Measuring Vocabulary Size and Vocabulary Depth of Secondary Education Students in a Thai-English Bilingual School

Somjai Srimongkontip[1]
Pamararat Wiriyakarun[2]

ABSTRACT

This paper reports findings from a study which measured the vocabulary knowledge of 12th grade students of a Thai-English Bilingual Program in the school. The study investigated two dimensions of vocabulary knowledge, namely breadth or vocabulary size and depth. The Vocabulary Levels Test (VLT) version 2 and the Depth of Vocabulary Knowledge Test (DVK) were administered to 104 subjects. The findings indicated that the students could not reach the targeted 3000 word level which was the threshold level for this study. Furthermore, the average vocabulary size was below the 2000 word level. The mean scores of the students' vocabulary sizes at Academic Word List level (AWL) were below the minimum requirement. Likewise, the mean scores of the students' depth of vocabulary knowledge were lower than 50% of the total scores. The results confirmed that over fifty percent of the subjects had some vocabulary deficiencies that would hinder their academic progress.

Keywords: Vocabulary knowledge, vocabulary size, vocabulary depth, academic word list, vocabulary levels test

---

[1]M.A. candidate at King Mongkut University of Technology Thonburi. She holds a B.Sc. in Education for English Language Teaching from Sri Nakharinwirot University.

[2] Assistant Professor at King Mongkut University of Technology Thonburi.

บทคัดย่อ

งานวิจัยนี้ศึกษาการวัดความรู้คำศัพท์ของนักเรียนชั้นมัธยมศึกษาปีที่ 6 หลักสูตรสองภาษา ไทย-อังกฤษ ของโรงเรียนแห่งหนึ่ง โดยวัดความรู้คำศัพท์ทั้งสองมิติคือ ความรู้ในเชิงขนาด หรือเชิงกว้างและความรู้ในเชิงลึก กลุ่มตัวอย่างจำนวน 104 คนได้ทำแบบทดสอบสองฉบับ เพื่อวัดระดับความรู้คำศัพท์ในเชิงกว้างและเชิงลึก ผลการทดสอบพบว่ากลุ่มตัวอย่างมีขนาดความรู้คำศัพท์ต่ำกว่าเกณฑ์ที่กำหนดไว้ คือ ระดับ 3,000 คำ อีกทั้งคะแนนเฉลี่ยของความรู้คำศัพท์ต่ำกว่า 2,000 คำ นอกจากนี้คะแนนเฉลี่ยของความรู้คำศัพท์เชิงวิชาการทั่วไปอยู่ในระดับที่ต่ำกว่าเกณฑ์ด้วย ส่วนคะแนนเฉลี่ยของความรู้คำศัพท์ในเชิงลึกนั้น อยู่ในระดับต่ำกว่าร้อยละ 50 ผลการวิจัยนี้สรุปว่า กลุ่มตัวอย่างจำนวนมากกว่าร้อยละ 50 มีความรู้คำศัพท์ไม่เพียงพอ ซึ่งจะเป็นอุปสรรคต่อการศึกษาต่อ ที่เกี่ยวข้องกับการใช้ภาษาอังกฤษในอนาคต

ศัพท์สำคัญ: ความรู้คำศัพท์ ความรู้คำศัพท์ในเชิงขนาด ความรู้คำศัพท์ในเชิงลึก ความรู้คำศัพท์เชิงวิชาการทั่วไป

1. Introduction

Vocabulary is not only the key to communication but it also allows the learners to develop other skills. Laufer and Sim (1985) stated that the most pressing needs of foreign language learning were vocabulary, subject matter knowledge and syntactic structure respectively. Accordingly, vocabulary size plays a key role in reading comprehension, fluency in speech, listening, and writing skills. It has been estimated that a native speaker's vocabulary size is approximately 20,000 word families and native speakers will add roughly 1,000 word families a year to their vocabulary size. (Nation & Waring 1997). In reality, the estimation of vocabulary used for daily communication was in the range of 3,000 to 10,000 words. Regarding the words that learners should know, there were different numbers of words required for L2 learners suggested by the researchers. Some researchers stated that 2,000 word families are the minimum amount required (Nation, 1993). Furthermore, some have mentioned that the L2 learners would need to know roughly 5,000 and preferably 10,000 words to cope well with English texts (Nation, 2004). Schmitt (2000) suggested that 5,000 words were required. However, the study conducted by Schmitt (2008) mentioned that knowledge of 3000 words was a threshold which should allow learners to begin to read authentic text. Additionally, Laufer (1997) has stated that the threshold vocabulary size essential for reading comprehension is at the 3000 words level.

