

Title	母国語の語義干渉の低減による適切な語義選択支援に関する研究
Author(s)	Kritsuthikul, Nattapol
Citation	
Issue Date	2017-09
Type	Thesis or Dissertation
Text version	ETD
URL	http://hdl.handle.net/10119/14830
Rights	
Description	Supervisor:長谷川 忍, 情報科学研究科, 博士

Doctoral Dissertation

**Improving proper word meaning selection by
reducing interference of word sense in native language**

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September 2017

Abstract

In Thailand, English is learned in a school for foreign language. It has been taught since elementary school and so on. Despite of learning for several years, English proficiency of Thais is still in unacceptable level. From all communication skills, writing skill is the most important skill since it is a key indicator for official communication. As writing tasks become more difficult in higher education level, students must apply a wide range of skills to write legibly and logically. This combination of requirements makes writing the most complex and difficult use of language. From observation, English writing skill of Thai students is one of the most troublesome in learning. Their writings contain a grammatical error and misleading vocabulary. However, grammatical errors in written text are explicitly detectable and easier to comprehend comparing to vocabulary issue. Hence, this thesis studies on reasons for the vocabulary error of Thai students in English learning and proposes a method/tool to improve the problem.

To find a cause of vocabulary errors, a corpus of English essay written by Thai students is used as source for analysis. From accessible resources, the corpus from the New EAGLE v3 was selected as a base for the error analysis. It contains 320 essay documents, and incorrect parts in the documents were manually tagged with error type. From my own analysis, the issues are grouped into three types as global comprehension, syntactic and semantic issue. Although the tag set is heavily focused on syntactic level, I found that the documents with less comprehensible are those with the tag of “Wrong words” and “L1 thought patterns (word-by-word translation)”. The incorrect part in these documents is about selecting an inappropriate word to represent an intended concept and leading to misunderstanding or incomprehensible. From deeper analysis, I found that the incorrect words of these types from most documents were not totally off when translated back to their native language, Thai. The reverse-translation to Thai of the text is understandable though it is hardly understandable in English counterpart, as the chosen translated word does not semantically fit in the context. This shows that English learners did become not aware or realize about homonym (different meaning with the same surface form) in their native language (L1) while trying to translate to target language (L2). Therefore, it conclusively indicates that homonymy of L1 word is one of the cause for misusing English words.

To help students understand about L1 homonym, a confusing word from L1 is a major key. Since this issue is language-dependent, Thai language is specifically investigated in this work as it is a students’ native language. It is noted that the confusing words of L1 homonym in this work is not the same as common confusing word in English learning English because the cause of confusion is not from L2 (the target language, English) but multi-sense from L1 part in students’ thought in writing process. The words in the list are collected from a frequently used Thai word containing many senses and appeared in the above-mentioned corpus causing the error.

The tool is implemented to give hints on L1 homonym once students use a word from the list of confusing words of L1 homonym. The hints in this work include possible translations of the L1 words and collocation statistic of the L2 words. The possible translations of the L1 words are generated from an existing Thai-English bilingual dictionary, LEXiTRON. The confusable word in English show all possible Thai translation words to help them realize that the word is ambiguous in their native language. In addition, those Thai words are attached with

their English translations as a guidance for other possible words in a case that the students do not know about the English translation of a given new sense. This hint is generated in graphical style as word translation relation. Another hint is given in a Pie Chart to inform collocation statistic of the L2 word. This Pie Chart will hint students about how many the chosen word compositions are used in general. It is the fact that if students compose a sentence containing a word with wrong sense, the frequency of those consecutive words will be noticeably low. The Pie Chart is generated in focusing on the confusable word and their surroundings. The statistics are from the hit rate of search engines including Google and Bing. The last hint is Text Hint which generates from suggestions between the word relation of hypernym and hyponym in WordNet. The Text Hint represents to the students as a text in order to provide the most appropriate for the students not to be too general and specific. With these three hints, it is expectable that students will realize and learn the correct word sense from L1 to L2 and select proper word in their English writing.

To evaluate the tool, an experiment to see students' improvement in vocabulary selection and a questionnaire about using the tool were conducted. 210 Thai students in Grade 8 in the same school participated in the experiment. All the students were asked to answer the vocabulary knowledge test which consists ten questions with given multiple choices for the confusable words before doing the main test. The Thai word for the missing part was given to represent intended concept meaning. The Thai word, though, was a confusable L1 homonym, and the choices were the possible translations of the confusable Thai word. When the students conducted the test once, the proposed tool was given to them to change the answer freely. A comparison between the pre-using and with-tool was collected to see the improvement of the answer results. In the testing, the samples were grouped to 14 testing groups. The groups were to find the effect on different hint types from the tool. Moreover, the questionnaire was given after the with-tool experiment for the students to inform feeling about the tool.

The experiment results in overall showed that around 30% of the total answers were adjusted while they used the tool, and about 78% of the changed answers were to change from incorrect to correct answer. Regarding the hint types, the word relation hint performed best to convince them to correct the wrong answer the most, and the Pie Chart hint came in second. A one-way ANOVA was conducted to compare the effect of the hint types. There was a significant effect of amount of hint types at the $p < 0.05$ level for the seven conditions [*Welch's F*(6, 89.723) = 5.199, $p < 0.001$]. Post hoc comparisons using the Games-Howell test indicated that the mean score for the word relation hint condition was significantly different. The results can also be implied that the students with moderate proficiency or lower were more affected by the hints than those with high proficiency. In addition, no case was found in the experiments that the students chose to change from a correct answer to incorrect answer with the given hints. From the results, it showed that the tool can help the students to realize a different in word sense selection based on ambiguity of L1 homonym effectively. Moreover, it can be used to give vocabulary information for the students to learn new meanings of the confusable word.

From the questionnaire, the students mentioned that the hints were effective to give them a clue in their word selection. The Relation of word graph received the best favorite while the word relation came in secondly. 77% of the students found the tool was useful, and their main reason was that it could give extra information of ambiguity in words across languages. Moreover, they stated that the hints of the tool were easy to understand.

In conclusion, this study reveals that homonym from L1 can greatly cause a misusing L2 word in English writing. To solve the issue, the tool is implemented to clarify the ambiguity from L1 with the hints including all word relations of confusable L1 word and Pie Chart of collocation statistic of L2. The word relation hint helps Thai students to be aware of possible meanings of L1 and realize their intended meaning before selecting an English word. The collocation hint assists them to crosschecking a possibility of word compositions and to observe context more carefully after choosing the English words.

Keywords: English as a Foreign Language (EFL), L1 interference, Meaning Selection, Vocabulary Acquisition, Computer-assisted Vocabulary Instruction (CAVI)

Acknowledgements

I am indebted to many people whose guidance and help lead the completion of this thesis especially Associate Professor Dr. Shinobu Hasegawa, my advisor. He dedicates himself with all support and advice to the students with his soul. He paves me a path of the motivation to create and complete this thesis. Every moment of my study, he is not only an advisor but also my ideal model of a researcher. I am very grateful to be one of his students.

I would like to express my sincere to thank all committee members, Professor Dr. Satoshi Tojo, Associate Professor Dr. Le-Minh Nguyen, Associate Professor Dr. Cholwich Nattee, and Dr. Thepchai Supnithi who provide me good suggestions and comment to fulfil my research.

I thank all members of Hasegawa-lab in JAIST and Language and Semantic Technology Laboratory (LST-lab) in NECTEC for working through the adventure of my research journey with their support and suggestion that shows their concern to develop my research.

I thank my family members for supporting and accommodating for my study.

Lastly, I am thankful for the full-time grant on SIIT-JAIST-NECTEC Dual Doctoral Degree Program to provide valuable experience to develop my education learning in Japan to share all knowledge to my beloved country, Thailand.

I will always keep in mind every second of my memory in Kanazawa. Beautiful autumn, exciting winter, beginning of spring, comfortable summer, delicious Sushi (すし) and Oolong tea (烏龍茶), and the generous of Japanese people will always be shared in my mind. Now, my journey in Kanazawa comes to the end but it is always mentioned as my second home forever.

Since B.E. 2560 (A.D. 2017) by Nattapol from Thailand

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List of Abbreviations

ANOVA	Analysis of Variance
CAI	Computer-assisted Instruction
CALI	Computer-assisted Language Instruction
CALL	Computer-assisted Language Learning
CARI	Computer-assisted Reading Instruction
CAVI	Computer-assisted Vocabulary Instruction
CMC	Computer-mediated Communication
CMI	Computer-mediated Instruction
df	Degree of Freedom
Dr.	Doctor
EAL	English as an Additional Language
EFL	English as a Foreign Language
EOL	End of Line
ESL	English as a Second Language
GPA	Grade point average
ICCE	International Conference on Computers in Education
JAIST	Japan Advanced Institute of Science and Technology
L1	First language
L2	Second language / Learned language
LST	Language and Semantic Technology Laboratory
Max	Maximum
Min	Minimum
NECTEC	National Electronics and Computer Technology Center
PhD	Doctor of Philosophy
POS	part-of-speech
S.D.	Standard Deviation
Sig.	Significant
SIIT	Sirindhorn International Institute of Technology
SL	Source Language
SVO	Subject, Verb, and Object
TA	Teacher Assistant
TELL	Technology-enhanced Language Learning
TL	Target Language
TU	Thammasat University

Chapter 1

Introduction

Chapter 1: Introduction

1.1 Motivation

In global communication, English language has been considered as an international language and become one of common studying subject in school all over the world. Apparently, many countries have attempted to promote the learning of English as a foreigner language (EFL) as a part of the standard school curriculum from elementary class. English learning can be unexpectedly difficult for those who have their native language from different language typology because of unfamiliar syntactic structure, semantic sense, phonetic theme, and so on.

In Thailand, we use English as a foreign language and the results of TOEFL iBT Tests score (ETS, 2016) are shown that we are nearly worst 5 score in Asia. Moreover, the average English score from Original National Educational Test in Thailand is decreasing from 2005 to 2015 as shown in Figure 1 (NIETS, 2015). This shows the crisis situation in learning English among Thai students.

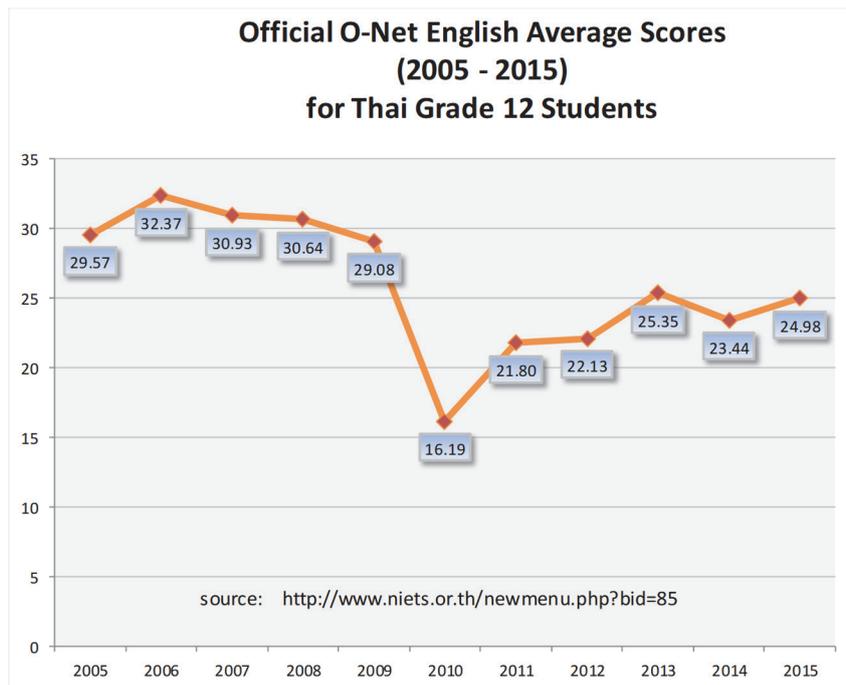


Figure 1 Official O-Net English Average Scores for Grade 12 Thai students

To learn the foreign language is to learn another unfamiliar cultural context since language was derived from culture and environment. There were studies called contrastive rhetoric (Kaplan, 1966) indicating that a person's first language (L1) and culture influence his or her usage in a learned language (L2). It causes an ungrammatical and incorrect in word sense output in his/her writing and speaking. Though the influence affects several aspects of language such as phonetic, semantic, and syntax, the most important problem is word sense ambiguity

since it is very difficult to guess an intended sense if misleading words are chosen based on native culture and language. This issue can be seen that EFL students choose to translate their L1 sentence in a word-by-word translation manner without recognize the difference of word senses in L2. Please see the real-world examples in Figure 2(a) and Figure 2(b).



Figure 2 Actual examples of Thai language influencing on writing in English

From Figure 2(a), the sign describes in the Thai language that “ห้าม เกาะ กระจก [hâ:m kòʔ kràʔ.tə̀ok]” (literally means “do not touch the shelf glass”), but since the word “เกาะ [kòʔ]” is polysemous and has several meanings including island (noun) and attach (verb), the sign-maker chose to use the incorrect sense of English word and made a mistake in English word selection. In Figure 2(b), the sign informs travelers about departure station with the Thai words as “รถไฟ เที่ยวขึ้น [rót.faj thiâv kʰûn]”, but the words “เที่ยว ขึ้น [thiâv kʰûn]” was directly and separately translated to “trip (เที่ยว [thiâv])” and “up (ขึ้น [kʰûn]),” respectively without considering context that these two words together mean “to depart.” Undoubtedly, this kind of errors cannot be comprehensible by other English users from other countries since they do not share the L1 knowledge about the vocabulary polysemy. This issue is one of the common confusing errors found in Thailand since most of the ordinary-used Thai words represent several meanings.

In fact, according with contrastive rhetoric of Kaplan’s study (Kaplan, 1996, 1997, 2000), the issue is caused by cultural difference. The meaning of a word in a language can be different from another. This difference is a cause of confusion to EFL students who hardly understand foreign culture. The problem can be grouped into two types. The first one is the multi-senses of their native word. By memorizing a translation pair, the students rarely realize that their native word contains several senses (homonym) and often choose to use an English translation they know to represent the thought without awareness of difference. The second one is a divergence in a sense scope. It is a fact that each language developed within different culture; thus, fundamentals of word creation are not the same. It is possible that word in a language may not be exactly equivalent but comparable. This issue can affect students in word choosing since the concept of their native word can be broader and vice versa. (Kosawat, Akaraputthiporn, & Aroonmanakun, 2009; Leenoi, Supnithi, & Aroonmanakun, 2009) The

difference in sense scope may lead to confusion in a different translation regarding context. So, the strategy of word to word translation by the EFL students can limit their thought in choosing appropriate English word. With these two issues, the confusion is beyond a single language understanding but knowledge of cross-language conceptualization, and these issues rarely are in concern in English teaching.

Hence, EFL students in a highly different culture, such as Thai, need a specific guidance on the issues. To increase the proficiency of EFL students in Thailand, they are required to realize the difference in word senses of L1 homonym and to consider meaning selection with collocated word. We expect that the tool will help in reducing the confusion in word senses based on L1 multi-sense terms to L2.

1.2 Research questions

In this work, we aim to assist Thai EFL students in terms of vocabulary selection. Since there were little to none work in the past studying in this subject, it is best to find actual source of the problem. We plan to study on English writings of Thai student since writing results are good evidences of their mistakes. Our hypothesis is that the confusing in English vocabulary selection originates from a lack of understanding in L1 senses based on L1 interference and a lack of L2 translation of the unknown senses. In this study, we will analyze the writing results and prove the hypothesis and/or find a source of the errors. Regarding to the found source of errors, we also aim to design a tool for assisting in the writing tasks. Based on the hypothesis about L1 interference, we plan to research into methods of reducing L1 interference. There can be several methods to help in the problem. Hence, we aim to study on effectiveness of each method from usage results made by Thai EFL students. With the above-mentioned statements, research questions of this study are listed as follows:

RQ1: What are the main sources of error in English writing for Thai students?

RQ2: How can we design the assisting tool to reducing main sources of error in English writing for Thai students?

RQ3: How effective is the assisting tool for Thai students?

1.3 Thesis Outline

The rest of this thesis is organized as follow

Chapter 2: This chapter provides background and related works involved in Common Errors in EFL Writing skill of Thai Students. The three obstacles of writing are discussed.

Chapter 3: This chapter dedicates to find an answer to the first research question that is “RQ1: What are the main sources of error in English writing for Thai students?”. The procedure to finding the significance of error type in English writing for Thai students will be discussed in details.

Chapter 4: This chapter explains the main contribution of this thesis: Selecting Proper Semantic Meaning Assisting Tool, which is used to provide three types of the hints for the students, namely, Text Hint, Pie Chart, and Word Relation Graph.

Chapter 5: This chapter presents our main experiment settings, results, evaluation, and discussion of evaluation based on the hint from the prototype.

Chapter 6: This chapter summarizes the entire thesis together with its achievement and contributions. We review our goals and our method proposed in the thesis. We finally present future works and conclude the thesis.

Chapter 2
Literature Review / Background

Chapter 2: Literature Review / Background

2.1 Motivation

In this chapter, theories and related work projects will be presented. Topics in this chapter will be mainly about English language learning for non-English-native speakers. This chapter will also include problems and obstacles in learning and using English for the non-native speakers. Finally, a solution to assist learners in English will be summarized and presented.

2.2 English Learning for non-English native country

In countries that the English language is not used officially, the English language is only taught in school as an additional language for global communication. The English instructed in class is not as strict as a secondary or foreign language as same as other subjects such as mathematics and science. Terms such as English as a second language (ESL), English as a foreign language (EFL) and English as an additional language (EAL) are used to represent the concept. Though these terms may slightly differ in meaning and intention, they are all meant for instructing the English language for non-English-native speakers. Among those, EFL is the most direct concept as learning English outside of English-speaking countries and will be used henceforth to refer to the concept in this thesis.

In EFL, most of the difficulties that learners encounter is a difference of their native language and English (Connor, 1996). A native speaker of Thai will find much more difficulties than a native speaker of French since French is more closely related to English than Thai. It is in fact that a difference of native language (first language or L1) and target language (second language or L2) is the obstruction in learning a foreign language (Svenconis, & Kerst, 1994.).

EFL learners often produce errors of syntax, vocabulary, and pronunciation as a result of the influence of their L1. The examples of the obvious errors are as follows.

- Using L1 grammatical patterns inappropriately onto the L2
- Pronouncing unfamiliar sounds to L1 incorrectly or with difficulty
- Confusing terms and meaning of vocabulary

These errors caused by L1 are known as L1 interference (Kaplan, 1996). Not only the L1 language makes difficulties for learners, but cultural differences in thinking styles and communication habits are also affect their communication. With these issues in combination, we can conclude that the main obstacle in learning the English language is the differences in L1 and L2 language.

2.3 Writing Skill in English Communication

Writing is one of the most troublesome skills in teaching (Pawapatcharandom, 2007). Since a result in writing is an evidence of one's thought, learners have to be careful in the thinking process. As with most languages, written language for technical in English uses a formal register and grammatical pattern, unlike spoken language. Hence, there are more areas to think about than speaking. For instance, mistakes in written language can be obviously detected, and the trend in improving English writing skill is to find errors, and let the learners learn the reason of the errors (Takhom, Trakultaweekoon, Chotimogkol, Porkaew, Na-Thalang, & Supnithi, 2011).

However, the abovementioned errors mostly focused on grammatical types. Another important issue in writing is about idea and concept. These involve in several perspectives in understanding such as choosing vocabulary, systematical thinking and smoothing reasoning. The difficulties in this problem are not only a lack of knowledge from L2, but the L1 interference plays a crucial ambiguity in the task. To sum up for difficulties in this issue (see Figure 3), three major obstacles of writing effectively are as follows.

1. L1 Meaning Selection
2. Incorrect structure based on L1 structure
3. Non-smoothing sentence in topic (Kritsuthikul, Nattee, Supnithi, & Hasegawa, 2012)

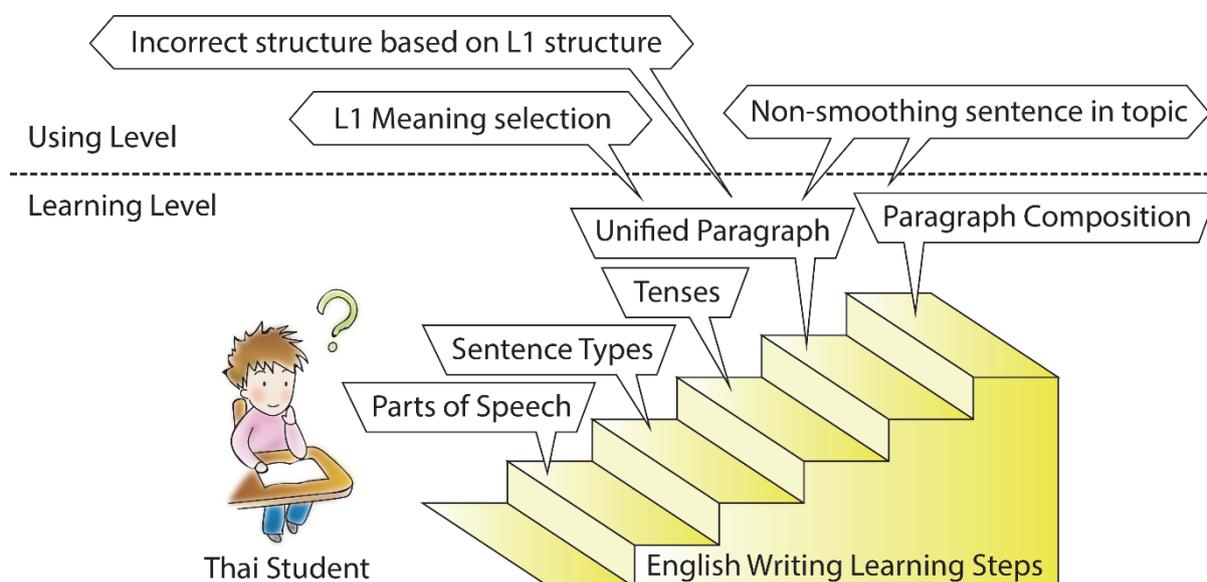


Figure 3 Common Errors in EFL Writing skill of Thai Students

From the figure, a gap in learning and using requires different skills. For example, memorizing vocabulary and its part-of-speech can help learners to know a meaning of the word. However, when using the word, the learners have to understand meanings of the word and choose one among all memorable words to represent their own idea and fit in a context. Moreover, L1 interference can also affect the learners' decision and likely to become unaware

of the L2 sense from chosen words and surroundings. These obstacles are no doubt a core of errors for EFL students, and the root of the troubles is deeper than a difficulty of English language alone but L1-L2 differences.

2.3.1 L1 Meaning Selection

Within a word, many strong and complicated features are resided (Schmitt, 2002; Wesche & Paribakht 2000). Learners may think that learning words involve only learning its pronunciation, spelling, and meaning. However, in fact, such words also include grammatical properties, collocations, and contextual factors affecting their appropriate use (Nation, 2001). From these aspects, the most important ones in writing are meaning and collocations. The meaning of a word constitutes the relationship between the word and a concept while collocations show relations of the word to surroundings. In EFL, the learners have to connect L1 meaning to L2 meaning in choosing the word to represent the concepts. This task requires a high level of understanding of words' aspects from both languages.

For a common language user, knowledge of words may be insufficient to select and use properly even in their L1. Moreover, not all of language users are aware of a word with multiple meanings (homonym). Thus, the meaning of the word is one of the highest difficulties in language learning and usage.

In EFL, the students tend to select an L2 word by directly translating the word that they think of in L1. However, the fact that they tend not to be aware of L1 meanings can cause them to choose an improper L2 word. The improper words are normally generated by L1 word with several meanings, and they translate the L1 word to English with unintended meaning. Please consider the following example. Let us assume that Thai word (L1) has two different meaning and translatable to two respective different English words (L2) as L2A and L2B. The correct translation from the context and intended meaning is L2B, but the student only learns the translation of L2A and never know that L2B is also another meaning of L1. Based on his/her memory, L2A is chosen without a doubt in his/her decision since the student intends to use this L1 word and L2A is its translation.

From the example, the incorrect L2 word is unaware of L1 meaning or not knowing a translation of another meaning. Furthermore, some students who do not excel in meaning may also think that all translations of the same surface word are replaceable so they select a L2 word that they are sure of its spelling. In fact, confusable words of a single language such as a list of homonym can be a base to help in showing students words with multiple senses. In Thailand, there are very few studies about Thai homonym such as (Nagarachinda, & Ratitamkul, 2015). In their studies, a list of homonyms collected from Thai National Corpus (Aroonmanakun, Tansiri, & Nittayanuparp, 2009) is presented. On the other hand, there are many lists of confusable words for English provided in the internet. These resources can be used to educate and exemplify students about sense difference of words in a single language. However, this issue cannot easily be solved unlike the confusable words of the single language since this issue is about the understanding in meaning of both L1 and L2 words.

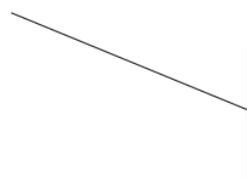
2.3.2 Incorrect structure based on L1 structure

The structure of a sentence is a group of words gathering as the sentence to create the intended meaning. The structure is related to grammars. Thus, the incorrect structure includes grammatical mistakes and may express the wrong intended meaning.

In the Thai language, there is no rule of verb inflection. They can use all the same verb in any time of situation, but in English, we have to change the verb form to suit with the time of situation happens.

Yesterday, I **go** to school

→ Yesterday, I **went** to school

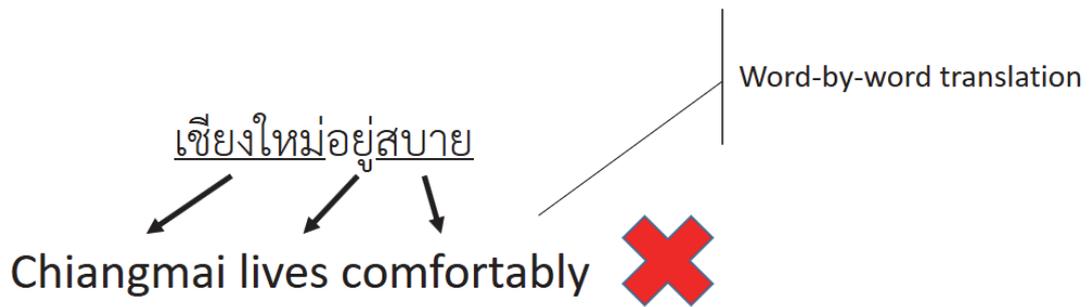


Thai does not have tenses
& No verb inflection in Thai

Figure 4 Incorrect structure based on L1 structure: an example 1

Though this type of error is not serious mistakes, it can create the problem of misunderstanding. However, L1 structure problem is difference because it doesn't make the grammatical errors in the sentences

Moreover, the difference in the culture of the way of thinking is also a problem for this type. In Thai natural language, a grammatical structure is not strict. Hence, a sentence can be made without concerning in a pattern but a composition of meaning words. For Figure 5, an example as “เชียงใหม่อยู่สบาย” - [Chiang Mai-N] [stay-V] [comfortable-ADV] (which literally means “It is comfortable to live in Chiang Mai”) is composed of three words to form an acceptable and used sentence. In detail, Chiang Mai grammatically is not a subject of the sentence, but located in a subject slot in the SVO pattern. Since Thais do not concern on grammar and freely place words without thinking about it. This cultural concept also affects their English composition and results in ungrammatical English writing by the word-by-word translation as *Chiang Mai live comfortably. From the pattern alone, the given sentence is composed of noun, verb, and adverb respectively, and it looks fine to the Thai student. However, Thai student may not recognize that the Chiang Mai cannot perform an action “to live” since this knowledge is not clearly taught in the Thai language since Thai is not strict in grammar. Apparently, this issue is caused by the lack of concern in grammar from Thais' perspective, and its effect apparently displays in written output from Thais.



