The results of the analysis showed that collocate- node relationship indeed affected the learning of target items measured in terms of correct answers of the posttests. The participants consistently produced correct answers of adjective-noun collocations, followed by verb-noun collocations and phrasal verb collocations in all three types of posttests.

There are several issues in Peters (2015) that could be modified and improved to examine the collocate-node relationship. The first issue lies in the type of collocations used in the study. Business English collocations were included in the tests. It is possible that participants would have to create the new concepts of the collocations in the field of business while incorporating them into the mental lexicon. This extra working load may have a potential impact on the retention of the target items.

The second issue lies in the type of exercise provided in the treatment. The treatment involved exercises that may undermine the learning of verb-noun collocations. For example, in the fill-in-the-gap exercises, participants were required to fill in the correct forms of the verb-noun collocations. The exercises included different inflectional variations of past tense, participles, and passive voice. These variations increased the memory load of the verb-noun collocations. On the contrary, there were no alterations in the form in the cases of adjective-noun collocations.

The last issue lies in need of delayed posttest to examine the effect of learning over a longer period. The implementation of delayed posttest has both ecological

value and theoretical value. It resembles the real learning scenarios that could reflect the attrition of knowledge over a period. It could also inform the researchers on the lasting effects of the learning.

#### 5.2.5 Incidental learning and intentional learning of collocations

The literature on the learning of words has unanimously followed the tradition of two learning modes, i.e., incidental learning and intentional learning (also known as implicit and explicit learning). The research of incidental learning of words was based on the assumption that learners could pick up new words from reading the texts. This assumption was first empirically examined in the L1 literature (Nagy, Herman and Anderson, 1985). Their study established the role of incidental learning by stating that “word learned incidentally from context are likely to constitute a substantial proportion of children’s yearly vocabulary growth” (1985:250). This piece of encouraging evidence from L1 literature has fueled the interest in researching into incidental learning in L2 context. Till today, the vast body of research has shown that it is possible to learn multiple aspects of vocabulary knowledge from reading for both single words and collocations (e.g., Brown, Waring & Donkaewbua, 2008; Horst, Cobb, & Meara, 1998; Pellicer-Sanchez, 2015; Pellicer-Sanchez & Schmitt, 2010; Szudaski, 2012; Szudaski & Carter, 2014; Waring & Takaki, 2003; Webb, 2005, 2007a,2007b; Webb, Newton and Chang, 2013).

Webb, Newton, and Chang (2013) investigated the likelihood of learning collocations incidentally through reading by manipulating the frequency of target



collocations in the text. 161 EFL university students with L1 Chinese participated in the study and were classified into 4 experimental groups depending on the number of encounters of target collocations in the text (group 1 with one encounter, group 2 with five encounters, group 3 with ten encounters and group 4 with 15 encounters). The participants read and listened to the text for 40 minutes during the treatment. The posttest included a battery of four tests tapping into the form and meaning aspects of knowledge in receptive and productive knowledge. The results showed learning gains on the receptive tests of collocations with the increase of the number of encounters, with 27% of unknown words for one encounter, 33% of five encounters, 55% of ten encounters and 76% of 15 encounters. They concluded that incidental learning was effective for learning collocations and the frequency of encounters had a significant effect on learning the form and meaning of collocations.

Szudaski and Carter (2014) examined the effectiveness of incidental learning of collocations by manipulating the typological enhancement and frequency of encounters of the target collocations. 41 Polish EFL learners from three intact classes took part in the study. They were assigned to two experimental groups depending on the type of typological enhancement and one control group. The target collocations were infrequent collocations above the threshold of mutual information score. The treatment adopted the longitudinal design with a span of three weeks, during which the participants read six stories with two stories each week in two treatments (one experimental group with target collocations underlined in the stories and another experimental group with no typological enhancement of the target collocations). Both

groups encountered ten target collocations for six times and another set of ten collocations for twelve times. The posttests consisted of five tests tapping into the form and meaning of target collocations for recall and recognition. Unlike Webb, Newton, and Chang (2013), the results of this study showed an inconsistent picture on the learning gains from incidental learning. There were no significant gains in both experimental groups regardless of the typological enhancement and number of encounters for the majority of the tests. The two tests of form recall revealed significant learning gains when target words were encountered for 12 times. It was only in the form recognition test that significant learning gains were found for six encounters. The study revealed an uncertain picture of incidental learning and the complex nature of acquiring and measuring collocational knowledge.

To address the discrepancies left by previous research, Pellicer-Sanchez (2015) carried out an empirical study into the effectiveness of incidental learning of adjective- noun collocations using pseudowords as nouns. Forty-six L2 learners of English from a diversity of L1 background in a UK university participated in the study. The participants were randomly assigned to read one of the two stories. Story one included eight encounters of the target collocations and the other story with eight encounters with the noun collocates of the collocations and four encounters with the target collocations as a whole. The story was presented to participants on 25 different cards to avoid re-reading. The posttest included a battery of five tests of the recall and recognition of form and meaning of the target collocations. The results supported the assumption that learners could acquire new collocations from reading by showing that

there were on average 11% gain in the form recall of the target collocations and 50.5% in the form recognition.

A review of the studies on incidental learning shows that there are several factors that are likely to affect the learning gain. The first factor is the enhancement during the reading process to improve learning gain. For example, Webb, Newton, and Chang (2013) used audio enhancement of the reading texts to let learners read the stories while listening to the texts. Szudaski and Carter (2014) used typological enhancement of the target collocation by underlining them to direct learners' attention to the collocations. Although these two studies reveal opposite results regarding learning gain, it is reasonable to conclude that enhancement techniques are needed to improve the efficiency of incidental learning. The underlying reason for enhancement technique employed in the studies is that awareness of the target items is needed as a prerequisite of learning of items. Since learners do not have a clear goal in mind for collocational learning during reading, there is no guarantee that they would notice the collocations in the texts.

If learners are aware of the unknown collocations in the reading text, the learning would depend on another factor, i.e., the number of encounters of collocations in the reading text. Research of collocations has followed the studies into single words and recognized the importance of frequency of encounters in learning. The three studies reviewed above have all manipulated the frequency of encounters in the texts ranging from one encounter to 15 encounters. Due to the differences in methodology, it is not easy to draw a clear threshold where learning gains seem to occur. However, judging

by the results of these studies, it seems that eight times would be needed for sizable learning to take place. Then, it raises a question. Is it possible in real reading scenarios for a collocation to appear for at least eight times for learning to occur? Not to mention the fact that verb-noun collocation needs greater repetition due to the morphological variation. Cobb (2007) have cast doubt on the incidental learning of vocabulary through extensive reading based on the adequate number of encounters in the reading text. Being aware of the fact that these two factors are hard to satisfy in real learning scenario, researchers have recognized the necessities of explicit teaching of collocations in the classroom.

Compared with incidental learning research, the literature on intentional research has covered much wider areas of interest. The literature has used different types of tasks and activities to elaborate on the target items, a variety of ways of typological enhancement of target items, diverse ways to present collocations and the innate quality of collocations that might affect learning. Beside using corpus tool, there are other activities and tasks that can be used in explicit teaching to improve retention of collocations, i.e., dictionaries (Laufer, 2011), meaning-focused activities and form-focused activities (Laufer & Girsai, 2008), and vocabulary exercises (Boers, Demecheleer, Coxhead & Webb, 2014). The typological enhancement was more often found in the research of single words than on collocations. Peters (2012) investigated the effectiveness of typological enhancement (**bold and underline**) on retention of collocations and found that form saliency had an effect of the learning of collocations. One word of caution is that the learners were warned of a coming posttest during

treatment and this may affect the results of the study.

The results of the studies into the activities, tasks, and enhancement have shown that these activities could contribute to the learning of collocations and promote the retention of different aspects of collocational knowledge. However, it also shows that learners need training on their abilities to make use of tools and activities. For example, learners often consults bilingual dictionaries where there are few collocations and half of the collocations they have looked up were used wrongly in Laufer (2011) study. Also, textbooks should carefully choose the types of exercises to reinforce the knowledge of collocations. Boers, Demecheleer, Coxhead and Webb (2014) found that three types of mostly used exercises in textbooks (connecting the two parts, inserting the verb, underlining the verb) only yielded minimal gain in the knowledge of verb-noun collocations.

There are studies that used a more simplified way of presenting target items to learners, and in turn, greatly reduced the learning load during treatment and increased the control of the learning process. These studies presented collocations in the word list and explored the possible ways to improve learning through this learning method (Nakata, 2008; Nakata, 2011; Nakata, 2015; Nakata & Webb, 2015; Kasahara, 2011; Kornell, 2009).

Nakata (2015) carried out an empirical study into the effectiveness of spacing (the lag of time between the repetition of items) in list learning for twenty collocations. 128 Japanese EFL learners participated in the study and were randomly assigned to four groups based on the degree of spacing between items (short, medium, long and

massed). The experiment was carried out on computers where the word pairs were presented to learners in two sets, and the treatment lasted eight minutes. After the treatment, the participants sat the immediate posttest including a receptive and productive test of form and meaning using translation. One week later, they took the delayed posttest. The scoring adopted two level of sensitivity, i.e., the strict scoring and sensitive scoring (partial answer were scored as correct). The results showed that all treatment led to a considerable gain in the retention of collocations. The findings also indicated that spacing was conducive to learning collocations. The insignificant differences between the performance of three experimental groups led Nakata to conclude that, as long as there was spacing between the presentation of target items, the difference in spacing contributed little to the learning outcomes.

Webb and Kagimoto (2009) examined the effects of direction of learning (receptive and productive) on learning of collocations with 145 Japanese EFL learners. The learners were randomly assigned to two experimental groups and one control group. The participants in the two experimental groups learned 24 verb-noun collocations in two conditions (receptive and productive), and the collocations were presented to them in word lists (L2 collocations paired with L1 translation) with three glossed sentences. In the receptive treatment, the participants read through the L2 target collocations, L1 translation and sample sentences. In the productive treatment, the participants were asked to choose appropriate target collocations to fill in the gap in the three glossed sentences. Four posttests were administered before and immediately after the treatment, i.e., tests of productive and receptive knowledge of

collocations and meaning. The results showed that both receptive and productive learning was effective and the learners demonstrated 69% and 35% learning gain in receptive and productive knowledge of target collocations after the treatment. Both the lower group and advanced group of learners demonstrated significant gains after the treatment.

Another stand of study in explicit learning of collocations centered around the effect of innate qualities of collocations on learning, i.e., congruency between L1 and L2 (Peters, 2015); number of collocates, position of node word and presence of synonyms (Webb & Kagimoto, 2011); the collocate-node relationship (Peters, 2015).

Webb and Kagimoto (2011) investigated the effect of three factors (number of collocates, the position of node words and synonyms) on the learning of 5 set of L2 collocations. 41 Japanese EFL learners participated in the study and learnt 60 collocations in five sets in glossed sentences. The learners were given 15 minutes to learn all the collocations. There were two tests in the same format administered one week before the treatment and immediately after completing the treatment. The tests used translation task with L1 provided and learners needed to write down the L2 target collocations. The results showed that increasing the number of collocates per node words was conducive to learning. Learners were able to provide 96% correct answers for the condition where one node words were presented with 6 collocates. Whereas, the position of the node words, be it on the left-hand side of the collocates or right-hand side), did not affect learning. The presence of synonyms interfered negatively with the learning. The participants learned 60% of the collocations in the

condition where node words were synonyms and 71% with unrelated node words.

A review of the research on the explicit teaching of collocations shows that there are no disputes as to the effectiveness of this teaching method on the learning gain. The vast body of research into explicit learning also reveals the complex nature of acquiring the collocations. It is worthwhile to bear in mind the factors that could influence and contribute to the explicit learning. These factors include the different types of activities and tasks, the way that the target collocations are presented (with context embedded in sentence or decontextualized in word list, in mass or with adequate spacing between items); the direction of instruction (receptive or productive); the type of collocate-node relationship (verb-noun collocations, adjective-noun collocations or other types); the level of congruency between L1 and L2; the presence of synonyms and the position of node words; the type of attention-drawing techniques (typological enhancement, etc.); and the type of knowledge examined in the tests (productive or receptive knowledge of form and meaning).

The fact that explicit learning could yield positive learning gains in collocations in relatively short amount time makes it a worthwhile method to explore. The previous studies have used ten minutes on average on instruction during treatment. In Nakata (2015), it took eight minutes for 20 items to be presented for four times. On another study which included the greatest number of collocations, i.e., 60 collocations in Webb and Kagimoto (2011), the treatment lasted for 15 minutes. It is encouraging to learn that the limited amount of time spent on instruction could lead to positive and lasting learning gains (as measured by delayed posttests). The factors that might



influence the explicit teaching of collocations warrant further exploration to improve the effectiveness of teaching in language classrooms.

The literature has pointed out the importance of collocations in L2 learning and the need of studies investigating the factors that affect the acquisition of collocations. Previous chapters in the thesis have shown that learners have difficulties in using collocations, and there was a lack of awareness of association strength in collocations. The present study served as a pedagogical experiment of the thesis with the attempt to explore the way of enhancing collocational learning and investigate the role of factors, i.e., the association strength and type of collocations, in the process of collocational learning. It set out to investigate whether the explicit teaching of collocations in the phase of new item learning has the potential to boost learners' retention of the new items and the type of collocations that has the best effect. Research into the effectiveness of the explicit teaching of vocabulary allows us to investigate whether it is worthwhile to devote classroom time to vocabulary teaching and, if so, how it can be effectively conducted. Based on the observation of the previous studies, this study sought to address the following research question:

- 1) Are there different learning gains for collocations and single words in explicit learning? If there is any, are the differences durable over time?
- 2) To what extent does the association strength between collocations influence the learning gains in explicit learning? If there is any, is the influence durable over time?
- 3) In what ways does the collocate-node relationship influence the learning of collocations in explicit learning? If there is any, is the influence durable over time?

### 5.3 Methodology

A classroom-based experiment was conducted on three groups of learners. There were two independent variables in this study. The first independent variable was the three types of treatment (i.e., high-MI group, low-MI group and single words). The second independent variable was the collocate-node relationship (i.e., verb-noun collocations and adjective-noun collocations). The first independent variable was between-participants variable. The second independent variable was within-participants variables. The dependent variable was the responses of the post-tests for the treatments (i.e., scores of the immediate post-test and delayed post-test). The collocations and the single words were presented to the learners in word lists (with English collocations and singles words provided with Chinese meanings). The learning gains were measured by the post-tests of the treatment at two-time intervals.

#### 5.3.1 Participants

The participants were 101 first-year undergraduate students from three parallel classes in Jiangxi Normal University (for detailed description on the university, see pp.64). 102 students participated in the treatment and sat the immediate post-test, however, one of them failed to participate in the delayed post-test. And therefore, the test results of the remaining 101 students were included in the analysis. The three parallel classes were randomly assigned to two experimental groups based on the independent variables. The first experimental group received instruction on collocations with high association strength; the second experimental group received

instruction on collocations with low association strength and the control group received instruction in single words. The first experimental group included 33 students, the second experimental group included 35 students, and the control group included 33 students. Participants signed the consent form before whole procedure of the invention. They were informed that their participation was voluntary and they could opt out any time in the process.

The participants shared homogeneous backgrounds. The first language for all of the students was Chinese, and none of them had any prior experience of staying in English-speaking countries. The demographic information of the participants is shown in table 5.1. All participants were English major students. They received instruction on the four skills of English during the first year of study in college from courses of intensive reading, extensive reading, oral English and English writing. At the time of the experiment, they were in the second semester of year one study. Vocabulary acquisition including single words, collocations, and formulaic sequences was one of the priorities of their study, and therefore, they were quite motivated to participate in the present study.

The study used the weighted scores of their final exams of the past semester to examine the proficiency levels of the three groups. The weighted scores were based on the final exam grades of the compulsory courses of intensive reading, extensive reading, oral English, English listening and English writing. The result of one-way ANOVA showed that the proficiency level of the three groups was not significantly different from each other ( $F(1, 101) = 2.334, p = .103$ ).

Table 5.1 *Demographic Information of Participants*

	No. of participants	Gender(F/M)	Average age	English learning (year)
Experiment group 1	33	29/4	18	8
Experiment group 2	35	33/2	18	8
Control group	33	32/1	18	8

Table 5.2 *Descriptive Statistics of the Weighted Scores of the Three Groups*

	Mean (SD)	95% confidence interval
Experimental group1	78.53(6.98)	75.92-81.14
Experimental group2	76.17(6.63)	73.69-78.64
Control group	79.56(5.53)	77.63-81.49

### 5.3.2 Target items

There were several steps involved in the selection of target items. The first step was to choose the pool of potential target items. All test items were selected from the students' textbooks of intensive reading class and required reading materials of the writing class to increase the ecological value of the study. I chose the reading materials from intensive English class based on deep-rooted Chinese adherence to textbooks and the importance of intensive reading courses for English tertiary learners. Chinese tertiary English education, like other stages of English education, is primarily text-based and rely heavily on the prescribed textbooks (Leedham & Cai, 2013). The reverence for written texts in textbooks in China is rooted in Chinese culture, and teachers and learners alike have a habit of adherence to contexts in textbooks in the

learning process. The intensive reading class is the core units of English major students in China. Although being named as reading class, the courses comprise of four skills in English. The status of intensive reading course has remained as the most important courses for English major students despite the changes undergone in Chinese education (Hu, 2002; Leedham & Cai, 2013). The initial search of the materials yielded 155 potential target words including both verbs and nouns.

This study used the online corpus interface ([corpus.byu.edu](http://corpus.byu.edu)) to create the collocates for the 155 node words to explore the differentiations in the learning gain of collocations with high MI score and low MI score. To draw a definite line between high and low collocates was a difficult task since there were many variables involved in the issue. One of the most important variables was probably the proficiency level of the student.

