



## EFL Students' *Yahoo!* Online Bilingual Dictionary Use Behavior

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### Abstract

This study examined 38 EFL senior high school students' *Yahoo!* online dictionary look-up behavior. In a language laboratory, the participants read an article on a reading sheet, underlined any words they did not know, looked up their unknown words in *Yahoo!* online bilingual dictionary, and wrote down the definitions of their looked-up words. The participants' dictionary look-up records were collected, their look-up errors were categorized into four types, and their look-up behavior was interpreted through seven patterns. The results showed that some participants looked up a word in the dictionary without removing the inflection of it, looked up individual words instead of a fixed expression, did not make good use of the example sentences or phrases provided by the dictionary, or did not take the context into consideration when selecting an appropriate meaning for a word. Based on the students' online dictionary look-up errors and their dictionary-consulting behavior patterns, pedagogical implications concerning dictionary look-up instruction are raised and discussed.

**Keywords:** Online dictionary use behavior, Dictionary look-up errors

### 1. Introduction

Dictionaries are considered good companions to language learners, especially to second or foreign language learners because dictionaries can provide a quick and direct access to the meaning of an unknown word. In EFL contexts, the supporting role of dictionaries has been emphasized by both teachers and researchers (e.g., Bogaards, 1996), and the training of dictionary skills is considered important and necessary because EFL learners may not be able to make good use of dictionaries without explicit instruction (Fan, 2000; Su, 2003; Wright, 1998).

Nowadays with the easy and widespread access to the Internet, more and more EFL students begin to use online dictionaries when they encounter unknown words in their English learning tasks (Lan, 2005). It is mainly because online dictionaries, like electronic ones, can provide students with the information about the looked-up words with ease and speed. Given the fact that EFL students may frequently consult online dictionaries, examining their online dictionary look-up behavior may reveal *how* they interact with the online dictionary and even *how* they process the unknown words.

### 2. Background

Although there is pedagogical value in investigating EFL learners' dictionary use behavior, research in this regard is quite scant. Studies on EFL learners' dictionary use often center on issues such as their preferences of dictionary types (Diab & Hamdan, 1999; Liang, 2006), their purposes of consulting dictionaries (Atkins & Varantola, 1997; Liang, 2006; Su, 2003), and the piece(s) of information they had extracted from their dictionary consultations (Fan, 2000). In spite of the rare research in exploring the process of how EFL students consult dictionaries, there exist two such studies (Al-Ajmi, 2002; Nesi & Haill, 2002), both of which examined students' use of *paper* dictionaries by analyzing their look-up errors.

Al-Ajmi (2002) analyzed 46 EFL students' look-up errors in doing translation tasks, trying to detect some possible links between these errors and the structural features of two English-Arabic paper dictionaries. The errors he had found were categorized into three types, accompanied by several possible reasons (Al-Ajmi, 2002, p. 123):

1) *Users' difficulties with dictionary information:*

(a) Failure to find the correct sense in a polysemous entry. (b) Failure to find the headword although it was there. (c) Searching in the wrong entry. (d) Selecting the wrong sub-sense. (e) Searching for proper nouns and foreign words. (f) Selecting the wrong synonym. (g) Choosing more than one equivalent (uncertainty). (h) Inability to recognize multiword expressions. (i) Selecting parts of explanation or equivalents.

2) *Problematic macro- and microstructural features of the dictionary:*

(a) Missing or untranslated derivatives. (b) Lack of appropriate equivalents. (c) Missing senses. (d) Typeface size of Arabic equivalents.

### 3) *Difficulties resulting from interaction with the text:*

- (a) Misreading the problematic word. (b) Word division at line endings in English texts.

Nesi and Haill (2002) analyzed 89 EFL/ESL students' look-up errors in their use of several paper dictionaries to do reading assignments in a natural setting. They categorized students' errors into five types (Nesi & Haill, 2002, p. 282):

- 1) The subject chose the wrong dictionary entry or sub-entry.
- 2) The subject chose the correct dictionary entry or sub-entry but misinterpreted the information it contained.
- 3) The subject chose the correct dictionary entry or sub-entry, but did not realize that the word had a slightly different meaning in context.
- 4) The subject found the correct dictionary entry or sub-entry, but rejected it as inappropriate in context.
- 5) The word or appropriate word meaning was not in any of the dictionaries the subject consulted.

The above two studies demonstrate the difficulties that EFL students may encounter in using *paper* dictionaries. Although Nesi and Haill's (2002) classification of errors differed from that of Al-Ajmi's (2002), similar look-up difficulties were found in both studies. For example, the students had difficulty in selecting an appropriate meaning in a polysemous entry or they might select meanings from a wrong word entry due to their misidentification of the grammatical class of the looked-up word. Moreover, students' look-up errors might be attributed to the dictionaries because there were missing senses of the words in the dictionaries. These look-up error analysis studies may reveal students' lack of training in using dictionaries or be suggestive of their insufficient knowledge of the English language. Based on the errors students make and the difficulties they encounter in consulting dictionaries, teachers can provide proper instruction to students in the use of dictionaries.