It is comfortable to live in Chiangmai

Figure 5 Incorrect structure based on L1 structure: an example 2

2.3.3 Non-smoothing sentence in topic

When we write an essay, there are many groups of sentences gathering together as a paragraph to describe what the content is. Every single sentence in a topic will be arranged to generate the student's idea. Smoothing sentence can help the teacher easily sequences the story line as the topic. Therefore, we can imply that non-smoothing sentence in the topic can lead both the student and the teacher misunderstood the intended content.

The sequence of time is one of the examples for non-smooth sentence. Assuming three sentences gathering together to tell the story: (1) "I go to school." (2) "I study Math in the afternoon." (3) "I play football in the morning," the correct order would become the sentence number (1), (3), and (2) respectively.

Another example is non-coherence. Assuming three sentences gathering together to tell the story: (1) "I go to school." (2) "My father likes fishing." (3) "My friend likes playing football," none of these sentences are related together.

Lastly, writing smoothing sentences can help not only the student organizes and generates his/her idea but also the teacher understands the story easier.

2.4 Writing Assistant tools

There were many writing assistant tools in a market. Most of them focus on grammatical and semantic assistant in writing such as Grammarly (Grammarly, 2009), ProWritingAid (Pro Writing Aid, 2012), and MasterWriter (MasterWriter, 2012). However, some tools are designed to assist and solve for specific issues such as SWAN (Na-Thalang, Chotimongkol, & Supnithi, 2010) and EAGLE (Takhom, Trakultaweekoon, Chotimogkol, Porkaew, Na-Thalang, & Supnithi, 2011). In this section, we summarize the tools and compare them as shown in Table

1

Table 1 The tools summarization and comparison

Tool	Assisting aspects	Method	Providing
Grammarly	<ul style="list-style-type: none"> Grammar 	<ul style="list-style-type: none"> Parsing Pattern detection 	An automatic detection and suggestion of ungrammatical chunk in writing piece
ProWritingAid	<ul style="list-style-type: none"> Grammar Vocabulary 	<ul style="list-style-type: none"> Parsing String detection 	An automatic suggestion of focusing on proper and simplified usage of vocabulary
MasterWriter	<ul style="list-style-type: none"> Writing Song composing 	<ul style="list-style-type: none"> Dictionaries such as rhyming dictionary, phrase dictionary, synonym list 	A tool with many available words to choose as word choice
SWAN	<ul style="list-style-type: none"> Content structure Flow of content 	<ul style="list-style-type: none"> Automatic suggestion from predefined patterns and rule 	Template of content and evaluation of fluidity in writing
EAGLE	<ul style="list-style-type: none"> Error in grammar Error in word-sense 	<ul style="list-style-type: none"> Collaboration of teachers and students 	A medium to identify errors and communicate about errors

In details, there are notable tools as follows.

- SWAN - Scientific Writing AssistaNt (Na-Thalang, Chotimongkol, & Supnithi, 2010) is a leading tool aiming to assist a user in writing an academic publication. Its specification is to guide with the contents, not the grammar or spelling. The tool provided a predefined list of necessary contents for each section as a predefined structure of contents. This tool also includes a function for evaluation based on predefined rules. The role of evaluation function is mainly to detect fluidity of the contents. Fluidity represents how well a text flows from sentence to sentence, which helps to connect the content in unison.
- EAGLE - an Error tAGger for Learners of English (Takhom, Trakultaweekoon, Chotimogkol, Porkaew, Na-Thalang, & Supnithi, 2011) is a tool designed for learning from error in grammar and word-sense in writing. EAGLE aims to assist EFL and ESL students to learn from the analysis of their own error to improve their writing. The tool focuses on learning from a mistake by collaboration between teachers and students. The students input sentences into the tool, and the teachers will assign error type(s) from a predefined list as a personal analysis. Students therefore revised the error part and learned a reason of a mistake.

The tools mentioned in the table are all designed to serve in different purposes. Unfortunately, none of all these tools focus on the L1 interference in EFL learning.

2.5 Summary

In this chapter, theories in EFL learning is mentioned and analyzed. The main issue in EFL learning difficulties is about L1 interference. By focusing on writing, we learned that L1 could lead to many difficult circumstances such as L1 Meaning Selection and Incorrect structure based on L1 structure. Moreover, writing tools in the market are reviewed and summarized. However, none of them focus on assisting in L1 interference issue which is a major issue for EFL students.

Chapter 3

Problems of Thai Students in English Usage

Chapter 3: Problems of Thai Students in English Usage

3.1. Motivation

In finding an answer to the first research question that is “RQ1: What are the main sources of error in English writing for Thai students?”, it is necessary to collect many English texts from Thai students and analyze the errors in them. A tool named “New EAGLE” has collected many texts already tagged for errors. A predefined error tag set in the tool was designed to cover several aspects of error including grammar, semantic sense and usage. The data collected from the tool can be considered as sufficient in amount for analysis. The error-tagged English texts are in different genres; thus, this dataset will be a good representative of errors found in general made by Thai students.

The EAGLE tool is a tool designed to annotate found errors in written text with a predefined tag set. The tool aims for students to get feedback from English teacher and to learn to overcome the errors by themselves. The main approach of the tool is a student-centric approach as they perform both practicing and learning from the mistake. However, this approach of the tool led to a great burden for the teacher, and the result showed that the students using the tool were slightly improved.

For greater benefit, a collaborative approach has been suggested nowadays. The approach is famous for several advantages such as greater improvement in learning, and cost-effective, and so on. Accordingly, it should be better if the EAGLE tool has been upgraded into collaborative approach since it will overcome the burden of the teacher and boost up learning for the students. As a result, I decided to upgrade it into the “New EAGLE v3” to include collaborative approach and to use it to collect error-tagged English texts from Thai students.

Although New EAGLE v3 was updated to support collaborative approach, EAGLE’s legacy function is still adequate for collecting statistics and analyzing the writing errors to answer RQ1. In the system point of view, New EAGLE v3 is developed by adding the users’ role concept such as TA (Teacher Assistant), Auditor and so on. The system flow of New EAGLE v2 and its modules are modified to match with the varieties of the users’ role. The size in bytes of New EAGLE v3 is larger than New EAGLE v2 by about 40%. To develop New EAGLE v3 for supporting collaborative approach is only my Minor research project. The main point of this chapter is to find the results of RQ1 not to estimate the efficiency of the collaborative approach. However, I would like to provide brief information of the EAGLE.

3.2 New EAGLE v3

3.2.1 Brief history of EAGLE

The EAGLE (an Error tAGger for Learners of English) tool was first developed under the project funded by NECTEC, Thailand in 2010-2011. It was a field-test prototype and published in CULI 2010 (Na-Thalang, Chotimongkol, & Supnithi, 2010) and ICCE 2011 (Takhom,

Trakultaweekoon, Chotimogkol, Porkaew, Na-Thalang, & Supnithi, 2011). In the first version, it was designed for personal use as a standalone web-based application. The error tag set could be freely designed depending on the interest of a user.

Due to demand as a framework for multi-users, it was re-developed into the New EAGLE version 1 (New EAGLE v1 in short) in the year 2012 by Peerachet PORKAEW who was the one of the developer team of the EAGLE. The New EAGLE v2 supported multi-user and role-based approach. Teacher and student were assigned with a role for different tasks. Moreover, an error tag set designed by an expert was adopted for universal use across the system. A task for the teacher role was to give instruction and error tag to the students' written text. The student role is responsible for writing an English text following an assigned topic.

To apply the collaborative approach, Nattapol KRITSUTHIKUL upgraded it to the New EAGLE v3 shown in Figure 6. Additions and changes include:

- A new role as TA (Teacher Assistant), high GPA students will be assigned by the teacher assistants. TA is responsible for giving comments and assigning error tags on the text of other students.
- Teacher role becomes a supervisor who can give comments to the comments made by TA and contain the same task of TA.
- Students are allowed to access the comments from anyone.

The new role adding in New EAGLE v3 system is TA to give collaborative learning opportunities not only among the students but also between TA and the students as well. Most Thai students are uneasy to consult either directly with the teachers or the tool. These students, especially who have low proficiency in English skill, are slightly worried that such consultation may cause disturbance to their teachers. This affects to reduce the opportunities for learning. Consulting with TA provides a better chance for these students to develop their potential. This concept conforms to the collaborative approach.

Such collaborative approach not only provides good result among the students but also between the students and the teachers. Giving advice about the writing errors to the students, teachers' analysis why the students make this type of error to provide the best suggestion in grammar, syntax, and selecting appropriate word meaning. We called this model as *learning from others' mistakes*. This is a new learning model which will be developed together with the students and TAs. In this model, the teacher will develop an analysis procedure and understand the students' problem. The most beneficial point for the students is to develop their own English writing skill more effective because of receiving the relevant point to improve the skill.

The students can log into EAGLE system for getting teacher's or TA's suggestions to indicate what their writing errors are. After getting the hint for correcting, they can use the EAGLE tool to revise the writing errors as shown in Figure 7. EAGLE tool records students' correction as well as teachers' or TA's suggestion and shows all correcting history for them.

The tool was a part of a project corresponding with Assistant Professor Dr. Saneh THONGRIN^①, Faculty of Liberal Arts, Thammasat University, Thailand. It was used as a tool

^①Assistant Professor Dr. Saneh THONGRIN was awarded an outstanding research in the field of Education for the year 2012 from the National Research Council of Thailand. Her research is "Integrating Thai Collectivist Conventions into EFL Writing Instruction".

to tag errors for an examination in paragraph writing. The data were a collection of an English paragraph summited as an examination for “Paragraph Writing” subject in university level from the year 2005, 2006, 2007, and 2010. A total number of texts are “320” and the content is not limited to any specific domain.



Figure 6 New EAGLE v3 @ <http://language-semantic.org/eagle/>

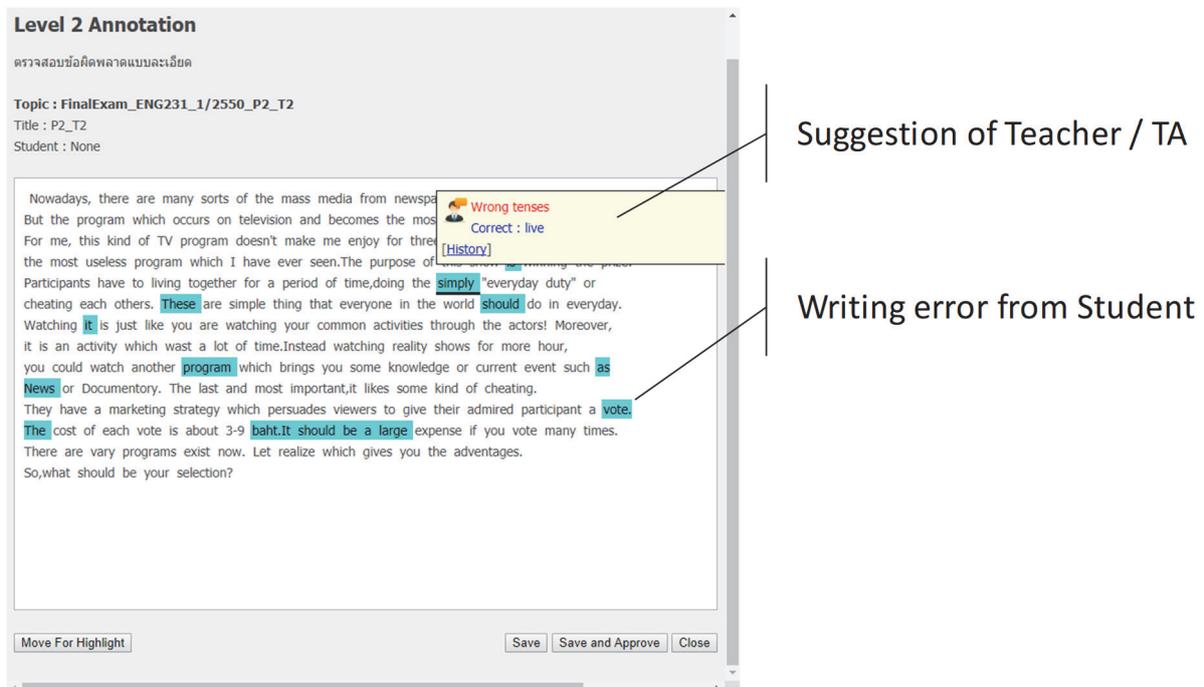


Figure 7 Student views of teacher suggestion for New EAGLE v3

3.2.2 System Architecture

The system architecture is shown in Figure 8. The New EAGLE v3 composes of six main components: Document Management Module, Document Assignment Module, Document Analysis Module, Tag Set Management Module, Error Tagging Module, and Document Exportation Module. The brief details are as follows:

Document Management Module is used to import the text to the system by either uploading a file or directly typing the text in the tool.

Document Assignment Module is used to assign the tag-set to the document.

Document Analysis Module is used to generate the statistical results of tagged documents.

Tag Set Management Module is used to manage the tag-set, including adding more nodes, changing tag names and deleting tags based on a hierarchical tree tag-set approach.

Error Tagging Module is used to tag the documents assigned by the Document Assignment Module.

Document Exportation Module is used to export tagged documents into another format, e.g. WordSmith Tool (Scott, 1996)

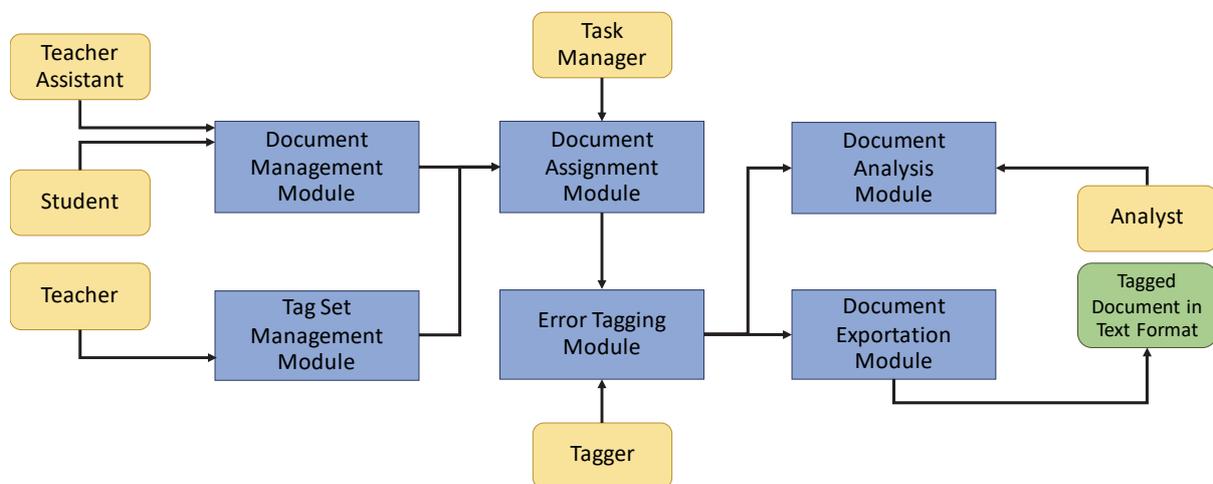


Figure 8 New EAGLE v3 System Architecture

3.3 Analysis to Find Issues of Thai Students in English Usage

3.3.1 English Written Corpus for Analysis

320 articles from the New EAGLE v3 were used as samples to study for errors in English writing of Thai students. The data were the answers of Final examination in Paragraph Writing course for 2nd year undergraduate students in Faculty of Liberal Arts, Thammasat University, Thailand. The data was originated in paper-based before submitting into the tool and were tagged with the error types based on the error tag guideline from Dr. Saneh. Analysts were two experienced linguists from Language and Semantic Technology Laboratory (LST), NECTEC, Thailand. The analysts were Thai native speakers and obtained TOEFL iBT score over 100 points.

3.3.2 Detail of the Corpus

The error tag set was developed by Dr. Saneh based on her experience in English teaching more than ten years. She classifies the error tag set into three main types and sub-types as shown in Figure 9. In the tagging process, both analysts must analyze the texts together and agree in tagging; these error tags were assigned via the New EAGLE v3 tool.

The tag set, however, focuses mostly on a grammatical level such as subject-verb agreement, fragment, wrong determination, and wrong tense. These can be analyzed that they are one of the most frequently found mistakes and affect highly on readability. Moreover, they can easily be detected or noticed since these errors are explicit from surface and composition. However, a little number of tags are for semantic level such as the wrong word. It clearly shows that this issue requires the analysts to realize an intention of the writers' in what to express, but it is difficult in this case since the writers, and the analysts have never been communicated to each other in the process. In conclusion, the tag set heavily focuses on a grammatical level while a semantic level is apparently ignored since it requires the understanding between the writers and the readers.

- 1) Global Comprehension
 - 1.1) Ambiguous meaning (unclear thought)
 - 1.1.1) L1 thought patterns (word-by-word translation)
 - 1.1.2) Logical reasoning
 - 1.1.3) Incomplete ideas
 - 1.2) Paragraph elements
 - 1.2.1) Topic sentence to be added/changed
 - 1.2.2) Supporting details to be added/changed
 - 1.2.3) Concluding sentence to be added/changed
- 2) Major Mistakes
 - 2.1) Sentence construction
 - 2.1.1) Illogical sentence markers
 - 2.1.2) Wrong types of sentences
 - 2.1.3) Fragment (incomplete sentences as a result of verb absence)
 - 2.1.4) Sentence ended based on idea units
 - 2.2) Wrong tenses/voices
 - 2.2.1) Wrong tense
 - 2.2.2) Wrong voice
 - 2.3) Wrong subject-verb agreement
 - 2.4) Wrong noun-pronoun agreement
 - 2.5) Wrong parts of speech
 - 2.5.1) Comparative/superlative forms of adjectives
 - 2.5.2) Noun needed
 - 2.5.3) Adjective needed
 - 2.5.4) Verb needed
 - 2.5.5) Adverb needed
 - 2.6) Lexis
 - 2.6.1) Wrong words
 - 2.6.2) Wrong collocation
 - 2.6.3) Noun-pronoun agreement
 - 2.7) Non-finite verbs needed
 - 2.8) Singular-plural noun/pronoun agreement
- 3) Small Mistakes
 - 3.1) Wrong determination
 - 3.2) Wrong prepositions
 - 3.3) Wrong articles
 - 3.4) Wordy (redundant phrase/clause/sentence)
 - 3.5) Wrong punctuation
 - 3.6) Capitalization needed
 - 3.7) Spelling
 - 3.8) One more space needed
 - 3.9) Word(s) to be deleted

Figure 9 Summary of error tag set taxonomy

3.3.3 Statistics of Corpus and Error Tags from New EAGLE v3

The corpus contained 320 English articles made by Thai students. Each article consisted of around 60 words per article. The found errors, 4,037 errors, were annotated with a tag from the list given in Figure 9. Examples of each tag type are given in Table 4, Table 5, and Table 6, respectively. For statistics, a summary of mistake types with frequency percentage from the corpus is given in Table 2 and Table 3.

Table 2 Summary of frequency in Global Comprehension / Major Mistakes / Small mistakes

Global Comprehension		Major Mistakes		Small Mistakes	
No. of error	%	No. of error	%	No. of error	%
57	1.41	2,377	58.88	1,603	39.71

Table 3 Frequency of Error Tag Set

Error Tag Set	No. of error (Total=4,037)	%
1) Global Comprehension		
1.1) Ambiguous meaning (unclear thought)		
1.1.1) L1 thought patterns (word-by-word translation)	42	1.04
1.1.2) Logical reasoning	8	0.20
1.1.3) Incomplete ideas	0	0.00
1.2) Paragraph elements		
1.2.1) Topic sentence to be added/changed	4	0.10
1.2.2) Supporting details to be added/changed	1	0.02
1.2.3) Concluding sentence to be added/changed	2	0.05
2) Major Mistakes		
2.1) Sentence construction		
2.1.1) Illogical sentence markers	26	0.64
2.1.2) Wrong types of sentences	64	1.59
2.1.3) Fragment (incomplete sentences as a result of verb absence)	210	5.20
2.1.4) Sentence ended based on idea units	28	0.69
2.2) Wrong tenses/voices		
2.2.1) Wrong tense	234	5.80
2.2.2) Wrong voice	56	1.39
2.3) Wrong subject-verb agreement	252	6.24
2.4) Wrong noun-pronoun agreement	211	5.23
2.5) Wrong parts of speech		
2.5.1) Comparative/superlative forms of adjectives	18	0.45
2.5.2) Noun needed	43	1.07
2.5.3) Adjective needed	55	1.36
2.5.4) Verb needed	38	0.94
2.5.5) Adverb needed	4	0.10

2.6) Lexis		
2.6.1) Wrong words	472	11.69
2.6.2) Wrong collocation	40	0.99
2.6.3) Noun-pronoun agreement	1	0.02
2.7) Non-finite verbs needed	252	6.24
2.8) Singular-plural noun/pronoun agreement	373	9.24
3) Small Mistakes		
3.1) Wrong determination	8	0.20
3.2) Wrong prepositions	248	6.14
3.3) Wrong articles	92	2.28
3.4) Wordy (redundant phrase/clause/sentence)	204	5.05
3.5) Wrong punctuation	262	6.49
3.6) Capitalization needed	40	0.99
3.7) Spelling	642	15.90
3.8) One more space needed	92	2.28
3.9) Word(s) to be deleted	15	0.37

Table 4 Examples in Global Comprehension

Error Tag set	
1) Global Comprehension	
1.1) Ambiguous meaning (unclear thought)	
1.1.1) L1 thought patterns (word-by-word translation)	
	<ul style="list-style-type: none"> I don't know how can I give them back as much as I have <u>[gotten. Since]</u> I was born, my family has "protected" me from everything that make me unhappy and support me to be a good person. At least I know that I still have my family beside me all the time. Last and most importantly, diligence makes we succeed in life. Success in life is the ultimate goal of everyone that if we are diligence we shall be successful such as <u>[we are students if we want graduate we must be diligent as a result us to do a good job and good things will follow much more.]</u> <u>[Who have learned and prefix first name Doctor, Professor and Assistant Professor. Who have knowledge it comparison with scholarly.]</u> In addition, it is an important thing that making we have a good job.
1.1.2) Logical reasoning	
	<ul style="list-style-type: none"> Those people living beside the river used water,ate <u>[,some of it used and washed.]</u> Many children had fun. She doesn't reproach her student if her student is wrong but she is talk to them and ask the reason are them when them doing it.In addition,she was kind , when she saw the animals is hungry <u>[and weary,she was share her food]</u> to the animals.With me, when I want the one person is stay with me, I have my mother.She give the love and warmth to me . There make a lot of social problem.In the future campaign possible story may be better <u>[or bad . We must to]</u> follow look in the future
1.1.3) Incomplete ideas	
	<ul style="list-style-type: none"> <i>No example</i>
1.2) Paragraph elements	

- 1.2.1) Topic sentence to be added/changed
- [I agree with this verse that make readers realize the importance of diligence. I think that diligence] brings many good benefits to our life.
 - [I never thought that heaven is not far for me. Until the day I go from here so I know that I am very happy to be here.] When I went away I felt like back to the world of happiness again.
 - [If someone wants me to think of the first woman who always has the warm smile. I knew -- that she loved me the most and always stayed by my side.] No one could ever take your place, she is my mother.
- 1.2.2) Supporting details to be added/changed
- Third should have lamp [on the roads go to the domitary on night] more than now or change light new for old and can't switch on I think it can help save the student's life from an accident from cars on the road too.
- 1.2.3) Concluding sentence to be added/changed
- Thammasat let freedom of dresses. For example, students don't important wear uniform take a lesson, sometime they can casual clothes. Indeed, freedom is signal along together Thammasat that has been happened in the past. Therefore, we don't hold the only piece of paper, [being knowledgeable and moral human is the best.]
 - His thin [red mouth that always gave the word to cheer up French 's soldier, so he can bring the great victory to France. Because of his ambitious, bravery, attemp that brought the completely to his life.]

Table 5 Examples in Major Mistake

Error Tag set
<p>2) Major Mistakes</p> <p>2.1) Sentence construction</p> <p>2.1.1) Illogical sentence markers</p> <ul style="list-style-type: none"> • I felt very worry <u>[that]</u> Can I write paragraph as good as I write free writing at home? And if I can't recollect words, what can I do? So, I tried to recite importance words; transition words, action verb, etc. and I tried to write paragraphs that I made title up for practice by following all learned writing grammars. • Although we are not clever by nature <u>[but]</u> diligent practicing can make us to be more clever than ever. As someone said "Practice is perfect". • Success in life is the ultimate goal of everyone that if we are diligence ^we shall be successful <u>[such as]</u> we are students if we want graduate we must be diligent as a result us to do a good job and good things will follow much more. <p>2.1.2) Wrong types of sentences</p> <ul style="list-style-type: none"> • But how they <u>[can]</u> get that knowledge if teachers didn't give a chance for them? I knew that maybe I shouldn't write about teachers in this way but I have no bad faith. • Some teacher's questions could suspect me. For example, we grow and harvest Thammasat rice because we want to understand farmers' hardship or it just an activity that we do it because of tradition? And <u>[what we've learn]</u> from this activity? Did we really understand farmers' feeling? It's

the question that we have to find the answer by ourselves. And the most depression story of today was the story about people with disability and some teachers of English major in Thammasat (I didn't mean you!!!).

- Everybody have good thing and bad thing in their life, someone use good thing more than bad thing they will success, someone use bad think more than good thing they [will lose.Its teach me to know myself. I think reality TV show have many kind of knowleage more than you think.]

2.1.3) Fragment (incomplete sentences as a result of verb absence)

- “Papa, I wanted to have a new phone, blackberry”, “of course” he said quickly, but it had something which more important than things [was] my good feeling. I don’t know how can I give them back as much as I have gotten.
- [Although] since childhood until now, I rarely read books especially those which have only text and have no pictures.
- For example, we grow and harvest Thammasat rice because we want to understand farmers' hardship or it [just] an activity that we do it because of tradition? And what we've learn from this activity? Did we really understand farmers' feeling? It's the question that we have to find the answer by ourselves.

2.1.4) Sentence ended based on idea units

- When I was young, my grandma often took me to the cloth room where're storing Thai dance dresses and antique things of her. She's an old Thai dance teacher [so] she had many dresses and accessories.
- My mother is kindly heart and [Buddha rectitude. She always likes to] donate some of foods and money to the people who lost benefit of social opportunity.
- She has a very beautiful smiling of fully gentle [when she is the giver more than a receiver status and I remember] that smile because of I had never met any smiling more beautiful than my mother.