Granger and Bestgen (2014) categorized collocations with MI score higher than seven as high MI collocations, and collocations with MI score higher than three but lower than five as the low MI score. However, the categorization does not fit the profile of the participants in this study. According to the results of the exploratory study into the use of collocations in first-year learner writing (as in part 2 of the dissertation), there were very few collocations with the MI score higher than 5 (38 collocation types out of 965 collocation types). Considering the profiles of the learner writing, this study used a different categorization from the previous study (Table 5.3).

After drawing the threshold of high and low MI score, the online interface with Corpus of Contemporary American English (COCA) as the reference corpus was used

to identify the collocates for the target words. COCA is one of the largest and representative corpora of current English use. It included a balanced source of texts with both written and spoken texts from a wide variety of domains, and the most recent texts was collected as recent as 2015.

Table 5.3 *Threshold of the Association Strength of Collocations*

Categorization of collocations	MI score
Collocational: low	$\geq 3$ and $< 4$
Collocational: medium	$\geq 4$ and $< 5$
Collocational: high	$\geq 5$

Another issue worth mentioning in identifying the collocates for the target words was the frequency levels of the collocates. This study used collocates that were known to learners. The control on the collocates could minimize the learning burden which could undermine the comparison between different learning conditions between collocate types and single words. Since the participants in this test were college students with an average of 8 years' experience of learning English, it was assumed that they have knowledge of all the most frequent 2000 word families in COCA. All of the target words and collocates were checked against the COCA-25, i.e., a word list created to include the most frequency 25,000 word families in COCA. The 25,000 word families have been collapsed into 25 bands with 1000 word families in each band. (VocabProfile on [www.lexutor.ca](http://www.lexutor.ca)).

With the two screening criteria, the 155 potential target words were reduced to 50

words. It was very difficult to find qualified node words that fit into the word class requirement of this study, while at the same time, had collocates of both high and low MI score which were high-frequency words. The search on Vocabproile showed that there were three words that were beyond the most frequent 2,000 word families in COCA, i.e., boundary (3,000 band), holy (3,000 band) and beast (4,000 band). In light of this, the fifty target words and the three collocates beyond the most frequent 2,000 word families were included in the pilot test.

In the second step, a pilot test was performed to test any prior knowledge of the chosen items. The pilot test was conducted on two parallel classes of sixty-eight students. The sixty-eight students were from two classes other than the three classes included in the experiment to ensure that, at the time of the experiment, the student hadn't any prior exposure to the target words. Four weeks before the treatment, the pilot test was conducted in the pen-and-paper format on the receptive knowledge test. English words were provided, and the students were asked to write down the Chinese meaning of the words if they recognized them (an example is given below). Receptive knowledge test of form and meaning translation was chosen since it was easy to complete than productive tests and would reflect any basic understanding of the words. If the correct translation of an English word was given by one student in the class, it was removed from the list. If any students wrote down the wrong meanings of the three collocates, it would be removed from the list. After the pilot study, there were 24 words remained on the list of target items and all of the students understood the meaning of the three collocates. Twenty words were used as the target items of

this study, and the remaining four were chosen as the filler items.

Example: brochure \_\_\_\_\_

This study included 20 collocations and 20 single words to inquire into the learning gain on different types of collocations and single words. To explore the learning burden of a collocation-node relationship, the 20 collocations for each experiment group included ten verb-noun collocations and ten adjective-noun collocations. The collocations and single words for the test can be seen from table 5.4. The results of the independent sample t-test showed that the MI score of the 20 high MI collocations was significantly higher than that of the 20 low MI collocations ( $t = 11.939, p = .000$ ).

Besides the target items, four filler items were included in the study: nurture, inhale, smear and ravine. These four filler items included two verbs and two nouns. The selection of filler items and the creation of their collocates were based on the similar criteria as the target items. The reason for choosing filler items was based on the phenomenon of serial position effects, which indicated that when target items were presented serially, the first and the last items were easier to be remembered (Karpicke & Roediger, 2007; Nakata, 2015; Nakata & Webb, 2015). To control for this effect, the filler items were presented as the first and the last items as the primacy and recency buffers in the learning materials. However, they were not included in the data analysis.



Table 5.4 *Frequency List of the Node Words*

Frequency level	Node words
4,000 word band	endeavor, reconcile, slump;
5,000 word band	chuckle, disposition, divert, erode, harness, memoir, roam, soothe, tame, toll, transcend, unleash;
6,000 word band	aroma, curtail, relics;
8,000 word band	metropolis;
9,000 word band	sitcom

Table 5.5 List of the 20 High MI Score Collocation, 20 Low MI Score Collocations and Single Words

Collocations with high MI score				Collocations with low MI score				Single words	
Verb-noun	MI score	Adjective-noun	MI score	Verb-noun	MI score	Adjective-noun	MI score	Verb	Noun
roam streets	6.59	bestselling memoir	8.39	roam land	3.16	new memoir	3.05	roam	memoir
unleash creativity	6.45	hearty chuckle	7.15	unleash energy	3.36	low chuckle	3.83	unleash	chuckle
reconcile differences	5.56	long-running sitcom	9.28	reconcile value	3.34	funny sitcom	3.83	reconcile	sitcom
curtail spending	5.26	fruity aroma	9.29	curtail cost	3.58	strong aroma	3.2	curtail	aroma
harness energy	6.71	holy relics	6.39	harness resources	3.49	religious relics	3.16	harness	relics
soothe fear	6.06	sunny disposition	7.92	soothe spirit	3.91	natural disposition	3.12	soothe	disposition
tame beast	7.32	economic slump	5.41	tame hair	3.25	recent slump	3.12	tame	slump
transcend boundary	8.34	worthwhile endeavor	7.17	transcend culture	3.08	successful endeavor	3.02	transcend	endeavor
divert attention	7.35	emotional toll	5.26	divert money	3.57	tragic toll	3.63	divert	toll
erode confidence	5.96	modern metropolis	5.32	erode power	3.15	huge metropolis	3.19	erode	metropolis

### 5.3.3 Learning materials

The learning materials for the three groups (two experimental group and one control group) were all in paired-associate format in which L2 collocation or single word were presented alongside with the L1 translation. All of the 40 collocations and 20 single words were translated into Chinese through consulting the bilingual dictionary of Oxford Advanced Learners' English-Chinese Dictionary 8th Edition (2014). And the Chinese translations were consulted against one experienced translation teacher in a Chinese university on the appropriateness of the wording.

The paired-associate format was chosen for three reasons. The first reason was that paired-associate format was found to be quite beneficial for vocabulary learning (Elgort, 2011; Kasahara, 2011; Nakata, 2011; Nakata & Webb, 2015; Webb, 2012). As evidenced by previous research, with even a limited amount of time used on paired- associate learning could produce positive learning results on reading and writing on immediate post-tests and durable gains in delayed post-tests.

Webb (2012) tested the effects of pre-reading vocabulary learning on reading comprehension and writing tasks. He found that, after six minutes learning of paired-associate pseudo-words, learners were able to show high scores in reading comprehension (an average score of 25.82 out of 30) and used the new words in picture describing tasks. Kasahara (2011) administered a study which gave L2 learners 8 minutes (3 minutes for instruction and 5 minutes for memorization) to learn 20 collocations and 20 single words in paired-associate learning. In the immediate post- test, learners were able to score correctly in the majority of occasions with the

average of 31.97 out of 40 for collocations in the translation tasks in which learners were required to produce the L1 meaning of the L2 cues. In a recent study with more elaborate design, Nakata and Webb (2015) found out that, after on-line learning of the 20 collocations with different spacing, learners demonstrated significant gains in the post-tests (an average of 14.5 out of 20 in the receptive tasks and an average of 13.5 out of 20 in the productive tasks).

The second reason was that the translation provided in paired-associated paradigm was conducive to word learning, especially at the early stage of form-meaning mapping (Hummel, 2014). Through learning the translations, the learners were engaged in the elaborate processing in the mental lexicon to identify interconnections between L1 and L2. The elaborate processing helps to reduce the initial lexical competition when a new word or phrase is integrated into the mental lexicon (Lindsay & Gaskell, 2010).

The third reason was that paired-associate learning is an often-adopted way of teaching and learning used by Chinese teachers and learners alike (O'Malley & Chamot, 1990). In the classroom, the teacher would only spend time elaborating on the keywords and phrases in the texts. For the remaining words, only the Chinese meaning would be provided to save the time on instruction. In the glossing of the texts, usually, the L2 words and phrases are presented together with the Chinese meaning. To prepare for the English proficiency tests in college, Chinese learners invariably resort to the recitation of English words and phrases in vocabulary books where L1 meaning often presented together with the L2 words and phrases.

#### 5.3.4 Dependent measures

Immediate post-tests and delayed post-tests were administered after the treatment to inquire into the learning gains of the collocations and single words. The delayed post-test was included for two reasons. The first reason was that the inclusion of the delayed post-test would increase the ecological value of the study since the primary goal of learning new words is to incorporate the words into long-term memory (Ellis, 1995). Examining the learning gain in delayed post-test would reveal the extent to which the instruction could achieve this aim. The second reason was that the inclusion of the delayed post-test would create more learning opportunities for participants as the expanded rehearsal, whereby learners would get another chance after a delay to recall the items learned. Delayed recall was regarded to be more important and effective for word learning than immediate recall to facilitate long-term retention (Ellis, 1995; Nakata, 2008).

The immediate and delayed post-tests were designed in the same format developed based on Chen and Truscott (2010), Webb (2007) and Webb, Newton and Chang (2013). The tests intended to measure the receptive and productive knowledge of form and meaning of the target collocations and single words. Testing multiple aspects of the knowledge of collocations and single words could provide a more accurate picture of the knowledge and more sensitive to even partial gains in knowledge (Webb, 2007b; Webb & Chang, 2012). The knowledge of form and meaning were chosen because these aspects are of greatest use to the learners and more likely to show learning gains after the first encounter (Webb, Newton and

Chang, 2013). Schmitt (2014) commented that “form-meaning link by itself would probably be enough to extract meaning in most cases” (p.919). For the two experimental groups of collocation learning and one control group of single word learning, three post-tests were administered which are listed below. The tests were ordered in a specific way: productive test of form, productive test of meaning and receptive test of meaning, to avoid possible learning effect.

#### Productive test of the form (collocations)

The first post-test was the productive test of form intended to tap into learners’ productive knowledge of the form of words. The first letter of the items was provided in the post-tests to prevent learner from writing down synonyms of the target items. Participants were given the collocates and were asked to write down the node words with the first letter provided. They were specifically asked to write down the node words which they had encountered in the treatment. To score correctly in the example, the participants needed to write down *memoir* in correct spelling as the node words of the collocates.

Example: bestselling m\_\_\_\_\_

#### Productive test of meaning (collocations)

The second post-test was the productive test of meaning. Following the design of previous studies on vocabulary learning (e.g., Webb, 2007), the productive test of meaning used the translation test. The translation test could engage the students in an

elaborating process of the items by requiring them to “(1) understand the meaning of a target word, (2) find an appropriate L1 word from the mental lexical that represents the meaning and (3) write it down” (Watanabe, 1997, p.290). The test used the translation format in which the L1 meanings were used to elicit the L2 responses. The purpose of the test was to see whether learners could recall the L2 collocations based on the L1 cue. In the test, participants were given the Chinese translation of the collocations and were asked to write down the L2 collocations as they had learned in the treatment. To score correctly in the example, the participants needed to write down *bestselling memoir* in correct spelling as the translation of the L1 pairs.

Example: 畅销的回忆录\_\_\_\_\_

Receptive test of meaning (collocations)

The third post-test was the receptive test of meaning in the translation format in which the L2 collocations were used as cues for L1 meanings. The aim of this test was to determine whether participants could remember the meaning of the L2 collocations. In the test, the participants were given the L2 translations and were asked to write down

the Chinese translation of the L2 collocations. To score correctly in the example, the participants needed to write down 畅销的回忆录 as the translation of L2 pairs.

Example: bestselling memoir \_\_\_\_\_

For post-tests on single words, the sequence of the tests was in similar order with

the test of collocations. In the productive test of form for single words, the teacher would read out the words to the participants for three times. The participant had to write down the word that they have heard. In the productive and receptive tests of the meaning of single words, the test was designed in the similar fashion of translation tasks with the test of collocations. In the productive test of meaning, the L1 form of the target words was provided, and the participants were required to write down the L2 words as they had learned in the treatment. In the receptive test of meaning, the L2 form of the target words was provided, and the participants had to write down the L1 translation of the L2 words.

#### 5.3.5 Procedure

All data were collected during normal classroom hours. Four weeks before the treatment, a pilot study test was administered to two classes to examine any prior knowledge of the target words. And, afterward, none of the words on the list were used as content for teaching since the target words were chosen from the materials of the second and third year of study. To avoid any learning of the target words before the treatment, the students who attended the pre-test were not included in the subsequential treatment and tests.

Two weeks before the main study, another pilot test was conducted on the whole procedure of the instruction on collocations to check the procedure of the instruction and administration of the tests. The purpose of this pilot study was to do a dry run on the main experiments, identify potential problems that needed to be addressed and



provide an estimation of the time needed for instruction, review, and tests. One parallel class of 32 students were chosen to attend the second pilot test. They sat through the instruction of collocations with high mutual information scores and tests in the same procedure as the main experiment (details of the procedure are provided below).

One important issue is that there were four posttests administered to students as immediate posttest in the pilot study, including the three tests mentioned in the dependent measures and one receptive test of form. The receptive test of form was in the format of multiple choice test in which the learners were required to choose the right form of the node words with the collocates as cues for collocations. The receptive test of form was excluded from the main study because the test results from the pilot study showed ceiling effect (Mean = 19.8, SD = 2.23). The ceiling effect could be the results of the learning effect of tests. The receptive test of form was the last test implemented, and participants had exposed to the form of the collocations for five times by the time they took the test (i.e., during instruction, review, productive test of form, productive test of meaning and receptive test of the meaning). They were quite familiar with the form of the target collocations, and the receptive test was too easy for them to complete. Considering this, the posttests in the main study only included three tests explained in the dependent measures, i.e., a productive test of form, productive test of meaning and receptive test of meaning.

During the first session, the students had to learn and memorize the collocations and the single words on the learning material. They received the one-page learning

material with English collocations and their Chinese meanings for the two experimental groups (20 collocations), and English single words and their Chinese meanings for the control group (20 single words). The treatment started with teachers' brief instruction on the target items to verify that all items were clear. The teacher pronounced the items and explained the Chinese meaning of the items. The instruction lasted about 5 minutes.

After the instruction, the students were given another 5 minutes with the instruction to memorize the target items. One minute before the end of the treatment, the students were informed that the learning materials would be collected after a minute to give them time for a final review. This would increase the ecological value of the present study since, in real learning scenarios, learners would always review the learning materials before the tests (e.g., Kronell, 2009). The teacher, being the researcher of the study, was the same for the two experimental groups and one control group to ensure that the instruction was in the same format and within the same amount of time.

Having completed the learning phase, the three groups of participants took the pen- and-pencil immediate post-test without notice. To avoid learning effect from the tests, the three tests (two productive tests of form and meaning and one receptive test of the meaning) were collected upon completion before the next one was handed out. The students were not informed of the number of tests that they had to sit. Two weeks later, the unexpected delayed post-test was administered to the three groups.

Table 5.6 *Procedures*

	Pre-test group	Experimental group 1	Experimental group 2	Control group
Week 1	pilot test 1			
Week 3	pilot test 2			
Week 5		learning session + immediate post-test		
Week 7		delayed post-test		

### 5.3.6 Scoring and data analysis

In a line of study, Webb and his colleagues have used the scoring system at two levels of sensitivity: sensitive and strict (Nakata & Webb, 2015; Webb, 2008; Webb & Kagimoto, 2009; Webb, Newton & Chang, 2013). The sensitive scoring system would assign a score to those words that were spelled incorrectly but showed a close resemblance to the correct answer. The strict scoring system worked in a dichotomous manner under which words that were spelled correctly would receive scores. They found that the two levels of sensitivity were more sensitive to little gains in knowledge of form and meaning. However, it is quite arbitrary to identify a wrong spelling word as “clearly resembles the correct answer” (Webb & Kagimoto, 2009:64). There is a great room for interpreting a word as a close resemblance to the correct answer. Therefore, the current study adopted the strict scoring system. The correct answer (with every word spelled in the right way) would be scored one point, and the incorrect answer (including wrong spelling) would be scored 0 points. The strict scoring might pose some difficulties on the learners since they only encountered the collocations and single words once during the treatment. However, the results showed that learners at this level of the study remembered the form and meaning of

the collocations and single words in a relatively short amount of time during the treatment, which resembled the real learning scenarios, and spelled them correctly in the tests.

All post-tests adopted the strict dichotomy scoring, where the correct answer received one mark, and the incorrect answer received zero marks. The MANOVA with post hoc analysis were used to answer research questions. The independent variables were the type of lexical items (collocations vs. single words), association strength (high vs. low collocations), and type of collocations (verb-noun collocations vs. adjective- noun collocations). The dependent variables were the test scores of the three posttests at two time intervals. In research question 1 and 2, treatment type (high MI collocations, low MI collocations, and single words) was the between-participant variable. The results of the post-tests (immediate and two weeks after the treatment) constituted the within-participant variable. In research question 3, the treatment type (high MI collocations, low MI collocations, and single words) were used as the between- participant variable. The collocation-node relationship (verb-noun collocation and adjective-noun collocations) was used as the within-participants variable.

#### 5.4 Results and discussion

This section presents the results of the experimental study in the two parts. The first part introduces the results of the three types of treatments (learning target items with high MI collocates, learning target items with low MI collocates and single

words) on the learning outcomes to answer research question one and two. The second part introduces the results of the differences between the two types of collocate-node relationship on the learning outcomes to answer research question three.

#### 5.4.1 The treatment groups

The descriptive statistics (mean and standard deviation) of the immediate and delayed posttests of vocabulary knowledge scores are reported in Table 5.7. Based on the results of the Kolmogorov-Smirnov test of normality, the null hypothesis that the scores were normally distributed cannot be rejected. Therefore, this study used parametric tests to analyze the results of test scores.