Knowing a word means recognition of the word. According to Read (2000), Qian (2002) and Vermeer (2001), vocabulary knowledge consists of the two dimensions of breadth and depth. The vocabulary size or a number of words that one knows is defined as a breadth of vocabulary knowledge. Whereas vocabulary depth

refers to the quality of vocabulary knowledge that a person knows or how well one knows a specific word or set of words. Consequently, both vocabulary size and vocabulary depth should be significant for language learners in their vocabulary study. Furthermore, Nation (1990) stated that knowing just the meaning of a word was inadequate but knowing how to use a word fluently was also needed. There were eight kinds of word knowledge that native-speakers should possess. These were knowledge of a word's meaning, spoken form, written form, grammatical patterns (part-of-speech and derivative forms), collocations (other words which naturally occur together with the target word in text), frequency, associations (the meaning relationships of words i.e. *diamond - hard, jewelry, weddings*), and stylistic restrictions (such as levels of formality and regional variation). From this perspective, measuring vocabulary size is insufficient to indicate the number of words a person should know. Depth of vocabulary knowledge is also needed in order to measure how well a person knows a word.

The importance of measuring the vocabulary knowledge of the students is to assess the language ability of the students that contributes to their academic success at the higher education level. As a result, some countries have set requirements for vocabulary knowledge the students should possess at each level. For example, the Chinese English Syllabus in 2001 required that Chinese students should learn to use 3,000 words at the high school level (Huang, 2007). In Taiwan, high school students were required to learn 5,500 words to meet the syllabus in 1997. In Thailand, there is some indication in the Thai curriculum of how many English words the Thai students should learn at each educational level. According to the Ministry of Education (2001), the core curriculum for national education at the basic level, out of eight core learning areas, English

was a compulsory subject. 12th grade graduates are supposed to obtain four language skills and are able to use the language in different ways such as communicating about their families, environment, occupations and science and technology. There are approximately 3,600-3,750 words with different levels of usage to be learned. Based on the minimum requirement of vocabulary knowledge determined in the Syllabus of some Asian countries, the estimation of words used for daily communication and some studies conducted by Schmitt and Laufer on the knowledge of 3000 words is the threshold for language learners to read authentic text. The 3000 words have been set as a minimum requirement for this study.

Although learning and teaching subjects at higher education institutions in Thailand are mostly conducted in the Thai language, it is necessary for university students to obtain sufficient English vocabulary for their academic study. Studying how many English words the Thai students know, particularly at the high school level, could be an indicator to assess the achievement of vocabulary teaching and learning in school compared with other countries in Asia. Additionally, measuring both vocabulary size and vocabulary depth of the students would lead to the school's actions in improving vocabulary learning materials which would be appropriate for students' need and requirement of vocabulary knowledge at the higher education level. Previous studies examining vocabulary size and depth of vocabulary are described below.

Measuring Vocabulary Size

Olmos (2009) measured the vocabulary size of students in the final year of high school education in Spain. The Vocabulary Levels Test was used in the study. It was found that no student had reached

the 3,000 and 5,000 word levels. A similar study was conducted in City University of Hong Kong by Cobb and Horst (1997). The first and the second year university students took the Vocabulary Levels Test designed by Nation in 1990. The results indicated that the two groups of students could in fact reach at the 2,000 and 3,000 word levels. It was interpreted that their knowledge at the 2,000 word level was derived from their formal secondary education. In other words, the Chinese students of City University had mastered vocabulary knowledge at the 2000 word level when they had graduated from high school.

Measuring Knowledge of Vocabulary Depth

Wesche and Paribakht (1996) stated that most research on L2 vocabulary acquisition focused on estimates of vocabulary size or 'breadth' measures rather than on the depth of vocabulary knowledge of specific words. As a result, measuring how well the given words are known became the limitation. In addition, research studies related to vocabulary depth focused on its relation to vocabulary breadth rather than solely measuring the vocabulary depth.

Qian (1998) conducted his study on the relationships among vocabulary size, depth of vocabulary knowledge and reading comprehension in English. The findings were that depth of vocabulary knowledge contributed to the predictions of reading comprehension and also played a role as the foundation of English language learner's reading comprehension processes.

As previously mentioned, English is one of the foreign languages that Thai students are required to study. The 1999 Education Act

emphasized the use of English for communication in the national curriculum. Correspondingly, the Ministry of Education launched the English Program (EP) for bilingual education to raise the quality of English learning and teaching at the school level. The model of bilingual education applied by the school is known as parallel immersion. The core subjects of English, Mathematics, Science and Social Studies are taught by foreign teachers without any language-switching occurring during instruction in class. In other words, the Thai core subjects and English grammar are taught in parallel with the English core subjects by Thai teachers. Consequently, the students in a bilingual school have a number of hours to be exposed to the English language more than that of the students in regular programs at other schools.