2.2) Wrong tenses/voices

2.2.1) Wrong tense

- Suddenly,There was a [handsome guy] came to me and said softy to me"Excuse me, Did you a student of Liberal Arts Faculty?" I replied to him"Sorry,I wasn't,but I lost the way."
- Second, I can improve myself in [studying from] the exercise. To illustrate, in the past,I don't like writing so much because I never do it.
- improve. Last and most improtant, Studying in [class] with a teacher I can ask the question that I don't know.For instance, when I don't understand the lessons I always ask a teacher.

2.2.2) Wrong voice

- Those wind like the air-condition that alway make me feel fresh [even] if in the hottest hour.
- With the [wabcam and] Microphone, you can feel as same as you are at the same place.
- Suddenly, [the lift] was stopped! I turned my face to the left and to the right.

2.3) Wrong subject-verb agreement

- Every individual [works] and group work helped me to improve my writing skill that I can write paragraph fluently in final exam and made me have more logic and inspiration.
 - I think that Thammasat people (teachers and students) [has] changed and Thammasat spiritual has fade from before.
 - Last and most importantly, diligence makes [we] succeed in life.
- 2.4) Wrong noun-pronoun agreement
- That is, diligent people will always do something innovative to develop [itself] indefinitely and made into a person who has a wealth of knowledge.
 - Moreover, diligence makes the people around us love us. For example, [boss] love people who are diligence, teachers love teaching students who are diligent people and husband to love his wife who is diligence. Certainly, if we are industrious we got love from everyone.
 - I like his works because when I read [it,] I can imagine about many things such as scenes, people or atmosphere.
- 2.5) Wrong parts of speech
- 2.5.1) Comparative/superlative forms of adjectives
- In [class] of EG 231.
 - So, it is [hard to] put yourself in front of academic books or get link through cyber course on website.
 - Sometime I usually go to walking with my friend [In the] morning ,sun light very hot but in the evening have wind blow and sound birds. We can see tonpo is very big in the temple, because age old .
- 2.5.2) Noun needed
- Last and most importantly, social networks is [alternative] ways for gain the information and news.
 - I rode it faster and faster, never worried [about] the danger of it.
 - When I play chat rooms on the Internet, I use name is Sara. Also, Chat rooms isn't true and dangerous. [In addition,] Chat rooms on the Internet is used sex for teenagers.
- 2.5.3) Adjective needed
- I know she is tired but never complain it. she always get [up early,] go to the market, back to the home at 9.30 am, go out to sell the sausages all day and back to the home again at 10.30 pm.
 - That is to say, I choose to chat with [my] friends or send e-mail to their, it is faster than send letters.
 - Those wind like the air-condition that always make me feel fresh even if in the hottest [hour. So, I always] feel like I am a little angel who is staying in the heaven.
- 2.5.4) Verb needed
- I actually love my writing table because when I want to study, it will be [a strong] table, but when I fall asleep, it will be the best temporary bed of my world.
 - A dream came true. It was my fault that I didn't put a report in school's [bag] after finished.
 - [We always better] to have a teacher in some certain ways. First, some lesson is difficult to understand.
- 2.5.5) Adverb needed

- Second, It's very economical. For example, In my last summer [at U.S.A, I] saw my boyfriend and my family everyday pass the Web-Camera and spoke pass the microphone in online chatroom for 3 months No doubt, I connected internet by local line phone which completely free but my poor friend, who use the international phonecard, must pay about 100 us dollars for call back home once a week. Last but most least, Online chat can practise you english skill. Icq is my lovely english teacher.
- They [not] only again academic knowledge in class room but also gain life experience outside classroom. In summary , ideal teacher is also my life , my sun and my everything.

2.6) Lexis

2.6.1) Wrong words

- As we can see, the teacher works [heavy] too. She has to gives remarks for every pieces.
- First of all, technology [makes] Thai teenagers [change].
- Thai culture does not [agree with] premarital sex.

2.6.2) Wrong collocation

- The hot weather from the fine that always burn [to boil] bad peoples in the big pan. The sound of crying with the painful.
- Finally, Thai teenager receive the curtire East-Western for example, They [watch movie westen] many people are meeting they are kiss with gentleness this is their curtire.
- After finished the conversation, my [dream vanished. When I] got up, I told this story to my friends.

2.6.3) Noun-pronoun agreement

- The first reason is [teachers will] make the students understand easier.

2.7) Non-finite verbs needed

- I believe that everyone [wish go] to the heaven, and the heaven in your imagination is different.
- I like read cartoonbooks because I [though] that reading cartoonbooks makes me is enjoys person.
- First [of] all, Thai teenagers should diligent more than.

2.8) Singular-plural noun/pronoun agreement

- He [don't be] with us all the time
- Tomorrow, she [have] important test.
- There are [few reasons] to think like that.

Table 6 Examples in Small Mistake

Error Tag set	
3) Small Mistakes	
3.1) Wrong determination	<ul style="list-style-type: none"> • My mother and I talked about everything such as education, health, sadness, happiness. When I [<u>have problem,</u>] I always tell her. • I'm the one who agree with it and I have threereasons [<u>why</u>] social network is useful. • Second reason to support why [<u>Thammasat students</u>] have to study Thai language, that is ,Thammasat University is a famous university of our country, so, the curriculum of learning should give the importance of native language for competition when the time of work came.
3.2) Wrong prepositions	<ul style="list-style-type: none"> • Previously, teacher ever quiz in the class for the students but this class she changed to give works for the students to take home because she want equality to occur in the class [<u>during my friends and me.</u>] • Opposite [<u>the</u>] house, it's the land that have the small office of patrol police locate on, that the place I always have many activities in there with my friends. • She has a very beautiful smiling of fully gentle when she is the giver more than a receiver status and I remember that smile because of I had [<u>never met</u>] any smiling more beautiful than my mother.
3.3) Wrong articles	<ul style="list-style-type: none"> • But I also have learned that study EG231 in AjarnSaneh's class for 4 months helped me wrote fluently and helped me have [<u>a</u>] freedom of thinking more than ever. • First of all, education helps people to have knowledge to live in a society, and if we don't have [<u>a</u>] good education or acknowledgement • I have a little chance [<u>to see</u>] everybody in my family since I live in the formitory.
3.4) Wordy (redundant phrase/clause/sentence)	<ul style="list-style-type: none"> • This place have many people invent every weeks. This place is street for walking on cars or [<u>bicycle. In</u>] font JJ market have BTS ,BMCL and trafficjam. • We give good Knowleages and teach everything story . We kind alway but we should scold student when [<u>mistake . We</u>] teach indoor and outdoor for students learn true sociey beause Students go to outdoor make fun and happy wich learning not boring for example plan travell in environment subject, go to temple in religion subedct etc. • For instance,in teenager who has sex between learing. It effect to [<u>doesn't concentrate with learning. Thus, in the future, students</u>] may haven't quality. Finally, Thai culture does not agree with premarital sex.For example, if people khow a young man who have premerital sex, they will feel bad with this young man.
3.5) Wrong punctuation	<ul style="list-style-type: none"> • Moreover, diligence makes the people around us love us. For example, boss love people who are diligence, teachers love teaching students who are diligent people and husband to love his wife who is diligence. Certainly, if we are industrious [<u>we</u>] got love from everyone.

- All of them make me falling asleep unconsciously and when I wake up [I] can feel the full power inside of me. That small area can give me a big power like it's my life's battery charger.
 - When the rain [fall the] smell of the glass and soil make me feel light like walking in the air.
- 3.6) Capitalization needed
- [my] best dream in my life is can became, what I want to be since I was young, a man who work for international relation job, help miserable people in foreign, and for above of all to gain a national interest.
 - Later day , I sit a time machine more went in the past. I 1840, I met artist in the world that is Leonado [davincy].
 - They don't want to see [siam parakon], There is a same in their country.
- 3.7) Spelling
- We give good Knowleages and teach everything story . We kind always but we should scold student when mistake . We teach indoor and outdoor for students learn true [society] [beause] Students go to outdoor make fun and happy [wich] learning not boring for example plan [travel] in environment subject, go to temple in religion [subedct] etc.
- 3.8) One more space needed
- This place have many people invent every weeks. This place is street for walking on cars or bicycle. In front JJ market have BTS [,BMCL] and [trafficjam].
- 3.9) Word(s) to be deleted
- As a teacher whose [job] is to teach, he should teach indoor and outdoor efficiency.
 - Accordingly, This can affect [Thai] people as a whole. In conclusion , having irresponsible sex has many negative effect on Thai society.
 - He is also advisor very good. He is open mind because we can consult him everytime and [every] problem.

From Table 3, it is noticeable that majority of the mistakes/ errors belongs to a type of major mistakes. The top three mistake types are spelling error, wrong word, and agreement in singularity-plurality, respectively.

For spelling mistakes, this can be regarded as a common mistake. From the fact that the text was originated in paper-based before submitting into the tool, it is natural to misspell a word or make a typo. Moreover, this mistake can be conveniently solved with existing tools and spell-checking function available in almost every sort of word processing software.

As the second top mistake, the wrong word was a lexical level mistake by choosing improper words unfit to the situation. The error is a representation of lacking in vocabulary knowledge of the students. Examples of this error are as follows:

- As we can see, the teacher works heavy too. She has to gives remarks for every piece.
- First of all, technology makes Thai teenagers change.
- Thai culture does not agree with premarital sex.

Since English has its own rhetoric different from a sense familiar to Thai people, the selection of word is also limited to conceptual sense known to Thai. From the first example, the intended meaning should be “works hard” to comply Thai phrase “ทำงาน [tham-ŋa:n] (work - verb)” and “หนัก [nàk] (heavy - adjective)” which together means to work hard. As well as the last example, “agree with” is translated from “เห็นด้วย กับ [hěn-duâj kàp] (agree – verb, accept - verb or acknowledge - verb).” This word from Thai contains several conceptual senses, but the correct translation should be “accept” from the context. Also, Thai students usually have a small number of vocabularies in their memory due to the lack of learning words properly. This easily leads to select a wrong translation for sentence.

The third top mistakes found in these texts are about the agreement in singularity and plurality. The mistakes are not to align on a number of subject and verb. This issue is grammatical level and commonly ignored by Thai students who are usually unfamiliar to plurality since a concept of plurality does not exist in Thai grammar. However, this kind of mistakes is not difficult to solve since several tools include checking for this error as one of their basic function. Examples of this error are given below.

- He don't be with us all the time
- Tomorrow, she have important test.

From the aforementioned mistakes, vocabulary is one of the most interesting issues since it yet cannot be solved systematically. Moreover, an issue of cross-cultural senses is an unsolvable global error for EFL students. EFL students often directly translate such word from Thai, but they do not realize of homonymy when a word can be translated into several words with a different sense. For a pair of English-Thai, a mistake is greatly intensified since Thai is a language with a low number of words and words commonly represent many senses (homonymy). Also, a sense of a word plays a crucial role in readability, unlike agreement in the plurality that can be overlooked. By selecting improper sense of translation, meaning can be wholly different in which is difficult to guess for the correct one.

3.4 Summary

From analyzing the results of mistakes made by Thai EFL students, the most interesting and important issue is about vocabulary in which is the second top mistake type. One of the cause of mistakes in vocabulary selection is the interference from the first language since students naturally select a method of translation word-by-word. For the Thai language full of homonymy, a translation can lead to choosing improper English words without realizing a different in a sense. Moreover, the mistake is one of majority issues that causes confusing in comprehension and significantly lowers the readability of a writing output. The next chapter will discuss the development of assisting tool in details.

Chapter 4

Selecting Proper Semantic Meaning Assisting Tool

Chapter 4: Selecting Proper Semantic Meaning Assisting Tool

4.1 Motivation

The aim of this chapter is to discuss the development of Selecting Proper Semantic Meaning Assisting Tool. It explains how to design and develop the tool inspired by finding the result of previous chapter leading to answer RQ2: “How can we design the assisting tool to reducing main sources of error in English writing for Thai student?”.

This chapter is an updated and improved version of the previous work as follows:

1. Nattapol KRITSUTHIKUL, Shinobu HASEGAWA, Cholwich NATTEE, and Thepchai SUPNITHI: Assisting Tools for Selecting Proper Semantic Meaning by Disambiguation of the Interference of the First Language, Workshop Proceedings of the 22nd International Conference on Computers in Education (ICCE 2014), Nara Prefectural New Public Hall, Nara, Japan, November 30 - December 4, 2014, pp. 609-615.

4.2 Background

In this section, we split the contents into two parts, i.e. related theories and related works.

4.2.1 Related Theories

There was a theory called contrastive rhetoric (Kaplan, 1966) explaining on how a person's first language and culture influence his or her writing in a learned language. The term was introduced by Robert Kaplan in 1966 (Kaplan, 1966) and widely expanded and studied further by Ulla Connor (1987, 1996, 2002, 2004). It claims that learners' first language and culture has a significant impact on the perception of writing in learning English in a non-English speaking country. Thus, the writing work of learners reflects from the native language and leads to unaware mistakes in their English output. The errors in senses of chosen words often come from the direct translation of L1 without realizing the sense of the word unfitting to the context.

However, the ambiguities in word sense from an interference of L1 do not include those errors from other types of confusion within a language. Regarding vocabulary issue in EFL and ESL, words likely to be confused can be grouped into three kinds (Diana & Sommers, 2016) as homophones, homographs, and homonyms. The first one is the homophonic issue. The homophone is a word that sounds the same or very similar as another word but gives a different meaning and spelling. These words may be confused and misused in students' writing. The second issue is homograph, a same spelled word with different meaning. This issue is not a problem in writing but may show an effect on pronunciation for learners. The last one is homonym, a word with same spelling and pronunciation with several meanings. These words

are prone to be mostly incorrect for language users if they are not aware of word sense and part-of-speech.

With the interference of L1, learning L2 becomes trickier since the homonym of L1 can be brought over to L2. EFL learners not only have to memorize a large number of vocabulary pairs in the spelling of L1-L2, but also have to understand vocabulary sense and cultural aspect of vocabulary (such as usage restriction and words often used together). Hence, competency in vocabulary learning is that how much the learners conceptualize word senses and how to use a correct sense based on different situations.

4.2.2 Related Tools and Works

In vocabulary learning, several tools have been suggested such as flashcard, dictionary, games (crosswords or hangman or multiple-choice), computer based software, and so on. Most of them provide a list of vocabularies in L2 and translated term (L1) for learners to memorize. Hence, their main aim is for the learners to recognize a massive amount of vocabularies with their translation as a pair. We can roughly classify them into groups as shown in Table 7.

Table 7 A summary of related tools and work in EFL vocabulary learning

Name	Type	(C) Computer / (M) Mobile-based	Hint	Flashcard	Dictionary	Games	Collocation	Semantic Structure	L1 to L2
(Nara, 1994)	CARI	C			<input type="radio"/>		<input type="radio"/>		
(Ratz, 2015)	CAVI	C			<input type="radio"/>				
(Milton & Cheng, 2010)	CALL	C	<input type="radio"/>				<input type="radio"/>		
(Svenconis & Kerst, 1994)	CALI	C			<input type="radio"/>			<input type="radio"/>	
(Alam, 2007)	CAVI	C			<input type="radio"/>	<input type="radio"/>			
(Basoglu & AKDEMIR, 2010)	CAVI	M		<input type="radio"/>					

(Sun, Huang, Liu, & others, 2011)	CAVI	C			○	○		○	
(Groot, 2000)	CAVI	C	○		○	○			
(Cobb, 1999)	CAVI	C					○		
(Goodfellow & Laurillard, 1994)	CAVI	C		○	○		○		
(Vtrain, 1999)	CAVI	C		○				○	
(Hot Potatoes, 1998)	CAVI	C				○			
The Compleat Lexical Tutor (Cobb, 2004)	CALL	C		○		○	○		
This Work	CAVI	C	○		○		○	○	○

Nara (1994) proposed a method to help the students understanding any Japanese word or kanji with the full contextual information. The method was applied the collocations of word to implement the user's need for monitoring progress and maintaining a sense of organization about their knowledge skill areas. In the formative evaluation, it showed that students who exhibited high monitoring skills of their learning activities tended to perform better.

Ratz (2015) studied the evaluation on the use of the Moodle glossary to support vocabulary learning in the modern language classroom. They concluded that technological support was necessary to encourage students to make more contributions with each other.

Milton and Cheng (2010) proposed a resource-rich toolkit that helped EFL writers to write accurate and fluent English. The tool identified lexico-grammatical errors by matching patterns gleaned from learners' texts. The demonstrate techniques could help L2 writers acquire accuracy and fluency in written English and develop life-long writing habit in the L2. Online resources, this helped students and teachers to put L2 writer at the center of the writing process by making learner accountable.

Svenconis and Kerst (1994) studied the evaluation of the effectiveness of using a hypertext/hypermedia environment for the teaching of second-language vocabulary in a semantic mapping format. The results showed that a well-crafted hypertext program promoted effective retention and recalled of the words.

Alam (2007) proposed software, multi-user, and multi-platform system, for learning English vocabulary on the Internet. It provided a graphical display of goals for the student and a simple means of preparing, editing exercise and modifying for the instructor. The system had proved to be a useful tool in teaching second-language vocabulary with several strengths including a design as a multiuser and multi-platform system.

Basoglu and Akdemir (2010) used the mixed-method research design of using vocabulary learning programs in mobile phones on students' English vocabulary learning. The

results indicated that using mobile phones as a vocabulary learning tool was more effective than one of the traditional vocabulary learning tools.

Sun and colleagues (2011) proposed a method to find Near-Synonyms and Similar-Looking words (NSSL) and investigated whether NSSL matching exercises could increase Chinese EFL learners' awareness of NSSL words. The results showed that the method extracted suitable NSSL words whose meaning EFL learners might confuse. It also showed that the system was practical for language learning and increased students' awareness of NSSL words.

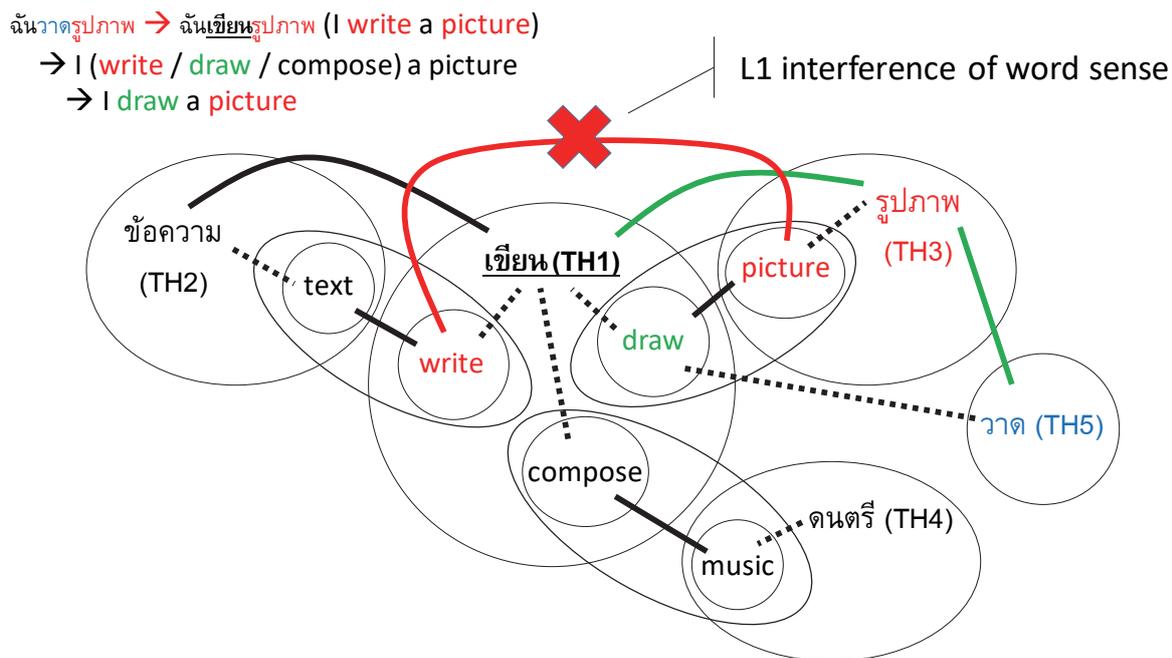
Many studies (Groot, 2000; Cobb, 1999; Goodfellow & Laurillard, 1994) have applied that multimedia media could be profitable in vocabulary acquisition. In the studies, they compared their effectiveness between paper-based vocabulary instruction and the computerized vocabulary instruction.

These learning tools eventually accomplish their goal. All of them can greatly serve for memorizing translation input to learners' cognition. In details, using a flashcard, in either physical or virtual form from software, provides a pair of translation of L1-L2 and may also give extra information such as pronunciation, etymology and usage example. A bilingual dictionary also supplies for lexical information in translation pairs with several details. One disadvantage of the dictionary is that there is an excessive amount of vocabularies to look for. Some dictionaries may annotate a symbol to notify learners for common words for learning, but the number is still too large and difficult for learners to scope for lexicons matching to their current level. The application of games is good as they are entertaining and motivate learning, but current games mostly focus on memorizing and recalling words rather than proper usage in context.

In summary, current works in vocabulary learning set their goal for learners to memorize and recall words with translation. However, vocabulary usage is not only how many translation pairs ones can use, but also properly use based on contextual sense and intention as a communicative output. Furthermore, none of abovementioned tools or works concern on homonymy of L1 that implicitly confuses learners in the use of L2.

4.3 System Requirements and Design

To help the students aware of the differences in word meaning, reminder of L1 interference, and appropriate word, not too broad and too narrow, we design the system requirements by analysis these issues by an example, shown in Figure 10, in Thai (L1), the word “เขียน” (TH1) can be applied with the word “ข้อความ” (TH3) and “รูปภาพ” (TH2). From L1's understanding, the students will attempt to communicate in English (L2) as “เขียนรูปภาพ” (TH1 TH3) by thinking that translating word-by-word as “write a picture” correctly and similarly to L1. However, the fact is “write” cannot be used for “picture”. This case is called L1 interference of word sense.



Note: The solid line can be applied together. The dashed line is the L2 translation.

Figure 10 An example of L1 interference of word sense

Analysis from the diagram is concerned about the three awareness.

As L1 Interference awareness, the word “เขียน” (TH1) has three possible L2 translations as “write” “draw” “compose” In English, these words are totally different both in use and meaning. In Thai, the word “เขียน” (TH1) is shared common concept shown in Figure 11. Because of sharing common concept in Thai, this is the main source of confusion in L1 interference of word sense. Such information is not collected, so we propose Confusing Word lists of L1 translation as L1 interference knowledge.

ฉันวาดรูปภาพ → ฉันเขียนรูปภาพ (I write a picture)
 → I (write / draw / compose) a picture
 → I draw a picture

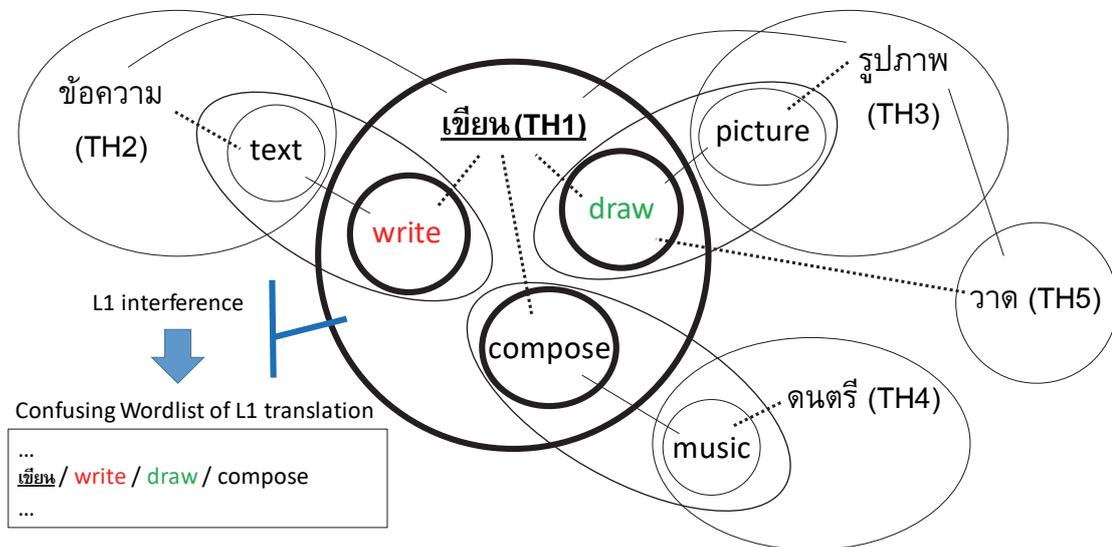


Figure 11 L1 Interference Knowledge

Differences in word meaning are to find out the meaning and the occurrence of words. The meaning is from L1 to L2 dictionary. The occurrence is from sentence examples. To understand the use of occurrence is to practice and observe it. Nowadays, a search engine is one of the collections of co-occurrence by an example in Figure 12. In the search engine, the common co-occurrence will result in more hit rates as “write” and “text” get more hit rate than “write” and “picture,” and “write” and “music.” All co-occurrence words with the main word are required to group and apply n-gram model for estimating maximum hit rate. The low hit rate is showed disjoint similar concepts. The n-gram model is played in the role of composing all combination of co-occurrence. The result from the search engine, hit rate, can be applied as one of information to aware the differences in word meaning.

ฉันวาดรูปภาพ → ฉันเขียนรูปภาพ (I write a picture)
 → I (write / draw / compose) a picture
 → I draw a picture

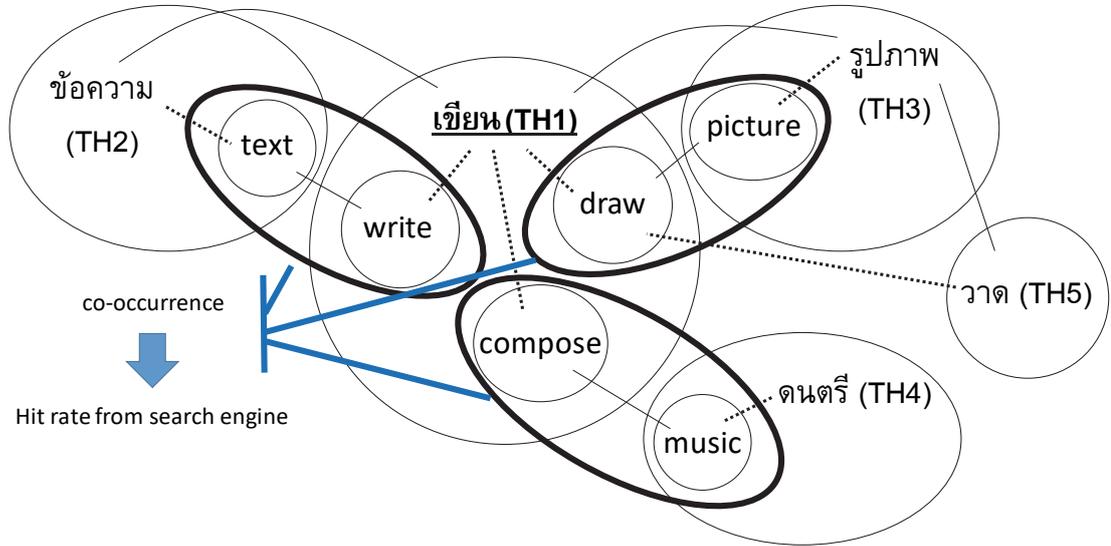


Figure 12 Appropriate Word Knowledge

To be aware of the students to choose an appropriate word, not too broad and too narrow, the relationship of hypernym and hyponym is required. This kind of information is available in WordNet (Princeton University, 2010). From Figure 13, we can find hypernym and hyponym from WordNet of these three words, write, draw, and compose.