The descriptive statistics provide a rough picture of the variance between the performance of the three treatment groups at two time intervals. In the immediate posttest, the results showed that treatment group of the low MI group has higher scores on the tests of a productive test of the form (Mean = 11.57) and productive test of meaning (Mean = 10.51) than high MI group (Mean = 9.51; Mean = 9.33) and single words group (Mean = 9.3; Mean = 8.48). High MI group performed much better than the other two groups in the receptive test of meaning (Mean=18.09 for high MI group, Mean = 14.48 for low MI group and Mean = 12.46 for single words group). In the delayed posttest, the advantage of learning collocations with high MI scores were conspicuous (Mean = 6.86; Mean = 6.17; Mean = 12.2 on three tests respectively). It outperformed the other groups on three types of tests. This is

encouraging results for promoting collocation learning with high MI scores since delayed posttest resembles real-life learning scenarios and thereby carries higher ecological value. Also, the purpose of learning in the real scenario is to facilitate long-term retention (Ellis, 1995; Nakata, 2008), and the delayed posttest has a better indication on the long-term retention than immediate posttest. The results needed statistical analysis to identify significant variance between the groups.

Table 5.7 Mean and Standard Deviations of the Scores of Posttests

	Immediate posttest			Delayed posttest		
	PF	PM	RM	PF	PM	RM
high MI group	9.51(5.08)	9.33(4.94)	18.09(2.45)	6.87(3.95)	6.17(4.36)	12.2(3.64)
low MI group	11.57(5.01)	10.51(5.1)	14.48(3.55)	5.85(3.8)	5.06(3.69)	5.97(3.19)
single words group	9.3(5.04)	8.48(4.61)	12.46(4.23)	6.16(3.34)	2.65(1.33)	8.35(3.4)

Note: standard deviations are in brackets, Maximum score=20. PF=productive knowledge of form; PM=productive knowledge of meaning; RM=receptive knowledge of meaning.

To determine whether there were overall differences between the experimental groups and control group, a multivariate analysis of variance (MANOVA) was performed using the type of treatment (collocations with high MI score, collocations with low MI score and single words) and time of posttests (immediate and delayed) as the independent variables and scores of the posttests (productive test of form, productive test of meaning and receptive test of meaning) as the dependent measures.

The MANOVA analysis showed the significant overall difference for treatment group (Pillai's Trace  $F(6, 394) = 16.381$ , partial  $\eta^2 = .200$ ; Wilks' Lambda  $F(6, 392) = 17.150$ , partial  $\eta^2 = .208$ ; Hotelling's Trace  $F(6, 390) = 17.920$ , partial  $\eta^2 = .216$ ; Roy's Largest Root  $F(3, 197) = 17.920$ , partial  $\eta^2 = .314$ ) with p value at 0.000. It suggests that the type of treatment has a significant effect on learning. The MANOVA analysis also showed the significant overall difference for the time of posttests (Pillai's Trace  $F(3, 196) = 52.889$ , partial  $\eta^2 = .447$ ; Wilks' Lambda  $F(3, 196) = 52.889$ , partial  $\eta^2 = .447$ ; Hotelling's Trace  $F(3, 196) = 52.889$ , partial  $\eta^2 = .447$ ; Roy's Largest Root  $F(3, 196) = 52.889$ , partial  $\eta^2 = .447$ ) with p value 0.000. It suggests that the time of the posttest also has a significant effect on learning.

Besides the significant main effect of treatment groups and time of posttest, the interaction between treatment group and time of posttests were also identified (Pillai's Trace  $F(6, 394) = 5.577$ , partial  $\eta^2 = .078$ ; Wilks' Lambda  $F(6, 392) = 5.742$ , partial  $\eta^2 = .081$ ; Hotelling's Trace  $F(6, 390) = 5.905$ , partial  $\eta^2 = .083$ ; Roy's Largest Root  $F(3, 197) = 11.242$ , partial  $\eta^2 = .146$ ) with value 0.000. Since the interaction between the



treatment group and the time of posttests were identified, the simple main effect was tested on the two variables to examine where significance lay. The simple main effects analysis of time of tests showed that there were significant differences found between treatment at both immediate posttests and delayed posttests ( $F(2, 196) = 18.81, p = .000$  at immediate posttest;  $F(2, 196) = 12.16, p = .000$  at delayed posttest). The simple main effect of treatment group showed converging results as the analysis of time of tests. In other words, three treatment group performed significant differently at two time intervals ( $F(1, 198) = 60.87, p = .000$  for high MI group;  $F(1, 198) = 78.21, p = .000$  for low MI group;  $F(1, 198) = 13.44$  for single words group).

Since significant variance was found between the group for the three types of posttests in the MANOVA analysis, a follow-up post hoc LSD analysis was conducted to pinpoint the places where differences lay (table 5.8). It should be noted that this analysis was conducted with the combined test scores of the three types of posttests at two time intervals (immediate and delayed) to reflect the overall differences between the groups.

There were no significant differences between groups in the productive test of form, which means that the performance of the three groups on this test was comparable. In the productive test of meaning, the high MI group outperformed the single words group significantly (Mean = 7.515, SD = 4.9 for high MI group; Mean = 5.85, SD = 4.53 for single words group; Mean differences = 1.66,  $p = .027$ ). Likewise, the low MI group performed significantly better than the single words group (Mean =

7.82, SD = 5.11 for low MI group; Mean difference = 1.97,  $p = .008$ ). There were no significant differences found between the performance of high MI group and low MI group (Mean difference = -.31,  $p = .67$ ). In other words, both the treatments of collocations outperformed the control group of single words in the productive test of meaning.

In the receptive test of meaning, the high MI group outperformed the low MI group significantly (Mean = 14.47, SD = 5.06 for high MI group; Mean = 10.53, SD = 5.42 for low MI group; Mean difference = 3.94,  $p = .000$ ). The high MI group also performed significantly better than the single words group (Mean = 10.7, SD = 4.4 for single words group; Mean difference = 3.75,  $p = .000$ ). There were no significant differences between the test scores of low MI group and single words group (Mean difference = -1.773,  $p = .783$ ). The results showed the advantageous effect of collocations with high MI group on the retention of the meaning of the collocations.

To sum up, the results of overall analysis of data showed that advantage of learning new items in collocations over single words on a productive test of meaning and receptive test of meaning. However, there were no significant differences in learning outcomes in the productive test of form. This partly corroborates the findings of Kasahara (2011) which also showed the advantage of learning new item with a known word as collocates facilitate the retention of new words. The reasons for these differences in results will be discussed in the general discussion.

Table 5.8 *Post hoc LSD Analysis of Between-group Variance*

		High MI group	Low MI group	Single words group
PF	High MI group		-0.74(0.342)	-0.1(0.896)
	Low MI group			0.64(0.409)
PM	High MI group		-0.31(0.673)	1.66(0.027)
	Low MI group			1.97(0.008)
RM	High MI group		3.94(0.000)	3.75(0.000)
	Low MI group			-0.18(0.783)

Note: Mean difference followed by significance value in brackets. PF=productive test of form; PM=productive test of meaning; RM=receptive test of meaning.

To understand the differences between the performance of three treatment groups at immediate posttest and delayed posttest respectively, two MANOVA analyses were conducted with each at one time interval. The first MANOVA was conducted with three treatment group as the independent variable (high MI group, low MI group, and single words group) and scores in three types of tests at the immediate posttest as the dependent variable (productive test of form, a productive test of meaning and receptive test of the meaning).

The multivariate tests showed the significant variance between groups (Pillai's Trace  $F(6, 196) = 10.057, p = .000$ , partial  $\eta^2 = .235$ ; Wilks' Lambda  $F(6, 194) = 11.6, p = .000$ , partial  $\eta^2 = .264$ ; Hotelling's Trace  $F(6, 192) = 13.172, p = .000$ , partial  $\eta^2 = .292$ ; Roy's Largest Root  $F(3, 98) = 25.949, p = .000$ , partial  $\eta^2 = .443$ ).

The analysis showed that there was no significant difference between the three groups in the productive test of the form ( $F(1, 3) = 1.512, p = .226$ , partial  $\eta^2 = .03$ ) and productive test of meaning ( $F(1, 3) = 1.089, p = .341$ , partial  $\eta^2 = .022$ ). Since the

differences did not achieve the significant level and the effect size was rather small, no post hoc analysis was conducted. This result suggests that the learning new items in collocations and single words produce similar gains in retention of the form of the words and collocations. The performance of the three treatment groups differed significantly in the receptive test of meaning ( $F(1, 3) = 23.467, p = .000, \text{partial } \eta^2 = .322$ ).

A post hoc LSD test was done to find out where the significance lay between the groups (table 5.9). The paired comparison indicated significant differences lay between the mean test scores of high MI group and low MI group (Mean difference = 2.58,  $p = .000$ ), high MI group and single words group (Mean difference = 5.71,  $p = .000$ ) and low MI group and single words group (Mean difference = 2.13,  $p = .000$ ). The results suggest that learning new items in collocations led to better learning gain in the receptive meaning of the items. And, learning collocations with high MI scores were more effective in retention of the meaning than learning collocations with low MI scores.

Table 5.9 *Post hoc LSD Analysis of Between-group Variance of Immediate Posttest*

		High MI group	low MI group	single words group
RM	High MI group		3.58(0.000)	5.71(0.000)
	Low MI group			2.13(0.012)

Note: Mean difference followed by significance value in brackets. RM=receptive test of meaning.

The second MANOVA analysis was conducted to examine whether there were

significant differences between treatment groups on the three posttests in the delayed posttest. The MANOVA was conducted with the treatment groups as the independent measures and scores of the three types of posttest as the dependent measures. The multivariate tests showed that there were significant differences between the performance of the treatment groups on the delayed post-tests (Pillai's Trace  $F(6, 196) = 17.258, p = .000, \text{partial } \eta^2 = .365$ ; Wilks' Lambda  $F(6, 194) = 17.493, p = .000, \text{partial } \eta^2 = .371$ ; Hotelling's Trace  $F(6, 192) = 17.722, p = .000, \text{partial } \eta^2 = .377$ ; Roy's Largest Root  $F(3, 98) = 24.584, p = .000, \text{partial } \eta^2 = .450$ ).

The MANOVA analysis indicated that the three treatment groups performed comparatively in the productive test of form with no significant difference between the groups ( $F(1, 3) = 0.615, p = 0.543, \text{partial } \eta^2 = .013$ ). The performance on the remaining two tests showed significant differences between three treatment groups ( $F(1, 3) = 8.7, p = .000, \text{partial } \eta^2 = .161$  for a productive test of meaning;  $F(1, 3) = 26.563, p = .000, \text{partial } \eta^2 = .369$  for a receptive test of the meaning). The results showed that, like immediate posttest, different learning conditions led to similar learning outcomes in terms of the retention of the form of target items. Although the high MI group performed better than the low MI group on this test, the results did not achieve significance level (Mean difference = 1.02,  $p = .279$ ). Surprisingly, the mean test scores on the productive test of the form of the single words group were better than the Low MI groups. It seems that learning new items in single words leads to slightly better retention than learning the items in collocations. However, the results

may be the products of test format than the learning condition. This will be discussed in more details in the general discussion.

The post hoc LSD analysis was conducted on the two tests of a productive test of meaning and receptive test of meaning. In the productive test of meaning, the high MI group performed slightly better than the low MI group, although the differences did not achieve a significant level (Mean difference = 1.11,  $p = .198$ ). Both high MI group and low MI group had high mean test scores than the single words group (Mean difference = 3.52,  $p = .000$  between high MI group and single words group; Mean difference = 2.42,  $p = .005$  between low MI group and single words group). In the receptive test of meaning, high MI group outperformed the other two groups significantly (Mean difference = 6.23,  $p = .000$  between high MI group and low MI group; Mean difference = 3.86,  $p = .000$  between High MI group and Single words group). The mean test scores of the single words group were higher than the low MI group (Mean difference = 2.39,  $p = .006$ ).

Table 5.10 *Post hoc LSD Analysis of Between-group Variance of Delayed Posttest*

		High MI group	Low MI group	Single words group
PF	High MI group		1.02(0.279)	0.71(0.459)
	Low MI group			-0.32(0.927)
PM	High MI group		1.12(0.198)	3.52(0.000)
	Low MI group			2.42(0.005)
RM	High MI group		6.23(0.000)	3.84(0.000)
	Low MI group			-2.39(0.006)

Note: Mean difference followed by significance value in brackets. PF=productive test of form; PM=productive test of meaning; RM=receptive test of meaning.

The results suggest that learning new items in collocations with high MI scores collocates could lead to significantly better learning outcomes in the three types of posttests of vocabulary knowledge of form and meaning. The learning gain was more prominent in the retention of the meaning of target items than on the retention of form. The most pronounced advantage of learning collocations with high MI collocates could be found in the retention of the meaning of target items. It seems that learning new items in collocations with low MI collocates did not yield consistent better learning outcomes than single words condition. It shows a minor advantage over single words group on the receptive knowledge of the meaning of the target items. While, at the same time, the single words group shows better learning gains in the receptive knowledge of form and meaning.

These results are not consistent with the findings of the previous study (Kasahara, 2011). According to the results of this study, learning new items in collocations would not invariably lead to better learning gains than learning new items in single words. The association strength between collocates would affect the learning outcomes when it comes to the effectiveness of collocation learning with a variability of gains in different types of vocabulary knowledge.

#### 5.4.2 The collocate-node relationship

All test scores for each posttest were collapsed to two parts to analyze the results of different types of collocate-node relationship on the learning outcomes. The full

scores for each test would be 10 points for verb-noun collocations and 10 points for adjective- noun collocations. The normality test of the scores showed that the scores were normally distributed with the significance of Kolmogorov-Smirnov test higher than

0.50. And therefore, parametric tests were used to analyze the data. The number of the correct answer and the percentages of the correct answers for each type of collocations as to all the correct answers for the verb-noun and adjective-noun combinations are listed in table 5.11.

A close look at the number of correct answers for each type of collocations showed that, in the majority of the cases, there were more correct answers for the adjective- noun collocations than the verb-noun collocations. It seemed that learners remembered more adjective-noun collocations after the treatments. However, in the treatment of low MI group, the correct answers for the verb-noun collocations were consistently more than the adjective-noun collocations. It means that, in this treatment, the verb-noun collocations led to the better retention rates. This suggests that the learning burden of the types of collocations are under the influence of other variables, like the treatment that learners received for vocabulary learning. It needs further parametric analysis to establish the influence of variables, and see if there exists any interaction between the variables on the learning outcomes.



Table 5.11 *The Number and the Percentage of Correct Answer of Each Type of Posttest in the Posttest*

		Immediate posttest			Delayed posttest			
		PF	PM	RM	PF	PM	RM	
High MI group	VN	146(42.9%)	138(40.2%)	276(81.2%)	VN	98(32.6%)	89(29.7%)	157(52.3%)
	AdjN	168(49.4%)	170(50%)	321(94.4%)	AdjN	108(36%)	96(32.2%)	189(63%)
Low MI group	VN	204(60%)	183(53.8%)	251(73.8%)	VN	110(33.3%)	90(27.3%)	104(31.2%)
	AdjN	191(56.2%)	175(51.2%)	257(75.6%)	AdjN	83(25.2%)	77(23.3%)	93(28.2%)
Single words group	V	144(43.6%)	123(37.2%)	177(53.6%)	V	84(27.1%)	41(13.2%)	96(30.9%)
	Adj	176(53.3%)	166(50.3%)	244(73.9%)	Adj	107(34.5%)	41(13.2%)	163(52.9%)

Notes: the number of correct answers are presented with the percentage in the brackets. VN=verb-noun collocation, AdjN=adjective-noun collocations. V = verb, Adj = adjective. PF=productive test of form; PM=productive test of meaning; RM=receptive test of meaning.

To address this, MANOVA was performed with the treatment (High MI group, Low MI group, Single words) and type of collocate-node relationship (verb-noun and adjective-noun) as the independent variable and the test scores as the dependent variable. The MANOVA test showed that there were significant differences between types of collocations (Pillai's Trace  $F(3, 196) = 6.322$ , partial  $\eta^2 = .088$ ; Wilks' Lambda  $F(3, 196) = 6.322$ , partial  $\eta^2 = .088$ ; Hotelling's Trace  $F(3, 196) = 6.322$ , partial  $\eta^2 = .088$ ; Roy's Largest Root  $F(3, 196) = 6.322$ , partial  $\eta^2 = .088$ ;  $p = .000$ ) and between groups (Pillai's Trace  $F(6, 394) = 14.099$ , partial  $\eta^2 = .177$ ; Wilks' Lambda  $F(6,392) = 15.422$ , partial  $\eta^2 = .191$ ; Hotelling's Trace  $F(6, 390) = 16.795$ , partial  $\eta^2 = .205$ ; Roy's Largest Root  $F(3, 197) = 32.363$ , partial  $\eta^2 = .330$ ;  $p = .000$ ).

There was no significant interaction between the type of the collocation-node relationship and treatment groups (Pillai's Trace  $F(6, 394) = 1.208$ ,  $p = .301$ ; Wilks' Lambda  $F(6, 392) = 1.213$ ,  $p = .298$ ; Hotelling's Trace  $(6, 390) = 1.218$ ,  $p = .298$ ; Roy's Largest Root  $F(3, 197) = 2.433$ ;  $p = .066$ ). The results showed that the effects of collocation-node relationship on the learning outcomes might be under the influence of other variables like the treatment groups. However, this effect did not achieve a significant level of the analysis.

Since, in this analysis, I was interested in the differences between the type of collocate-node relationship, a pairwise comparison was conducted to find out which type of collocation-node relationship led to between retention of target items. The results of t-test showed that the test scores of the two types of collocations differed

significantly both in the immediate and delayed posttest. Verb-noun collocations had significantly lower test scores than the adjective-noun collocations at two time intervals ( $t = -5.290$ ,  $df = 305$ ,  $p = .000$ ,  $d = .43$  for immediate posttest;  $t = -2.131$ ,  $df = 277$ ,  $p = .034$ ,  $d = .18$  for delayed posttest). However, from the effect size, it can be learned that the scale of differences between the two types of collocations in recall and retention rates were much smaller in delayed posttest than immediate posttest. It suggests that verb- noun collocations are harder to learn and memorize than the adjective-noun collocations (Peters, 2015). However, the learning difficulty of verb-noun collocations was less salient after two weeks of the intervention, mostly likely due to attrition of the knowledge of target items.