It is expected that students in the bilingual program should have higher proficiency levels than do students in the regular programs. Knowing the vocabulary sizes and vocabulary depth of these students would not only prepare them for studies at a higher education level but also provide feedback for improving the quality of teaching and learning through the medium of English for the bilingual program in Thailand.

Objectives of the Study

The aim of this study is to measure the vocabulary size and vocabulary depth of the 12th grade students in the bilingual school.

Research questions

1. What is the vocabulary size of the students from Science-Maths and English-Maths programs of the final year of secondary education of the Suksa Bilingual School?

2. What is the vocabulary depth of the students from Science-Maths and English-Maths programs of the final year of secondary education of the Suksa Bilingual School?

2. Methodology

2.1 Participants

The participants were the 12th grade students from the Science-Maths and English-Maths programs of the Suksa Bilingual School, a fictitious name assigned to maintain the privacy and reputation of the school. The Suksa Bilingual School was selected for this study for being one of the first bilingual schools established in Thailand since 1995. The Science-Maths Program and the English-Maths Program are the major programs which most of the students at the secondary education have selected to study for the reason that both programs will offer them more alternative fields of study at the higher education level. For this reason, all students from the two programs are targeted for this study. The number of participants was approximately 104 participants that included 55 Science-Maths program students and 49 English-Maths program students. The participants were both male and female. They were studying in the first semester of the 2013 academic year. Regarding exposure to English language of the students in both programs, the Science-Maths program students have 6 periods per week to study English subjects whereas the English-Maths program students have 8

periods per week. The students of both programs are given 6 periods per week to learn the 3 core subjects in English that include mathematics, science and social studies.

Instruments

Two data-gathering instruments were used which are described in detail as follows:

1. Vocabulary Level Test (VLT) version 2

The Vocabulary Level Test is used to measure vocabulary size. According to Nation (2008) the test is readily available and widely used by researchers. The test has been well researched as well. The Vocabulary Level Test (VLT) was originally designed by Paul Nations and was described in Nation (1983 and 1990). It was further developed by Norbert Schmitt, Diane Schmitt and C. Clapham. The test was made in two equivalent forms and indicated as VLT version 1 and VLT version 2. According to Schmitt (2008) both version 1 and 2 provided valid results and produced similar scores. Due to its availability during the preparation of instruments, the VLT version 2 was used for this study. The VLT has five levels within the test which consists of the 2000, 3000, 5000, 10000 word levels and the academic word list level (AWL). The 2000 word level is the first section of the test. It includes the high frequency words of general vocabulary. A separate vocabulary size test of the 1000 high frequency words was not used together with VLT to measure the vocabulary knowledge at the 1000 word level for the reason that it was assumed the 12^{th} grade students of the Bilingual Program should already have acquired vocabulary knowledge exceeding the 1000 word level. The 3000, 5000 and

10000 word levels are classified as low frequency words. The academic vocabulary is available as an academic word list level, in one section of the VLT (see more details in the next section).

The VLT contains 30 words or items per level in which 10 groups of 6 words are included. Each group of 6 words, in which 3 out of 6 words are distracters, is presented to match to 3 definitions. Every level of the VLT follows the same format. The VLT has been used by other researchers to measure learners' vocabulary size. It has been successful because it has shown itself to be a quick, reliable and effective tool for measuring the type and amount of vocabulary that students know. A sample test item is provided below.

This is a vocabulary test. You must choose the right word to go with each meaning. Write the number of that word next to its meaning. Here is an example.

1.	clerk		
2.	frame		
3.	noise	6	a drink
4.	respect	1	office worker
5.	theatre	3	unwanted sound
6.	wine		

From the example, as one of 10 groups in the VLT (at 2000 words level), there are three words tested (clerk, noise and wine) with another three distracters (frame, respect and theatre). All of these words are in the same word level.

Academic Word List Level (AWL)

The VLT includes one level test of academic vocabulary. It was designed to come after the first 2000 word level. Developed by A. Coxhead, the Academic Word List (AWL) was compiled from a diverse array of academic texts, with approximately 3.5 million running words. It consisted of 570 word families which were chosen

from all the selected texts. The AWL occurs in all four divisions of Commerce, Law, Science and Arts existing in 28 subject areas such as philosophy, finance and geography. It covered around 10% of running words in academic text, about 4% in newspapers and less than 2% in novels. The AWL is very important for the learners who learn English for academic purposes. The participants of this study intend to go on to academic study at university and they also studied their core subjects through the medium of English. Consequently, the AWL was thus used for this study to measure their general academic vocabulary knowledge. A sample of a test item from the AWL is given below.