ฉันวาดรูปภาพ → ฉันเขียนรูปภาพ (I write a picture)
 → I (write / draw / compose) a picture
 → I draw a picture

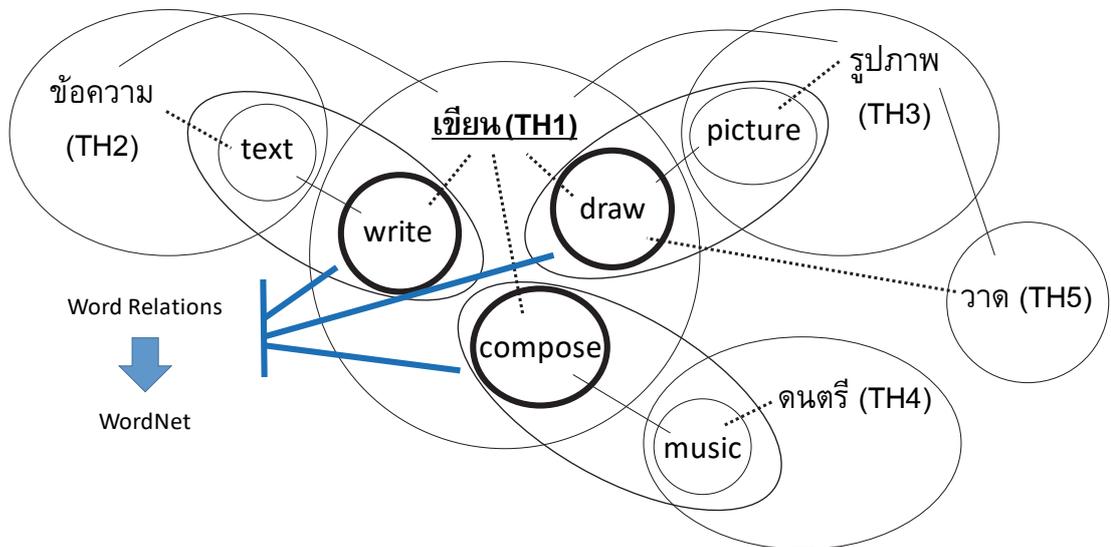


Figure 13 Word Relations Knowledge

Last but not least, lack of vocabulary knowledge is mandatory for EFL students. Although bi-lingual dictionary shows a list of word sense, each language in word concept is not exactly equivalent. Hence, language overlapping influences in each language in word sense not equivalent. The selection of appropriate word sense requires the understanding between L1 and L2 which is rarely difficult for EFL students. Bi-directional translation (Leenoi, Supnithi, & Aroonmanakun, 2009) is one of the algorithms that can be applied to reduce language overlapping. It is to limit only word sense that has the same meaning between L2 and L1. Thus, a bilingual dictionary for L1-L2 and L2-L1 is required to accomplish L1-L2-L1 information for this approach. Such kind of information is available in LEXiTRON (NECTEC, 1995), bilingual corpus-based dictionary, which is provided 53,217 unique word concepts with difference 83,683 word senses for L2-L1 (English to Thai) and 43,112 unique word concepts with difference 51,612 word senses for L1-L2 (Thai to English).

From the above analysis, it is classified as three hints considering from the essential requirement for students, Text Hint, Word Relation Graph, and Pie Chart, as mentioned in Table 8. Text Hint is designed to aware the students about broader and specific in meaning. While Word Relation Graph is designed to aware the lacking in vocabulary knowledge, Pie Chart is to aware the disjoint of similar concepts.

Table 8 System Requirements and Design

Hint Type	Awareness Type	Knowledge
Text Hint	Broader and specific in meaning	WordNet, n-gram model, and hit rate from search engine
Word Relation Graph	Lacking in vocabulary knowledge	Bi-directional dictionary (L1-L2-L1)
Pie Chart	Disjoint similar concepts	n-gram model, and hit rate from search engine

4.4 System prototype

This work aims to improve students' vocabulary learning by providing hints of sense selection. Regarding the section mentioned above, we attempt to disambiguate a vocabulary cognition affected from L1 influence in learning English (L2). Thus, the hints will include the semantic relation of the words in question and statistical information of their collocated words. The system architecture is illustrated in Figure 14.

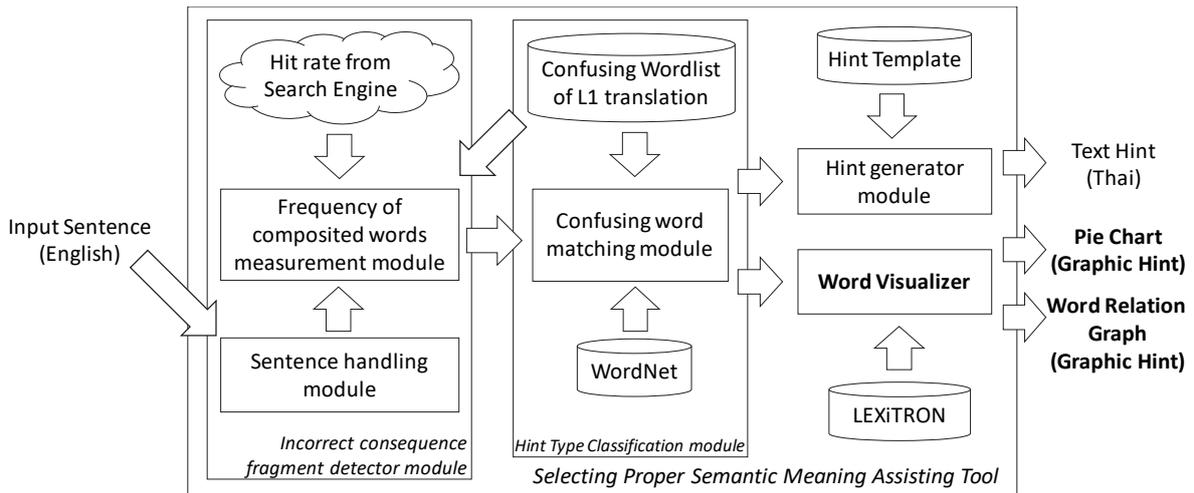


Figure 14 System architecture of the proposed system

The system is developed as a web-based application using HTML, CSS, ECMAScript as front-end web-based programming language, PHP for server-side script language, and MySQL as database engine.

4.4.1 Sentence handling module

This module gets an input as a digital English sentence made by EFL Thai students. To find an incorrectly semantically used English word in a sentence, words are chunked with the n-gram model with Laplace Smoothing (Liu, Gales, & Woodland, 2009). The system divides the sentence into a group of consequent fragments. For example, an input sentence from a student is “I write a picture.” It will be assigned in n-gram model as given in Table 9. In this work, we skip unigram out since we focus on word sense within contexts.

Table 9 An n-gram model of the sentence “I write a picture”

n-gram	consequent fragments			
	1 st -word	2 nd -word	3 rd -word	4 th -word
4	I	write	a	picture
3 #1	I	write	a	
3 #2		write	a	picture
2 #1	I	write		
2 #2		write	a	
2 #3			a	picture

4.4.2 Frequency of composited words measurement module

To acknowledge with the words with an inappropriate semantic meaning within the sentence, hit rate (Number of the search result) from search engines (e.g. Microsoft Bing, Google, and so on) is employed as a concordance for measurement (Kilgarriff & Grefenstette, 2003). Since the less frequency the words are used in co-occurrence, the more chance they are incorrectly composed with the wrong semantic meaning together according to many paper works (Ando, Furukawa, & Tsunashima, 2009; Beyer & Stein, 2014). The rate is assigned to every roll. In the fact that, we cannot imply that the hit rate from the most popular search engine is the best result. Thus, we used average hit rate from Google and Bing. As a result, from Table 9, the hit rates of their responding consequent fragments are exemplified in Table 10.

Table 10 Hit rates of each gram by using Bing and Google

<i>n</i> -gram	consequent fragments				Hit rate	Hit rate	Average
	1 st -word	2 nd -word	3 rd -word	4 th -word	from Bing	from Google	
4	I	write	a	picture	6	22	14
3 #1	I	write	a		5,970,000	31,800,000	18,885,000
3 #2		write	a	picture	4,220,000	32,100,000	18,160,000
2 #1	I	write			10,100,000	83,700,000	46,900,000
2 #2		write	a		13,700,000	279,000,000	146,350,000
2 #3			a	picture	12,100,000	206,000,000	109,050,000

From Table 10, according to extremely low hit rates from both Bing and Google for *n*-gram where *n* = 4, it is assumed that *n*-gram where *n* = 4 is incorrect. Moreover, *n*-gram where *n* = 3 starting from “write” (3 #2 roll) also gets a remarkably low once compared to other hit rates. With the results, we find the common among low hit rated search and acknowledge that “write a picture” is incorrect and not used in general.

4.4.3 Confusing word matching module

Once the consequent fragments are found with low hit rate, each fragment is examined through the Confusing Wordlist of L1 translation. (see detail on section 4.3.4) For each L1 word, if there are several senses and lead to several translations, we group translated words in L2 of the L1 together since they can represent a confusable pair when students attempt to generate an L2

sentence. Examples of dictionary data are exemplified in Table 11. An example of Confusing Wordlist of L1 translation is shown in Figure 15.

Table 11 An example of translated words in L2 of the L1

L1 (Thai)	L2 (English)
เขียน	<ul style="list-style-type: none"> • write • paint • draw • compose
ทันสมัย	<ul style="list-style-type: none"> • modern • trendy • fashion • up to date
...	• ...

1.	เขียน / write / paint / draw / compose
2.	ทันสมัย / modern / trendy / fashion / up to date
3.	คน / human / citizen / stir / inhabitant
4.	ดัง / resound / boom / well known / loud
5.	เก็บ / collect / store / put away / preserve
6.	หยุด / break / end / absent / shut
7.	เดิน / travel / walk / move / transport
8.	เสีย / dead / broken / lose / spoiled
9.	...

Figure 15 An example of Confusing Wordlist of L1 translation

From Figure 15, each line contains the words all of which can be translated into the same Thai word. For example, line#1 contains four words which are compose, draw, paint, and write. These four words, once are mentioned as the Thai language, represent in the same word as “เขียน.” The Thai word is polysemy of those four words as translation and can cause English learners to be confused when they made an attempt to express an English sentence with those concepts.

With words given in Confusing Wordlist of L1 translation, an example from Table 10 is found with the word in given in line#1 from Figure 15 therefore the system attempts to replace the first found word with the given alternative words in the list and re-do the Frequency of composited words measurement module with replacing word “write” with word “paint”, “draw”, and “compose”, we gain the result demonstrated in Table 12 only for low hit rates from the prior.

Table 12 Hit rate after replacing the confusing word

<i>n</i> -gram	consequent fragments				Hit rate	Hit rate
	1 st -word	2 nd -word	3 rd -word	4 th -word	from Bing	from Google
4	I	paint	a	picture	129,000	473,000
3 #2		paint	a	picture	664,000	8,530,000
4	I	draw	a	picture	272,000	669,000
3 #2		draw	a	picture	4,770,000	9,850,000
4	I	compose	a	picture	21	169,000
3 #2		compose	a	picture	89,900	400,000

From comparing the hit rate with new words, we found that the highest rate “draw a picture” obtains much higher hit rate ratio than the original sentence.

4.4.4 Confusing Wordlist of L1 translation

The Confusing Wordlist of L1 translation have 84 sense groups which is collected from internet such as web board and social network. The confusing wordlist in this paper mainly focus on native language (L1) translated to not exactly equivalent to second language (L2) but comparable. Because of the identity of each language, it is necessary to be based on native confusing wordlist to provide a better understanding to the students. It is noted that the wordlist in this work is not the same as common confusable words in L2 learning because the cause of confusion is not from L2 but multi-sense from the L1 part in the students thought in their writing process.

Figure 16 shows a file format specification of the Confusing Wordlist of L1 translation applied in the system. Each line is a sense group consisting of SL: Source Language, / (forward slash) and TL: Target Language respectively. TL should have at least one word having accordant meaning with SL. If a TL word is not found, the system will skip that line. Inserting part-of-speech (POS) in each word, SL, TL is an optional. POS can be mentioned after the sign “@” and follow with the roles of POS, as v (Verb), n (Noun), adj (Adjective) and adv (Adverb). Without mentioning the roles of POS, the system will analysis as any of POS.

```

SL1[@POS] / TL1[@POS] / TL2[@POS] / TL3[@POS] / ... <EOL>
SL2[@POS] / TL4[@POS] / TL5[@POS] / TL6[@POS] / TL7[@POS] / ... <EOL>
SL3[@POS] / TL8[@POS] / TL9[@POS] / ... <EOL>
.
.
.

```

Figure 16 Confusing Wordlist of L1 translation file format specification

An example of POS, it is shown in Figure 17. If POS of SL is mentioned same as POS of TL like No. 3, the system will analysis only the TL which have the same POS as SL; human, citizen and inhabitant.

```

1. เขียน@v / write@v / paint@v/ draw@v / compose@v
2. ทันสมัย@adj / modern@adj / trendy@adj / fashion@n / up to date@adj
3. คน@n / human@n / citizen@n / stir@v / inhabitant@n
.
.
.

```

Figure 17 Example of Confusing Wordlist of L1 translation file with POS

If there are more than one groups of L1 redundancy, the system will automatically choose only the first group found. An example of this case is shown in Figure 18. The system will choose SL1 (TL1, TL2, TL3) instead of SL1 (TL100, TL101) because SL1(TL1, TL2, TL3) was firstly found.

```

SL1 / TL1 / TL2 / TL3 / ... <EOL>
SL2 / TL4 / TL5 / TL6 / TL7 / ... <EOL>
.
.
.
SL1 / TL101 / TL102 / ... <EOL>
.
.
.

```

Figure 18 Example of redundancy in Sense Group

If there are more than one L2 word redundancies in any group, the first group consisting of this redundancy word will be used. An example of this case is shown in Figure 19. The system will choose SL1(TL1, TL2, TL3) instead of SL99(TL201, TL1, TL202, TL203) because SL1(TL1, TL2, TL3) was firstly found and SL99(TL201, TL1, TL202, TL203) was ignored and not loaded in the system.

```

SL1 / TL1 / TL2 / TL3 / ... <EOL>
SL2 / TL4 / TL5 / TL6 / TL7 / ... <EOL>
SL3 / TL8 / TL9 / ... <EOL>
.
.
.
SL99 / TL201 / TL1 / TL202 / TL203 / ... <EOL>
.
.
.

```

Figure 19 Example of redundancy in TL Word Sense

4.4.5 Hint generation module

To give a text suggestion with reason, WordNet (Princeton University, 2010) is exploited to this work to show a relation between a written word and a correct word. An example of this case, “write” as a written word and “draw” as a correct word, is shown in Figure 20.

...

Sense 18
draw -- (write a legal document or paper; "The deed was drawn in the lawyer's office")
=> write, compose, pen, indite -- (produce a literary work; "She composed a poem"; "He wrote four novels")
=> create verbally -- (create with or from words)
=> make, create -- (make or cause to be or to become; "make a mess in one's office"; "create a furor")
Also See-> ... up#4
...

Too general term Hypernym of word 'draw (v)' from WordNet

Figure 20 Example of Extract relationship from WordNet

The relation between the written word and the correct word is used from the relation of WordNet and categorized into three cases as shown in Table 13.

Table 13 List of all cases to apply the template

Case	Condition
1	<p>If the written word is a hypernym by WordNet of the word returning better Hit rate, the template which mentions the word in use is “too general term” will be shown.</p> <p>The Hint Template of “too general term” both in Thai and English are as follows: TH: คำว่า “\${word}” เป็นคำที่มีความหมายกว้างเกินไป ขอให้พิจารณาคำศัพท์อื่นครับ EN: The word “\${word}” has a broad meaning. Please consider another word.</p>
2	<p>If the written word is a hyponym by WordNet of the word returning better Hit rate, the template which mentions the word in use is “too specific term” will be shown.</p> <p>The Hint Template of “too specific term” both in Thai and English are as follows: TH: คำว่า “\${word}” เป็นคำที่มีความหมายแคบเกินไป ขอให้พิจารณาคำศัพท์อื่นครับ EN: The word “\${word}” has a specific meaning. Please consider another word.</p>
3	<p>If both words are not related within WordNet, only the suggested words are given as a possible better word based on the Confusing Wordlist of L1 translation.</p> <p>The last Hint Template for this case in Thai and English are as follows: TH: คำว่า “\${word}” เป็นคำที่มีได้หลายความหมาย ขอให้พิจารณาคำศัพท์อื่นครับ EN: The word “\${word}” has much meaning in one word so please consider other words.</p>

From the example of the too general term, the template of the too general term is chosen. The system will look up for the template variable, \${word}, and replace with a value of the input word from the sentence. For this case, “write” is replaced as \${word}. the result is mentioned in Figure 21.

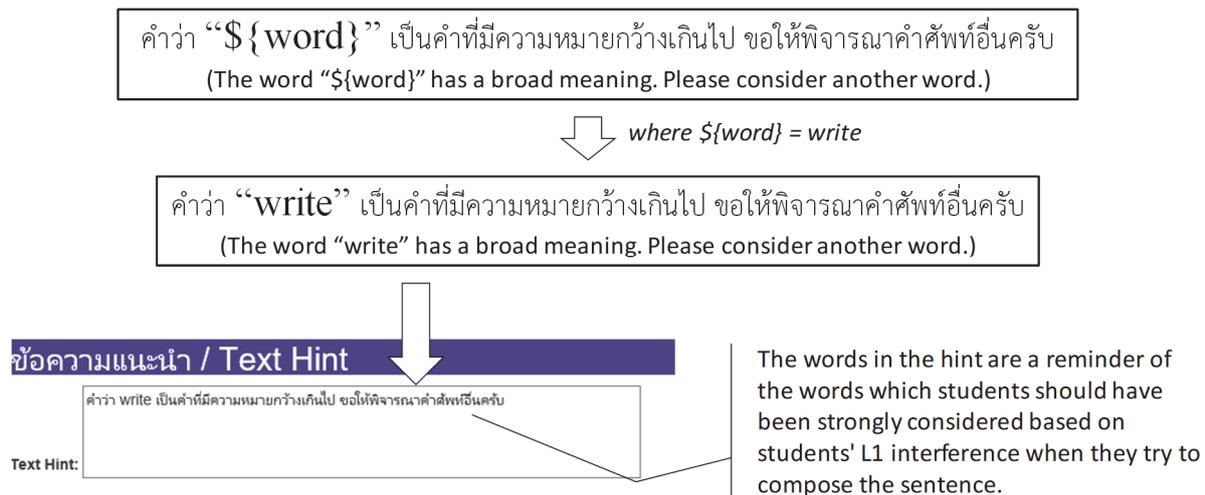


Figure 21 Example of Text Hint for “too general term” in the tool

4.4.6 Word Visualizer

4.4.6.1 Word Relation Graph

To provide an ambiguity of word senses, we generate a graphic image of sense relations based on L1 homonyms. According to an entry in a bilingual dictionary (NECTEC, 1995), we collect data of surfaces and find the word. Since some of the lexical entries may not describe identically but in details such as description or words in compound form, we expect these details can impulse the doubt in a conceptual sense and lead to more understanding in its specification in learners' cognition. Thus, a network of surfaces from L1 to L2 to L1 (Figure 22(b)) is made for every entry in graphical using D3.js (open source JavaScript library for manipulating documents based on data) (D3.js, 2011). An example of a sense network is illustrated in Figure 22(a).

กราฟความสัมพันธ์ของคำ / Word-relation graph

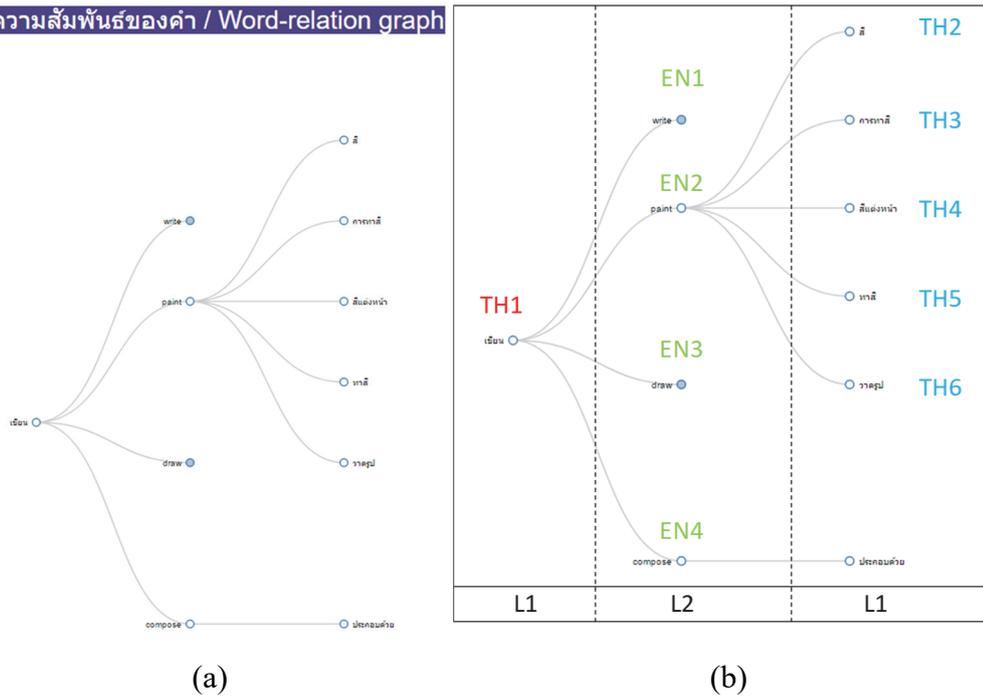


Figure 22 Graphic Hint - Word Relation Graph

An example of the method of generate Word Relation Graph is to use the sentence “I write a picture” as an input sentence.

Step 1) Input sentence is used to search every single word of confusing wordlist of L1 translation which will be found the word “write” in “เขียน” (TH1) / write (EN1) / paint (EN2) / draw (EN3) / compose (EN4) to be as TH1(EN1, EN2, EN3, EN4). So, TH1 is used as the root of Word Relation Graph. (see Figure 23)

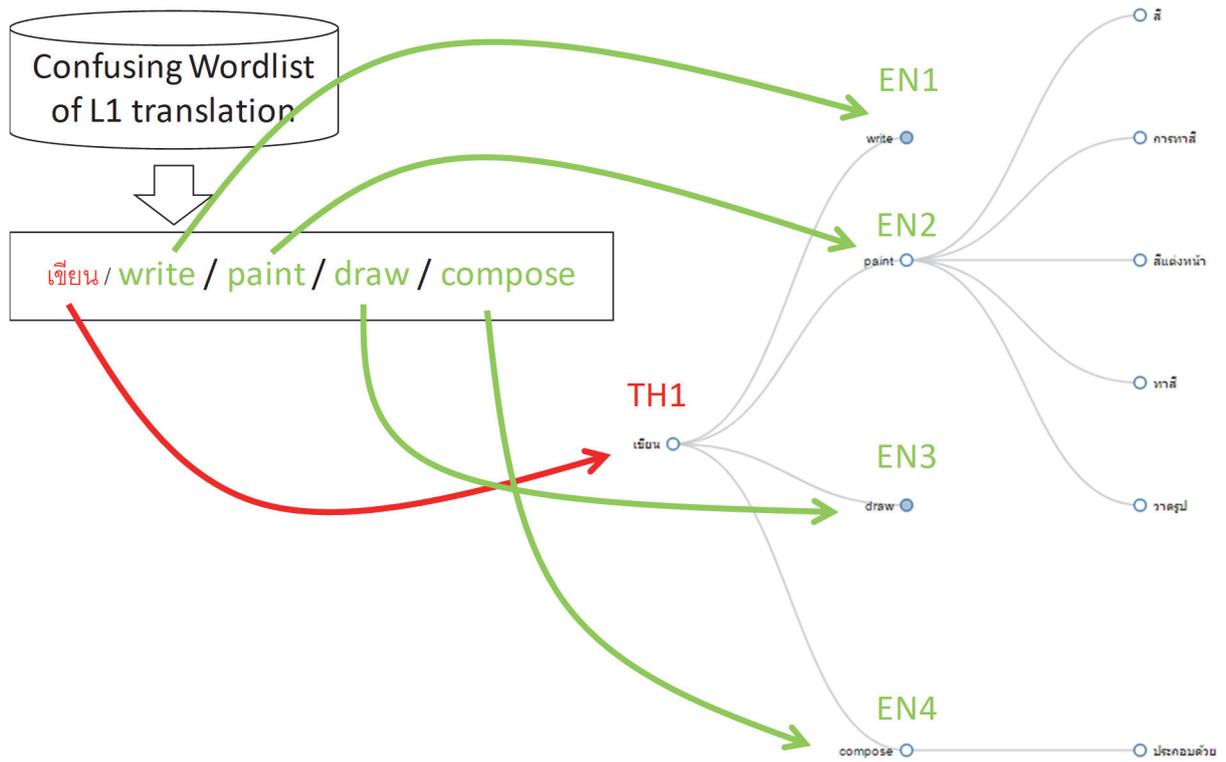


Figure 23 Word Relation Graph processing step 1

Step 2) EN1, EN2, EN3, EN4, is searched in LEXiTRON dictionary for the meaning in L1 shown in Figure 24.