## 5.5 General discussion

The purpose of this study was to examine how L2 vocabulary learning was affected by the type of target items presented (two types of collocations vs. single words), the association strength between collocates, and the collocate-node relationship. 101 students participated in the study in two experimental groups, in which they received instruction on the 20 target items in different types of collocations (collocations with high MI score and collocations with low MI score), and one control group, in which they received instruction on the target items in single words. The learning outcomes of the experiment were measured at two time intervals, i.e., immediate posttest and delayed posttest two weeks after the treatment, in three

tests focusing on two aspects of vocabulary knowledge. The three tests were the productive test of form, the productive test of meaning and receptive test of meaning.

In answer to the first research question, the study indicated that, generally speaking, learning new items in collocations yielded better retention of the form and meaning than learning new items in single words. Through incorporating multiple tests of vocabulary knowledge, the study showed that the advantage of collocations over single words were more complicated than the previous study has predicted (Kasahara, 2011). In the immediate posttest, the experimental groups received significantly higher scores than control group only in the receptive test of meaning. It was in the delayed posttest when greater differences between the groups were identified. The two experimental groups outperformed the single words group in the productive and receptive test of meaning. Among the two experimental groups, the differences between the learning outcomes of the experimental groups that has learned new target items in collocations with high association strength and the control group were more pronounced than the differences between the experimental group that has learned the new items in collocations with low association strength.

It cannot be taken for granted that learning new items in collocations would lead to better learning gains than in single words. It seems that the advantage of collocations over single words in retention and retrieval of newly learned items was affected by the type of collocations as well as the type of vocabulary knowledge tested. Unlike this study, Kasahara (2011) has found a clear advantage of collocations.

In his study, the experimental group (instruction on the new items in two-word collocations with one known word and one unknown word) has consistently outperformed the control group, (instruction on single words) in the immediate and delayed posttest (Mean = 31.97 vs. Mean = 19.33 in the immediate posttest; Mean = 23.97 vs. Mean = 4.97 in the delayed posttest).

This study differed from Kasahara's study in an important aspect. In Kasahara's study, the learning gain was measured with one test of vocabulary knowledge: the receptive test of meaning. Whereas this study has used three tests of vocabulary knowledge to examine the learning gains in two aspects of form and meaning. The two experimental groups also showed a clear advantage over the control group in the receptive test of meaning in this study. Taken the results of two studies together, it seems that learning new items in collocations lead to better retention of the meaning of target items.

There are three possible reasons that could explain the better retention rate in the experimental group. The first reason is the facilitative effect that the collocate plays as cues for integrating the new words into the mental lexicon. In the process of new word learning, the known words being used as the collocate of the new words have created a cue for storing and retrieval of the meaning of the new items. This facilitative effect of the cue was evident in the initial process of form-meaning mapping attested by the results of the immediate posttest and much more pronounced in the process of the attrition of the vocabulary knowledge attested by the results of

the delayed posttest. This cue could speed up the initial process of incorporating a new L2 item into the mental lexicon through strengthening the link of L2 form and L1 meaning. The effect has been exemplified in Jiang (2000)'s paradigm of three steps of form-meaning mapping of L2 words in the learners' mental lexicon. The cue that the collocates have created for the target items are more resilient facing the attrition of the word knowledge, especially in the case of the productive knowledge of meaning. In the delayed posttest, the participants in the experimental group could score correctly more than twice as much as the correct answers of the participants in the control group.

The second reason for the better scores for the experimental group is the innate quality of the collocations, i.e., semantic transparency and congruency of the L1 and L2 collocations. The collocations in this study were semantically transparent which bore great resemblance to the free combinations and restricted collocations in Howarth's continuum model (1996, 1998). Wolter and Gyllstad (2016) have used semantic judgment tasks to examine the processing advantage of the free combinations vs. collocations (in their study were defined in resemblance with the phrasal verb + noun collocations). Their results showed that advanced learners responded much quicker to free combinations with lower error rates.

Another quality of collocations that merits discussion is the congruency of collocations between L1 and L2. To empirically test the framework of Kroll and Steward (1994) and Jiang (2000), Yamashita and Jiang (2010) carried out an

experiment on EFL learners, ESL learners and native speakers of English. They examined the learning of congruent collocations (identical lexical elements shared between L1 and L2) and incongruent collocations (different words used in L1 and L2 to express the concept) using phrase-acceptability task. They found that EFL learners took longer to react to the incongruent collocations and made more errors in judgment of these collocations. ESL learners (the advanced learners in the study in terms of greater exposure to the language) performed better than the EFL learners with lower error rate and faster speed in identifying collocations. The collocations in the experiment could be classified as the congruent collocations, which implied that there were identical lexical choices in L1 and L2.

All collocations in this study could find the equivalent translation in Chinese. For example, bestselling memoir could be directly translated as 畅销的回忆录 (*Chang4Xiao1De1Hui2Yi4Lu4*); fruity aroma could be translated as 水果的香气 (*Shui3Guo3De1Xiang1Qi4*). Wolter and Gyllstad (2011) commented on this facilitative effect of collocational learning more clearly in their observation that “When an L2 word is activated, it stimulates not only the L2 words (known) L2 collocations but also the L1 translation equivalent and that word’s L1 collocations” (p.444). This observation would explain the reason why congruent collocations were easier to learn than the incongruent collocations. The congruency between L1 and L2 collocations promotes the mapping of the L2 collocations into the mental lexicon by reducing learning burden of cross-linguistic confusions. When learners are asked to

retrieve the meaning of the collocations from their memory, they could retrieve the target words and the known collocates and their L1 counterpart. This study lends support to Yamashita and Jiang (2010) with evidence from second language acquisition with learners' lower error rates in the experimental group than control group.

The third reason for the advantage of the collocational learning could be seen as the evidence for learners being able to store collocations holistically in the mental lexicon. When they were asked to retrieve collocations in the posttest, they showed better performance in terms of greater accuracy in the form and meaning of the target items. Previous studies into the native and non-native speakers have lent support to the assumption that learners store collocations as a holistic unit in the mental lexicon (e.g., Conklin & Schmitt, 2007; Jiang & Nekrasova, 2007; Libben & Titone, 2008; Tremblay & Baayen, 2011; Siyanova-Chanturia, Conklin & Schmitt, 2011). Using an online phrase judgment task, Jiang and Nekrasova (2007) found that nonnative speakers used shorter reaction time to respond to the formulaic sequences and demonstrated much smaller error rates in judging the formulaic sequences. Based on these results, their research was evidence to support the holistic store of formulaic sequences in the mental lexicon. In this study, the learners in the experimental group could retrieve the forms (productive task) and meanings (receptive task) with greater accuracy than the learners in the control group. This shows that, in the early stage of new item learning, advanced learners could see the collocations as a unit. Knowing



one part of the combinations primes the knowledge of the remaining components.

Regarding language processing, Sinclair (1991) have proposed the “open choice principle” and “idiom principle”. The open choice principle is “a way of seeing language text as the results of a very large number of complex choices. At each point where a unit is completed (a word or a phrase or a clause), a large range of choice opens up and the only restraint is grammaticalness” (p.109), while the idiom principle postulates “a language user has available to him or her a large number of semi-preconstructed phrases that constitute single choices, even though they might appear to be analyzable into segments” (p.110). The results of this study show that, when the collocations were presented together without context, learners could view the newly learned collocations as a unit, and memorize them as an integrated unit.

Wray (2012) has distinguished the holistic storage of the collocations in a linguistic unit as possessing a “different quality to holistic storage and access” from the open choice principle where every word is stored separately (p.234). She summarized three qualities as “First, it could entail the synchronous access of all components. Second, it could entail accessing (albeit in sequence) larger base components, through a direct mapping from the meaning of the entire expression to the phonological form (of those parts that are reliably fixed-as construction models might favor). Third, in the case of word strings that have become fused through repeated use, it could entail the creation of a new access pathway that bypasses the original componential route as the extensive neurological research into automatic

processing indicates” (p.234). The third quality is clearly beyond the scope of this study since it only covers the initial stage of new item learning. However, when I consider the vast body of research into learner writing, I have concerns about the extent to which learners could use holistic store the collocations in their mental lexicon (e.g., Durrant & Schmitt, 2009; Granger & Bestgen, 2014; Laufer & Waldman, 2011). The results of their study suggest that learners have a quite limited range of collocations at their disposal which could be observed from their overreliance on the high-frequency collocations. Additionally, they demonstrated heavy reliance on the creative combinations of collocations.

Taken together the results of these studies and the research on the use of collocations in learner writing, it seems likely that, when learners first encounter collocations without context, they memorize them as a holistic unit. However, if learners are allowed to access the items productively, the holistic storage of the collocations would regress back to store the collocations as separate components only subject to the grammaticalness when used as illustrated in the open choice principle.

There is one notable issue in the performance between experimental group and control group, i.e., the comparable outcomes in the productive test of form in the immediate and delayed posttest. In the two posttests, there were no significant differences in the test scores of the productive test of form both the two experimental groups and control group. There are two possible reasons to explain this comparable performance. The first reason is the level of the difficulty of the test adopted by the

experimental group and the control group. The type of the test adopted by the experimental group was a fill-in-the-gap task. The participants needed to write down the target words (with the first letter given to avoid confusion and other possible answers) with the collocates given as the prompt. The task used for the control group was a dictation task. The participants were supposed to write down the words that they have heard from the teacher. Comparatively, the dictation task is less demanding than the fill-in-the-gap task. In the fill-in-the-gap task, the cue for retrieving the target words was the collocates, and the participants were required to write down the form of the words without other help on the words per se. Whereas, in the dictation task, the phonological cue for the words serves as a stronger cue for the target words. In a dual lexicon model of lexical entries, the phonological knowledge of words is stored closely together in the mental lexicon with the orthographic knowledge of the words as part of the lexeme (Jiang, 2000; 2002). In the initial stage of new word learning, the L2 learners would use the phonological cue as a scaffold to map the new words in the mental lexicon. This would facilitate the decoding and encoding process, during which the learners would have to use the sound cues to link the words that they hear to existing words in the mental lexicon to decode messages. For encoding messages, they would have to retrace these steps to link the words in the mental lexicon to its pronunciation to express the words properly (Levelt, Roelof & Meyer, 1999). While memorizing words, Chinese learners would adopt the rote learning strategy to recite the words out aloud to expedite the memorization of the form of words (Li, 2004).

This happened in the instruction stage in the experiment of this study. When asked to take some time to memorize the newly learned words and collocations, the participants in the experimental group and control group unanimously recited the target items in the classroom to promote stronger footprints in the memory.

The second reason lies in the innate quality of collocation and single words. Previous studies have shown that learning collocations were more challenging than single words in the aspect of retention of the form (Peters, 2012; 2014). She explained that the learning burdens of collocations were likely to be greater than single words since learners faced a greater challenge in learning collocations to allocate their attentional resources to two collocates at the same time. However, I am cautious in interpreting the results of this study and Peters, since the studies used different target items, types of treatment and posttests. It is important to note that, in Peters (2014), the single words and collocations included different words, and therefore, made the comparison of the results between the retention of form a little bit harder. On the contrary, this study used the same set of target words in the single words treatment and collocational treatment to rule out the possible effects of different words, such as word length, frequency, on the comparison of the results.

This result is different from Pellicer-Sanchez (2015). In her paper, she found out that, in the incidental learning condition, learners could pick up the form and meaning of the collocations at the similar rates with single words. For experimental group who has exposed to the target words and collocations for eight times, the participants have

scored around 50% in the recognition tests and 10% in the recall tests for collocations and single words. Although the participants scored slightly higher in the tests of collocations, the difference did not achieve significant level. The similar trend held true for the other experimental group exposed to the target items for six times. She observed that “When encountering new words in reading, L2 learners seem to pick information about the form, meaning and the collocates of unknown words with the same level of difficulty, provided that they encounter them sufficient times” (p. 15).

In her study, the target single words and collocations were encountered eight times in the study. Whereas, in this study, the learners only encountered them twice (once during the instruction and once during the memorization phase). The present study found a clear advantage of collocations over single words in the retention of meaning (Mean difference = 5.71,  $p = .000$  for immediate posttest and Mean difference = 3.84,  $p = .000$  for delayed posttest). Like Pellicer-Sanchez (2015), the present study found that participants scored higher on the posttest of form retention for collocations than single words (Mean = 9.33 for collocations and Mean = 8.48 for single words in immediate posttest; Mean = 6.87 for collocations and Mean = 6.16 for single words in delayed posttest). However, these differences did not significant level.

It is likely that, with the increase in the number of encounters, learners could gradually build up familiarity with the form of the collocations. This could go back to the problem that Durrant and Schmitt (2010) have raised

“...adult second language learners do retain some memory of which words go together in the language they meet. ...this suggests that adult L2 learners are likely to

gather information about the collocations in their input....This suggests that any shortcomings in non-natives' grasp of collocational links between words may be a product of an insufficient exposure to the target language.”(2010:179).

In reality, it is very unlikely that the same collocations would appear for enough time of repetitions for learners to build a solid knowledge of them (Boers & Lindstromberg, 2009; Boers, Demecheleer, Coxhead & Webb, 2014; Tsai, 2014). In light of this, it would be left to teachers to explicitly draw learners' attention to aspects of knowledge of collocations that could require much greater encounters to grasp, like the form of the collocations.

The third reason is the level of difficulty of the type of tests. Laufer and Goldstein (2004) has graded the level of difficulty of the vocabulary test based on the widely accepted distinction between receptive and productive knowledge (used as active and passive knowledge in their study). There were four levels of difficulty with the active recall of form as the most difficult, followed by active recall of meaning, passive recognition of form and passive recognition of meaning. They argued that productive knowledge was a more “advanced degree of knowledge” since the “recall of information indicates a better memory trace than recognition of the same information... Language learners who can recall the meaning of a given word can typically recognize the meaning among several options.” (p.408).

Among the three types of tests in this study, the productive test of form was the most demanding one according to Laufer and Goldstein (2004)'s classification. Productive test of form entails the similar test requirement as the active recall of form

in which test takers are required to produce the written form of the target item based on the L1 translation equivalent as prompt. It is possible that the limited amount of time on instruction and memorization could only contribute significant different performance on the easier aspects of word knowledge as the active and passive recall of meaning in collocational learning over single words learning, as addressed by Wolter and Gyllad (2011) on the facilitative effect of activation of meaning.

The second research question examined whether collocations with greater association strength (measured by higher MI value) would lead to better retention than collocations with smaller association strength (measured by lower MI value). The results suggest that collocations with strong association strength could lead to stronger retention during both immediate and delayed posttest. The differences in performance between the two experimental groups were more pronounced in the delayed posttest than in the immediate posttest. In the delayed posttest, the high MI group scored correctly in more answers than the low MI group in all tests, although only the productive and receptive test of meaning achieved significant level. The delayed posttest is, in a way, a better proof of the differences in the treatment than the immediate posttest. The immediate posttest was conducted shortly after the instruction when participants were given a few minutes to memorize the items on the instruction sheet. Although the memorization before the test would increase the ecological value of the study, the effect of the different treatments could very likely be offset by the memorization. In light of this, the discussion would primarily be on

the results of the delayed posttest for research question two.

The reason behind the better retention of the collocations with higher mutual information value is that they are more likely to be processed as a unit rather than being treated as two different words and processed independently. Ellis, Simpson-Vlach & Maynard (2008) commented in their paper addressing the processing advantage of formulaic sequences with high mutual information value as “Their processing is a psycholinguistic instantiation of the idiom principle in that they ( native speakers) preferentially recognize high-MI formulas as units.” (p. 301). Although in their study, the advanced ESL learners were sensitive to frequency information but not to the mutual information of the formulaic sequences in the oral tasks. This study showed that learners demonstrated better retention of the collocations with higher MI values during new item learning. The MI score implies a closer relationship between the meanings of the collocates and greater likelihood for collocations to appear more frequently than chance could predict. Although the collocations with high MI scores are infrequent ones, the exclusiveness of the collocates could trigger the holistic processing of the collocations.

In this study, collocations with high MI score like bestselling memoir, fruity aroma, economic slump, modern metropolis included adjectives that were more exclusively used with the nouns than in the cases of the collocations with low MI scores like new memoir, strong aroma, recent slump and huge metropolis. In the posttest of the knowledge of form, when the participants saw the collocate bestselling



as the prompt, they were more likely to remember memoir than the prompt new. Although new is much more frequent than bestselling, it could be used to modify a wide range of nouns. While bestselling has a much smaller range of nouns to modify and greater chances to be used with memoir. The same goes for the posttest of the knowledge of meaning. The meaning of bestselling is much more likely to be associated with memoir than the meaning of new. The participants would more likely memorize the meaning of bestselling memoir as a holistic unit than the new memoir because of the close relationship in terms of meaning between the collocates with higher association strength. In light of this, the participants were more likely to remember the meaning of the high MI collocations in posttests and produce the proper translations.

The third research question was on the learning load of the collocate-node relationship. In the majority of the posttests, the learners scored better on the adjective- noun collocations, except in the test outcomes of the low MI group. The learners of this experimental group performed better on the verb-noun collocations in the productive test of form and meaning in the immediate posttest and productive test of form, meaning and receptive test of form in the delayed posttest. The results of the pairwise comparison test showed that the performance on the adjective-noun collocations was significantly better than the verb-noun collocations. However, the difference between the performance was much less salient during the delayed posttest.

These results are in line with Peters (2015), which demonstrated the better

retention of adjective-noun collocations than verb-noun collocations. Peters (2015) tested learners' retention of the two types of collocations using two form recall tests and one form recognition test. In the two form recall tests, participants answered correctly 46.7% and 52% for the adjective-noun collocations respectively, compared with the 37.8% and 38.6% for the verb-noun collocations. The most salient differences between the retention of the two types of collocations lied in the form recognition test. The participants answered correctly 90.7% for the adjective-noun collocations, compared with 69.1% for the verb-noun collocations.