1. access
2. gender _____male or female
3. implementation _____study of the mind
4. license _____entrance or way in
5. orientation
6. psychology

2. The Depth of Vocabulary Knowledge Test (DVK)

The Depth of Vocabulary Knowledge Test (DVK) is used to measure the vocabulary depth. It was originally a word association test developed by John Read (Qian, 2004). The test was revised in 2004 by David Qian to assess vocabulary depth knowledge. The DVK measures two aspects of depth of vocabulary knowledge: a) word meaning, particularly polysemy and synonymy, and b) word collocation. The test is designed to produce verifiable evidence of how well the test takers know a target word. It involves a recognition task, where test takers select responses rather than recall them from memory. The DVK test was mostly used to identify the relationship between the depth of vocabulary knowledge and

the ability of learners in other aspects of language learning such as academic reading performance and the perceived ease of L2 lexical inferencing.

The DVK test includes 40 items. Each item consists of one stimulus word which is an adjective and two boxes in which each box contains four words. The box on the left is the word meaning section and the word collocation section is in the right box. One item has 4 correct answers. Among the four words in the left box, one to three words can be synonymous to one aspect of, or the whole meaning of, the stimulus word. Meanwhile among the four words in the right box, it could be one to three words which collocate with the stimulus word. A sample test item is provided below.

Direction: In the test, there are 40 items. Each item looks like this:
Sound

(A) logical (B) healthy (C) bold (D) Solid	(E) snow (F) temperature (G) sleep (H) dance

There are eight words in the two boxes, but only four of them are correct words.

In this example, there are three correct answers on the left (A, B, C) and one on the right (G), but in some other items there will be either one on the left and three on the right, or two on the left and two on the right.

Procedure

The study was divided into the following stages.

1. The participants were given 40 minutes to take the Vocabulary Level Test. They were instructed to skip the answer for any word for which they did not know its meaning. This was done so that the result of the test would not show actual vocabulary knowledge in the event that the guessed answer was fortunately correct. As the 3000 word level was determined as the threshold level for meeting the requirements of the 12th grade students in this study, the students were told to complete the test for the 3000 word level, the AWL level and the 5000 word level. They were allowed to stop the test at the 10000 word level if they found that the words were unknown to them at this level. More than 50% of students did not take the test at the 10000 word level. They said that they were not familiar with the words at this level.

2. The participants were given 1 period, or 50 minutes to take the Depth of Vocabulary Knowledge (DVK) test on the following day. The test includes 40 items of stimulus words with 4 correct answers for each item meaning that the test has 160 correct answers.

Data Analysis

1. *Vocabulary Level Test*: One score was given for a word which was matched to a correct definition. The scores were counted separately at each level providing a maximum score of 30. According to Nation (2008), knowing at least 27 out of 30 words at a given level is considered satisfactory. As a result, a cut-off point of

the score for this study was 27 or 90%. It implies that the participants who take the test at the 2000 word level of VLT and have achieved a score of 27 out of 30 have the vocabulary knowledge at the 2000 word level. The mean and standard deviation of the score of each individual participant at each word level (2000, 3000, 5000 and academic words) and the percentage of students who passed each word level were calculated.

2. *Depth of Vocabulary Knowledge Test:* The correct answer of each word is given one point, meaning that a maximum possible score is 160 points for 40 items or 4 correct answers per item. The word meaning section of the test comprised a total of 79 correct answers whereas there were 81 correct answers in the word collocation section. The means and standard deviation of the total scores, those of the word meaning section and the word collocation section were calculated. After that, the scores of the two sections were compared in order to see which section of depth of vocabulary students were likely to acquire more than the other. There is no indication to decide at what level of the DVK scores could be set as a minimum requirement. In this study, 50% of the DVK score was therefore used as a cut-off point to find how well the students who studied in the last year of secondary education know the word in terms of word meaning and word collocation.

3. Results

To answer research question 1, the vocabulary sizes of the Science-Maths program students and the English-Maths program students, the results from the scores on the VLT test are presented as follows.

Table 1: Mean scores and standard deviation of students in different programs at the 2K, 3K and 5K words levels.

Participant	N	2K level		3K level		5K level	
		Mean	SD	Mean	SD	Mean	SD
Science-Maths Program students	55	25.13	4.51	20.00	5.90	13.09	6.96
English-Maths Program students	49	18.06	6.81	12.04	7.07	7.39	5.49
Science -Maths and English-Maths Programs students	104	21.80	6.70	16.30	7.70	10.40	6.90

Table 1 illustrates that the mean scores of the Science-Maths Program students and English-Maths Program students were 21.80 out of 30 at the 2K level, 16.30 at the 3K level and 10.40 at the 5K level. For the mean scores of Science-Maths Program students, they were 25.13 at the 2K level, 20.00 at the 3K level and 13.09 at the 5K level.