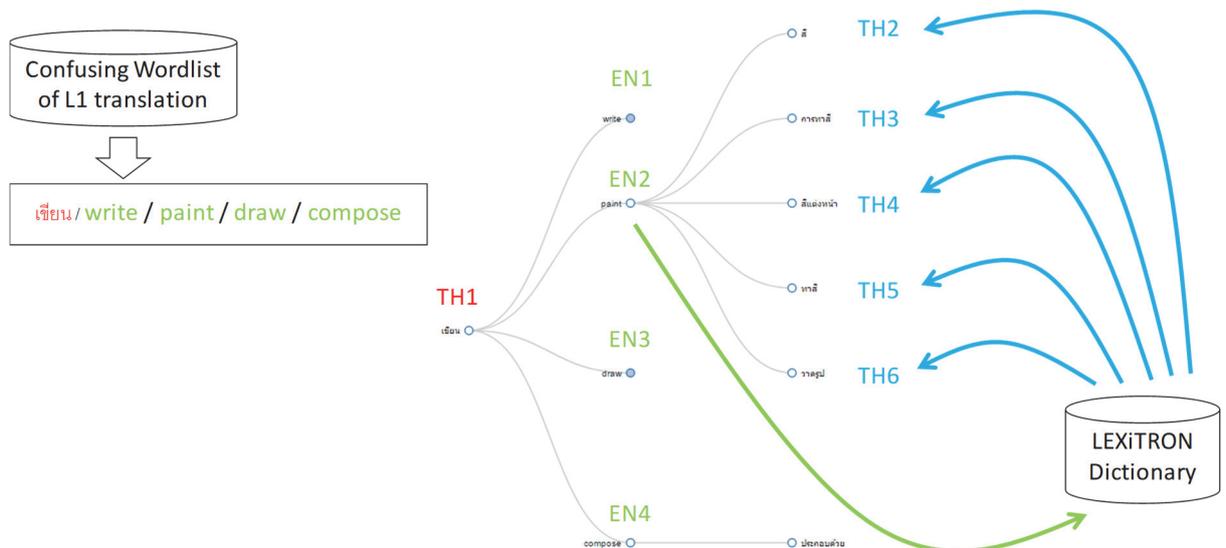


Figure 24 Word Relation Graph processing step 2

4.4.6.2 Pie Chart

Another hint is given in a Pie Chart to inform collocation statistic of the L2 word. This Pie Chart will hint students about how many the chosen word compositions are used in general. It is the fact that if students compose a sentence containing a word with wrong sense, the frequency of those consecutive words will be noticeably low. The Pie Chart is generated in focusing on the confusable word and their surroundings. The statistics are from the hit rate of search engines including Google and Bing. We expect that this Pie Chart image may inform learners of the co-occurrence of words based on world-wide usage. A Pie Chart representing hit rates of co-occurrence is exemplified in Figure 25. For the sample, the word “draw” is the majority of hit rate ratio as 49.0%” while the word “write” is 43.3%. The word “paint” and “compose” has slightly hit rate ratio as 6.8% and 0.9% respectively.

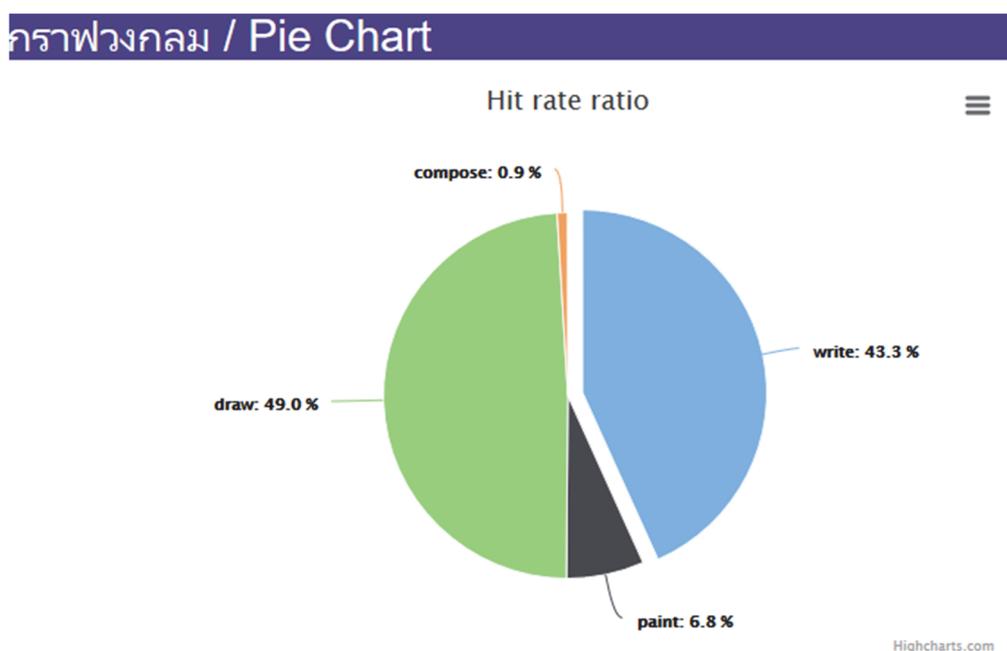


Figure 25 Graphic Hint - Pie Chart

4.5 Application in practice

To apply the methods into practice, user-interface of the tool is designed as shown in Figure 26. The input of the system is the English sentence created by a student. Once it is submitted, the sentence will be processed, and the result will be shown in the bottom of the UI. The result is the list of words that are likely to cause confusion in the sense based on L1 homonym. The result also returns a hint which provides notable details of the found confusable words. The details include graphical relations of the word (L2) to L1 and vice versa. Moreover, WordNet information is also given to provide a semantic relation of the word for users to gain cognitive relevance of words. Another information is the statistical data from hit rate to give a hint on collected words in general.

Meaning Selection Assisting Tool : Prototype 2

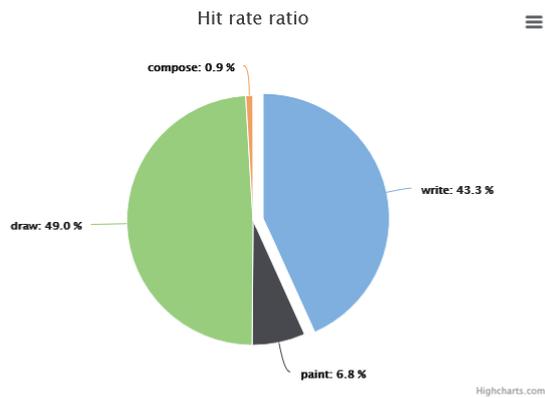
Input sentence: | I write a picture |

ข้อความแนะนำ / Text Hint

คำว่า write เป็นคำที่มีความหมายกว้างเกินไป ขอให้พิจารณาคำศัพท์อื่นครับ

Text Hint:

กราฟวงกลม / Pie Chart



กราฟความสัมพันธ์ของคำ / Word-relation graph

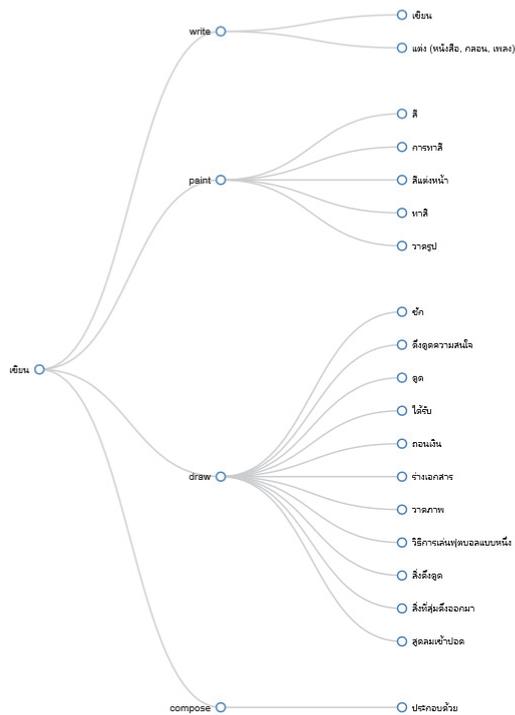


Figure 26 An UI of the proposed system

4.6 Discussion

The tool is designed as a standalone web-based application. The program receives the input text as an English sentence and delivers and analyzes the information to the web server. The tool shows three types of hints; Text Hint, Pie Chart, and Word Relation Graph.

- Text Hint is the suggestion from Hint generation module. The analysis process, it uses advantage from the Synset relationship between hypernym and hyponym from WordNet. Text Hint is effective for the same relationship among confusing words.
- Pie Chart applies the information from Search Engine Hit rate to show the practical ratio of word sense. Pie Chart is suitable for the well-matched usage of Word Relation Graph.
- Word Relation Graph is beneficial for the information L1 to L2 electronic dictionary and L2 to L1. The electronic dictionary shows the pattern of L1-L2-L1 word graph. Word relation becomes a broad benefit for primary vocabulary.

4.7 Summary

This chapter presents a method to provide the hints to help in EFL vocabulary learning. The focused issue in this work is confusion in the meaning of words regarding native language. Unlike confusion within the English language itself, the issue comes from homonym in learners' native language which is translatable into different senses in the learned language. To resolve such an issue, we provide three types of details, i.e. 1) a relation of words in the bilingual direction from an electronic dictionary, 2) statistical data of surrounding words in context via search hit rate, and 3) details on word sense in English from WordNet.

In the next chapter, findings from student experiments, questionnaires, and interviews are presented.

Chapter 5

Experiment

Chapter 5: Experiment

5.1 Motivation

In this chapter, we set up a couple of experiments to evaluate the usability of the prototype in EFL vocabulary learning of Thai students. It is hypothesized that EFL learners cannot select appropriate L2 (English) words in the context because of the interference from the native language (Thai; L1). Hence, we expect they will understand and choose correct terms regarding contexts if we provide a hint about word sense of the confusing vocabularies from L1-L2 translation.

This chapter is an updated and improved version of the previous work as follows:

1. Nattapol KRITSUTHIKUL, Shinobu HASEGAWA, Cholwich NATTEE, and Thepchai SUPNITHI: Assisting Tools for Selecting Proper Semantic Meaning by Disambiguation of the Interference of the First Language, Workshop Proceedings of the 22nd International Conference on Computers in Education (ICCE 2014), Nara Prefectural New Public Hall, Nara, Japan, November 30 - December 4, 2014, pp. 609-615.

5.2 Preliminary experiment on the Text Hint

In the early state of this work, Text Hint were first developed in attempting for assisting EFL Thai learners to select proper words by their semantics that they intend to. We conducted an experiment to see the results and published the work in ICCE 2014 on the title of “Assisting Tools for Selecting Proper Semantic Meaning by Disambiguation of the Interference of the First Language”.

The objective of the experiment was to evaluate the usability of the Text Hint and how users react to the given hints. Samples were fifteen volunteered Thai students in Grade 8 from a provincial boarding school in Chonburi province, Thailand. Each student was assigned a task to compose ten sentences in both Thai and English. In specification, words from Confusing Wordlist must be used once in each of written English sentences. The words in the confusing wordlist are as follows.

able / above / accept / accord / accordance / according to / advice / affect / agree / bring / capable / citizen / come / converse / draw / effect / enable / equal / equivalence / espadrille / exact / except / flip-flop / flipflop / go / going to / gonna / good / guide / higher / in accordance with / accurate / inhabitant / introduce / lay / lie / mule / native / over / people / population / prevent / protect / raise / rise / said / same same / sandal / say / slippers / speak / suggest / take / talk / tell / thongs / well / write

The experiment result was measured as 88.88% precision, 94.11% recall and 91.42% F-measure. The results of the experiment were shown in Figure 27 were implied as follows. Human checker found three more words detected as incorrect word. These words were unfortunately not in the confusion wordlist; thus, the tool ignored them. Moreover, the tool returned 36 found incorrect words from 150 sentences. From 36 found incorrect words, two words (5.56%) were mistakenly detected as *incorrect* even though there was nothing wrong with them. The cause of the mistakes was that the hit rates of the correct one was lower than the incorrect one. In fact, one of the case was “I speak English well.” Since the n-gram chunked the sentence into gram-based fragments, the immediate word “I speak” was focused while the word “speak” is one of the confusing words specified in the wordlist along with converse / said / say / speak / talk / tell. Hence, the system tried for hit rates of “I say”, and it gave much higher hits ratio. This issue was generated from considering low gram number. Therefore, we can conclude that the low gram numbers such as uni-gram and bi-gram should take less priority while tri-gram and higher are more effective for this task.

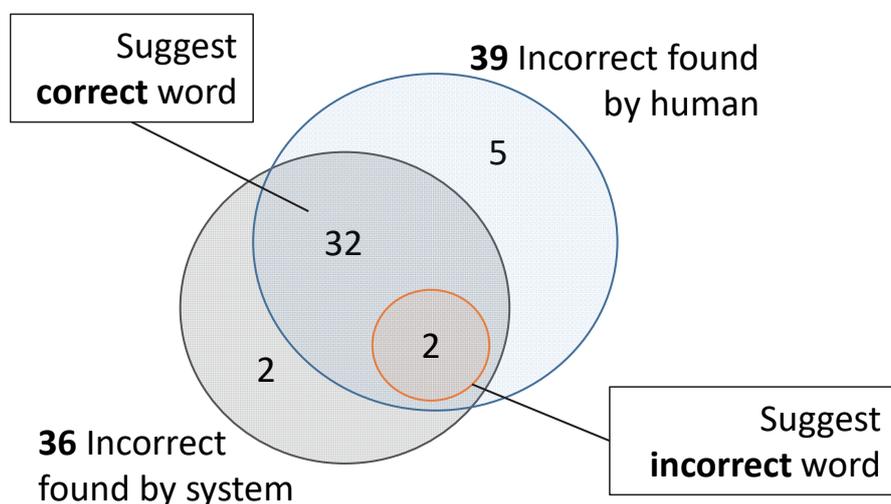


Figure 27 Results of Text Hint in terms of accuracy comparing to human

Moreover, since we asked samples to write sentences in both Thai and English, we analyzed the sentences and found the cause of their mistaken words. From their Thai sentences parallel to English sentences with an incorrect word, there was nothing wrong in word-sense usage. However, their parallel incorrect English words were a translation from Thai word in the wrong sense. This can be inferred that these samples could not distinguish the senses of homonym Thai word and chose the translation from the sense they knew. At worse, a few of incorrect English translations ignored the difference in part-of-speech. Thus, this led us on a track of L1-L2 translation in EFL learning. The result also pointed out the possibility in learners' confusion of L1 homonym that affects to L2 word selection.

5.3 Experiment of Using Tool to Improve Students in Vocabulary Selection

5.3.1 Experiment Settings

The test took 60 minutes and includes two parts, 30 minutes for a pre-test and 30 minutes for a post-test. We set the pre-test to examine base knowledge in the vocabulary of testers. The test is to let the testers map words in a list of L2 words (English) to L1 words (Thai). This test will let us know which word testers know a meaning and which they do not recognize. This knowledge will carry on in the main evaluation of the prototype.

The confusing words in this experiment are chosen from 10 out of 84 sense groups. We use four multiple choices so that each sense group could have at least 4 words in it. The confusing wordlist in ten sense-groups are common simple words but ambiguous. Each word is commonly used since Grade 1 to 9 from 41 English books authorized by Ministry of Education, Thailand based on Basic Education Core Curriculum B.E. 2551 (A.D. 2008). Lastly, we also consult with 10-year-experience teachers to reassure that these ten sense groups are commonly misused among the students.

The main evaluation is for testers to answer a set of fill-in test in English with four choices. In the test, there were ten questions all of which were asked to give an answer. The missing word in a question is a word with L1 interference while four choices are the words from L1 homonym. One of those choices is the correct one. An example of the questions and choices are shown in Figure 28.

- 1) I เขียน a picture by pencil.
(a) write (b) paint **(c) draw** (d) compose

- 2) This shirt is ทันสมัย.
(a) modern **(b) trendy** (c) fashion (d) up to date

- 3) He is an American คน.
(a) human **(b) citizen** (c) stir (d) inhabitant

*Figure 28 Examples of questions and choices for experiments
(a color-marked indicates a correct answer)*

The testers were asked to use the prototype to hint them in considering re-answer of the questions once the pre-emptive answer was given. After getting a hint, the testers can freely change the answer or stood for the first answer. In this experiment, we collected both pre-emptive answer and answer after the hint. The summary of procedure of the experiment is shown in Figure 29.

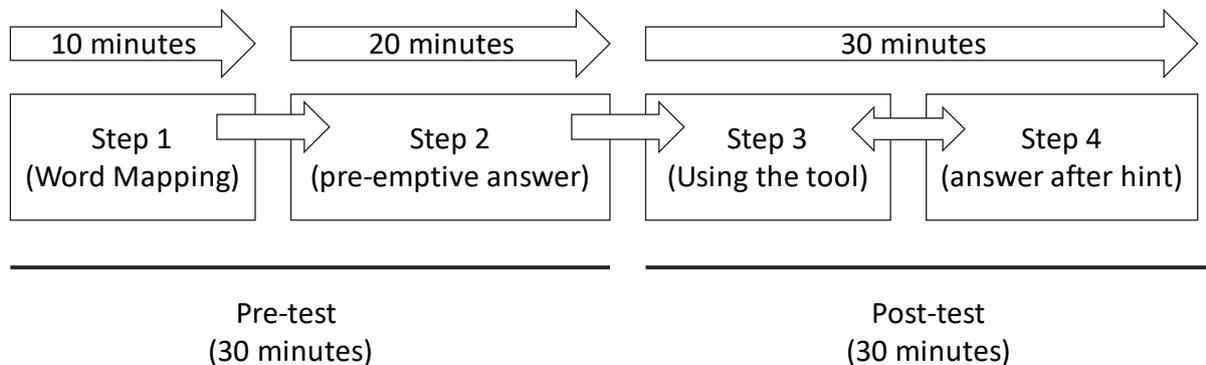


Figure 29 Summary of procedure of experiment

Samples in the experiment are Thai students in Grade 8 of the same the school; namely, Nakhonnayok Witthayakhom School, the school was established on August 5, 1971 (B.E. 2514). In 2016, 2,765 students were enrolled in grade 7-12. The school is a provincial public secondary school, and is operated under the authority of OBEC (Office of the Basic Education Commission) under Ministry of Education of Thailand. The school has received recognition as the best school in Nakhonnayok province in Thailand. There is a total of 210 testers who all have been studying English for three years from school. Please note that this test does not effect from other factors such as gender and social status; hence, such information was not collected. These samples were randomly separated into 14 groups as 15 students per group. Each group was given with different tool settings as shown below to see an effectiveness of functions from the tool.

1. Text Hint without POS in generating hint (T_np)
2. Word Relation without POS in generating hint (W_np)
3. Pie Chart without POS in generating hint (P_np)
4. T_np +W_np
5. T_np +P_np
6. W_np +P_np
7. T_np +W_np +P_np
8. Text Hint with POS in generating hint (T_p)
9. Word Relation with POS in generating hint (W_p)
10. Pie Chart with POS in generating hint (P_p)
11. T_p +W_p
12. T_p +P_p
13. W_p +P_p
14. T_p +W_p +P_p

The experiments for both pre-test and post-test were conducted on a computer-based system specifically designed for the purpose to store the input in digital data as shown in Figure 30 and Figure 31.

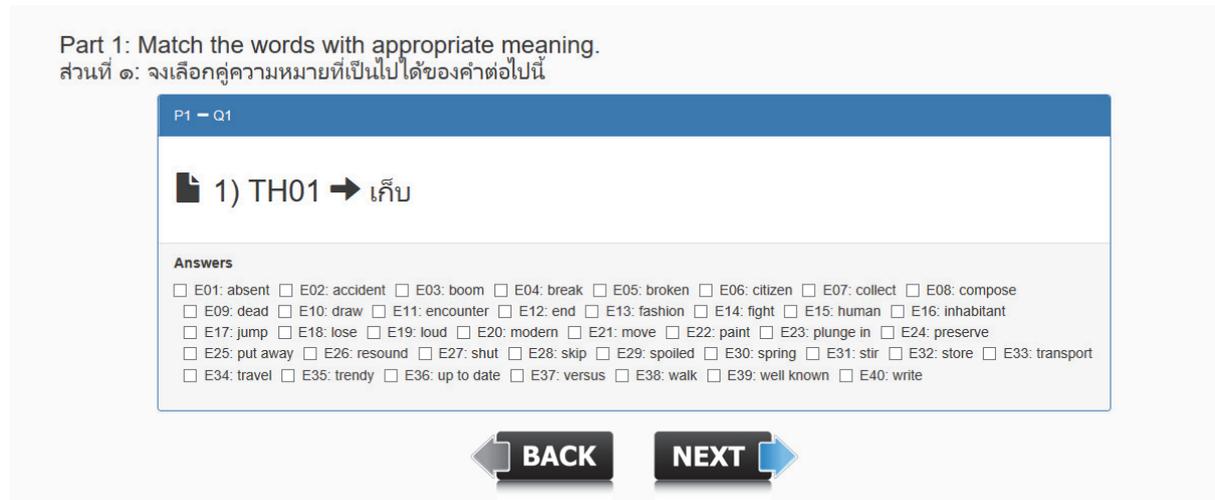


Figure 30 A user interface of a tool for word mapping to check sample's proficiency level and vocabulary background

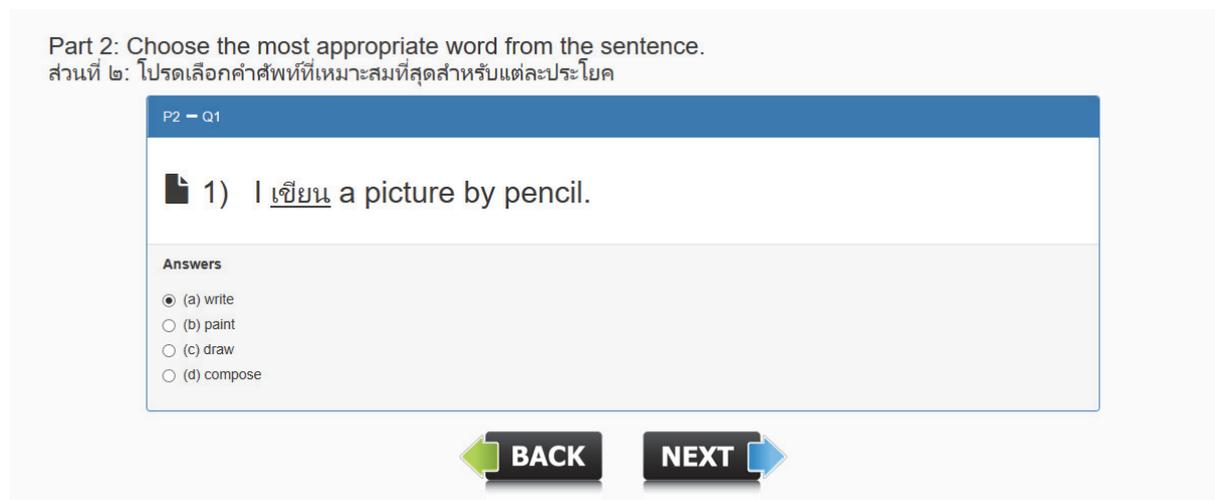


Figure 31 A user interface of a tool to collect answering data in experiments

After finishing the test, 30 participants from group#7 and group#14 in the experimental group were voluntarily asked to complete the questionnaire and interview to reveal varied perceptions and attitudes toward the tool and its usage.

5.3.2 Experiment Results of Pre-test

First, a result of word mapping is given to separate samples into the proficiency level based on vocabulary knowledge for analysis. Students who know more than 70% of the given words are grouped into a strong proficiency group (S). Those who know less than 30% belong to weak group (W), and the rest is in a moderate group (M). The results in separation by the proficiency of each testing group are shown in Table 14.

Table 14 Statistics of samples of each group based on proficiency of vocabulary

	Testing Group														<u>Total</u>
	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	
S	2	3	1	3	3	3	4	3	3	2	4	3	1	2	36 (17.14%)
M	7	8	11	9	8	8	6	8	8	7	9	10	9	9	118 (56.19%)
W	6	4	3	3	4	4	5	4	4	6	2	2	5	4	56 (26.67%)
<u>Total</u>	15	15	15	15	15	15	15	15	15	15	15	15	15	15	<u>210</u>

From Table 14, each group contained all levels of proficiency based on vocabulary knowledge, and distribution was roughly equal. As a summary, average numbers of strong, moderate and weak samples in each group were 17.14%, 56.19%, and 26.67%, respectively.

First of all, all the samples of any groups were asked to answer the test with their own knowledge. The result before using the tool is given in Table 15 as a baseline of their vocabulary knowledge.

Table 15 Results from pre-emptive test of all samples

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong	213/360 (59.17%)	0/360 (0.00%)	58/360 (16.11%)	89/360 (24.72%)
Moderate	333/1160 (28.71%)	28/1160 (2.41%)	249/1160 (21.47%)	550/1160 (47.41%)
Weak	60/580 (10.34%)	52/580 (8.97%)	111/580 (19.14%)	357/580 (61.55%)
			428/2100 (19.90%)	

The results show that the percentage of the correct answers reflected from their proficiency. Moreover, the correct answers were mostly from the words that the students remarked as already known, but some answer despite of being known resulted in incorrect answer for about 19.90% from overall students. This shows that even though they knew the word, they may not realize that the word may not match in the contextual meaning or have another meaning. The result would be a baseline to compare with changes after using the tool.

5.3.3 Experiment Results of Post-test

According to the settings, there were 14 testing groups following the availability of the tool functions. At first, the results of each group are analyzed separately in details. For each group, the results of the pre-test and the post-test are given and comparing to the baseline of the group are given.

5.3.3.1 group#1: Text Hint without POS in generating hint (T_{np})

For the group #1, Table 16 shows the results of the pre-test before using the tool, Table 17 shows the results of the post-test after using the tool. Table 18 also compares the changes by the Text Hint without POS.

Table 16 Results from group#1 before getting hints (T_{np}) from the tool

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong (2)	13/20 (65.00%)	0/20 (0.00%)	3/20 (15.00%)	4/20 (20.00%)
Moderate (7)	21/70 (30.00%)	2/70 (2.86%)	14/70 (20.00%)	33/70 (47.14%)
Weak (6)	6/60 (10.00%)	5/60 (8.33%)	13/60 (21.67%)	36/60 (60.00%)

Table 17 Results from group#1 after getting hints (T_{np}) from the tool

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong (2)	14/20 (70.00%)	0/20 (0.00%)	2/20 (10.00%)	4/20 (20.00%)
Moderate (7)	22/70 (31.43%)	6/70 (8.57%)	13/70 (18.57%)	29/70 (41.43%)
Weak (6)	7/60 (11.67%)	6/60 (10.00%)	12/60 (20.00%)	35/60 (58.33%)

Table 18 Results in comparison of before and after using the tool of group#1

	I-I		C-C	I-C	C-I
	same	change			
Known Words	26	1	40	3	0
Unknown Words	61	7	7	5	0
Total	87	8	47	8	0

From getting the Text Hint without POS in generating hint, the samples in group#1 rarely made changes in answering. Total changes made in this group were 16 answers from a total of 150 times. In statistic, 12 out of 15 samples adjusted their answers, and only four samples made changing for maximum of two answers from all the ten questions. This shows that the provided hint did not much convince them to change their mind in selection since the change numbers were very few.

From the point of improvement in answering, 50% of the changes (8 out of 16) were from incorrect to correct answer. The total of the correct answers from this group after using tool was 36.67%. It improved by around 5% from 31.33% of the baseline. In addition, there was no change from the correct answers to the incorrect answer.

5.3.3.2 group#2: Word Relation without POS in generating hint (W_{np})

Table 20 shows the results of the post-test from the group#2, and Table 21 compares the changes from the hints of the word relation without POS to the baseline shown in Table 19.