The present study demonstrated similar trends for the retention of the two types of collocations. However, the differences between the two types of collocations were much less salient in the present study than in Peters (2015). The participants could answer more test items correctly for adjective-noun collocations than verb-noun collocations. For high MI group, the ratio of correct answers was 42.9% for verb-noun collocations and 49.4% for adjective-noun collocations in the immediate posttest. The differences were less salient in the delayed posttest. The participants scored 32.6% correctly for verb-noun collocations and 36% for adjective-noun collocations. The collocate-node relationship was conditioned by the type of test, the treatment condition and the time of the test.

To add to the findings in Peters (2015) in the retention of form, the present study found that there was also better retention of meaning for adjective-noun collocations than verb-noun collocations. There was higher retention of the meaning of

adjective-noun collocations in both experimental groups in the two types of tests. The participants could score from 4% to 15% more correct answers for adjective-noun collocations than verb-noun collocations, depending on the type and time of the tests. The differences were more pronounced in the receptive test of meaning than the productive test of meaning.

There is one possible reason that could explain the reason why the test results were more salient in Peters (2015) than in the present study, i.e., the absence of the morphological variations in the verb form of the verb-noun collocations. In Peters (2015), the target collocations were presented with the L1 translation and L2 sample sentence. Learners were required to do gap filling exercises to use the proper form of the verb-noun collocations in the given sentences to optimize the learning outcomes of the explicit instruction. The sample sentences and the exercises involved different morphological variations of the target collocations, thereby created heavier memory load on the learners. For example, the verb-noun collocations appeared in different morphological variations of past tense (*exceeded the budget*) or passive voice (*be tied up in property*). Morphological variation of the verb forms is one of the major reasons that give rise to the learning difficulties of the verb-noun collocations (Laufer, 2011). She pointed out that, when looking for target collocations in the dictionary, learners felt bewildered when they encountered different verb form in the entries and the exercises. For example, take measures was explained in the sample sentence as “They took strong measures against dangerous drivers.” Learners need to process the

different verb forms in the sample sentences and the inserted adjective strong. In this study, the target collocations were presented in paired-associate learning format, which only involved one form without variation. The follow-up instruction was mostly on the meaning of the collocations. Therefore, in the instruction, learners did not come across different morphological variations which could leave them disoriented. This finding suggests that, at the early stage of new verb-noun collocational learning, it is better to present one single verb form to create a unified picture in learners' memory and long-term retention.

The present study found that, in low MI group, verb-noun collocations yielded better test results than adjective-noun collocations. It could be possible that the types of adjectives in the low MI collocations has led to this result. The adjective-noun collocations in the low MI group included high frequency adjectives that could be used to modify a wide range of nouns and, in the term, showed low relevance regarding exclusiveness of meaning to the noun collocates. Seven out of ten adjective-noun collocations in the low MI group used frequent and general adjectives like new, low, funny, strong, recent, successful, and huge as in the cases of new memoir, low chuckle, funny sitcom, strong aroma, recent slump, successful endeavor and huge metropolis. These adjectives are all highly frequent adjective. It was likely that the advanced EFL learners in this study did not perceive these collocations as fixed combination but the random combinations of two grammatically possible words. And therefore, they did not spend much time in memorizing these collocations as a

holistic unit. Instead, they might have devoted attention to the single words in the collocations. Comparatively, the verb-noun collocations in the low MI group adopted nouns that are much less general as the adjectives in the adjective-noun collocations, such as unleash energy, harness resources, soothe spirit, transcend culture and erode power. Therefore, it was more likely for learners to perceive them as holistic and memorize them as single units.

## 5.6 Conclusion and pedagogical implications

This study aimed to explore the effectiveness of collocational instruction (collocation vs. single words), the strength between collocates (collocations with high MI scores vs. collocations with low MI scores) and the effect of intralexical factors (verb-noun collocations vs. adjective-noun collocations) on vocabulary learning of advanced Chinese EFL college learners.

The results support the advantage of teaching new vocabulary items in collocations over single words. Learners in the two experimental groups performed better than the control group on the immediate and delayed posttest two weeks after the treatment in the productive and receptive test of meaning. It corroborates the findings in the psycholinguistic research to show the facilitative effect of collocations in the retention of meaning. At the same time, the findings support the assumption that advanced EFL learners could store newly learned collocations as holistic units in their mental lexicon. Although the experimental groups and control group showed

comparable performance in the productive test of form in the two delayed posttests, it is most likely due to the habit of rote learning of learners and the type of test adopted in this study. Taken the results of the previous and this studies together, it seems that learning collocations are more difficult than single words in the retention of form, but are easier in the retention of meaning. It would need future research for a more sensitive test to explore the effect of collocational learning on the productive knowledge of form in short-term and long- term retention.

Additionally, this study indicates that collocations with greater associate strength could lead to better short-term and long-term retention of the productive and receptive knowledge of meaning. The exclusiveness and close relationship between the collocates attested with the higher mutual information scores are facilitative for collocational learning. Collocations with low association strength could yield similar learning outcomes in some tests as the single words learning condition, since the advanced learners might not conceive those collocations as a holistic unit, and therefore, did not opt to whole-unit memorization.

The interlexical factor (collocation-node relationship) showed significant influence on the learning outcomes in this study. However, this influence was not so pronounced compared to a previous study (Peters, 2015) and the effect was minimal in the delayed posttest. Previous studies have unanimously pointed out that verb-noun collocations exerted great learning burden on learners (e.g., Laufer & Waldman, 2011; Laufer, 2011). The result of this study is an encouraging piece of evidence which

suggests that the presentation of verb-noun collocations in the paired-associate format during instruction can lead to comparable retention as the adjective-noun collocations.

This study has three important pedagogical implications. The first pedagogical implication is the use of collocations when presenting new words for learning. The results of the study show that learners consistently perform better in the receptive and productive tests in the experimental groups when they encounter the new items in collocations than single words. The participants for this study are advanced EFL learners who already have a fair repertoire of vocabulary in the mental lexicon. By presenting new words with known collocates, the teachers could help learners memorize the new item by building a meaningful relationship with the known words. In this way, the learners could integrate the new items into their mental lexicon linking to the known words rather than create a new path for the items.

However, it could not always be assumed that learning new vocabulary items in collocations yield greater retention than in single words in all aspects of vocabulary knowledge. This study showed that the experimental groups did not show a significant difference from the control group in the productive knowledge of form, which meant that learning new items in collocation could only lead to better gains in the knowledge of meaning. Jung (2016) pointed out that learners may have allocated more attentional resources to process the meaning of the collocations than the form, and therefore, resulted in better retention of the meaning. Additionally, as I have discussed in the previous section, the number of encounters needed for learners to

build a solid knowledge of collocations are well beyond the number of repetitions in textbooks in reality.

In light of these two aspects, teachers may direct learners' attentional resources explicitly to the form of the collocates to raise learners' awareness, and hence, enhance the effectiveness of instruction on more aspects of vocabulary knowledge. It could be realized by making the target collocations salient to learners using visual enhancements like underlining the collocations and collocations in bold or italics. (Bishop, 2004; Laufer, 2011; Peters, 2012; Sonbul & Schmitt, 2013; Szudarski & Carter, 2014). Also, teachers could pronounce the collocations in front of the class to create additional phonological detail in learners' memory as this will be included in the initial encounter with the novel collocations and helps to link the form of the collocations to the meaning (Lindsay & Gaskell, 2010).

To further build upon the first implication is the type of collocations that should be included in the instruction. Previous studies have raised my concern about the advanced EFL learners' lack of awareness of the collocations with high association strength (Durrant & Schmitt, 2009; Durrant, 2014). The results of the present study showed that despite the lack of sensitivity to the association strength between collocates of the advanced EFL learners, collocations with high association strength would lead to better retention of meaning for the learners. During the selection of collocations for teaching based on the corpus information, teachers for the advanced learners might shift their focus from high frequency collocations to collocations with



lower frequency but higher association strength. Drawing their attention to these collocations might be the tentative move to improve the use of low frequency collocations in written and spoken production and reduce their dependence on high frequency collocations in writing.

To raise their awareness of the collocations with high association strength, teachers could design activities that allow learners to make a comparison between the collocations with high association strength and low association strength. For example, to ask them to compare collocations like bestselling memoirs and new memoirs, economic slump and recent slump to tell the differences between the collocations to develop an awareness of the level of specificity of the adjectives and the close relationship between the collocates. The repetition of tasks of this type would gradually develop an awareness of identifying native-like collocations in learners and help them to integrate these collocations into their lexicon.

The third implication is that, to promote retention of the new collocations, it is effective to present them in paired-associate format. This would be especially relevant for explicit teaching of vocabulary in the limited classroom hours. The results of the present study show that, even after a short amount of time of instruction, the learners were able to recall correctly around 50% in the productive test of form and meaning of the target collocations, and around 90% in the receptive test of meaning in the immediate posttest. The retention rate would regress to around 35% and 60% in the delayed posttest. The retention rate was higher than the learning gains in another

intentional study by Peters (2015) using additional learning exercise after the presentation of L2 target collocations and L1 meaning. The learning gain in her study was around 40% of target collocations in the recall tests and 75% in the recognition test.

Additionally, the results of the present study are better than incidental learning of collocation in a study by Webb, Newton, and Chang (2013) with learning gains around 15% of the recall test and 45% of the recognition test. One notable thing is the instruction time in the present study is around 10 minutes, much shorter than the other explicit learning study (40-60 mins in Peters, *op.cit.*) and the incidental learning (38 mins in Webb, Newton & Chang, *op. cit.*). It shows the clear advantage of explicit, deliberate and decontextualized teaching on the initial form-meaning mapping of new collocations for advanced EFL learners.

In paired-associate learning, teachers could direct learners' attention to the form and meaning of the collocations with little interference from other information as in the contextualized learning conditions. This isolated and decontextualized learning is highly efficient in building the initial form-meaning link of the collocations since learners are required to allocate their attention explicitly on the formal properties of the collocations. Peters (2014) commented that the decontextualized learning was especially effective for semantically transparent collocations since they could go unnoticed in reading activities, and hence, unlikely to be picked up and learned by learners in incidental learning conditions. By making them salient in the paired-

associate learning, future exposures to the collocations could enrich the knowledge of the collocations as integrating other aspects of knowledge into the mental lexicon (Schmitt, 2014). It is important to consider how much time teachers and learners should spend on intentional learning of vocabulary when we consider all the demands that have been made on them in the previous classroom hours (Tian & Macaro, 2012). And therefore, the efficiency of paired-associate learning deserves greater attention in this respect.

At the same time, presenting verb-noun collocations in paired-associate format could reduce the confusion that learners have when facing different morphological variations in contextualized learning materials, such as sentences and longer contexts (Laufer, 2011). In paired-associate instruction, teachers can draw learners' attention directly to the unified form of the verb in the collocations which would undoubtedly leave a strong memory trace than the different forms in exercises in Peters (2015). Recognizing and using the morphological variations would involve additional knowledge of collocations, i.e., the morphological knowledge, which could create greater learning load in addition to building the initial form-meaning link. It is better to leave this additional learning load to future encounters when learners are well acquainted with the collocations. When learners are familiar with the verb-noun collocations, they could recognize the morphological variations in later cases during reading and, hopefully, use the variations in writing.<sup>3</sup>

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<sup>3</sup> Part of this chapter has been revised and submitted as a journal article entitled "The explicit learning of vocabulary: the effects of item types, association strength and collocate-node relationship".

## Chapter Six Discussion and Conclusion

### 6.1 The discussion of the thesis

This thesis has attempted to address three main questions regarding the development of vocabulary knowledge and use of Chinese tertiary EFL learners. The first question was the correlation between the vocabulary knowledge (operationalized as the knowledge of collocations) and use (operationalized as lexical variation). An equally important factor in the development of knowledge and use, i.e., the communicative use of language, was also explored and investigated in the correlation between communicative use of language and lexical use (operationalized as lexical variation). The findings suggest that the correlation between knowledge of collocation and lexical variation develops in a non-linear manner and is quite modest for three levels of study. Significant correlations were found for learners at the second and third year of study, and the strongest correlation was found for learners at the second year of study. Moreover, knowledge of collocation with words at 5,000 level was the only frequency level that showed consistent correlation with lexical variation for all three levels of learners. There were very weak correlations between the four types of communicative use of language and lexical variation. This finding suggests that exposure to English outside classrooms has very little contribution to the use of words in writing. This finding cast doubt on the assumption that exposure to the language is beneficial not only at the level of reception but also at the level of production.

The second question addressed by this thesis was the use of collocations in learners writing. Qualitative information of the sources of the collocations and learners' confidence in collocational use were also investigated to add additional insights into collocational use found in quantitative data. The analysis on the use of collocations by learners reflected both group and individual variabilities. The findings added to the understanding of the first question and showed that there was only marginal development in the use of collocation as the function of years in study. Moreover, the overwhelming majority of the collocations produced by three levels of learners were below the threshold of mutual information score, which indicated that these collocations were either creative or erroneous. The study provides support to the overuse of highly frequent collocations, while at the same time, reveals the new piece of evidence that there are dynamic changes in the use of highly associated collocations (as evidenced by collocations with high mutual information scores). The interview with learners on the sources of learning resonates with the findings of the first part and suggest that learners have not developed awareness of acquiring collocations from multiple sources. They relied on classroom instruction on the acquisition of collocations. Also, they clung to highly frequent collocations learned from high school and were reluctant to use collocations learned in tertiary education. Their confidence on the use of collocations unraveled their habit of combining two grammatically possible words to randomly form "collocations."

The third issue addressed by this thesis was the intralinguistic factors that affect

the learning of collocations in new item learning. The findings suggest that learning new vocabulary items in collocations lead to better retention of meaning than in single words. This finding sheds light on the storing of vocabulary items in the mental lexicon. Moreover, the results showed that collocations with higher associate strength were more beneficial for learning than collocations with lower association strength, although this advantage was only evidence in the receptive and productive knowledge of meaning but not in the form of the collocations. Taken together the findings of the second and third part, I could conclude that, although learners have used little collocations with strong association strength, the close association between the constituents of the collocations could facilitate the learning of meaning. Learners, especially advanced learners in this study, should steer their attention to collocations with high association strength as possible means to decrease their reliance on high frequency collocations. Another important intralinguistic factor is the type of collocations. The effect size of the t-test between the learning outcomes of the two types of collocations decreased from medium to small from immediate to delayed posttest. This indicated that, although verb-noun collocations were more difficult to learn than adjective-noun collocations, the learning burden could be minimized in paired- associate learning.

Three issues that have emerged from the thesis deserve special attention. First, improving the use of collocation in writing is a slow process, and its development is non-linear. The slow process could be witnessed in the weak correlation between the

knowledge of collocation and lexical variation. Moreover, the slow process could be witnessed in the static development in the use of collocations measured by frequency and association strength. Learners could use more collocations (verb-noun collocations, adjective-noun collocations, and noun-noun collocations) in writing as the function of proficiency levels. However, even though there were more collocations in writing from the second and third year of study, learners used a small range of high-frequency collocations repetitively. On the contrary, they only used a small range of collocations with high association strength (around 10% of all collocation tokens). The non-linear development of the knowledge and use of collocations could be reflected in the development of one aspect (the knowledge of collocations) and regress in another aspect (the use of collocation).

This thesis adds to the findings of the growing body of research into learner writing of advanced L2 learners, all of which demonstrate the slow and static process in the use of collocations. For example, a recent longitudinal study conducted by Hou, Loerts, and Verspoor (2016) into 18 ESL advanced Chinese learners. They found that, over the course of 18 months, the improvement in the use of chunks was subtle. For collocations, learners appeared to use a similar number of collocations in the two texts written at the beginning and end of 18 months. Although this thesis adopted the cross-sectional design, it could inform us to some extent on the development of lexical knowledge and use of L2 learners longitudinally. To be able to reflect the trajectory of development with learners from different levels of study, I controlled for

most known variables that might cause variations within the same level of learners as much as possible. I selected participants from highly similar backgrounds in terms of age, gender, academic background and learning the history of English. I asked them to write short texts under similar contexts with the same topic and genre. With the tight control over selection of participants and task implementation, I could project the findings of the cross-sectional study to the longitudinal one (Derwing & Munro, 2013; Gass and Mackey, 2006; Verspoor, Schmid & Xu, 2012; Saito, 2015; Saito, Webb, Trofimovich & Issacs, 2016). When there was a significant difference in a variable between two consecutive levels, for example, year one students and year two students, I assumed that most students in that level would progress from year 1 to year 2 with changes in that aspect.

The slow process of the development of the knowledge and use of collocations could very likely due to the lack of the awareness, i.e., the awareness of collocations, association strength and general and specific words. Chapter three showed that learners' receptive knowledge of collocations was far from satisfactory for all four levels of words. Learners knew around 75% of the collocates for words at 2,000 level, 50% for words at 3,000 level and the knowledge tailed off to around 30% for words at 8,000 level. Another piece of evidence is from Chapter four. Chapter four showed that learners had developed the habit of using two grammatically possible words to form collocations. When asked about their confidence in the use of collocations, participants from three levels of the study reported that around 50% of the



collocations used in their writing were randomly combined words, although there was a clear divergence between high-performance and low-performance learners across years. This habit resulted in the high ratio of erroneous and creative collocations in writing (over 80% as measured by MI score). Taken together, the deficient receptive knowledge of collocations and the habit of randomly combined words suggest that there is a general lack of awareness of collocation and, more importantly, collocations with high association strength.