Obviously, the mean scores of English-Maths Program students at all levels were lower than those of the Science-Maths Program students and the mean scores of the combination of students in the two programs. The mean scores of English-Maths Program students were 18.06 at the 2K level, 12.04 at the 3K level and 7.39 at the 5K level.

To determine that the students have mastery of the vocabulary knowledge, they are expected to know at least 27 out of 30 words at each level of the test. This means the students whose scores range between 27 and 30 have reached a satisfactory level. From Table 1, the mean scores of the students in each vocabulary level were below 27 with a great value of standard deviation. However, the results revealed that some students could pass the test at both the 2000 and the 3000 word levels as illustrated in Figure 1and 2. The bar charts show the percentage of the number of students in both programs and the scores they got at the 2000 and 3000 word levels.

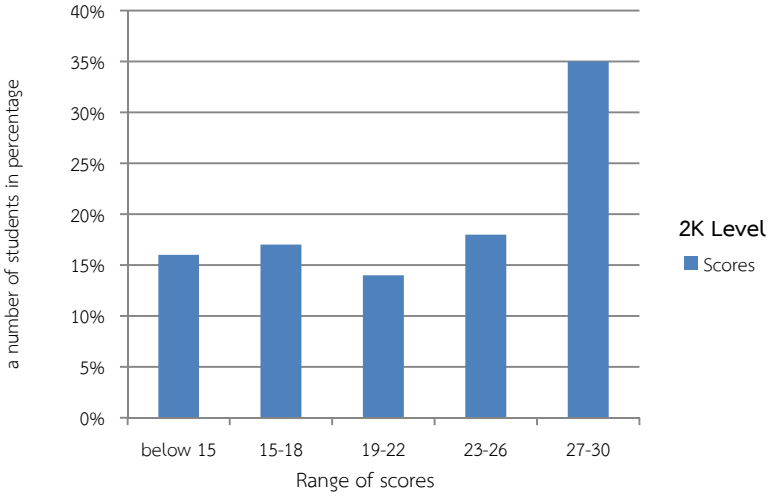

Figure 1: Percentage of the number of students and scores at the 2000 word level.

Figure 1 suggests that 35% of the students could reach the standard 2K level. In other words, 65% of students could not pass this level. The bar chart illustrated that 35% of the number of students in the Science-Maths Program and English-Maths Program scored between

27 and 30, followed by 18% for the scores between 23 and 26, 17% for the scores between 15 and 18, 16% for the scores below 15 and 14% for the scores between 19 and 22, respectively.

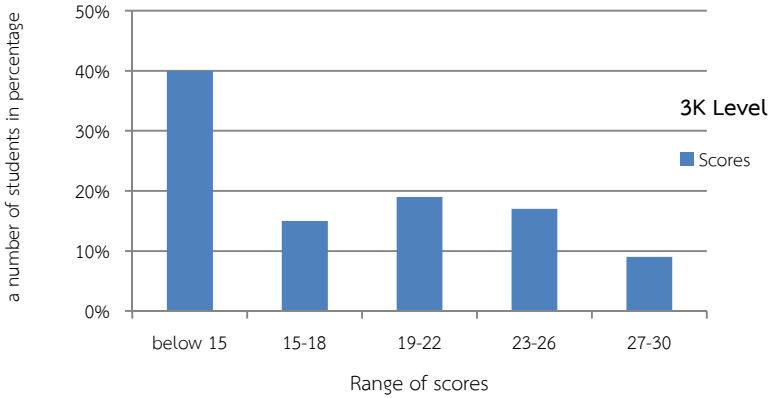

Figure 2: Percentage of the number of students and scores at the 3000 word level.

As shown in Figure 2, the highest percentage (40%) of students in the Science-Maths Program and English-Maths Program scored below 15, followed by 19% of the scores between 19 and 22, 17% of the scores between 23 and 26, 15% of the scores between 15 and 18 and 9% of the scores between 27 and 18 respectively. At the 3000 words level, 9% of the students could reach the standard of this level. Conversely, 91% of students could not pass the 3000 words level.

Since the AWL level was to measure the academic vocabulary, the result from this level of the test was presented separately from the other general English word level test. Table 2 is presented below to

describe the mean scores and standard deviation of students in different programs at the AWL level.

Table 2: Mean scores and standard deviation of students at the AWL level.

Participant	N	AWL level	
		Mean	SD
Science-Maths Program students	55	19.51	6.88
English-Maths Program students	49	12.04	7.07
Science -Maths and English-Maths Programs students	104	15.99	7.88

From Table 2, the academic word mean score of the Sceince-Maths Program students was 19.51. Meanwhile, the English-Maths Program students achieved a mean score of 12.04.