Table 19 Results from group#2 before getting hints

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong (3)	12/20 (60.00%)	0/20 (0.00%)	3/20 (15.00%)	5/20 (25.00%)
Moderate (8)	24/80 (30.00%)	1/80 (1.25%)	14/80 (17.50%)	41/80 (51.25%)
Weak (4)	5/50 (10.00%)	8/50 (16.00%)	11/50 (22.00%)	26/50 (52.00%)

Table 20 Results from group#2 after getting hints (W_{np}) from the tool

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong (3)	14/20 (70.00%)	2/20 (10.00%)	1/20 (5.00%)	3/20 (15.00%)
Moderate (8)	28/80 (35.00%)	13/80 (16.25%)	10/80 (12.50%)	29/80 (36.25%)
Weak (4)	10/50 (20.00%)	17/50 (34.00%)	6/50 (12.00%)	17/50 (34.00%)

Table 21 Results in comparison of before and after using the tool of group#2

	I-I		C-C	I-C	C-I
	same	change			
Known Words	17	0	41	11	0
Unknown Words	43	6	9	23	0
Total	60	6	50	34	0

The results from the word relation hint without POS in generating hint (W_{np}) shows that it helped the samples to moderately adjust answers. The changes obviously increased the total of the correct answers from 33.34% to 56%. From the total changes of 40 times, 85% (34 answers) led to the correct one. From the results, the numbers of the correct answers after getting hints with unknown words were the most to be increased as additional 20 answers. This can signify that the word relation hint works well with the unknown words since it gives all possible translations of the L1 terms for users to learn about unknown senses or unaware ambiguity. Moreover, the samples from the weak group got the best improvement with this hint since they gained 28% correct answers more than their own baseline. Again, we also found that the hint did not lead the samples to once adjust the correct answers to the incorrect one.

5.3.3.3 group#3: Pie Chart without POS in generating hint (P_{np})

Table 23 shows the results of the post-test from the group#3, and Table 24 compares the changes from the hints of the Pie Chart without POS to the baseline shown in Table 22.

Table 22 Results from group#3 before getting hints

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong (1)	4/10 (40.00%)	0/10 (0.00%)	2/10 (20.00%)	4/10 (40.00%)
Moderate (11)	25/90 (27.78%)	1/90 (1.11%)	22/90 (24.44%)	42/90 (46.67%)
Weak (3)	4/50 (8.00%)	5/50 (10.00%)	9/50 (18.00%)	32/50 (64.00%)

Table 23 Results from group#3 after getting hints (P_np) from the tool

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong (1)	4/10 (40.00%)	0/10 (0.00%)	2/10 (20.00%)	4/10 (40.00%)
Moderate (11)	33/90 (36.67%)	10/90 (11.11%)	14/90 (15.56%)	33/90 (36.67%)
Weak (3)	7/50 (14.00%)	12/50 (24.00%)	6/50 (12.00%)	25/50 (50.00%)

Table 24 Results in comparison of before and after using the tool of group#3

	I-I		C-C	I-C	C-I
	same	change			
Known Words	21	1	33	11	0
Unknown Words	56	6	6	16	0
Total	77	7	39	27	0

From the results, an effectiveness of the Pie Chart hint (P_np) can be seen with the increasing in the correct answers comparing to the baseline. The results show that the affected group was mostly the moderate samples. The results of the moderate group were boosted by about 18% when the samples obtained the hints. In this group, the samples from the moderate level answered incorrectly for all questions containing the unknown words. With the hint, they recognized the difference in word senses with the statistics of collocated words and corrected the answer. Regarding these cases, we found that the eight changes (from unknown words I-C) came from the same question from eight different samples. At the baseline, the incorrect answers were given in distributions to two incorrect choices out of four total choices, but they changed the answer to correct one after getting the hint. The question of this matter is to choose among words for Thai sense of “เสี” which can be translated to four choices as (a) dead, (b)

broken, (c) lose and (d) spoiled as the L1 word has several homonymous senses. The correct answer is the word “spoiled” though this word is rarely known for the most of the samples. The baseline answer of these samples was either “dead” or “broken” that were typical word frequently used and known for most students. From the hint, it is likely that both “broken food” and “dead food” are even mildly not collocated, and the hint pointed out that it is unlikely for these words to be used together. With the hint, the samples learned that there is another word fit to use in the situation and chose the correct one accordingly.

5.3.3.4 group#4: *T_np + W_np*

Table 26 shows the results of the post-test from the group#4, and Table 27 compares the changes from the hints to the baseline shown in Table 25. This group is a combination of 2 hints which are text (*T_np*), and word relation (*W_np*) hint.

Table 25 Results from group#4 before getting hints

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong (3)	20/30 (66.67%)	0/30 (0.00%)	3/30 (10.00%)	7/30 (23.33%)
Moderate (9)	24/90 (26.67%)	3/90 (3.33%)	19/90 (21.11%)	44/90 (48.89%)
Weak (3)	2/30 (6.67%)	1/30 (3.33%)	6/30 (20.00%)	21/30 (70.00%)

*Table 26 Results from group#4 after getting hints (*T_np+W_np*) from the tool*

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong (3)	21/30 (70.00%)	1/30 (3.33%)	2/30 (6.67%)	6/30 (20.00%)
Moderate (9)	30/90 (33.33%)	14/90 (15.56%)	13/90 (14.44%)	33/90 (36.67%)
Weak (3)	5/30 (16.67%)	8/30 (26.67%)	3/30 (10.00%)	14/30 (46.67%)

Table 27 Results in comparison of before and after using the tool of group#4

	I-I		C-C	I-C	C-I
	same	change			
Known Words	16	2	46	10	0
Unknown Words	48	5	4	19	0
Total	64	7	50	29	0

The results of this group were similar to those of group#2 that the most affected group was the weak samples as about 33% in increasing. Moreover, the changes were made for I-C for 29 times out of 36 times, and they mostly occurred in the cases of the unknown words.

Moreover, we looked into the details among the results of these two groups and found that there are three samples in group#2 and #4 with the same proficiency level as the moderate and made some same incorrect answers in the baseline. They, after getting the hint, were surprisingly made exactly alike changes in answering for three questions. These questions are about Thai words with overlapping meanings such as the questions#5. This leads to a conclusion that the effectiveness of the word relation hint is stable for these two groups, and overpowers the Text Hint. Hence, we will carefully inspect these questions with the above-mentioned hypothesis in the further groups involved with the word relation hint.

5.3.3.5 group#5: T_np +P_np

Table 29 shows the results of the post-test from the group#5, and Table 30 compares the changes from the hints to the baseline shown in Table 28. This group is a combination of two hints which are the Text Hint (T_np), and the Pie Chart (P_np) hint.

Table 28 Results from group#5 before getting hints

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong (3)	18/30 (60.00%)	0/30 (0.00%)	5/30 (16.67%)	7/30 (23.33%)
Moderate (8)	21/80 (26.25%)	1/80 (1.25%)	19/80 (23.75%)	39/80 (48.75%)
Weak (4)	6/40 (15.00%)	1/40 (2.50%)	8/40 (20.00%)	25/40 (62.50%)

Table 29 Results from group#5 after getting hints ($T_{np}+P_{np}$) from the tool

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong (3)	18/30 (60.00%)	0/30 (0.00%)	5/30 (16.67%)	7/30 (23.33%)
Moderate (8)	22/80 (27.50%)	12/80 (15.00%)	18/80 (22.50%)	28/80 (35.00%)
Weak (4)	8/40 (20.00%)	4/40 (10.00%)	6/40 (15.00%)	22/40 (55.00%)

Table 30 Results in comparison of before and after using the tool of group#5

	I-I		C-C	I-C	C-I
	same	change			
Known Words	27	2	45	3	0
Unknown Words	49	8	2	14	0
Total	76	10	47	17	0

The results show that there were I-C cases for a total of 17 answers (62.96% of changes made from all samples) after getting the hints. The strong samples did not make any changes in their answering with this type of hints at all while most of the moderate and weak group were affected from the hints.

5.3.3.6 group#6: $W_{np} + P_{np}$

Table 32 shows the results of the post-test from the group#6, and Table 33 compares the changes from the hints to the baseline shown in Table 31. This group is a combination of two hints which are the word relation, and the Pie Chart hint.

Table 31 Results from group#6 before getting hints

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong (3)	17/30 (56.67%)	0/30 (0.00%)	6/30 (20.00%)	7/30 (23.33%)
Moderate (8)	26/80 (32.50%)	0/80 (0.00%)	19/80 (23.75%)	35/80 (43.75%)
Weak (4)	5/40 (12.50%)	2/40 (5.00%)	7/40 (17.50%)	26/40 (65.00%)

Table 32 Results from group#6 after getting hints ($W_{np} + P_{np}$) from the tool

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong (3)	18/30 (60.00%)	1/30 (3.33%)	5/30 (16.67%)	6/30 (20.00%)
Moderate (8)	28/80 (35.00%)	8/80 (10.00%)	17/80 (21.25%)	27/80 (33.75%)
Weak (4)	7/40 (17.50%)	8/40 (20.00%)	5/40 (12.50%)	20/40 (50.00%)

Table 33 Results in comparison of before and after using the tool of group#6

	I-I		C-C	I-C	C-I
	same	change			
Known Words	26	1	48	5	0
Unknown Words	49	4	2	15	0
Total	75	5	50	20	0

The results of this group were similar to the results of the group#5 since the improvement in the correcting answers was from 50 (33.34%) to 70 (46.67%) in total. However, the noticeable results were that 80% of the changes made after getting the hints (20 out of 25 changes in total) led to the correct answers.

5.3.3.7 group#7: $T_{np} + W_{np} + P_{np}$

Table 35 shows the results of the post-test from the group#7, and Table 36 compares the changes from the hints to the baseline shown in Table 34. This group is a combination of all possible hints which are the Text Hint, word relation and Pie Chart hint.

Table 34 Results from group#7 before getting hints

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong (4)	23/40 (57.50%)	0/40 (0.00%)	8/40 (20.00%)	9/40 (22.50%)
Moderate (6)	17/60 (28.33%)	0/60 (0.00%)	14/60 (23.33%)	29/60 (48.33%)
Weak (5)	6/50 (12.00%)	5/50 (10.00%)	8/50 (16.00%)	31/50 (62.00%)

Table 35 Results from group#7 after getting hints ($T_{np} + W_{np} + P_{np}$) from the tool

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong (4)	25/40 (62.50%)	3/40 (7.50%)	6/40 (15.00%)	6/40 (15.00%)
Moderate (6)	22/60 (36.67%)	7/60 (11.67%)	9/60 (15.00%)	22/60 (36.67%)
Weak (5)	7/50 (14.00%)	9/50 (18.00%)	7/50 (14.00%)	27/50 (54.00%)

Table 36 Results in comparison of before and after using the tool of group#7

	I-I		C-C	I-C	C-I
	same	change			
Known Words	22	0	46	8	0
Unknown Words	51	4	5	14	0
Total	73	4	51	22	0

The results of the group#7 gained additional correct answers for about 14% (from 34% to 48.67%) after getting the hints. In this group, the changes of the known word cases were 100% leading to correction while the unknown word cases were 14 out of 18 cases.

5.3.3.8 group#8: Text Hint with POS in generating hint (T_p)

Another set of testing is the hints from the tool using POS to generate. These groups compare with the hints without POS in concern in the hint generation. In the group #8, Table 37 shows the results of the pre-test before using the tool, Table 38 shows the results of the post-test after using the tool. Table 39 also compares the changes by the Text Hint with POS.

Table 37 Results from group#8 before getting hints (T_p) from the tool

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong (3)	15/30 (50.00%)	0/30 (0.00%)	6/30 (20.00%)	9/30 (30.00%)
Moderate (9)	26/90 (28.89%)	2/90 (2.22%)	19/90 (21.11%)	43/90 (47.78%)
Weak (3)	2/30 (6.67%)	2/30 (6.67%)	6/30 (20.00%)	20/30 (66.67%)

Table 38 Results from group#8 after getting hints (T_p) from the tool

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong (3)	15/30 (50.00%)	1/30 (3.33%)	6/30 (20.00%)	8/30 (26.67%)
Moderate (9)	27/90 (30.00%)	7/90 (7.78%)	18/90 (20.00%)	38/90 (42.22%)
Weak (3)	2/30 (6.67%)	7/30 (23.33%)	6/30 (20.00%)	15/30 (50.00%)

Table 39 Results in comparison of before and after using the tool of group#8

	I-I		C-C	I-C	C-I
	same	change			
Known Words	25	5	43	1	0
Unknown Words	57	4	4	11	0
Total	82	9	47	12	0

In this group, changes were made 21 times in total. Most of the improvement was from the moderate and weak samples.

5.3.3.9 group#9: Word Relation with POS in generating hint (W_p)

Table 41 shows the results of the post-test from the group#9, and Table 42 compares the changes from the hints (W_p) to the baseline shown in Table 40.

Table 40 Results from group#9 before getting hints

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong (3)	19/30 (63.33%)	0/30 (0.00%)	4/30 (13.33%)	7/30 (23.33%)
Moderate (8)	23/80 (28.75%)	3/80 (3.75%)	17/80 (21.25%)	37/80 (46.25%)
Weak (4)	4/40 (10.00%)	1/40 (2.50%)	8/40 (20.00%)	27/40 (67.50%)

Table 41 Results from group#9 after getting hints (*W_p*) from the tool

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong (3)	19/30 (63.33%)	3/30 (10.00%)	4/30 (13.33%)	4/30 (13.33%)
Moderate (8)	29/80 (36.25%)	9/80 (11.25%)	11/80 (13.75%)	31/80 (38.75%)
Weak (4)	8/40 (20.00%)	10/40 (25.00%)	4/40 (10.00%)	18/40 (45.00%)

Table 42 Results in comparison of before and after using the tool of group#9

	I-I		C-C	I-C	C-I
	same	change			
Known Words	19	0	46	10	0
Unknown Words	45	8	4	18	0
Total	64	8	50	28	0

The results of this group were similar to the ones of the group#2 that applied the word relation hint without the use of POS. I-C cases occurred in both known and unknown words. The noticeable results different from other groups were that each of the strong samples of this group made the same change in the same question, and this resulted in one question improvement for each of them

5.3.3.10 group#10: Pie Chart with POS in generating hint (*P_p*)

Table 44 shows the results of the post-test from the group#10, and Table 45 compares the changes from the hints (*P_p*) to the baseline shown in Table 43.

Table 43 Results from group#10 before getting hints

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong (2)	14/20 (70.00%)	0/20 (0.00%)	2/20 (10.00%)	4/20 (20.00%)
Moderate (7)	22/70 (31.43%)	3/70 (4.29%)	13/70 (18.57%)	32/70 (45.71%)
Weak (6)	8/60 (13.33%)	6/60 (10.00%)	10/60 (16.67%)	36/60 (60.00%)

Table 44 Results from group#10 after getting hints (P_p) from the tool

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong (2)	14/20 (70.00%)	0/20 (0.00%)	2/20 (10.00%)	4/20 (20.00%)
Moderate (7)	24/70 (34.29%)	9/70 (12.86%)	11/70 (15.71%)	26/70 (37.14%)
Weak (6)	12/60 (20.00%)	18/60 (30.00%)	6/60 (10.00%)	24/60 (40.00%)

Table 45 Results in comparison of before and after using the tool of group#10

	I-I		C-C	I-C	C-I
	same	change			
Known Words	18	1	44	6	0
Unknown Words	45	9	9	18	0
Total	63	10	53	24	0

For the Pie Chart hint with POS in the hint generation, the results were impressive since the samples from the moderate and weak decided to change their many answers. Though some of them (10/34) were still incorrect, it shows that they recognized that they were wrong. This experience can be helpful for them to be aware in vocabulary choosing.

5.3.3.11 group#11: T_p + W_p

Table 47 shows the results of the post-test from the group#11, and Table 48 compares the changes from the hints to the baseline shown in Table 46. This group is a combination of 2 hints which are text (T_p), and word relation (W_p) hint.

Table 46 Results from group#11 before getting hints

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong (4)	25/40 (62.50%)	0/40 (0.00%)	7/40 (17.50%)	8/40 (20.00%)
Moderate (9)	26/90 (28.89%)	3/90 (3.33%)	20/90 (22.22%)	41/90 (45.56%)
Weak (2)	3/20 (15.00%)	3/20 (15.00%)	4/20 (20.00%)	10/20 (50.00%)

Table 47 Results from group#11 after getting hints ($T_p + W_p$) from the tool

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong (4)	28/40 (70.00%)	1/40 (2.50%)	4/40 (10.00%)	7/40 (17.50%)
Moderate (9)	31/90 (34.44%)	15/90 (16.67%)	15/90 (16.67%)	29/90 (32.22%)
Weak (2)	3/20 (15.00%)	9/20 (45.00%)	4/20 (20.00%)	4/20 (20.00%)

Table 48 Results in comparison of before and after using the tool of group#11

	I-I		C-C	I-C	C-I
	same	change			
Known Words	23	0	54	8	0
Unknown Words	38	2	6	19	0
Total	61	2	60	27	0

The results of this group show that majority of changes were I-C (27/29 answers). For the strong samples, 4 out of 15 incorrect answers were corrected after getting hints.

5.3.3.12 group#12: $T_p + P_p$

Table 50 shows the results of the post-test from the group#12, and Table 51 compares the changes from the hints to the baseline shown in Table 49. This group is a combination of 2 hints which are Text Hint (T_p), and Pie Chart (P_p) hint.

Table 49 Results from group#12 before getting hints

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong (3)	18/30 (60.00%)	0/30 (0.00%)	4/30 (13.33%)	8/30 (26.67%)
Moderate (10)	29/100 (29.00%)	5/100 (5.00%)	18/100 (18.00%)	48/100 (48.00%)
Weak (2)	1/20 (5.00%)	3/20 (15.00%)	4/20 (20.00%)	12/20 (60.00%)

Table 50 Results from group#12 after getting hints ($T_p + P_p$) from the tool

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong (3)	22/30 (73.33%)	0/30 (0.00%)	0/30 (0.00%)	8/30 (26.67%)
Moderate (10)	36/100 (36.00%)	14/100 (14.00%)	11/100 (11.00%)	39/100 (39.00%)
Weak (2)	1/20 (5.00%)	4/20 (20.00%)	4/20 (20.00%)	11/20 (55.00%)

Table 51 Results in comparison of before and after using the tool of group#12

	I-I		C-C	I-C	C-I
	same	change			
Known Words	13	2	48	11	0
Unknown Words	55	3	8	10	0
Total	68	5	56	21	0

The moderate samples of this group most corrected their errors as 16 out of all 66 incorrect answers from baseline. In focusing into the moderate group, they performed I-C for 16 times (76.19%) out of all 21 I-C cases in this group and became a majority of I-C cases in this group.

5.3.3.13 group#13: $W_p + P_p$

Table 53 shows the results of the post-test from the group#13, and Table 54 compares the changes from the hints to the baseline shown in Table 52. This group is a combination of 2 hints which are word relation (W_p), and Pie Chart (P_p) hint.

Table 52 Results from group#13 before getting hints

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong (1)	4/10 (40.00%)	0/10 (0.00%)	2/10 (20.00%)	4/10 (40.00%)
Moderate (9)	25/90 (27.78%)	1/90 (1.11%)	22/90 (24.44%)	42/90 (46.67%)
Weak (5)	4/50 (8.00%)	5/50 (10.00%)	9/50 (18.00%)	32/50 (64.00%)

Table 53 Results from group#13 after getting hints ($W_p + P_p$) from the tool

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong (1)	4/10 (40.00%)	0/10 (0.00%)	2/10 (20.00%)	4/10 (40.00%)
Moderate (9)	33/90 (36.67%)	10/90 (11.11%)	14/90 (15.56%)	33/90 (36.67%)
Weak (5)	7/50 (14.00%)	12/50 (24.00%)	6/50 (12.00%)	25/50 (50.00%)

Table 54 Results in comparison of before and after using the tool of group#13

	I-I		C-C	I-C	C-I
	same	change			
Known Words	21	1	33	11	0
Unknown Words	56	6	6	16	0
Total	77	7	39	27	0

The results in changes of this group were 34 in total. 27 from that were in the I-C type. No change was made from the strong sample. The I-C cases were from the moderate group for 17 answers, and 10 answers were from the weak group.

5.3.3.14 group#14: $T_p + W_p + P_p$

Table 56 shows the results of the post-test from the group#14, and Table 57 compares the changes from the hints to the baseline shown in Table 55. This group is a combination of all possible hints which are Text Hint (T_p), word relation (W_p), and Pie Chart (P_p) hint.

Table 55 Results from group#14 before getting hints

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong (2)	11/20 (55.00%)	0/20 (0.00%)	3/20 (15.00%)	6/20 (30.00%)
Moderate (9)	24/90 (26.67%)	3/90 (3.33%)	19/90 (21.11%)	44/90 (48.89%)
Weak (4)	4/40 (10.00%)	5/40 (12.50%)	8/40 (20.00%)	23/40 (57.50%)

Table 56 Results from group#14 after getting hints (T_p + W_p + P_p) from the tool

Group	Correct		Incorrect	
	Known word	Unknown word	Known word	Unknown word
Strong (2)	12/20 (60.00%)	1/20 (5.00%)	2/20 (10.00%)	5/20 (25.00%)
Moderate (9)	28/90 (31.11%)	13/90 (14.44%)	15/90 (16.67%)	34/90 (37.78%)
Weak (4)	5/40 (12.50%)	9/40 (22.50%)	7/40 (17.50%)	19/40 (47.50%)

Table 57 Results in comparison of before and after using the tool of group#14

	I-I		C-C	I-C	C-I
	same	change			
Known Words	22	2	39	6	0
Unknown Words	58	0	8	15	0
Total	80	2	47	21	0

The last group with all the hint types shows that there were only two changes remaining incorrect out of all 23 changes. Though the total change number was not as many as other groups, the I-I cases made changing were obviously low. Surprisingly, this result is likely the same to results from group#7 that all the hint types are provided.

With these results, a comparison and analysis are given in the next section in details.

5.3.4 Discussion of the tool usage

All of the results indicate that the hints from the tool can improve the students' understanding in English vocabularies since their improvement of the correct answers were obtained from all the testing groups. Moreover, there was no change in the answers that lead the correct to the incorrect ones at all. Hence, the tool can be claimed that it assists the students in improvement in English proficiency.

Based on the algorithm of the proposed system, it is designed to be two different working modes depending part-of-speech (POS) in Confusing Wordlist of L1 translation. The first mode is POS while the second mode is no part-of-speech (NOPOS) in Confusing Wordlist of L1 translation. Since, hit rates from search engines, Google and Bing, are not required POS as input. That is why the working mode with POS and NOPOS of the proposed system are the same effective regarding accuracy in word selection on the proposed system, but different in performance in terms of the computation time consumption. In general, POS is one of the most effective factors in NLP research field, but in this case, POS is not influenced. According to the results in Table 58 from Independent Samples T-Test with all paired among NOPOS and

POS, they are shown no statistically significant difference. The Sig. (2-Tailed) values in all pairs are less than 0.05. Because of this, we can conclude that there is no statistically significant difference between the students' improvement for NOPOS and POS conditions.

Table 58 NOPOS vs POS

Paired	Levene's Sig.		t-test for Equality of Means Sig. (2-tailed)	Significant?
T_np vs T_p	0.098	Equal variances assumed	0.069	No
		Equal variances not assumed	0.071	
W_np vs W_p	0.251	Equal variances assumed	0.150	No
		Equal variances not assumed	0.150	
P_np vs P_p	0.103	Equal variances assumed	0.519	No
		Equal variances not assumed	0.519	
TW_np vs TW_p	0.845	Equal variances assumed	0.452	No
		Equal variances not assumed	0.452	
TP_np vs TP_p	0.515	Equal variances assumed	0.062	No
		Equal variances not assumed	0.062	
WP_np vs WP_p	0.281	Equal variances assumed	0.892	No
		Equal variances not assumed	0.892	
TWP_np vs TWP_p	0.604	Equal variances assumed	0.655	No
		Equal variances not assumed	0.655	

Since, NOPOS and POS is no statistically significant difference. it can simply combine each similar hint-type pair with NOPOS and POS as mentioned on Table 59.

Table 59 Combined Group

Hint Type	NOPOS		POS	
T	group#1	T np	group#8	T p
W	group#2	W np	group#9	W p
P	group#3	P np	group#10	P p
TW	group#4	T np + W np	group#11	T p + W p
TP	group#5	T np + P np	group#12	T p + P p
WP	group#6	W np + P np	group#13	W p + P p
TWP	group#7	T np + W np + P np	group#14	T p + W p + P p

A One-way ANOVA was used to examine whether students' improvement on a standardized test is a function of the different tool setting they received. The independent variable represented the seven different types of the different tool settings: T, W, P, TW, TP, WP, and TWP where T = Text Hint, W = Word-relation Graph, P = Pie Chart. The dependent variable was the students' score on a standardized test. See Table 60 for the means, standard deviations, min, and max for each of the seven groups.

Table 60 Descriptive Statistical of Different Tool Settings

	N	Mean	S.D.	Min	Max
T	30	0.67	0.758	0	2
W	30	1.87	1.479	0	5
P	30	1.23	1.135	0	4
TW	30	1.87	1.408	0	6
TP	30	1.27	1.048	0	4
WP	30	1.57	1.040	0	4
TWP	30	1.43	1.104	0	3
Total	210	1.41	1.208	0	6

An alpha level of 0.05 was used for all subsequent analyses. The test for homogeneity of variances was significant [*Levene's* $F(6, 203) = 2.215, p = 0.043$] indicating that this assumption underlying the application of ANOVA was not met. As such, the *Welch's F* test was used. The one-way ANOVA of standardized test score (see Table 61) revealed a statistically significant main effect [*Welch's* $F(6, 89.723) = 5.199, p < 0.001$] indicating that not all seven groups of the different tool settings resulted in the same standardized test score. The estimated omega squared ($est. \omega^2 = 0.107$ ^②) indicated that approximately 10% of the variation in standardized test score is attributable to differences between the seven groups of the different tool settings.

② $est. \omega^2 = \frac{df_1 \times (F-1)}{df_1 \times (F-1) + N} = \frac{6 \times (5.199-1)}{6 \times (5.199-1) + 210} = 0.107$

Table 61 Welch's ANOVA for students' improvement

	df1	df2	F	Sig.
Welch	6	89.723	5.199	.000

Post hoc comparisons, using Games-Howell procedure, were used to determine which pairs of the seven group means differed significantly. These results are given in Table 62 and indicate that students who had received W, TW, WP, and TWP setting (Mean = 1.87, 1.87, 1.57, and 1.43; S.D. = 1.479, 1.408, 1.040, and 1.104) scored significantly higher on the standardized test than did students who had received T (Mean = 0.67). The effect size ($ES^{\textcircled{3}}$) for these four significant effects were $1.021 \left(ES_{W,T} = 1.200 / \sqrt{\frac{1.479^2 + 0.758^2}{2}} \right)$, $1.061 \left(ES_{TW,T} = 1.200 / \sqrt{\frac{1.408^2 + 0.758^2}{2}} \right)$, $0.989 \left(ES_{WP,T} = 0.900 / \sqrt{\frac{1.040^2 + 0.758^2}{2}} \right)$, and $0.802 \left(ES_{TWP,T} = 0.767 / \sqrt{\frac{1.104^2 + 0.758^2}{2}} \right)$, respectively. It was shown that W, TW, WP, and TWP did perform significantly better on the test than T.