This lack of awareness in L2 learners has been investigated in the previous study using experimental design and the analysis of learner writing (e.g., Ellis, Simpson-Vlach & Maynard, 2008; Durrant, 2014). Their studies suggest that association strength is a stronger predictor of proficiency than frequency information of the collocations. And, native speakers of English were more sensitive to mutual information score than the raw frequency in language processing. Durrant (2014:472) commented that “It is the underuse of this type of collocations (referring to collocations with high MI score), ... rather than a lack of collocation knowledge in general, that accounts for the often-reported sense that L2 writing lacks idiomaticity due to a lack of collocations”.

The interview into learners’ confidence in collocational use demonstrated that high- performance learners have gradually developed the awareness of collocations over the three years of study. Their recollections on the use of collocation in writing indicated that around 50% of the collocations in first-year learner writing were recited

combinations and this ratio raised to around 85% in second-year and third-year learner writing. However, the mean MI scores of the collocations in their writing were below the threshold of 3 (some examples are listed: Jie, 1.38; Liangzhen, 0.78; Xiaojun, 1.47; Xiaoyue, 0.83; Yiqing, 1.25; Yunqi, 2.3). An examination of the collocations in their writing indicated that they had developed the awareness of collocations. However, their awareness only covered high-frequency collocations, for example, have money, make money, make ideas, live life. The awareness has not extended to collocations that are of lower frequency but higher association strength.

The findings in the experimental study in Chapter five has offered some insights into the possible solution of this issue. The results suggest that, if presented in decontextualized manner, learners could memorize two-word collocations as a holistic unit, rather than two consecutive single words. And, the known constituents in the collocations primes the retention of the other collocates. This finding suggests that learners could process collocations as an independent entity and not as randomly combined words. With this concern, it might be useful to view collocations as an independent entity rather than the sub-category of the knowledge of single words as evidenced in the framework of Nation (2001, 2013). Palmer (1933) defined collocations as “combination of two words that are best learned as integral wholes or independent entities, rather than by the process of placing together their component parts” (cited from Durrant, 2014). This is especially true for advanced learners such as the participants in the thesis, who face the urgent needs to steer their attention from

single words to multi-words units.

However, when we are conceptualizing a separate model of collocational knowledge and teasing it apart from the knowledge of single words, it should be noted that this collocational perspective seems more pertinent to advanced learners than the beginning and intermediate learners. Research into the processing advantage of multi-word units of L2 learners are based on the research findings of advanced learners (e.g., Jiang & Nekrasova, 2007; Siyanova, Conklin & van Heuven, 2011; Tremblay, Derwing, Libben & Westbury, 2011). Moreover, the evidence that collocations facilitate retention of newly learned items are also based on the research on advanced L2 learners (e.g., Kasahara, 2011; Webb & Kagimoto, 2011). Advanced learners have accumulated a fair repertoire of vocabulary knowledge. They can approach the vocabulary learning more analytically with a handful of learning strategies at their disposal. This prior knowledge can facilitate the learning of new items. However, the beginning and intermediate learning may not enjoy this facilitative effect. A comprehensive model of collocational knowledge including learners from different proficiency levels need to take this possibility into account.

The lack of awareness of general and specific words are quite evident in learner writing in the thesis. The learner writing in Chapter six showed that L2 learners extensively used a narrow range of general verbs, nouns, and adjectives in their writing to form collocations. This explained why the collocations in learner writing were lack of collocations with high MI scores. For example, for verb-noun

collocations, learners favor general verbs such as *have, make, get, and do* to form collocations (e.g., *have will, have time, do things, have life, make money*). For adjective-noun collocations, learners use extensively *people* to refer to any individuals from different walks of life (e.g., *many people, more people, all people, other people*).

A few examples of the sentences are provided:

1. You help more people, when you look at their smile. I know maybe many rich people...
2. You do many things to make more money. Then, you have no time to do something you really want to do.
3. Different people have different opinions.

The wide use of general verbs and nouns have increased the ratio of high-frequency collocations in learner writing. When examined the collocations with high MI score, I found that the general verbs and nouns were replaced with more specific ones. For example, *make money* was instead rephrased as *create wealth*; *do things* were described in more specific moves such as *drink wine, surf internet, write poem and ride bike*. The general noun of *people* could be more specifically referred to as *the prime minister, younger generation, white-collar worker and middle class*.

These examples indicate that collocations with high MI scores do not necessarily have to be infrequent and rare words. It could be high frequency combinations that carry specific semantic meanings. This finding is in line with Yoon (2016) who found that learners used a small range of general verbs in the verb-noun collocations in academic writing. Yoon (2016) have combined the longitudinal and cross-sectional

approach and examined the academic ESL writing of US tertiary students. He identified the overuse of general verbs and underuse of specific verbs in learner writing. The comparison of the verb-noun collocations with general verbs and their semantically comparable counterparts with more specific verbs showed that using the specific verbs could greatly increase the MI score of the collocations. For example, do test (MI = - 1.04) compared with perform test (MI = 3.39); get apartment (MI = -0.03) with rent apartment (MI = 6.78); make crimes (MI = -0.39) with commit crimes (MI = 7.40). These observations led him to conclude that “It was often hard to make a clear distinction between felicitous and infelicitous collocations. Thus, what researchers need is a genre-specific understanding of acceptable verb-noun pairs (and other phraseological units). For example, in argumentative writing, L2 writers should be encouraged to reduce their reliance on common verbs and to use semantically specific verbs that fit their adjoining nouns” (2016: 53).

The second issue that has emerged from the thesis is the narrow sources for collocational development for Chinese tertiary learners. As evidenced by Chapter three and Chapter four, I could conclude that learners showed an overreliance on in-class intentional learning of collocations. The subtle relationships between communicative use of language and lexical variation in Chapter three revealed the inefficiency of incidental learning and the lack of contribution of incidental learning to use of vocabulary in free writing. There were no significant correlations between reading books and social networking and the lexical variation for learners from three

years of study. This indicates that the two major ways of incidental learning of language (in receptive and productive direction) has no contribution to the increased range of words used in writing. The two weak correlations were found in watching movies and videos for first-year learners and listening to music for second-year learners.

Chapter four provided support to the findings of Chapter three on the narrow sources of input through interviews of learners. The interview data revealed that the overwhelming majority of the collocation types used in writing were learned from high school. The ratio remained constant across three years of study (97.5% for first-year learners, 88.5% for second-year learners and 80.7% for third-year learners). Moreover, interview with learners revealed that 88% of the collocation types used in their writing were acquired through intentional learning. The communicative use of language, such as reading novels and news, watching movies and casual talks with peers, had very little contribution to their collocational use in writing. The findings of the two studies suggest that learners rely too heavily on the intentional learning in classroom instructions for collocational learning and, although they are exposed to English outside classrooms, they could not effectively acquire collocations from these resources. I have discussed the two factors that may cause this inefficiency in collocational learning in Chapter five: the lack of awareness and the number of repetitions. Here, I would discuss this issue from another perspective: Chinese learners' learning habit and the Chinese English education.

The overreliance on the intentional learning from classroom instruction is rooted in Chinese reverence for textbooks. Chinese has the tendency to regard what is written in the textbooks as true and undebatable (e.g., Kirkpatrick & Xu, 2012). Lin (1948:211) noted that: “[t]his worship of scholarship has taken the form of a popular superstition that no paper bearing writing should be thrown about or used for indecent purposes, but should be collected and burned at schools or temples.” (cited from Leedham & Cai, 2013). This reverence for written words is extended to teachers and knowledge learned from classroom under teachers’ guidance.

The most common way in China to learn English is through rote learning, which is rooted in Chinese belief that what is written in the textbooks is the best model to follow. The three years’ English instruction in middle school is mostly directed towards preparation for the national examination for college entrance. The instruction is mainly in the explanation of grammar rule, the memorization of short passages and sample wrote exemplars, and memorization of vocabulary items (Jin & Cortazzi, 2006). The rote learning for vocabulary items has both positive and negative influence. On the positive side, it allows learners to use decontextualized learning methods to quickly accumulate a relatively large number of vocabulary items in the mental lexicon. Moreover, the repetitive practices on these items in high school have deeply engraved these items in learners’ mind. However, when learners move on to higher levels of learning. The habit of rote learning has undermined the use of newly learned and lower- frequency vocabulary items. This led to the high ratio of high-frequency

collocations and the lack of lower-frequency collocations with stronger association strength, and learners' reluctance in using collocations acquired in college.

In college, the reverence for written textbooks has been exalted to such an extent that the English courses are often called as “intensive reading class,” which is identified by the participants in Chapter four as their main sources of vocabulary learning. The majority of the time in classes are spent on comprehension of the contents of the texts using paraphrasing, summarizing and story-retelling (Cortazzi & Jin, 1996). In these classes, new vocabulary items are usually explained with the meaning, grammatical rules, and sample sentences. The vocabulary items are usually presented alongside or after the texts in word list fashion, and learners are instructed to memorize these lists after classes (Leedham & Cai, 2013). The decontextualized learning of vocabulary and the overreliance on textbooks has greatly undermined learners' potential of uptake vocabulary incidentally from the communicative use of language after classrooms. The design and the context of the English courses in tertiary education are not oriented towards facilitating a rich input for language or developing an interest in language learning. Instead, it is designed similarly as in high school for learners to obtain certain language proficiency certificates during tertiary study for job hunting (Xu, 2010).

I am not in the position to criticize the decontextualized learning and rote learning of Chinese learners. As discussed earlier, this type of learning has facilitative effects at the beginning level of language learning. Chapter five has provided support to the



decontextualized learning in the paired-associate format in its benefits for retention of newly learned collocations. However, after first exposure, learners need multiple encounters to reinforce their knowledge of the collocations (mostly likely the knowledge of form and meaning) and acquire additional aspects of collocational knowledge. To achieve this end, learners need the awareness to notice the collocations from their daily exposure to language both in and outside of classrooms to maximize the chances of repetitive encounters. In addition, for collocations which are firstly learnt as unanalyzed whole as in the condition of the experiment in chapter five, learners would decompose them into the constituent as they become more proficient. They usually attempt to use them in different grammatical contexts (Gitsaki, 1996). Learners need the awareness to increase their encounters with the collocations from multiple resources to be equipped with the knowledge to use collocations in varied contexts.

Third, the findings of the thesis shed light on the developmental pattern of the knowledge and use of collocations for advanced learners. Chapter three revealed the findings that the correlation between the receptive knowledge of collocations and lexical variation was weak. Presumably, it is the evidence of learners' difficulties in transferring their receptive knowledge into the productive use of collocations in writing. This assumption was empirically examined in Chapter four which showed that there was a marginal improvement in the use of collocations across three years of study. One major difficulty undermining the use of collocations is the morphological

variation of the collocates, especially verbs (e.g., Laufer, 2011; Peters, 2015). This difficulty has led Stengers, Boers, Housen & Eyckmans (2011) to raise the question of the representation of collocations (and other types of formulaic languages) in the mental lexicon. Their concession is that there might be one canonical form of the formulaic sequences stored in the mental lexicon and the variants are left to be generated procedurally at the time of production.

The representation of the collocations (as a kind of formulaic sequences) is affected by several factors, including the language backgrounds of the speakers (Wray, 2002), the types of collocations (Schmitt, 2005) and the language system (synthetic or analytic) (Stengers, Boers, Housen & Eyckmans, 2011). The type of collocations that have been explored in Chapter four could be categorized into the lexical bundles identified by Schmitt (2005), in which he defined *lexical bundles* as “continuous strings identified by corpus analysis” (2005: 21). He assumed that, given the relative fixedness in form and high frequency of these combinations, they were likely to be stored as single units. The evidence found in the thesis suggest otherwise. It is more likely that advanced L2 learners could only store the canonical form of the collocations in mind, and use their grammatical knowledge to form the variants at the time of production. This is evident is the morphological errors that learners have made in their writing and their cautiousness to use the collocations that they are confident of its grammatical knowledge. For example, there was a misuse of word class in the collocations in writing, such as *pursuit money* (*pursue money*) and *luxury*

*life (luxurious life).*

Another important finding in Chapter four is the omnipresent use of collocations with mutual information score lower than the threshold value. These collocations were the combination of two grammatically compatible words. L2 learners are known to use a small range of high-frequency verbs to create combinations. For example, for the verb-noun collocations used by first year learners, there were 87 collocation tokens all shared the verb *have*. They have used combinations like *have ability, have advantages, have aim, have attitude, have chance, have charm, have desire, have energy, have features, have feelings, have food, have friend, have gap, have head, have heart, have influence, have lesson, have life, have lifestyle, have luxury, have money, have name, have opinion, have party, have preference, have pressure, have pursue, have qualification, have stress, have style, have thing, have time, have trip, have trouble, have use, have view, have wedding*. These examples showed that learners have overextended the use of *have* in places of other more appropriate verbs, such as *hold party* and *hold wedding*. As evidenced by these examples, I support the contention of Laufer and Waldman (2011:665) that “learners construct messages from individual words rather than from prefabricated patterns.” The interview on the participants has provided additional support to this contention. Learners’ reliance on grammatical knowledge in collocational use has led them to view collocations as any two words which can grammatically fit together. They construct collocations in a manner more pertinent to the open choice principle than the idiom principle (Sinclair,

1991).

The two issues raised by the thesis, i.e., the representation of canonical forms and the open choice principles, has led to the issue of the representation of collocations in the mental lexicon and how this representation changes and develops from the initial exposure to being fully automatized in the brain. Chapter five suggests the learners' initial exposure to the collocations and single words; Chapter three explored the storing of the knowledge of these items in the mental lexicon, and Chapter four shed light on the use of the collocations in production. Piecing the jigsaws together, I propose that there are four possible paths that collocations develop in the mental lexicon instead of a converging one as proposed by Gitsaki (1996). In the ideal scenario, collocations are first learned as a holistic unit from initial exposure and remain that way with the reinforcement of the subsequent encounters. There are a very small number of collocations that can follow this path. In most cases, for L2 learners, these collocations are high-frequent ones that are salient and could be encountered repetitively in the same combination, such as the high-frequency collocations like *spend money*, *earn money*, *ride bike*, *sing song*, *wash dish* and *pay attention*.



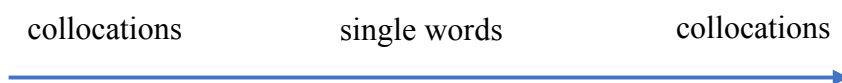
The second developmental pattern is those collocations, which have been learned in holistic units. When learners become more proficient, they decompose these

collocations and use the constituents with other syntactically compatible words to form new combinations. Consequently, the collocations are used like the combination of two single words adopting the open choice principle. Some collocations follow this pattern in development as evidenced by the findings in Chapter four. For example, learners have learned *economic development* as a collocation; learners have formed new combination based on the grammatical structure of the two words, such as *economic burden*, *nice development*, and *big development*.



Collocations in the third developmental pattern are those first learned as the unanalyzed holistic units. As the collocations in the second developmental pattern, they are later decomposed to constituents and follow open choice principle to form random combinations. However, what differs between the second and third developmental pattern is that, with the repetitive use and the increasing awareness of the collocations and association strength, learners will distinguish the differences between collocations and random combination of two words and adhere to the collocations. For example, an often-used example in applied linguistic research is the *strong tea* and *powerful tea*. With the increasing awareness of collocations and association strength, learners will gradually tell the differences between these two combinations and understand that *strong* and *powerful* could not be used

interchangeably even though they share similar semantic meaning and word class.



In the fourth scenario, words are first learned as single words. When learners become more proficient, they have developed the awareness of collocations and association. Learners will start to distinguish between collocations and random combination of two words. However, this developmental pattern is quite hard to follow as evidenced by the collocational use of high performance learners in Chapter four. Although they have identified most of the collocations in their study as strong collocations, the mean MI score of the three types of collocations in their writing is below the threshold value.



Considering the difficulty of developing single words into collocations, it is important to introduce the new vocabulary items in collocations at the initial encounter. These four patterns provide support to Durrant (2014) and suggest that the necessity of considering collocation as an independent entity, rather than an aspect of knowledge of single words. As I have discussed, the model of an independent entity for collocation is more pertinent to advanced learners. The four patterns also reveal that the single words and collocations co-exist as two sub-dimensions in the

same L2 lexical system. From the complex dynamic system's perspective, Zheng (2016) suggest that the two sub-dimensions develop in a competitive and co-adaptive process as the proficiency advances. When learners have advanced at a highly advanced stage like the professional writers, the two sub-dimensions will resolve into a more balanced co- existing system.

Jiang (2000) has proposed the lexical representation of single words in the mental lexicon in three steps. At the early stage, the links with L2 words and the concept is mediated through the L1 equivalence. To use a word productively, learners need to activate the L1 translation to have access to the semantic and syntactic specificity of the words. The L1 translation would, in turn, activate the L2 words. When learners become more proficient, the association between L2 words and L1 words is strengthened. The semantic and syntactic information of the L1 words is copied onto the L2 words. During the process of activation, the L1 words and L2 words can be activated together. In the last stage, L2 words are fully integrated into the mental lexicon and can be directly linked to the concept without the mediation of L1 words.

Based on the evidence in Chapter five, I propose a parallel processing of collocations in the mental lexicon for advanced L2 learners who have a certain level of knowledge of vocabulary as the extension of the original model. I argue that collocations can be presented to learners in the combination of known-unknown words to facilitate retention and help learners integrate L2 collocations into the mental lexicon.