Overall, the mean score of the students in both programs was 15.99. The mean score of academic words of English-Maths Program students was lower than that of the Science-Maths Program students and the mean score of combination of the students in the two programs. Looking at the mean scores of the 5K level in Table 1 and that of the AWL level in Table 2, it should be noticeable that the mean scores at the AWL level were close to those at the 3000 word level.

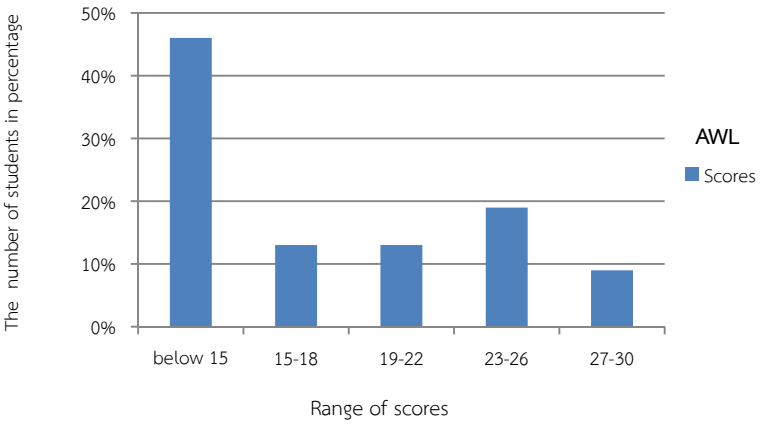

Figure 3: Percentage of the number of students and scores at the academic word list level.

As presented in Figure 3, 46 % of the students in the Science-Maths Program, and English Maths Program scored below 15, followed by 19% for the scores between 23 and 26, 13% for the scores between 15 and 18 and the scores between 19 and 22 and 9% for the scores between 27 and 30 respectively. To sum up, 9% of the students could reach the standard of the AWL level. Conversely, 91% of students could not pass the Academic Word List level. It was observed that the number of students who passed the 3000 word level were the same amount as that of the students who passed the AWL level.

The Scores of Vocabulary Depth

To answer research question 2, on the vocabulary depth of Science-Maths Program students and English-Maths Program students, the mean and standard deviations of students' vocabulary depth test are presented in Table 3.

Table 3: Mean scores and standard deviation of students' vocabulary depth test.

Participant	N	word meaning scores (out of 79)		Word collocation scores (out of 81)		Total scores of vocabulary depth (out of 160)	
		Mean	SD	Mean	SD	Mean	SD
Science-Maths Program students	55	27.98	16.79	23.22	13.95	51.20	29.91
English-Maths Program students	49	14.98	11.18	12.16	9.70	27.14	20.25
Science-Maths and English-Maths Programs students	104	21.86	15.76	18.01	13.29	39.87	28.38

From Table 3, overall, the mean of word meaning scores were higher than the means of word collocation scores. Regarding the mean of word meaning scores, the Science-Maths Program students scored 27.98. Meanwhile the English-Maths Program students scored 14.98 and 21.86 for the Science-Maths and English Maths Program students.

Regarding the mean of word collocation scores, the Science-Maths Program students scored 23.22. The English-Maths Program students scored 12.16 whereas the Science-Maths and English Maths Program students scored 18.01.

Obviously, the mean scores of word meaning and word collocation of the Science-Maths Program students were higher than those of the English-Maths Program students. Accordingly, the mean score of vocabulary depth of the Science-Maths Program students was higher than that of the English-Maths Program students.

4. Discussions

1. Vocabulary size

Based on the results, the mean scores of the students' vocabulary knowledge were below 27 at all levels, meaning that the students could not reach the minimum level needed to show mastery of the vocabulary knowledge (see Table 1). It seemed to be in harmony with the results from the study of Olmos (2009) which demonstrated that the mean scores of 2K, 3K and 5K levels of the final year students in a High School in Murcia, Spain were below the minimum level. Kalajahi and Pourshahian (2012) carried out a study on vocabulary learning strategies and vocabulary size of the first year undergraduate ELT students at Eastern Mediterranean University in Northern Cyprus, and the findings revealed that the mean scores of vocabulary knowledge at 2K, 3K and AWL levels were a bit higher than those of the students in this study. However, they were below 27 as well.