Table 62 Games-Howell Post Hoc Results

(I) hint_type	(J) hint_type	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
T	W	-1.200	0.303	<u>0.005</u>	-2.14	-0.26
	P	-0.567	0.249	0.277	-1.33	0.20
	TW	-1.200	0.292	<u>0.003</u>	-2.10	-0.30
	TP	-0.600	0.236	0.166	-1.32	0.12
	WP	-0.900	0.235	<u>0.006</u>	-1.62	-0.18
	TWP	-0.767	0.245	<u>0.042</u>	-1.52	-0.02
W	T	1.200	0.303	<u>0.005</u>	0.26	2.14
	P	0.633	0.340	0.515	-0.41	1.68
	TW	0	0.373	1	-1.14	1.14
	TP	0.600	0.331	0.546	-0.41	1.61
	WP	0.300	0.330	0.970	-0.71	1.31
	TWP	0.433	0.337	0.855	-0.60	1.47
P	T	0.567	0.249	0.277	-0.20	1.33
	W	-0.633	0.340	0.515	-1.68	0.41
	TW	-0.633	0.330	0.477	-1.64	0.38
	TP	-0.033	0.282	1	-0.90	0.83
	WP	-0.333	0.281	0.897	-1.19	0.53

$ES_{i,j} = \frac{\bar{X}_i - \bar{X}_j}{\sigma_{i,j}}$ where $\sigma_{i,j} = \sqrt{\frac{\sigma_i^2 + \sigma_j^2}{2}}$; $\bar{X}_i - \bar{X}_j$ is Mean Difference between \bar{X}_i and \bar{X}_j

	TWP	-0.200	0.289	0.993	-1.08	0.68
TW	T	1.200	0.292	<u>0.003</u>	0.30	2.10
	W	0	0.373	1	-1.14	1.14
	P	0.633	0.330	0.477	-0.38	1.64
	TP	0.600	0.320	0.507	-0.38	1.58
	WP	0.300	0.320	0.964	-0.68	1.28
	TWP	0.433	0.327	0.837	-0.57	1.43
TP	T	0.600	0.236	0.166	-0.12	1.32
	W	-0.600	0.331	0.546	-1.61	0.41
	P	0.033	0.282	1	-0.83	0.90
	TW	-0.600	0.320	0.507	-1.58	0.38
	WP	-0.300	0.270	0.922	-1.12	0.52
	TWP	-0.167	0.278	0.997	-1.02	0.68
WP	T	0.900	0.235	<u>0.006</u>	0.18	1.62
	W	-0.300	0.330	0.970	-1.31	0.71
	P	0.333	0.281	0.897	-0.53	1.19
	TW	-0.300	0.320	0.964	-1.28	0.68
	TP	0.300	0.270	0.922	-0.52	1.12
	TWP	0.133	0.277	0.999	-0.71	0.98
TWP	T	0.767	0.245	<u>0.042</u>	0.02	1.52
	W	-0.433	0.337	0.855	-1.47	0.60
	P	0.200	0.289	0.993	-0.68	1.08
	TW	-0.433	0.327	0.837	-1.43	0.57
	TP	0.167	0.278	0.997	-0.68	1.02
	WP	-0.133	0.277	0.999	-0.98	0.71

Note: The value in underline are significant at the 0.05 level.

The tool contains three hints available for the students to remind vocabulary selection. To find out a potential of each hint type, we compare the results of each hint on the changes made after getting the hints. We compare the use of single hint together and obtain the graph shown in Figure 32.

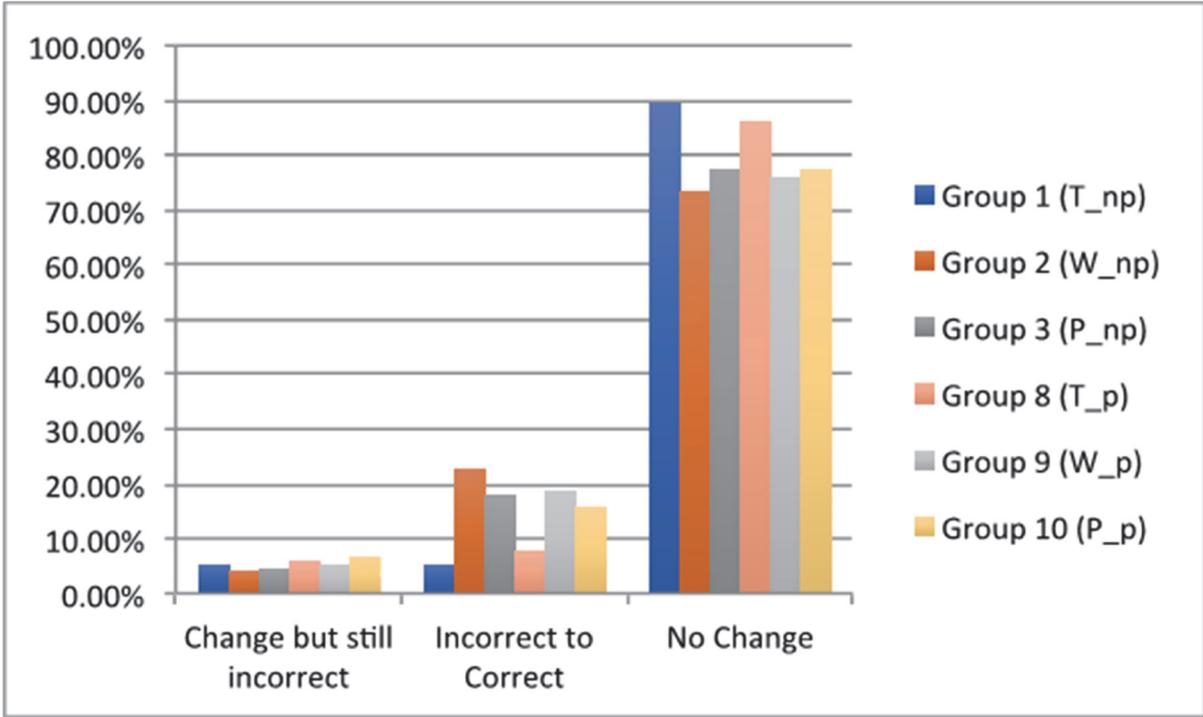


Figure 32 A comparison result of a single hint type

Figure 32 shows that the average of the changes is about 30%, and the change from incorrect to correct answers is about 15%. The most effective changes are from Group#2, #9, #3 and #4, respectively. The word relation hints yielded the best from either with POS in generation or not. On the other hands, the Text Hint did not perform well since it hardly convinced the students to make the changes in answering by comparing to the other two hint types.

With the no difference in POS generation on the previous comparison, we then compare Group#7 and #14 in which provided all the hint types to assure the assumption. We thus gained a chart shown in Figure 33.

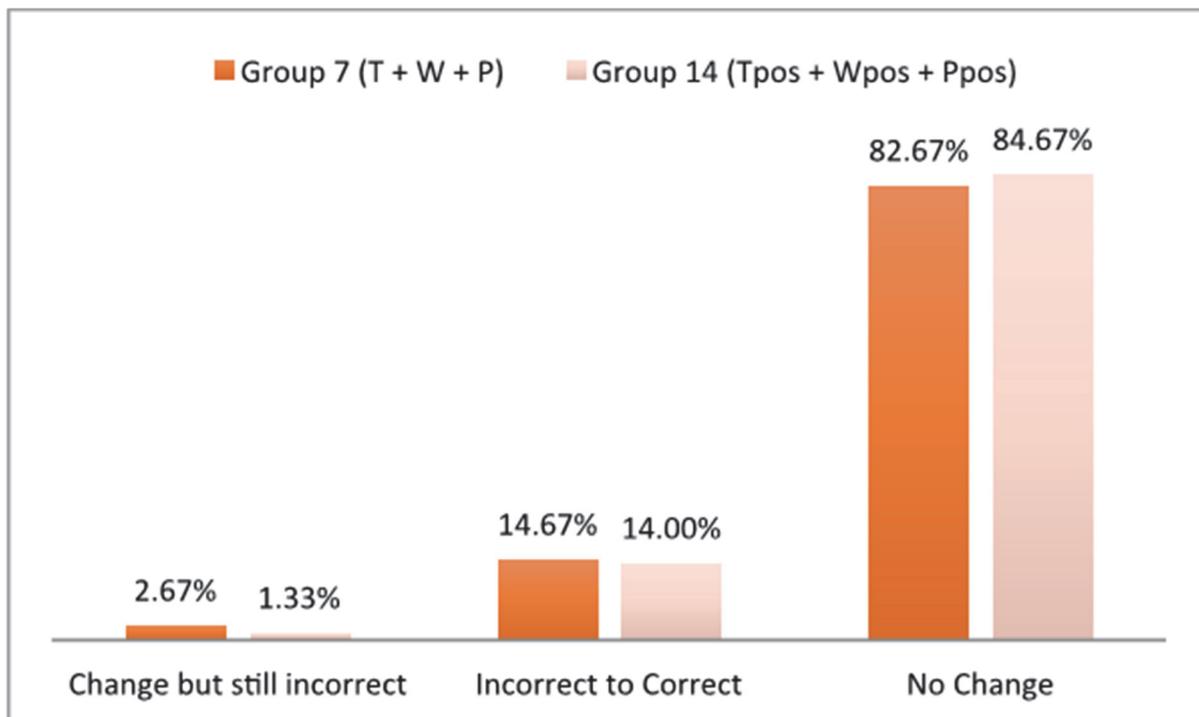


Figure 33 A comparison result of all the hint types

From the figure, the difference of applying POS in hint generation is small. With the previous comparison, this can be concluded that the hints for the students to learn word senses do not get benefit from POS, but giving more information seems to become more suitable hints. The chart also shows that more information provided from all the available hints reduced ineffective changes as lower percentages of “change but still incorrect” than the single hint type. This can also imply that the more hints giving to the students, the less confusing in word senses they can achieve. Since we found that POS did not affect the differences in the results, the further analysis will combine groups with the same settings together to increase the sample volume.

Furthermore, we are interested in improvement based on the sample group based on the level of proficiency. Hence, we summarize each group regarding difference in answering from their baseline. The results are given for the strong, moderate and weak level in Figure 34, Figure 36, and Figure 38, respectively.

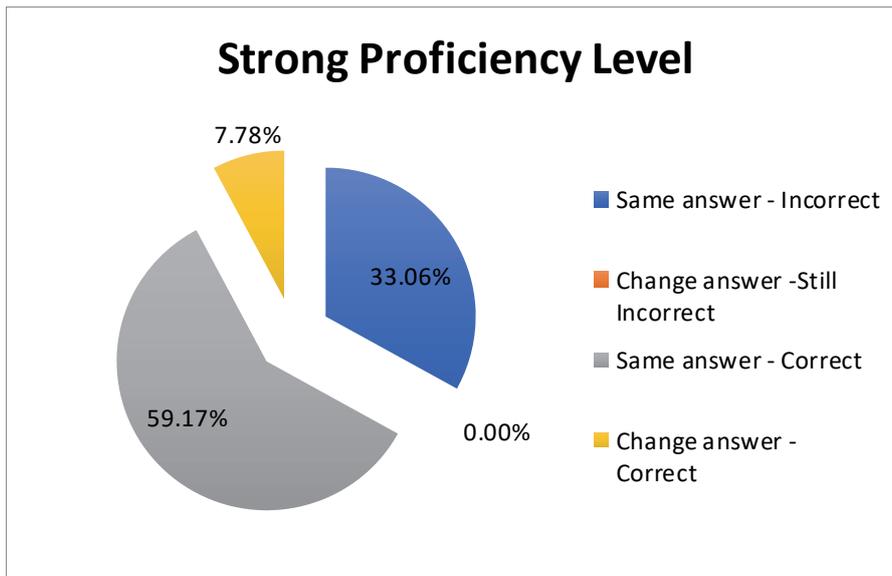


Figure 34 Improvement of the strong proficiency level

For the samples in strong proficiency level, correct answers were the majority in the baseline as about 60%. The samples in this group, regardless of hint types, made a few changes in answering, but all changes made were to correct ones. It can be seen as they fixed the errors and improved for 19.05% from their all mistakes. When comparing effectiveness by each hint type for all I-C cases, we found that the word relation hint was the best while the Pie Chart hint was slightly better than the Text Hint type as shown in Figure 35.

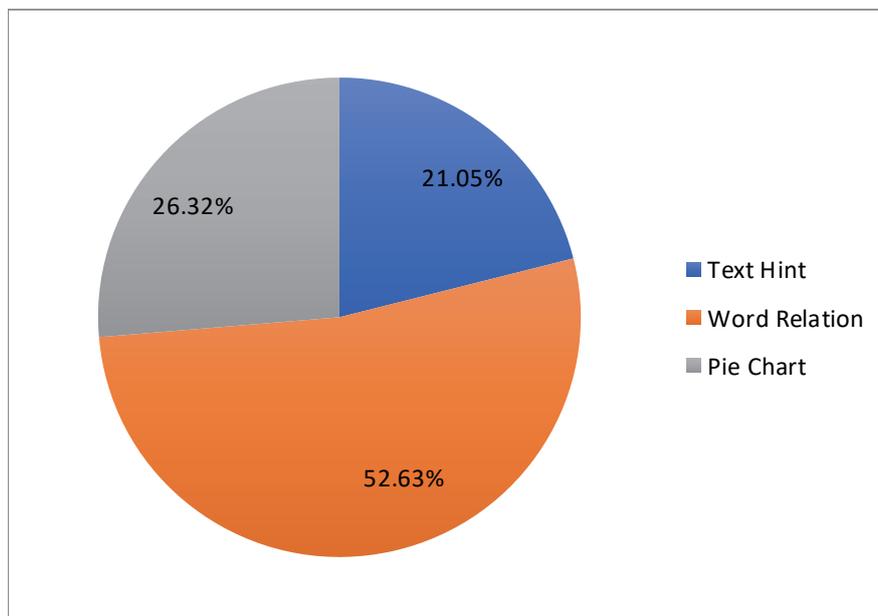


Figure 35 Effectiveness of the hint types in correcting wrong answers from the moderate proficiency samples

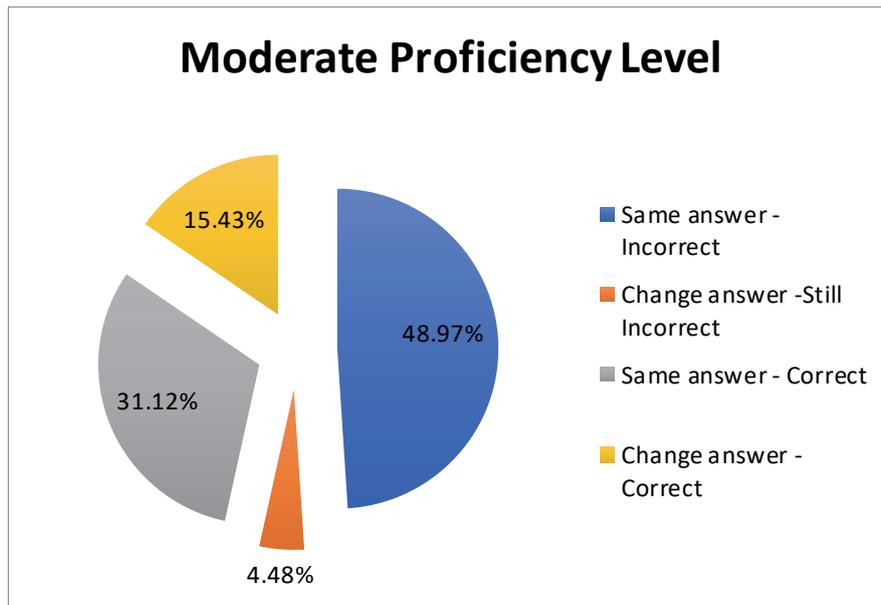


Figure 36 Improvement of the moderate proficiency level

The moderate level had their baseline with more incorrect than the correct one as 68.88%. With the hints, they made the changes for 19.91%, and only 15.43% changed for the correct answers. In details, the moderate level samples with the word relation hints gained the best improvement when focused into improvement based on the hint type as shown in Figure 37.

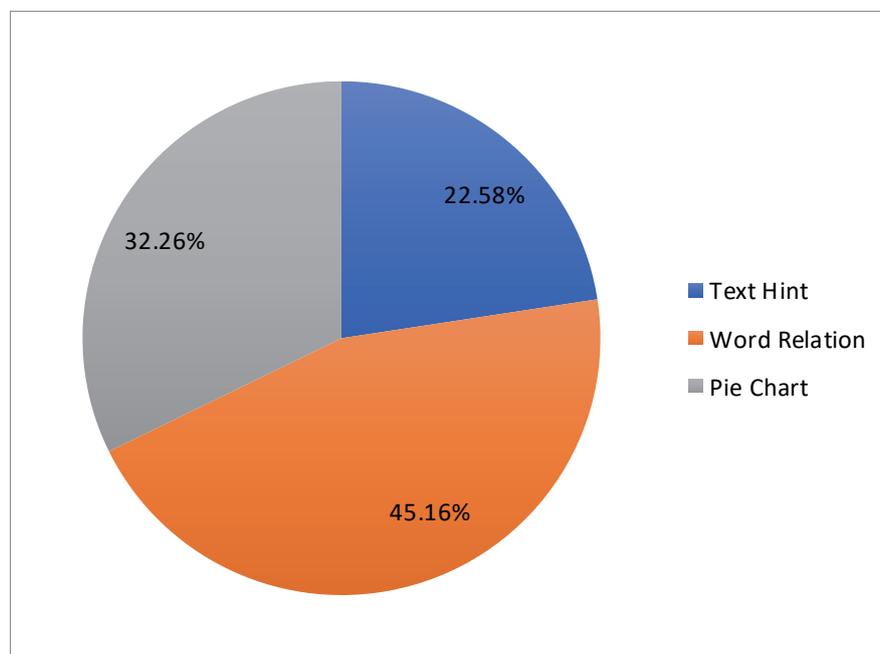


Figure 37 Effectiveness of the hint types in correcting wrong answers from the moderate proficiency samples

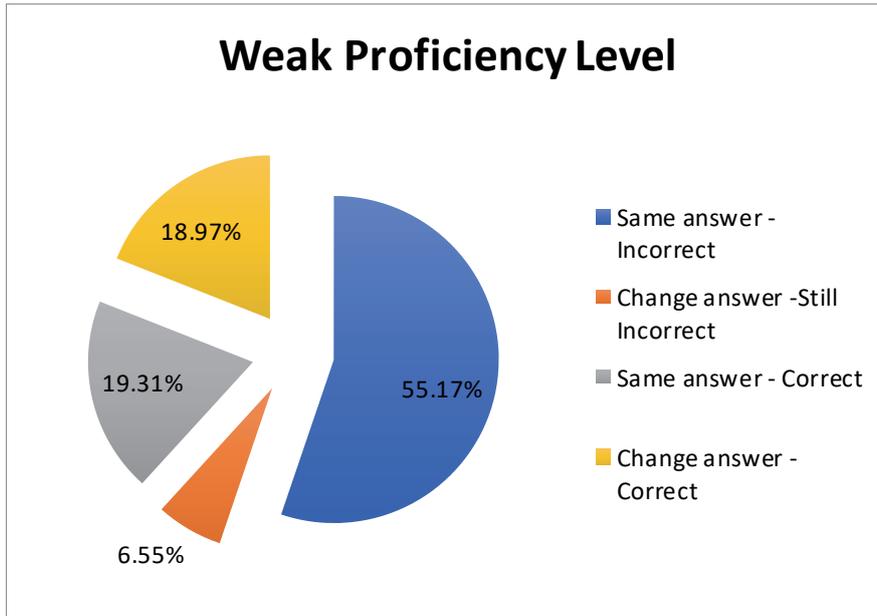


Figure 38 Improvement of the weak proficiency level

For the weak proficiency level, the majority of the answers in the baseline were incorrect as 80.69%. This group however gained the best percentage in choosing the right answers after the hints. Regarding the hint types, the samples from this group got convinced to change to the correct answers mostly with the Pie Chart and secondly with the word relation hint as shown in Figure 39.

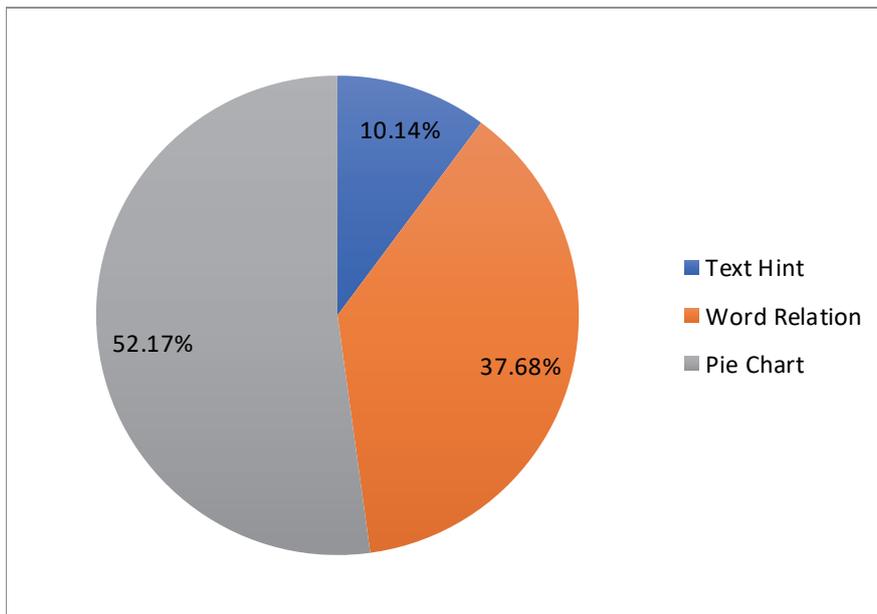


Figure 39 Effectiveness of the hint types in correcting wrong answers from the weak proficiency samples

From details given above, we can conclude that the tool got the good response from both moderate and weak level of the samples. Since the tool is designed to give the hints as information for the students, those who initially lack vocabulary knowledge may gain more than who already know and have their own information for decision-making.

5.4 Questionnaire

The questionnaire composed of two parts. The first part was for the participants to rate themselves for base knowledge and effect from the tool. The rate answer is on Likert-scale (5 scales) from “strongly agree” to “strongly disagree” respectively. The question and results are summarized in Table 63. The second part was free to fill. The questions are designed to get their opinions on the hints by each type (Text Hint, Pie Chart, and Word Relation Graph) and to get their additional suggestions.

The participants were all the samples of group#7 and group#14 from the experiment. They were chosen since they had experience and accessed to all the hint types from the tool.

Table 63 Summary of a questionnaire for selection of proper words in communication tool

	Question	Strongly Agree	Agree	No opinion	Disagree	Strongly Disagree
Q1	Text Hint helps better understanding the differences of word meaning.		1 (3%)		7 (23%)	22 (74%)
Q2	Text Hint helps better selecting word meaning.		1 (3%)	3 (10%)	8 (27%)	18 (60%)
Q3	Pie Chart helps understanding the differences of word meaning.		6 (20%)	23 (77%)	1 (3%)	
Q4	Pie Chart helps better selecting word meaning.		10 (30%)	20 (70%)		
Q5	Word Relation Graph helps better understanding the differences of word meaning.	4 (13%)	21 (70%)	5 (17%)		
Q6	Word Relation Graph helps better selecting word meaning.	12 (40%)	18 (60%)			
Q7	Thai vocabulary in a question matches with my intentional meaning.	2 (7%)	27 (97%)	1 (3%)		

Q8	All Thai vocabulary in a question is generally primary vocabulary.	25 (83%)	5 (17%)			
Q9	The tool helps to increase understanding in both Thai vocabulary and English vocabulary's meaning.	4 (13%)	17 (57%)	5 (17%)	3 (10%)	1 (3%)
Q10	The tool helps me better to choose English vocabulary matching with the intentional meaning.	11 (37%)	18 (60%)	1 (3%)		
Q11	The tool is to provide better understand the essential of word meaning in communication.	12 (40%)	8 (27%)	8 (27%)	2 (7%)	
Q12	I think the tool help my English vocabulary's acquisition more easily.	21 (70%)	6 (20%)	3 (10%)		
Q13	I think the tool was too difficult for me.		1 (3%)	2 (7%)	2 (7%)	25 (83%)
Q14	Before using the tool, it is adequate word by word communication abilities.	13 (53%)	15 (60%)		1 (3%)	1 (3%)
Q15	After using the tool, it is adequate word by word communication abilities			7 (23%)	16 (53%)	7 (23%)

From the results about the hints, Q1, Q3, and Q5 were focused and interpreted as follows:

- Q1: The Text Hint got negative results from the participants as it cannot help them to recognize difference in word meaning by getting disagree (23%) and strongly disagree (74%). This can be concluded that the Text Hint is not effective for most of the participants.
- Q3: The Pie Chart is moderate and received scatter rates. It got some positively (20%) from agree (20%) but mostly on no opinion (77%) and some on disagree (3%).
- Q5: The Relation of word graph received most of the answer as positive with 83% for strongly agree (13%) and agree (70%). This can be concluded that the Relation of word graph is apparently useful to help the participant in seeing difference in word meaning.
- From above results, they can be inferred that the Word Relation Graph is the best while the Pie Chart can relatively help for some cases but the Text Hint was not preferred at all.

From Q2, Q4 and Q6, the results of usefulness from the hint also co-related to the aforementioned results. Q7 and Q8 results were about vocabularies in the test. The students commonly answered in positive, and none was on negative. Most of them also answered in positive in usage and benefit of the tool. The majority of the answers from Q9, Q10, and Q11 were on positive side.

The Results of Q12 show that 90% of the students believed that the tool could help them in learning English vocabulary, and there were 70% among them strongly agreed to the question. 10% of the students had no opinion on this question.

From Q14 and Q15, the students' answer could be implied that they recognized on the problem with word-to-word translation without knowing L1 interference. With their

recognition, it shows that they could further improve vocabulary learning since they became aware of L1 interference.

Finally, the results of Q13 could be implied in terms of difficulty in using the tool. Most of the students (90%) also responded negatively (i.e. 83% of them answered “strongly disagree” and 7% answered “disagree”). Only one student (3%) positively agreed to the question. 7% of the participant neither agreed nor disagreed.

Overall, the results suggest that the majority of the students in the experimental group had positive perceptions about the tools in usefulness, word meaning, and vocabulary’s acquisition.

5.5 Students’ Views and Suggestions

The second part of the questionnaire allowed the participants to freely express their opinion and suggestion in a the text form. More interviews from the participants were conducted to extract all information to clarify their thoughts. The answers were analyzed and classified into the groups for easier interpretation. The first group was the positive opinions from the participants. The examples of the positive opinions were as follows.

- P1: This tool is nice with simple clarifying each word meaning.
- P2: The Pie Chart is easily used by seeing the most percentage of the words.
- P3: This tool is consisted of many functions especially the Word Relation Graph for more meaning.
- P4: I do not have to open a dictionary, just see the Word Relation Graph.
- P5: I just know that one word can have a lot meaning.

However, not all comments gave a good vibe, but some were in negative too. The negative comments were as follow.