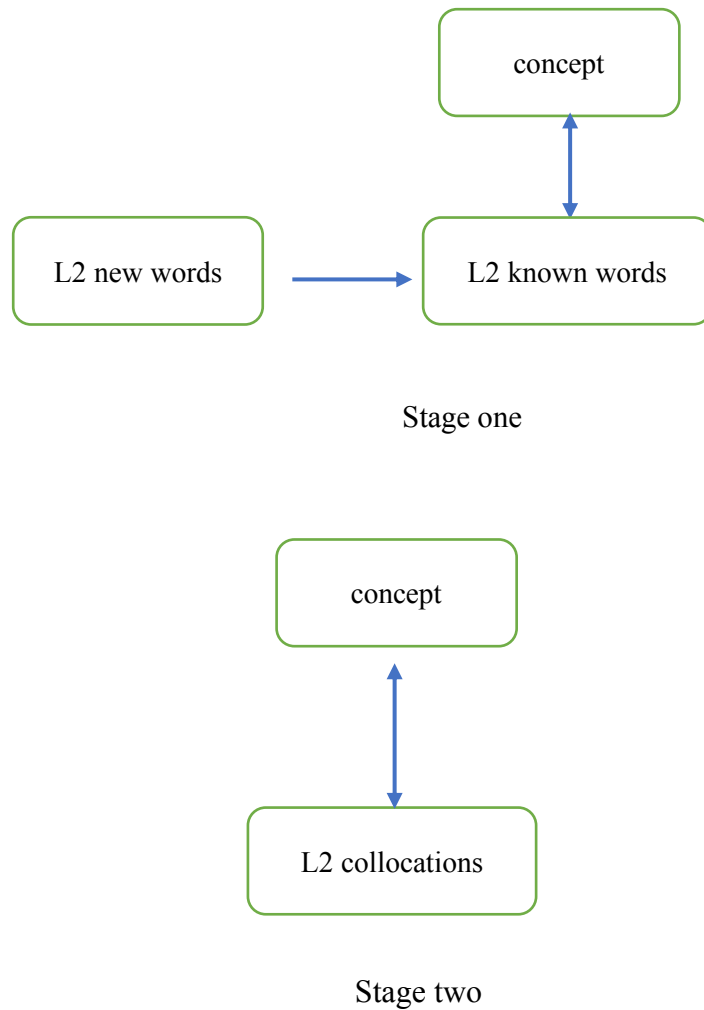


Figure 6.1 *Processing of Collocations in the Mental Lexicon*

In the initial encounter, the collocations could be presented in the known-unknown combination. The unknown words could map onto the semantic and syntactic specificity of the known words using the close association in meaning between the two words. This facilitative effect in retention is shown in the high scores of the posttests of the meaning of the collocations. This benefits for retention is evident for collocations with high association strength whose meaning are closely related. In receptive recognition of the collocations, the recognition of L2 collocations



could activate the L1 translations. Presumably, the semantic and syntactic information of the L2 cue words could facilitate the comprehension of the L2 collocates and hence, the L2 collocations. In the productive use of the collocations, the L1 translations could activate the L2 known words whose semantic meaning would match the translations. In turn, the L2 known words could activate the newly-learned L2 words, and hence, the whole collocations. Through repetitive encounters, the links between the collocates are strengthened, and the two words are fused together. The activation of the collocations would not have to follow the two steps in the initial stage, which means the mediation of the cue words is no longer needed. It could be processed receptively and productively simultaneously. A word of caution is that the integration stage might take place in the early stage of learning. As I have described in the four developmental patterns, it has to be fused together before learners start to decompose them into constituents. This requires repetitive encounters early on in the learning process.

I acknowledge that this processing model is a tentative one. The integration of the collocations into the mental lexicon is more complex since it involves greater variations than the single words. It may depend on many factors, such as the L1-L2 congruence of the collocations, semantic transparency of the collocations, the collocate-node relationship and the degree of knowledge of the L2 known cue words. Some aspects of knowledge, like the morphological information of the collocations, may not be fully available to learners, since the L2 cue words could offer limited

information on this aspect. Moreover, morphological information is language-specific knowledge, for languages that do not have this type of knowledge such as Chinese, it would be difficult for learners, even at an advanced stage, to have full access to this knowledge at initial encounter. The morphological variation of the collocations is more complex than single word since it may involve two words of different word class. For example, in verb- noun collocations like *cause problem*, it could have variations such as *caused problem* and *cause problem*. Also, I would be cautious to extend this processing model to free use of collocations in a larger context, like sentences and writing, since the experiment in chapter five was conducted in a controlled manner and the posttests were based on knowledge of form and meaning in restricted contexts.

## 6.2 Conclusion

This thesis intended to explore the development in the vocabulary knowledge and use of Chinese tertiary learners of English. The current study filled in the gap of the research into vocabulary teaching and learning from many perspectives. First, it adds to the understanding of the construct of vocabulary knowledge and use by exploring the relationship between the two variables and showing how these two aspects related to each other at different stages of learning. Second, it used both quantitative analysis into the collocational use in learner writing and qualitative data from interview to investigate the use of collocations of Chinese tertiary learners. Thereby, it reveals the

types of collocations used in writing, the sources of learning and the types of knowledge needed to produce the collocations. Third, it has empirically examined how association strength influence the learning of collocations and found positive evidence to support the use of association strength in identifying new collocations for learning for advanced learners.

The thesis consisted of three parts. In the first part, it explored the relationship between the knowledge of collocations and the quality of lexical use (attested by lexical variation) in writing. In addition, it examined the relationship between the communicative use of English and the lexical variation of writing. Participants from the three levels of learning in college (first year, second year and third year) were asked to finish the test on the knowledge and collocations and write a short composition as the baseline data for retrieving lexical variation.

Although the present study adopted the cross-sectional design, the findings could be projected longitudinally since the current study has controlled most variables in the participants that might cause variations. It included participants from highly homogenous backgrounds in terms of first language, age, learning history of English and educational background. The knowledge of collocations was measured in multiple choice format with node words from four frequency levels (2000, 3000, 5000, 8000). The statistical analysis revealed that there was a weak correlation between the two variables for all three levels of learners with some variations at each level. It showed that the contribution of the increased knowledge of collocations to the range

of words in writing was quite limited. The development in the correlation between the two variables did not follow a linear development, with the strongest correlation found in second year learners. The overall trend showed that the correlation improved as the proficiency advances.

The scores on the knowledge of collocation test were collapsed to four sub-scores with each for one frequency level. The correlation between the knowledge of collocation at various frequency levels and lexical variation showed that knowledge of collocation at 5000 level was the only level that has shown consistent significant correlation with lexical variation for all three levels of learners. The knowledge of words at this level has the strongest contribution to an improved range of words in writing. It provides empirical evidence to support the importance of mid-frequency words for upper-intermediate and advanced learners at tertiary level.

The weak correlation between the knowledge of collocation and lexical variation in writing has two important implications. First, it supports the assumption that there are two sub-systems in the mental lexicon for single words and formulaic sequences (Schmitt & Carter, 2004; Schmitt, 2010). And therefore, the improved knowledge of collocations has little contribution to the use of single words in writing since the lexical variation was the measurement of single word units. Second, the transition from receptive knowledge of collocations to productive use in writing is a long process. The improved knowledge of collocations might not witness the corresponding improvement in the use of collocations in writing. The second

implication was empirically examined in chapter four.

Chapter three also reveal that there was a weak correlation between the exposure to English and lexical variation in writing. The same group of participants reported their weekly communicative use of English in a questionnaire and the data was used to examine the correlation between the exposure to English and lexical variation. There was no type of activities that could show significant correlation with lexical variation for all three levels of learners. The results of the correlational analysis showed that watching movies and television programs and listening to music were correlated weakly to first year and second year learners. There was no correlation found between reading books and social communication with lexical variation for all three levels of learners. This result implied that learners were quite reliant on the intentional instruction provided by teachers for vocabulary acquisition. Their autonomous learning ability needs to be greatly improved if they want to reap the benefit of incidental learning. This finding is also supported by the interview in chapter four.

The second issue explored the questions left unanswered from the results in study one. It investigated the use of collocations in learner writing. It collected three types of collocations (verb-noun collocations, adjective-noun collocations, and noun-noun collocations) from the learner writing collected for study one. And it also included post-writing interviews with learners to explore the learning sources and the confidence of the collocational use. The results indicated that learners could use more

collocations of all three types of the proficiency advanced. However, I found that there were marginal improvements in the use of collocations in terms of frequency of occurrence and association strength (as measured by the frequency information in the reference corpus of COCA). The profiles of the collocations in learner writing remained to be similar for learners at three levels. Learners at three levels of study exhibited heavy reliance on the high frequency collocations or random combinations of two words with high frequency. The majority of the collocations used in learner writing, regardless of levels of learning, were creative combinations with low mutual information score. These two findings have two implications. First, it takes a longer period to witness sizable improvement in the use of collocations for learners. This finding is in line with previous studies that have suggested longer period for improvement in collocational use (e.g., Hou, Loerts & Verspoor, 2016). It might be possible that, at this stage of learning, the lexical development is not obvious as the learners' development is more pronounced in other aspects, such as the syntactic level (Verspoor, Schmid & Xu, 2012). It needs a study that adopts the dynamic system theory with a large range of variables from different levels of discourse to map the trajectory of different variables. Second, there is a general lack of awareness of association strength in collocations among learners. Collocations with stronger association strength are in most cases of lower frequency. It is likely that high frequency collocations have been deeply entrenched in learners' memory, and hence, learners would resort to this group of collocations when their attentional resources are

quite limited during the writing process. Also, learners may not have developed the awareness of the exclusiveness in the collocates in collocations. The lack of awareness is corroborated from their interview on the confidence of collocational use.

The quantitative data of the collocational use has been complemented by the post-writing interview with learners. The interview data revealed that learners showed heavy reliance on the collocations they have acquired during the high school and were reluctant to use the collocations learnt from college. This partially explained the high ratio of high frequency collocations in writing. Interview with the learners also corroborated the findings in chapter three and reiterated the low efficiency in vocabulary acquisition from incidental learning sources. From the interview, I found that it was not that learners did not read books, watch movies and videos or share casual talks with their peers. The problems lie in their lack of awareness that these sources could be possible learning sources of vocabulary. They seemed to draw a clear line between learning and leisure exposure to English, and restricted learning to explicit instruction in classroom or assignment after class. In addition, the interview data found the narrow sources for collocational learning in writing and pointed out the lack of contribution of teachers' feedback. It raised concern for research in corrective feedback as a possible source for vocabulary acquisition. Chapter four also revealed that learners have the habit of regarding two grammatically possible words as collocations. The findings showed that, with the improvement of proficiency, high-performance learners had developed the awareness of collocations. However,

this awareness was not found in low-performance learners.

Chapter five explored the possible ways of enhancing the learning efficiency of collocations. It investigated the learning gains of collocations and single words in new item learning. The participants of this study learned 20 collocations and single words in three groups. One group learned 20 collocations with high association strength; the second group learned 20 collocations with low association strength and the third learned 20 single words. The study used same node words for the three groups. Learners who have learned the new target words in collocations showed better retention rates than in single words. The study lent support to the facilitative effect of known cue words for new items in collocational learning. It also shed light on the storing of a new item in the mental lexicon. The results suggest that, if presented together at the first exposure, learners could perceive the collocations as holistic units and store them together in the mental lexicon. However, it should be noted that the facilitative effect of collocations lay in the receptive and productive knowledge of meaning but not on the productive knowledge of form. It could be possible that the priming effects of the cue words could enhance the integration of meaning in the mental lexicon but not the formal properties of words.

Chapter five also explored the intra-linguistic factors that might influence the learning of collocations. This part followed the findings of chapter four on the lack of awareness towards collocations of high association strength and empirically examined that extent to which the association strength affected the learning of collocations. The



result filled in the blank in the current research and revealed that collocations with high association strength led to better learning gains than collocations with low association strength. The differential learning outcomes between the two experimental groups were more salient in the delayed posttest than the immediate posttest. The result suggests that the close relationship between the two collocates of high association strength could lead to better retention rates for meaning and this facilitative effect could endure long duration. Also, learners demonstrated similar learning gains for collocations with low association strength and single words, which suggest that learners might not have perceived these collocations as holistic units and the priming effect of the cue words might not be salient.

Another intra-linguistic factor that has been explored in the third study was the collocate-node relationship. The 20 collocations in the study consisted of 10 verb-noun collocations and ten adjective-noun collocations. The findings supported the previous studies and showed that verb-noun collocations posed greater learning burden for learners than adjective-noun collocations. This held true for collocations with high association strength in three types of tests in immediate and delayed posttest and the collocations with low association strength in the majority of the tests in the two delayed posttests. However, it should be noted that the differences in learning gain were much more salient in the immediate posttest than in delayed posttest. It indicated that presenting collocations in paired-association format could decrease the learning burden of verb-noun collocations, especially in long-term retention, since the

decontextualized way of presenting collocations could minimize the possible learning burden of morphological variation of verb-noun collocations.

Taken together, the present thesis demonstrated that the development of the vocabulary knowledge and use of Chinese tertiary learners was marginal in the three years of study. It seemed that the learning process was quite static for learners. I have described four developmental patterns for collocations for this group of learners in chapter six. These developmental patterns suggest that it is better to perceive collocations (including longer word strings in formulaic sequences) and single words as separate sub-dimensions in the lexicon. Hence, the learning materials should do justice to the distinct qualities of collocations and present them as holistic units. In addition, advanced learners' attention should be redirected from high frequency collocations that they are familiar with to collocations with higher association strength. This might be the right push for further development beyond the most frequent collocations for advanced learners.

### 6.3 Limitations and implications for future research

The present study contributes to the existing literature of vocabulary research both theoretically and pedagogically. Theoretically speaking, it explored the relationship between the vocabulary knowledge and use and examined how these two aspects related to each other at different levels of study. By observing the vocabulary knowledge and use of learners from different levels of study, this study

could portray the dynamic changes in the relationship at different time of study. Pedagogically speaking, it suggested that collocations should be presented as a single unit to be learnt explicitly for learners. Also, it is better to present new vocabulary items in collocations than in single words for advanced learners at college level.

Although the findings of this thesis provide useful insights into the development of vocabulary knowledge and use of Chinese tertiary learners, it may still have some limitations. First, the findings may not represent the knowledge and use of all types of collocations. The knowledge of verb-noun, adjective-noun and noun-noun collocations were examined in chapter four. Chapter five examined the knowledge of verb-noun collocations and adjective-noun collocations. These three types of collocations were chosen since they comprise the majority of collocations in the language. Also, it is important to note that I used frequency-based definitions of collocations, the collocations examined in this thesis were mostly transparent collocations, except for a few collocations in chapter 5 with node words using metaphorical sense. It is not clear how the knowledge and use of idiomatic collocations develop over the three years of study.

The second limitation of the present study is the size of the data in chapter four. The data was collected from the writing of 194 tertiary learners from three levels of study. The total number of running words of the compositions was 47,890. The data size was small compared to existing corpus. The present study collected learner

writing from primary sources instead of the corpus was due to the need of qualitative analysis of the learning sources and the confidence in collocational use. Also, the present study controlled writing topic to minimize the potential effect of topic on the use of vocabulary. We could compare the results of the present study to existing studies using corpus as the baseline data to gauge the use of collocations.

The third limitation is the selection of participants. The participants in the present study were chosen based on convenient sampling. They all come from the same university with similar academic backgrounds. This limits the extent to which the results could be generalized to the larger groups of learners in China. There are certain factors that could influence the language performance of students. For example, it would be better if future studies could include learners from different levels of universities with different rankings from different geographic locations. The language performance of students from 985, 211 universities might show different developmental rates from students coming from lower level universities. Also, students from universities in well-developed cosmopolitan cities may show different levels of performance from students from universities in less developed cities, since there would be more opportunities for exposure to English in cosmopolitan cities. Also, it would also include the writing samples from students of different majors than the English major students in the present study. Selecting learners from social science and science majors could be more representative of the development in the knowledge and use of Chinese tertiary learners than learners from English majors.

Future research on the development of the knowledge and use of vocabulary could incorporate the single words and formulaic sequences into the same research to examine how these two dimensions develop and interact with each other (Zheng, 2016). Also, it could use the writing of different genres to explore the use of collocations in writing, since genre-based studies into the lexical use have suggested that genre (argumentation and narration) could affect the lexical variations (measured in the unit of collocations) (Yoon, 2016). In addition, research could also explore the collocations in textbooks and teaching materials. This study reveals that the primary learning sources of collocations for tertiary learners are a textbook. Therefore, whether the textbooks include a wide range of collocations with enough repetitions for learning to occur is crucial for improvement in learners' knowledge and use of collocations. It is interesting to include studies into the textbooks and learner writing in the same study to explore the extent to which the collocations in textbooks have found a way in learner writing.

In addition to considering the collocations in learner writing and textbooks, future research could also explore the learning path of collocations among L2 learners. In chapter six, I have described four developmental patterns of collocations based on previous research and findings of the thesis. However, these evidence does not come from the same group of learners over an extended period. The four developmental patterns could be explored using longitudinal studies covering longer period with a set of target collocations. The longitudinal study could record the retention of the

collocations from the first exposure and follow their retention and attrition over an extended period. It could chart the developmental patterns of different types of collocation, such as verb-noun collocations and adjective-noun collocations, and explore how collocations are stored in the mental lexicon and interact with the constituent words. This type of longitudinal study could empirically investigate the representation of collocation in the mental lexicon from the first exposure to testify if the collocations are represented similarly as single words. Bordag, Kirschenbaum, Rogahn, Opitz, and Tschirner (2017) have suggested that the transition from weak to strong representation does not have to be gradual for single words. The evidence from chapter five seems to support this claim. A future study could use target collocations with two new words to investigate whether this phenomenon stands. Also, the longitudinal study could use collocations from a range of different frequency levels to examine how phrasal frequency affect the developmental patterns of collocations (Siyanova-Chanturia, 2015b). This type of research could fill the gap of the existing studies on the learning and storing of collocations in the mental lexicon.

Future research could also consider inviting participants of different proficiency levels to examine the effectiveness of association strength in collocational learning. In chapter five, the findings were based on the test results of the advanced L2 learners. In addition, the model of the representation of L2 collocations in learners' mind was also more pertinent to advanced learners. It is not yet clear the effect of association strength on collocational learning for learners at other proficiency levels. Learning

collocations for L2 learners at other proficiency levels, especially beginning level, would be distinctly different from advanced learners. Beginning L2 learners may not have the opportunity to use known words to anchor the newly learned collocates in their memory. At the same time, association strength favors words with lower frequency levels. For beginning L2 learners, the priority of learning would be of high frequency words. It would be interesting to compare the learning of collocations with high and low association strength for this group of learners.

## Appendix A Questionnaire

What is your gender?     Female     Male

What is your age?

How long have you been learning English?