Similarly, the mean score of the students' academic word knowledge could not reach the minimum requirement (see Table 2). Interestingly, it was likely that the level of difficulty of vocabulary knowledge at 3K level was equivalent to that of the AWL level. The evidence was that the mean score of the 3K level was more or less similar to the mean score of the AWL level (see Table 1&2). Furthermore, a number of students who passed the 3000 words and the AWL levels were the same as mentioned in the previous section. It was assumed that the students who know the words at 3K level probably know the words at AWL level or vice versa. This assumption could be explained with the reason that the words from the list of the 3K words level are excluded from a list of the high frequency words which appear at the 2K word level. In the meantime, the words from the AWL level are the academic vocabulary that was compiled with the exclusion of the 2000 high frequency words. In other words, the opportunities for students to gain exposure to the words at 3K level might be the same as those at the AWL level.

According to the results of the study, the vocabulary knowledge of the Science-Maths program students was higher than the English-Maths students. This can be seen from the result that the mean scores of the Science-Maths Program students at all levels were higher than those of the English-Maths Program students. Based on the study schedule, the English-Maths Program students had 8 periods per week to learn English meanwhile the Science-Maths Program students had 6 periods of learning English. The reason for the contradictory result could be that most of the students who studied in the Science-Maths Program tended to have high ability in learning English language.

Furthermore, it was clearly seen from the results that the Science-Maths Program students know more academic English words than the English-Maths Program students. In fact, the students in both programs studied the core subjects; English, Science, Maths and Social Studies for 6 periods per week. They therefore had the same numbers of periods of exposure to the academic words. A possible reason was that the background knowledge of the Science-Maths Program students in academic words was greater than that of English Maths program students. To support this point, most students who made a choice to study in the English-Maths Program were those who were poor in science. They thought that language learning was probably less difficult than science. Meanwhile, they also lacked a solid foundation of English language learning. For this reason, they were not able to have academic success in both English as well as other core subjects being taught through the medium of English. It is concluded that both knowledge of the English language and relevant subject matters contribute to the academic success of the learners. In other words, the two components complement each other.

2. Vocabulary depth

As presented in Table 3, it was evident that on average, the mean scores of vocabulary depth of both programs were much lower than 50% of total scores. Comparing the knowledge of word meaning with that of word collocation, the students seemed to have more knowledge of word meaning than word collocation. It responds to the issue that language learning will take place through meaning-focused receptive and productive language use. The learners need to memorize the meaning of the word and are able to use it in speaking and writing. In order to develop fluency, the language

learners may need to encounter the language chunks in the form of collocational sequences many times and then practice speaking and writing. Therefore, acquiring knowledge on collocation tends to be more complicated than word meaning knowledge. Accordingly, it was found that most vocabulary teaching and learning activities in class generally focus on word-meaning memorization rather than word collocations which will develop students' abilities in writing and speaking. Moreover, a time allocation of 4 periods per week for English class in school could limit the balance for language content to be taught.

Apparently, the pattern of mean scores of students' vocabulary size for the Science-Maths Program students and the English-Maths Program students was similar to that of that students' vocabulary depth (see Table 1&3). It supports the study of Nurweni & Read (1999) that suggests there is a possible strong link between depth and breadth or size of vocabulary knowledge. Furthermore, the study conducted by Vermeer (2001) revealed that vocabulary size and depth tended to grow in parallel. She also mentioned that when looking at breadth and depth of vocabulary knowledge from an assessment perspective, both dimensions seemed to ubiquitously be highly correlated with each other. The connection between the breadth and the depth was concluded to be that the learners who know more words would be able to describe a stimulus word in greater depth.

5. Implications

The two dimensions of vocabulary knowledge, depth and breadth, contribute to the academic success of the learners. Since the participants' vocabulary knowledge is below the minimum

requirement, it is important for the language teachers to focus their teaching on both dimensions. In order to increase the students' vocabulary knowledge, the teaching and learning activities should be designed in a way that allow students to have more exposure to the words through reading, listening and speaking as well as extra formal study of the words, their collocations, associations, different meanings and grammar. In addition, the teachers should raise students' awareness of collocations and guide the students to notice the collocations when they occur so that they can build their own knowledge of collocation.

It is proposed that the school use a vocabulary level test to measure the vocabulary knowledge of the students at the commencement of an academic year for the upper secondary level. The objective is to diagnose the areas of vocabulary that the students know well and what they do not know. As a result, the language teachers will know the gap between the requirement of vocabulary knowledge level and the students' knowledge level. It will help the teachers better prepare teaching materials and teaching methods that are suitable for the ability and needs of the students especially to assist the weak students. Laufer and Nation (1999) mentioned that it was worthy for the language learners to pay attention to the 2000 high frequency words. Then, the words in the third, fourth, fifth 1000 levels should be taught onwards. Based on the result of study, it is recommended that the teachers should firstly put an emphasis on teaching the 2000 word level prior to the other word levels.