- N1: Why do not you do it on mobile app? The web based application is very legacy.
- N2: The tool is not provided the exact answer. I have to recognize by myself.
- N3: The Word Relation Graph has many words related and it makes me a bit difficult to use.
- N4: This tool is nothing. I do not understand how the difference of each words.
- N5: This tool is not interesting without any colorful graphic, animation, picture, and example sentences.

From these comments, it is true that the tool may help some participants to recognize the difference in senses between words based on L1 from P1, P3, and P5 (from 18 persons). However, it can also make them know too much details and caused negative feelings as N2, N3, and N4 (from 9 persons). From N1, some participants (3 persons) asked to extend the tool as a mobile application. Lastly, the N4 comment was unique though it implies that some students did not learn to know but for grade and this tool would not satisfy them.

5.6 Overall Discussion

This tool was designed to help EFL students in learning a sense of vocabulary that may be confusable due to L1 interference. The main role of this tool is to help them to gain more understanding of the word senses regarding the L1 interference problem to improve the students' word selections in writing. Despite of being a learning supportive tool, the tool does not automatically return an answer of the fittest word choice to students since the instant answer will prevent them in learning senses of the word properly.

In addition, the L1 interference issue has appeared in foreign language learning. It is the fact that learners usually apply a basis of their mother language as a base for the learned foreign language. As for Thai, grammar and vocabulary sense are not the main interests, but the rhyming and word play are the focus in language usage in daily life. Common Thai people rarely understand such grammatical function, such as part-of-speech (POS) and word order, or semantic roles such actor or experiencer, but they can use Thai fluently. This is what Noam Chomsky called the "Deep Structure" (Chomsky, 1969). It is where native speakers know what a grammatically correct without ever having studied grammar or know the meaning of the unknown word with a clue from the context. This can cause learning and using words to be very difficult.

Based on the results of the questionnaire and interview, it was found that the students revealed that the hints could help them recognize the difference among confusing words. Six participants clearly specified that they never know that the words in Thai (L1) can have several senses and translated to different English words (L2). Moreover, they can get the concepts of words with their proper collocated terms. However, they also mentioned that the textual explanation of the words is difficult to conceptualize, especially for verbs and abstract entities. They mentioned that a picture, an animated figure or a video clip might help in conceptualization.

5.7 Summary

In this chapter, the experiments were conducted to prove a usefulness of the proposed methods and the tools designed based on the concepts. The experiments showed that the tool can help the students to select a correct word senses among other possible candidates from L1 interference. We also found that the tool is more suitable for those with moderate or low vocabulary background knowledge. In comparison among the hint types, the Text Hint performed the lowest and could slightly improve their understanding in the word sense. On the other hands, the word relations and the Pie Chart were more preferable since the results showed that they can effectively help the participants to find difference in the word senses that confusable based on L1 homonym issues. In terms of usability, the participants' impressions for the tool were mostly easy to use and informative. They also suggested that the image or video clip might help more since it can be seen easier as concepts. The current issue stated by the participants was the hit rates from the search engine might not be much helpful since the given statistic may contain those from ungrammatical and could affect the hint directly.

To improve the tool, we plan to find better resources in generating statistics of collocation instead of the hit rates from the search engines such as official writing corpora. Based on the participants' suggestion, we plan to research on a better representation of providing word sense instead of the text-based explanation that may be ambiguity. Last, we will research further in L1-L2 word sense disambiguation regarding on multi-sense expression such as compound words and idioms.

Chapter 6

Conclusion

Chapter 6: Conclusion

6.1 Concluding remarks

This thesis focuses on studying in vocabulary in English language learning of Thai students. From the study, the important findings were the necessity of the first language (L1) interference in choosing the term to represent their thought. By learning errors from actual written texts from The New EAGLE v3, the conducted pointed out that the issue has been one of the most frequent errors made by the Thai students. It has also been an issue that cannot be solved with existing tools and that required actual understanding in sense different from L1 and L2 (foreign language) to solve and improve. This issue can be seen as general translation to English in many actual situations. The root of the problem is that L1 word contains several meanings and can be translated into several English words, and the Thai students do not understand or realize the sense of words. For example, Thai word “ของปลอม [kʰɔːŋ plɔːm]” has several senses such as fake, counterfeit, and pirate, depending on situation and sense. However, the students mostly know the translation of fake; thus, they will always translate the word to fake normally without considering the intended sense.

To assist such students in this matter, a tool to help students in understanding the senses of words based on homonym of L1 was designed. The tool applied three types of lexical information including word meaning, all translatable words from all possible senses of the L1 words, and statistic of surrounding contexts. These details are given to the students to help them notice and learn on senses. The words aimed to provide with this extended information are the only words given to the tool that can be confusable based on the L1 sense. Word meaning and all translatable words based on L1 are obtained from a Thai-English dictionary. The statistics of surrounding words in L2 are generated by exploiting search engine to represent real world language usage. The first and second options help the students to reveal the unknown senses and remind of possibility in sense ambiguity while the last option is to inform them the probability of co-location.

From testing with 210 student samples, the results show that the use of the tool can improve their understanding of L1-L2 senses. The most effective representation of information is the Word Relation Graph function that they preferred mostly due to easier in comprehension. Moreover, the improvement of the students in choosing terms with correct sense can be implied from the correct cases of vocabulary testing.

6.2 Summary of the Findings and Discussions

This section provides summaries of the results of this study base on the research questions.

6.2.1 Research Question 1

RQ1: What are the main sources of error in English writing for Thai students?

In response to this research question, Chapter 3 describe the most interesting and important issue is about vocabulary which is the second top mistake type. One of the cause of the mistakes in vocabulary selection is the interference from the first language since the students naturally select a method of translation word-by-word. Because Thai language includes full of homonymy, a translation can lead to choose improper English words without realizing a different in sense. Moreover, the mistake is one of the majority issues that causes confusing in comprehension and significantly lowers the readability of their writing output.

6.2.2 Research Question 2

RQ2: How can we design the assisting tool to reducing main sources of error in English writing for Thai students?

Chapter 4 presents a method to provide the hints to help in EFL vocabulary learning. The focused issue in this work is confusion in meaning of words regarding to native language. Unlike confusion within English language itself, the issue comes from homonym in learners' native language, which is translatable into different senses in the learned language. To resolve such an issue, we provide three types of details, i.e. 1) a relation of words in bilingual direction from an electronic dictionary, 2) statistical data of surrounding words in context via search hit rate, and 3) details on word sense in English from WordNet.

6.2.3 Research Question 3

RQ3: How effective is the assisting tool for Thai students?

As designed, the tool provided the hints to show information about concepts of a word regarding ambiguity from L1 towards L2. The results from Chapter 5 revealed that the hints from the tool helped the students to select more amounts of correct L2 vocabularies despite the words were ambiguous in L1. The improvement after getting the hints was 29.14% from wrong selected choices given in the baseline. From the experiments, the results can be implied that the effective hints are the word relation to show all possible translations based on L1 and Pie Chart hint to inform collocation statistic of L2. The students mostly affected with the hints were the moderate proficiency level or lower as the hints showing word relations influenced them to recognize in sense-differences and made changes in answering. Although some of the changes made by the students did not go for correct ones, it still indicates a good sign in vocabulary learning because the students at least begin to aware of difference of L1 word sense and to realize that the selected L2 word might not represent what they think about.

6.3 Contributions and limitations

The main contribution of this work is the finding that the root of semantic errors in English writing is L1 interference. This work also reveals that the students can learn and improve in word sense ambiguity by providing sufficient information about word senses and real word context. Furthermore, the students prefer the hint with all information about the word relations in translation in the graph form. All the studies show that declaring the difference in senses from L1 can reduce cloudy mind of EFL students in an unknown sense and remind them to be careful in sense selection.

This work remains with some limitations. First, the confusable wordlist in this work is limited to the most frequently confusing words from the corpus. The data in the corpus may occasionally be outdated and limited to the domains; thus, it is suggestive to update and expand confusing words. The tool will be more usable and perform effectively with updated confusing words. Second, the Confusing Wordlist of L1 translation supports only one to many relationships from not many to one relationship from L1 to L2. There is the limitation to apply other L1 languages to L2 which is language's relationship as many to one. Third, the use of the hit rates from the search engines should be remarked as temporary resources. Since nature of data in Internet is a rapid growth and unstable, the stability in collocation statistic will gradually change from time to time. It should be best to find more stable resources for collocation statistic.

In terms of the tool limitation, the students mentioned that the generated graphic of the hit rate did not help much to inform them in a collocation aspect since the hit rate amounts of some questions were not clearly cut and almost equaled in each distribution. Because the hit rate of consecutive fragments (words) came directly from search engines' result, they may not truly stand for examples of practical usage of those words. Since data on the Internet also contain those ungrammatical phrases and famous specific names of book and movie (which sometimes are not grammatically correct), the hit rate results could count these and gave bias frequency.

6.4 Future works

To improve the system, we plan to find better resources in generating statistics of collocation instead of the hit rates from the search engines such as official writing corpora. Based on the students' suggestion, we plan to research on a better representation of providing word sense instead of the text based explanation that may be ambiguity. Last, we will research further in L1-L2 word sense disambiguation regarding on multi-sense expressions such as compound words, idioms, and many to one relationship.

In future, to solve common errors in EFL writing skill of Thai students about non-smoothing sentences in a topic is a challenging work. To organize the ideas to be smooth and easy to understand is one of the interesting work to provide more efficiency in writing communication. To concern about the unawareness of Thai students in paragraph structure, we propose a tool to be aware of Thai students in organizing logically in paragraph structure by the hint. Most of Thai students are capable of composing sentences as a paragraph, but not many of them know how to organize a good flow as a paragraph. The logical idea is to organize

with good flow to express your ideas as a sequence. The tool creates the better communication for students to understand the content. This tool provides conceptual structure mapping by giving an example from articles.

Reference List

- Alam, Y. S. (2007). A software system for second-language vocabulary learning. In *Advanced Learning Technologies, 2007. ICALT 2007. Seventh IEEE International Conference on* (pp. 130–132). IEEE. Retrieved from <http://ieeexplore.ieee.org/abstract/document/4280971/>
- Ando, K., Furukawa, Y., & Tsunashima, Y. (2009). A Writing Support Tool for Learners of Japanese as a Second Language based on a Web Search Engine. Retrieved from <http://www.apsce.net/icce/icce2009/pdf/C3/proceedings452-456.pdf>
- Aroonmanakun, W., Tansiri, K., & Nittayanuparp P. (2009). Thai National Corpus: A Progress Report. Proceedings of the 7th Workshop on Asian Language Resources, ACL-IJCNLP 2009 (pp.153–160), Suntec, Singapore.
- Basoglu, E. B., & Akdemir, Ö. (2010). A comparison of undergraduate students' English vocabulary learning: Using mobile phones and flash cards. *TOJET: The Turkish Online Journal of Educational Technology*, 9(3). Retrieved from <http://search.proquest.com/openview/5fb90b6789b6013fa06f244cd7bf223e/1?pq-origsite=gscholar&cbl=1576361>
- Beyer, M. P. M. H. A., & Stein, B. (2014). Improving Cloze Test Performance of Language Learners Using Web N-Grams. Retrieved from <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.567.1071&rep=rep1&type=pdf>
- Chomsky, N. (1969). Deep Structure, Surface Structure, and Semantic Interpretation. Indiana University Linguistics Club. Retrieved from <https://books.google.co.th/books?id=3L1CAAAlAAJ>
- Cobb, T. (1999). Breadth and Depth of Lexical Acquisition with Hands-on Concordancing. *Computer Assisted Language Learning*, 12(4), 345–360. <https://doi.org/10.1076/call.12.4.345.5699>
- Cobb, T. (2004). The Compleat Lexical Tutor. Retrieved from <http://www.lextutor.ca/>
- Connor, U. (1987). Argumentative patterns in student essays: Cross-cultural differences. In U. Connor & R.B. Kaplan (Eds.), *Writing across languages: Analysis of L2 texts* (pp. 57-71). Reading, MA: Addison - Wesley.
- Connor, U. (1996). *Contrastive rhetoric: Cross-cultural aspects of second language writing*. Cambridge, UK: Cambridge University Press.
- Connor, U. (2002). New directions in contrastive rhetoric. *TESOL Quarterly*, 36(4), 493–510.
- Connor, U., & Farmer, M. (1990). The teaching of topical structure analysis as a revision strategy for ESL writers. In B. Kroll (Ed.), *Second language writing: Research insights for the classroom* (pp. 126-139). Cambridge: Cambridge University Press.
- Connor, Ulla. (2004). Intercultural rhetoric research: Beyond texts. *Journal of English for Academic Purposes* 3: 291-304

- D3.js. (2011). D3: Data-Driven Documents. Retrieved from <https://d3js.org/>
- ETS. (2016). TOEFL iBT Tests: Test and Score Data. Retrieved from http://www.ets.org/s/toefl/pdf/94227_unlweb.pdf
- Goodfellow, R. & Laurillard, D. (1994). Modeling learning processes in lexical CALL, *CALICO Journal*, 11, 19–46. Retrieved from: <http://calico.org/>
- Grammarly. (2009). Retrieved from <https://www.grammarly.com/>
- Groot, P.J. M. (2000). Computer assisted second language vocabulary acquisition. *Language Learning and Technology*, 4, 60–81.
- Hacker, D. (2007). A writer's reference (6th ed). Boston, MA: Bedford/St. Martins.
- Hot Potatoes. (1998). Retrieved from <http://hotpot.uvic.ca/>
- Kaplan, R. B. (1966). Cultural thought patterns in intercultural education. *Language Learning* 16, 1–20.
- Kaplan, R. B. (1997). Contrastive rhetoric. In T. Miller (Ed.), *Functional approaches to written text: Classroom applications* (pp. 18-32). Washington, D.C.: English Language Programs.
- Kaplan, R. B. (2000). Contrastive rhetoric and discourse analysis: Who writes what to whom? When? In what circumstances? In S. Sarangi & M. Coulthard (Eds.), *Discourse and social life* (pp. 82-169). London: Longman.
- Kilgarriff, A., & Grefenstette, G. (2003). Introduction to the special issue on the web as corpus. *Computational Linguistics*, 29(3), 333–347.
- Kosawat, K., Akaraputthiporn, P., & Aroonmanakun, W. (2009). A Bi-directional Translation Approach for Building Thai Wordnet. In *Proceedings of the International Conference on Asian Language Processing* (pp. 97-101).
- Leenoi, D., Supnithi, T., & Aroonmanakun, W. (2009). Building Thai WordNet with a Bi-directional Translation Method. In *Proceedings of the International Conference on Asian Language Processing* (pp. 48-52).
- Liu, X., Gales, M. J., & Woodland, P. C. (2009). Use of contexts in language model interpolation and adaptation. In *INTERSPEECH* (pp. 360–363). Retrieved from <http://mi.eng.cam.ac.uk/~xl207/publications/techs/tech-630-cntxlmia.pdf>
- MasterWriter. (2012). Retrieved from <http://www.masterwriter.com/>
- Milton, J., & Cheng, V. S. (2010). A toolkit to assist L2 learners become independent writers. In *Proceedings of the NAACL HLT 2010 Workshop on Computational Linguistics and Writing: Writing processes and authoring aids* (pp. 33–41). Association for Computational Linguistics. Retrieved from <http://dl.acm.org/citation.cfm?id=1860662>
- Nagarachinda, T., & Ratitamkul, T. (2015). Homonyms in Thai: The classification based on corpus data and language users' judgments. *Journal of humanities faculty of humanities Naresuan University*, 12(2), 67–85.

- Nara, H. (1994). Improved delivery of lexical information in a computer assisted reading instruction program. *CALICO Journal*, 19–36.
- Na-Thalang, S. S., Chotimongkol, A., & Supnithi, T. (2010). Toward the development of SWAN (Student Writing AssitaNt) for Thai learners. In *CULI's 7th International Conference 2010 Pathways in EIL: Explorations and Innovations in Teaching and Research* (p. 54). Retrieved from http://www.culi.chula.ac.th/international/conferences/International/International2010/res_culi2011.pdf#page=61
- NECTEC. (1995). Thai-English Electronic Dictionary LEXiTRON. Retrieved from <http://lexitron.nectec.or.th/>
- NIETS. (2015). The National Institute of Educational Testing Service (Public Organization). Retrieved from <http://www.niets.or.th/>
- Palingoon P., Chantanapraiwan P., Theerawattanasuk S., Charoenporn, T., & Sornlertlumvanich, V. (2002). Qualitative and quantitative approaches in bilingual corpus-based dictionary. In *Proceeding of conference of SNLP-Oriental COCOSDA 2002* (pp. 152–158). Retrieved from https://lexitron.nectec.or.th/2009_1/paper/paper_2.pdf
- Princeton University. (2010). About WordNet. Retrieved from <http://wordnet.princeton.edu/>
- Pro Writing Aid. (2012). Retrieved from <https://prowritingaid.com/>
- Ratz, S. (2015). Vocabulary Learning with the Moodle Glossary Tool: A Case Study. *Journal of Perspectives in Applied Academic Practice*, 4(1). Retrieved from <http://jpaap.napier.ac.uk/index.php/JPAAP/article/view/170>
- Scott, M. (1996). Retrieved from <http://www.lexically.net/wordsmith/>
- Speaks, J. (2014). Theories of Meaning. *The Stanford Encyclopedia of Philosophy (Fall 2014 Edition)*, Edward N. Zalta (ed.). Retrieved from <http://plato.stanford.edu/archives/fall2014/entries/meaning/>
- Sun, K.-T., Huang, Y.-M., Liu, M.-C., & others. (2011). A WordNet-Based Near-Synonyms and Similar-Looking Word Learning System. *Educational Technology & Society*, 14(1), 121–134.
- Svenconis, D. J., & Kerst, S. (1994). Investigating the teaching of second-language vocabulary through semantic mapping in a hypertext environment. *Calico Journal*, 33–57.
- Takhom, A., Trakultaweekoon, K., Chotimongkol, A., Porkaew, P., Na-Thalang, S. S., & Supnithi, T. (2011). EAGLE: an Error tAGger for Learners of English. In *Proceedings of the 19th International Conference on Computers in Education* (pp. 247-254). Retrieved from https://www.nectec.or.th/icce2011/program/proceedings/pdf/C3_F1_116F.pdf
- Vtrain. (1999). Retrieved from <http://www.vtrain.net/>

Publications

International Journal

Nattapol KRITSUTHIKUL, Cholwich NATTEE, Thepchai SUPNITHI, and Shinobu HASEGAWA: Error Analysis in English Writing of Thai Students, *International Journal of Computer Applications in Technology (IJCAT)*, 2017. (2017 under submitting)

Nattapol KRITSUTHIKUL, Cholwich NATTEE, Thepchai SUPNITHI, and Shinobu HASEGAWA: Improving EFL Vocabulary Learning by Reducing Interference of Word Sense in Native Language, *International Journal of Computer Applications in Technology (IJCAT)*, 2017. (2017 under submitting)

Conference Full Paper

Nattapol KRITSUTHIKUL, Shinobu HASEGAWA, Cholwich NATTEE, and Thepchai SUPNITHI: Assisting Tools for Selecting Proper Semantic Meaning by Disambiguation of the Interference of the First Language, *Workshop Proceedings of the 22nd International Conference on Computers in Education (ICCE 2014)*, Nara Prefectural New Public Hall, Nara, Japan, November 30 - December 4, 2014, pp. 609-615.

Nattapol KRITSUTHIKUL, Shinobu HASEGAWA, Cholwich NATTEE, and Thepchai SUPNITHI: A Virtual Environment for English as Foreign Language Learning Platform (veEFL): Applied “Single Idea of Concept” to Improve Writing skill of Low English Proficiency Students, *Proceedings of the 2nd Asian Conference on Information Systems (ACIS 2013)*, Merlin Beach Resort and Spa, Phuket, Thailand, October 31 - November 2, 2013, pp. 247-254.

Conference Short Paper

Nattapol KRITSUTHIKUL, Shinobu HASEGAWA, Cholwich NATTEE, and Thepchai SUPNITHI: A Virtual Environment for English as Foreign Language Learning Platform (veEFL): Applied “Single Idea of Concept” to Improve Writing skill of Low English Proficiency Students, *Proceedings of the 21st International Conference on Computers in Education (ICCE 2013)*, Grand Inna Bali Beach Hotel, Denpasar Bali, Indonesia, November 18-22, 2013, pp. 783-788.

Poster

Nattapol KRITSUTHIKUL, Cholwich NATTEE, Thepchai SUPNITHI, and Shinobu HASEGAWA: A Virtual Environment for English as Foreign Language Learning Platform (veEFL): Common Errors in EFL Writing of Low English Proficiency Students Infrastructure, *Proceedings of the 66th Special Interest Group in Advanced Learning Science and Technology*, The Japan Society for Artificial Intelligence (SIG-ALST 66), SIG-ALST-B202-W4, Keio University Hiyoshi Campus, Yokohama, Kanagawa, Japan, November 16, 2012, pp. 31-34.

Appendices

Appendix A - a test for selection of proper words in communication tool

Test4q5v3

ส่วนที่ ๑: จงลากเส้นเพื่อจับคู่ความหมายที่เป็นไปได้ของคำต่อไปนี้

Part 1: Match the words with appropriate meaning.

T01: เก็บ	E01: absent
T02: เขียน	E02: accident
T03: คน	E03: boom
T04: ชน	E04: break
T05: ดั่ง	E05: broken
T06: เดิน	E06: citizen
T07: โดด	E07: collect
T08: ทันสมัย	E08: compose
T09: เสีย	E09: dead
T10: หยุด	E10: draw
	E11: encounter
	E12: end
	E13: fashion
	E14: fight
	E15: human
	E16: inhabitant
	E17: jump
	E18: lose
	E19: loud
	E20: modern
	E21: move
	E22: paint
	E23: plunge in
	E24: preserve
	E25: put away
	E26: resound
	E27: shut
	E28: skip
	E29: spoiled
	E30: spring
	E31: stir
	E32: store
	E33: transport
	E34: travel
	E35: trendy
	E36: up to date
	E37: versus
	E38: walk
	E39: well known
	E40: write

Test4q5v3

ส่วนที่ ๒: โปรดเลือกคำศัพท์ที่เหมาะสมที่สุดสำหรับแต่ละประโยคโดยใช้ปากกาสีน้ำเงิน
หลังจากใช้เครื่องมือช่วยการเรียนแล้ว หากต้องการแก้ไขโปรดใช้ปากกาสีแดง

Part 2: Choose the most appropriate word from the sentence by using the blue pen.
Use the red pen for correcting.

- 1) I เขียน a picture by pencil.
(a) write (b) paint (c) draw (d) compose

- 2) This shirt is ทันสมัย.
(a) modern (b) trendy (c) fashion (d) up to date

- 3) He is an American คน.
(a) human (b) citizen (c) stir (d) inhabitant

- 4) His father is one of the ดัง person in this country.
(a) resound (b) boom (c) well known (d) loud

- 5) After I finished doing my homework, my mother said that เก็บ your books.
(a) collect (b) store (c) put away (d) preserve

- 6) She keeps talking an hour. It makes me upset so I tell her to หยุด her mouth.
(a) break (b) end (c) absent (d) shut

- 7) I would like to เดิน in the park.
(a) travel (b) walk (c) move (d) transport

- 8) She has stomachache because she ate เสีย food.
(a) dead (b) broken (c) lose (d) spoiled
- 9) I got bad grade because I often โดด class.
(a) jump (b) spring (c) skip (d) plunge in
- 10) My car got ชน.
(a) fight (b) encounter (c) versus (d) accident

Appendix B - a questionnaire for selection of proper words in communication tool

Test4pq1v3

ความหมาย: 5 = เห็นด้วยอย่างยิ่ง / 4 = เห็นด้วย / 3 = ไม่มีความเห็น / 2 = ไม่เห็นด้วย / 1 = ไม่เห็นด้วยอย่างยิ่ง

Legend: 5 = Strongly Agree / 4 = Agree / 3 = No opinion / 2 = Disagree / 1 = Strongly Disagree

	คำถาม	5	4	3	2	1
	Question					
Q1	ข้อความแนะนำช่วยเสริมสร้างความเข้าใจความแตกต่างความหมายของคำศัพท์ได้ดีมากขึ้น Text hint helps better understanding the differences of word meaning.					
Q2	ข้อความแนะนำช่วยให้เลือกใช้ความหมายได้ดีมากขึ้น Text hint helps better selecting word meaning.					
Q3	กราฟวงกลมช่วยเสริมสร้างความเข้าใจความแตกต่างความหมายของคำศัพท์ได้ Pie chart helps understanding the differences of word meaning.					
Q4	กราฟวงกลมช่วยให้เลือกใช้ความหมายได้ดีมากขึ้น Pie chart helps better selecting word meaning.					
Q5	กราฟความสัมพันธ์ของคำช่วยเสริมสร้างความเข้าใจความแตกต่างความหมายของคำศัพท์ได้ดีมากขึ้น Word-relation graph helps better understanding the differences of word meaning.					
Q6	กราฟความสัมพันธ์ของคำช่วยให้เลือกใช้ความหมายได้ดีมากขึ้น Word-relation graph helps better selecting word meaning.					
Q7	คำศัพท์ภาษาไทยในคำถามตรงกับความหมายที่ต้องการสื่อออกไป Thai vocabulary in a question matches with my intentional meaning.					
Q8	คำศัพท์ภาษาไทยในคำถามล้วนแต่เป็นคำศัพท์พื้นฐานที่รู้โดยทั่วไปอยู่แล้ว All Thai vocabulary in a question is generally primary vocabulary.					
Q9	เครื่องมือนี้ช่วยเพิ่มความเข้าใจ ความหมายของคำในภาษาไทยและความหมายของคำในภาษาอังกฤษ The tool helps to increase understanding in both Thai vocabulary and English vocabulary's meaning.					
Q10	เครื่องมือนี้ช่วยให้ฉันเลือกใช้คำภาษาอังกฤษได้ตรงกับความต้องการมากขึ้น The tool helps me better to choose English vocabulary matching with the intentional meaning.					
Q11	เครื่องมือนี้ทำให้เข้าใจได้ว่า ความหมายของคำ สำคัญในการสื่อสารอย่างยิ่ง The tool is to provide better understand the essential of word meaning in communication.					
Q12	ฉันคิดว่าเครื่องมือนี้ทำให้การเรียนคำศัพท์ภาษาอังกฤษง่ายขึ้น I think the tool help my English vocabulary's acquisition more easily.					
Q13	ฉันคิดว่าเครื่องมือนี้ใช้งานยาก I think the tool was too difficult for me.					

Test4pq1v3

Q14	ก่อนใช้เครื่องมือนี้ ฉันคิดว่า การแปลคำต่อคำ เพียงพอต่อการติดต่อสื่อสาร Before using the tool, it is adequate word by word communication abilities.					
Q15	หลังใช้เครื่องมือนี้ ฉันคิดว่า การแปลคำต่อคำ เพียงพอต่อการติดต่อสื่อสาร After using the tool, it is adequate word by word communication abilities					

หัวข้อ / topic	คำแนะนำ / comment
ข้อความแนะนำ Text Hint	
กราฟวงกลม Pie chart	
กราฟความสัมพันธ์ของคำ Relation of word graph	
อื่น ๆ Other	