How you ever studied English in an English speaking country?     Yes     No


(If yes, for how long?)


What is your level of English proficiency?


Beginner     intermediate     advanced

How many hours do you spend on using English outside classroom?

 Reading books, magazines and newspapers in English, or visiting English language websites?     0     1-2     2 or more hours

 Watching films, videos or TV in English?     0     1-2     2 or more hours

 Listening to music in English?     0     1-2     2 or more hours

 Using English to keep contact with people? (Wechat, QQ, English corner, skype, email, messages over phones, etc.)     0     1-2     2 or more hours



## Appendix B: The Test of Receptive Knowledge of Collocations

### 词语搭配测试

单选题。请选出与题目中的词语在句子中搭配使用的词语。请将答案写在题号旁。

- |    |            |              |               |               |               |
|----|------------|--------------|---------------|---------------|---------------|
| 1  | appreciate | a) ticket    | b) music      | c) apple      | d) blame      |
| 2  | ordinary   | a) day       | b) pin        | c) joy        | d) tip        |
| 3  | modern     | a) jaw       | b) pig        | c) mud        | d) art        |
| 4  | violent    | a) crime     | b) option     | c) mouse      | d) limit      |
| 5  | bitter     | a) fool      | b) wind       | c) hero       | d) leap       |
| 6  | regular    | a) mystery   | b) empire     | c) shadow     | d) customer   |
| 7  | loan       | a) steak     | b) scene      | c) house      | d) crowd      |
| 8  | private    | a) company   | b) defense    | c) journey    | d) strength   |
| 9  | thin       | a) hair      | b) shed       | c) rice       | d) heap       |
| 10 | classic    | a) guest     | b) style      | c) energy     | d) honey      |
| 11 | positive   | a) journey   | b) property   | c) military   | d) attitude   |
| 12 | constant   | a) occasion  | b) battery    | c) sentence   | d) reminder   |
| 13 | royal      | a) balance   | b) transfer   | c) wedding    | d) instance   |
| 14 | survive    | a) grant     | b) shock      | c) jeans      | d) plate      |
| 15 | deliver    | a) message   | b) pleasure   | c) murder     | d) contract   |
| 16 | nervous    | a) smile     | b) credit     | c) dozen      | d) tower      |
| 17 | earn       | a) tense     | b) victim     | c) money      | d) detail     |
| 18 | innocent   | a) cough     | b) print      | c) object     | d) child      |
| 19 | giant      | a) politics  | b) planet     | c) mission    | d) version    |
| 20 | solid      | a) attention | b) commerce   | c) friendship | d) profession |
| 21 | fulfil     | a) flower    | b) pencil     | c) promise    | d) animal     |
| 22 | enterprise | a) blonde    | b) private    | c) narrow     | d) nervous    |
| 23 | relieve    | a) surprise  | b) format     | c) emotion    | d) tension    |
| 24 | acquire    | a) knowledge | b) experience | c) adventure  | d) newspaper  |
| 25 | decline    | a) offer     | b) sword      | c) peace      | d) agent      |

26	fierce	a) autumn	b) board	c) sleep	d) battle
27	toss	a) song	b) mess	c) coin	d) road
28	virtual	a) mother	b) world	c) finger	d) coffee
29	alliance	a) strategic	b) inevitable	c) accountable	d) tremendous
30	error	a) damp	b) narrow	c) small	d) vast
31	mild	a) summer	b) nowhere	c) mission	d) article
32	sensible	a) arrest	b) corner	c) store	d) advice
33	convey	a) station	b) health	c) meaning	d) chicken
34	barrier	a) bread	b) trade	c) light	d) table
35	intimate	a) opportunity	b) relationship	c) programme	d) television
36	submit	a) direction	b) adventure	c) connection	d) proposal
37	neutral	a) affair	b) battle	c) silver	d) policy
38	interior	a) society	b) design	c) income	d) effort
39	tragic	a) glass	b) girl	c) piano	d) story
40	publish	a) book	b) duty	c) faith	d) golf
41	cosy	a) artery	b) litter	c) tenure	d) sofa
42	lethal	a) chin	b) drug	c) earl	d) veil
43	sermon	a) preach	b) dangle	c) pierce	d) tread
44	plausible	a) explanation	b) afternoon	c) importance	d) television
45	anguish	a) western	b) practical	c) spiritual	d) economic
46	coarse	a) weep	b) dock	c) salt	d) bead
47	tranquil	a) navy	b) pipe	c) sink	d) town
48	potent	a) kidney	b) weapon	c) message	d) parcel
49	meadow	a) major	b) strange	c) boring	d) grassy
50	dodge	a) ball	b) wish	c) star	d) laugh
51	buckle	a) mind	b) plan	c) wave	d) shoe
52	erase	a) elephant	b) memory	c) butter	d) patient
53	hover	a) cloud	b) alarm	c) juice	d) shore
54	oath	a) chronic	b) mediate	c) tropical	d) solemn
55	synthetic	a) tumor	b) fabrics	c) insect	d) cartoon
56	prolong	a) quality	b) meeting	c) telephone	d) welcome
57	nation	a) test	b) protect	c) make	d) start
58	harness	a) power	b) thirst	c) worry	d) mouth

59	trivial	a) tennis	b) change	c) lease	d) curtain
60	soothe	a) curriculum	b) perspective	c) transition	d) irritation
61	uproar	a) conscious	b) innocent	c) standard	d) political
62	amiable	a) manner	b) example	c) license	d) stream
63	elucidate	a) meaning	b) clothes	c) kitchen	d) trouble
64	lenient	a) weather	b) support	c) sentence	d) hospital
65	stagnant	a) storm	b) wound	c) fancy	d) water
66	banal	a) difference	b) conversation	c) television	d) photograph
67	froth	a) actual	b) final	c) white	d) sudden
68	wholesome	a) food	b) tail	c) list	d) chair
69	billow	a) academy	b) priest	c) curtain	d) volume
70	conducive	a) adventure	b) centimeter	c) strawberry	d) environment
71	devout	a) computer	b) believer	c) morning	d) station
72	gruesome	a) murder	b) salary	c) maximum	d) delivery
73	pamper	a) square	b) Friday	c) bottle	d) parent
74	itinerary	a) bread	b) judge	c) travel	d) shirt
75	waft	a) smell	b) tooth	c) heart	d) blood
76	pawn	a) bill	b) hole	c) shop	d) term
77	sumptuous	a) aisle	b) feast	c) niche	d) torch
78	posh	a) volume	b) lease	c) content	d) resort
79	elapse	a) time	b) mark	c) tape	d) case
80	derelict	a) discovery	b) holiday	c) building	d) difference

## Appendix Ci: Instruction Material for Collocations with High MI Scores

下列20个英语词组是由一个已知单词和一个新单词组成的。这些词组共分成两组，  
动名词词组和形容词名词词组。请记住这些新的单词和词组。

形容词 + 名词

bloody smear 血迹

bestselling memoir 畅销的回忆录

hearty chuckle 开心地笑

long-running sitcom 经久不衰的情景喜剧

fruity aroma 水果的香味

emotional toll 感情的伤害

modern metropolis 现代都市

sunny disposition 阳光的个性

economic slump 经济衰退

holy relics 圣物

worthwhile endeavor 值得付出的努力

steep ravine 陡峭的峡谷

动词 + 名词

nurture talents 培养人才

roam streets 流浪街头

unleash creativity 释放创造力

reconcile differences 调和差异

curtail spending 削减开支

harness energy 利用能量

soothe fear 安抚恐惧

tame beast 驯服野兽

transcend boundary 超越界限

divert attention 转移注意力

erode confidence 侵蚀信心

inhale perfume 闻香水

## Appendix Cii: Instruction Material for Collocations with Low MI Scores

下列20个英语词组是由一个已知单词和一个新单词组成的。这些词组共分成两组，  
动名词词组和形容词名词词组。请记住这些新的单词和词组。

形容词+名词

small smear 小块的污渍

new memoir 新的回忆录

low chuckle 小声的笑

funny sitcom 好笑的的情景喜剧

strong aroma 很浓的香味

religious relics 宗教文物

huge metropolis 很大的都市

natural disposition 自然的个性

recent slump 最近的衰退

tragic toll 痛苦的伤害

successful endeavor 成功的努力

small ravine 小山谷

动词+名词

nurture children 培养孩子

roam land 四处漫游

unleash energy 释放能量

reconcile value 调和价值观

curtail cost 削减成本

harness resources 驾驭资源

soothe spirit 抚慰精神

tame hair 梳理头发

transcend culture 超越文化

divert money 转移金钱

erode power 侵蚀力量

inhale water 吸水

## Appendix Ciii: Instruction Materials for Single Words

请学习下列两组英语单词，包括动词和名词。

动词

nurture 培养

roam 流浪，漫游

unleash 释放，发动

reconcile 调和

curtail 削减

harness 利用，驾驭

soothe 安抚，抚慰

tame 驯服

transcend 超越

divert 转移

erode 侵蚀

inhale 吸入



名词

smear 污迹

memoir 回忆录

chuckle 咯咯地笑

sitcom 情景喜剧

aroma 香味

relics 遗迹, 遗物

metropolis 都市

disposition 个性, 性格

slump 衰退

toll 伤害

endeavor 努力

ravine 山谷

## Appendix Di: Posttest for Collocations with High MI Scores

请根据给出的形容词和名词首字母，写出刚刚学过的对应单词。

bloody	s
bestselling	m
soft	c
popular	s
fruity	a
emotional	t
modern	m
sunny	d
economic	s
holy	r
worthwhile	e
steep	r

n	talents
r	streets
u	creativity
r	differences
c	spending
h	energy
s	fear
t	beast
t	limits
d	attention
e	confidence
i	perfume

请根据给出的中文意思，写下相应的英语词组。

血迹

\_\_\_\_\_

畅销的回忆录

\_\_\_\_\_

轻声浅笑

\_\_\_\_\_

流行情景喜剧

\_\_\_\_\_

水果的香味

\_\_\_\_\_

感情的伤害

\_\_\_\_\_

现代都市

\_\_\_\_\_

阳光的个性

\_\_\_\_\_

经济衰退

\_\_\_\_\_

圣物

\_\_\_\_\_

值得付出的努力

\_\_\_\_\_

陡峭的山谷

\_\_\_\_\_

培养人才

\_\_\_\_\_

流浪街头

\_\_\_\_\_

释放创造力

\_\_\_\_\_

调和差异

\_\_\_\_\_

削减开支

\_\_\_\_\_

利用能量

\_\_\_\_\_

安抚恐惧

\_\_\_\_\_

驯服野兽

\_\_\_\_\_

超越极限

\_\_\_\_\_

转移注意力

\_\_\_\_\_

侵蚀信心

\_\_\_\_\_

闻香水

\_\_\_\_\_

请根据给出的形容词和名词首字母，写出刚刚学过的对应单词。

bloody smear \_\_\_\_\_  
bestselling memoir \_\_\_\_\_  
soft chuckle \_\_\_\_\_  
popular sitcom \_\_\_\_\_  
fruity aroma \_\_\_\_\_  
emotional toll \_\_\_\_\_  
modern metropolis \_\_\_\_\_  
sunny disposition \_\_\_\_\_  
economic slump \_\_\_\_\_  
holy relics \_\_\_\_\_  
worthwhile endeavor \_\_\_\_\_  
steep ravine \_\_\_\_\_

nurture talents \_\_\_\_\_  
roam streets \_\_\_\_\_  
unleash creativity \_\_\_\_\_  
reconcile differences \_\_\_\_\_  
curtail spending \_\_\_\_\_  
harness energy \_\_\_\_\_  
soothe fear \_\_\_\_\_  
tame beast \_\_\_\_\_  
transcend limits \_\_\_\_\_  
divert attention \_\_\_\_\_  
erode confidence \_\_\_\_\_  
inhale perfume \_\_\_\_\_

\_\_\_\_\_

## Appendix Dii: Posttest for Collocations with Low MI Score

请根据给出的形容词和名词首字母，写出刚刚学过的对应单词。

small	s
new	m
low	c
funny	s
strong	a
religious	r
huge	m
natural	d
recent	s
tragic	t
successful	e
small	r

n	children
r	land
u	energy
r	value
c	cost
h	resources
s	spirit
t	hair
t	culture
d	money
e	power
i	water

请根据给出的中文意思，写下相应的英语词组。

小块的污迹

\_\_\_\_\_

新的回忆录

\_\_\_\_\_

小声的笑

\_\_\_\_\_

好笑的的情景喜剧

\_\_\_\_\_

很浓的香味

\_\_\_\_\_

宗教文物

\_\_\_\_\_

很大的都市

\_\_\_\_\_

自然的个性

\_\_\_\_\_

最近的衰退

\_\_\_\_\_

痛苦的伤害

\_\_\_\_\_

成功的努力

\_\_\_\_\_

小山谷

\_\_\_\_\_

培养孩子

\_\_\_\_\_

四处漫游

\_\_\_\_\_

释放能量

\_\_\_\_\_

调和价值观

\_\_\_\_\_

削减成本

\_\_\_\_\_

驾驭资源

\_\_\_\_\_

抚慰精神

\_\_\_\_\_

梳理头发

\_\_\_\_\_

超越文化

\_\_\_\_\_

转移金钱

\_\_\_\_\_

侵蚀力量

\_\_\_\_\_

吸水

\_\_\_\_\_

请根据给出的英语词组，写出相应的中文意思。

small smear \_\_\_\_\_  
new memoir \_\_\_\_\_  
low chuckle \_\_\_\_\_  
funny sitcom \_\_\_\_\_  
strong aroma \_\_\_\_\_  
religious relics \_\_\_\_\_  
huge metropolis \_\_\_\_\_  
natural disposition \_\_\_\_\_  
recent slump \_\_\_\_\_  
tragic toll \_\_\_\_\_  
successful endeavor \_\_\_\_\_  
small ravine \_\_\_\_\_

nurture children \_\_\_\_\_  
roam land \_\_\_\_\_  
unleash energy \_\_\_\_\_  
reconcile value \_\_\_\_\_  
curtail cost \_\_\_\_\_  
harness resources \_\_\_\_\_  
soothe spirit \_\_\_\_\_  
tame hair \_\_\_\_\_  
transcend culture \_\_\_\_\_  
divert money \_\_\_\_\_  
erode power \_\_\_\_\_  
inhale water \_\_\_\_\_

## Appendix Diii: Posttest for single words

请写下你听到的英文单词。

- 1 \_\_\_\_\_
- 2 \_\_\_\_\_
- 3 \_\_\_\_\_
- 4 \_\_\_\_\_
- 5 \_\_\_\_\_
- 6 \_\_\_\_\_
- 7 \_\_\_\_\_
- 8 \_\_\_\_\_
- 9 \_\_\_\_\_
- 10 \_\_\_\_\_
- 11 \_\_\_\_\_
- 12 \_\_\_\_\_
  
- 13 \_\_\_\_\_
- 14 \_\_\_\_\_
- 15 \_\_\_\_\_
- 16 \_\_\_\_\_
- 17 \_\_\_\_\_
- 18 \_\_\_\_\_
- 19 \_\_\_\_\_
- 20 \_\_\_\_\_
- 21 \_\_\_\_\_
- 22 \_\_\_\_\_
- 23 \_\_\_\_\_
- 24 \_\_\_\_\_



请根据给出的中文意思，写出相应的英文单词。

污迹                    s  
\_\_\_\_\_

回忆录                m  
\_\_\_\_\_

咯咯地笑            c  
\_\_\_\_\_

情景喜剧            s  
\_\_\_\_\_

香味                    a  
\_\_\_\_\_

遗迹，遗物         r  
\_\_\_\_\_

都市                    m  
\_\_\_\_\_

个性，性格         d  
\_\_\_\_\_

衰退                    s  
\_\_\_\_\_

伤害                    t  
\_\_\_\_\_

努力                    e  
\_\_\_\_\_

山谷                    r  
\_\_\_\_\_

培养                    n  
\_\_\_\_\_

流浪，漫游         r  
\_\_\_\_\_

释放，发动         u  
\_\_\_\_\_

调和                    r  
\_\_\_\_\_

削减                    c  
\_\_\_\_\_

利用，驾驭         h  
\_\_\_\_\_

安抚，抚慰         s  
\_\_\_\_\_

驯服                    t  
\_\_\_\_\_

超越                    t  
\_\_\_\_\_

转移                    d  
\_\_\_\_\_

侵蚀                    e  
\_\_\_\_\_

吸入                    i  
\_\_\_\_\_

请根据给出的英语单词，写出相应的中文意思。

smear \_\_\_\_\_

memoir \_\_\_\_\_

chuckle \_\_\_\_\_

sitcom \_\_\_\_\_

aroma \_\_\_\_\_

relics \_\_\_\_\_

metropolis \_\_\_\_\_

disposition \_\_\_\_\_

slump \_\_\_\_\_

toll \_\_\_\_\_

endeavor \_\_\_\_\_

ravine \_\_\_\_\_

nurture \_\_\_\_\_

roam \_\_\_\_\_

unleash \_\_\_\_\_

reconcile \_\_\_\_\_

curtail \_\_\_\_\_

harness \_\_\_\_\_

soothe \_\_\_\_\_

tame \_\_\_\_\_

transcend \_\_\_\_\_

divert \_\_\_\_\_

erode \_\_\_\_\_

inhale \_\_\_\_\_

## Appendix E Consent form for participants of the research

### Consent Form

This research project is a study into the vocabulary knowledge and use of Chinese tertiary learners. It studies the extent to which learners understand English vocabulary and how they use English vocabulary in language production. You are asked to finish a questionnaire with personal information, complete vocabulary knowledge tests, and write a composition. Also, you may be asked to join an interview on the learning and using vocabulary.

The participation to the research project is voluntary. And, you can opt out any time in the process if you feel uncomfortable. Your personal information will be kept from third parties and will not be exposed in the dissertation.

Your participation is kindly appreciated.

Signature of the researcher \_\_\_\_\_

Signature of the participant \_\_\_\_\_

Date of signature \_\_\_\_\_

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