Due to the use of the English language as a medium for teaching the core subjects for the secondary education of the bilingual program, the academic vocabulary should also be taught explicitly to improve the ability to learn subject matter. As the

academic word list is designed to come after the first 2000 word level, it therefore depends on the teachers' decision and the policy of the school to choose at what level between the 3000 word level and the academic word list should be taught after the high frequency word level.

It is recommended that the content-based instruction or Content and Language Integrated Learning (CLIL) could be one of the options for the school to be applied for the current teaching methods of the bilingual program. Stoller (2002) stated that through content-based instruction, which allowed the students to use prior knowledge of some of the topics learned in their L1 facilitated the comprehension and learning of them in English. Such an approach would increase the students' motivation in the sense that the topics, materials and activities used in class are relevant, meaningful, interesting and useful to them at present and in the future.

6. Conclusion

The objective of this study was to measure the two dimensions of vocabulary knowledge of the 12th grade students in the bilingual school. The mean score of vocabulary depth of the participants in this study were lower than 50% of the total score. Furthermore, their vocabulary size or breadth could not reach the threshold level of 3000 words. It was below the 2K level on average. As a result, it confirmed that more than 50% of the participants had some vocabulary deficiencies that would hinder their academic progress.

Acknowledgement

We greatly thank Dr. Natjiree Jaturapitakkul, School of Liberal Arts, King Mongkut's University of Technology Thonburi, for her thoughtful comments on an earlier version of this paper.

References

Cobb, T. and Horst, M., 1997, "Vocabulary sizes of some City University students*", Journal of the Division Language Studies of City University of Hong Kong* Vol.1, No.1, pp. 59-68.

Huang, J., et al., 2004, "On the Vocabulary Size for Chinese English Learners", *Polyglossia,* Vol. 13, No. 1, pp. 15-25.

Kalajahi, S. and Pourshahian, B., 2012, "Vocabulary learning strategies and vocabulary size of ELT students at EMU in Northern Cyprus", *English Language Teaching,* Vol. 5, No. 4, pp. 138-149.

Laufer, B. and Nation, P., 1999, "A Vocabulary-size test of controlled productive ability" *Language Testing*, Vol. 16, No.1, pp. 33-51

Laufer, B., 1997, "What's in a word that makes it hard or easy: Some intralexical factors that affect the learning of words.", *In Vocabulary: Description, Acquisition, and Pedagogy ,* N. Schmitt and M. McCarthy (Eds.), Cambridge: Cambridge University , pp. 140-155.

Laufer, B. and Sim, D.D., 1985, "Measuring and explaining the reading threshold needed for English for academic purposes texts", *Foreign Language Annuals,* Vol. 18, No. 1, pp. 405-411.

Ministry of Education, Basic Education Core Curriculum B.E. 2551 (A.D. 2008) [Online], Available: htpp://academic.obec.go.th /web/doc/d/147 [2013, October 20]

Nation, I.S.P. (2008). *Teaching Vocabulary: Strategies and Techniques,* Heinle, Cengage Learning. p. 143.

Nation, I.S.P., 1990, *Teaching and Learning Vocabulary,* New York: Newbury House, pp. 177-182.

Nurweni, A., and Read, J., 1999, "The English vocabulary knowledge of Indonesian university students", *English for Specific Purposes,* Vol. 18, No. 2, and pp. 161-175.

Olmos. C., 2009, "An assessment of the vocabulary knowledge of students in the final year of secondary education. Is their vocabulary extensive enough?*" International Journal of English Studies,* Vol. 9, special issue*,* pp. 73-90.

Qian, D., 2002, "Investigating the relationship between vocabulary knowledge and academic reading performance: An assessment perspective". *Language Learning,* Vol. 52, No. 3, pp. 513-536.

Qian, D., and Schedl, M., 2004, "Evaluation of an in-depth vocabulary knowledge measure for assessing reading performance". *Language Testing,* Vol. 21, No. 1, pp. 28-52.

Read, J., 2000, *Assessing vocabulary.* Cambridge: Cambridge University Press, pp. 178-187.

Stoller, F.L., 2004, "Content-based instruction: Perspective on curriculum planning", *Annual Review of Applied Linguistics,* Vol. 24, No. 1, pp. 261-283.

Vermeer, A., 2001, "Breadth and depth of vocabulary in relation to L1/L2 acquisition and frequency of input*", Applied Psycholinguistics,* Vol. 22, No. 2, pp. 217-254.

Wesche, M. and Paribakht, T.S., 1996, "Assessing second language vocabulary knowledge: depth vs. breadth*", Canadian Modern Language Review,* Vol. 53, No. 1, pp. 13-39.