Until now, there seems to be little research on examining how EFL learners use *online* dictionaries or to analyze their look-up errors in using *online* dictionaries. Given the growing popularity of online dictionaries among EFL learners (Lan, 2005), it would be of some pedagogical value to trace the process of their online dictionary use behavior and to find out their problems in using online dictionaries. In addition, by comparing the errors students' made in using *online* dictionaries and in using *paper* dictionaries, we can obtain a fuller picture of EFL learners' dictionary use behavior. In the EFL context in Taiwan, *Yahoo!* online bilingual dictionary (the English-Chinese version) is one of the most popular online dictionaries among students (Lee, 2008). Therefore, this study tried to preliminarily explore EFL students' *Yahoo!* online bilingual dictionary look-up behavior in doing a reading task. Specifically, two research questions were addressed:

- 1) What is EFL students' *Yahoo!* online bilingual dictionary use behavior? In order to answer this question, two sub-questions were examined. (a) What types of errors do students make in their online dictionary use? (b) What are these errors and non-errors suggestive of students' online dictionary look-up behavior?
- 2) What is EFL students' feedback on *Yahoo!* online bilingual dictionary?

## 3. The present study

### 3.1 Participants

The participants were 38 EFL students in a public senior high school in northern Taiwan. They were in their second year, their average age being 17. Among them, 19 were female and, 9, male. In particular, these EFL learners belonged to an English-gifted class in that school. Information from their English (also homeroom) teacher suggested that most of the students were English learners with high motivation, and their English proficiency was generally higher than their peers in other classes in the same school.

### 3.2 Instruments

#### 3.2.1 Yahoo! online bilingual dictionary (<http://tw.dictionary.yahoo.com>)

*Yahoo!* online bilingual dictionary (English-Chinese or Chinese-English version) was chosen as the instrument to collect the participants' look-up records not only because it is very popular among students in Taiwan (Lee, 2008) but also because it has been used by 92% of the participants (35 students) in an informal survey before the study. Thus, examinations of students' use of the *Yahoo!* dictionary may reveal their general use of online dictionaries.

*Yahoo!* online bilingual dictionary has three major functions (see Figure 1). Users can consult the meanings of English (or Chinese) words, scan the English words in alphabetical order, or submit a paragraph for translation. For meaning consultation, the dictionary provides information about a word's definitions, its synonyms and antonyms, derivatives, pronunciation, part of speech, example sentences, and some grammatical rules.

#### 3.2.2 Reading text

The reading text was entitled *Unlocking the Benefits of Garlic* (see Appendix A), taken from the New York Times

Website. The reason for selecting the reading text from this website was that the participants were regularly reading the news articles from the New York Times as supplementary materials prepared by their English teacher. Thus, using the text from the same material source would resemble their regular reading assignments. After the reading text was selected, it was sent to their English teacher for further examination. It was confirmed that the participants did not read the article before and that the article was difficult enough for the students and contained at least 20 words the participants did not know, which served well the dictionary look-up activity.

### 3.2.3 Questionnaire

A 7-item questionnaire was designed to investigate the students' feedback on *Yahoo!* online bilingual dictionary. The first three questions were in a 5-point Likert scale format, with 5 indicating *strongly agree* and 1, *strongly disagree*. They explored questions of whether students could use the dictionary to get the information they want, whether they were satisfied with the dictionary, and whether they would use it often. The last four questions were open-ended ones, which elicited students' responses to the actions they would take when a word has many definitions, the difficulties they encountered in using the dictionary, and their perceived strengths and weaknesses of the dictionary. The questionnaire was written in Chinese, the participants' L1. An English version of the questionnaire was shown in Appendix B, along with the results of the questionnaire.

### 3.3 Data collection procedure

This study was conducted in the senior high school's language laboratory, where every participant had access to the Internet, during one of the participants' regular English classes (50 minutes). The procedures were as follows. First, the students were informed of the purpose of this study, and then were reminded that the data collected in this study would not affect their English grade so as to lower their anxiety of poor performance. Second, a brief instruction in how to use the *Yahoo!* online bilingual dictionary was provided. Students were given time to set up their computer and practice with the online dictionary. Third, the sheets of the reading text were distributed to the students, and they were told to read the text first, and at the same time underline any English words they did not know. Fourth, the students looked up their own unknown words by using *Yahoo!* online bilingual dictionary for about 30 minutes. They were told to write down the words' parts of speech and their Chinese definitions in the blank space below the underlined English words on the reading sheet. In addition, if they could not find the word in the dictionary, they were told to report the failure. Finally, the students' reading sheets were collected, and they were asked to answer the questionnaire in Chinese.

### 3.4 Data analysis procedure

There were two sets of data in this study, namely, the look-up record data and the questionnaire data. Data of the participants' looked-up words were analyzed both quantitatively and qualitatively. First, the number of the participants' looked-up words was calculated. Then, the looked-up words were calculated by participant and by item. Every looked-up word was keyed into the *Yahoo!* online bilingual dictionary by the researcher to retrieve its correct meaning. By comparing the results of the *Yahoo!* dictionary and the definitions provided by the participants, the look-up errors were identified. Finally, the identified errors were categorized into four types based on Al-Ajmi (2002) and Nesi and Haill (2002) for further interpretation.

The questionnaire data consisted of two parts: three 5-point Likert-scale items and four open-ended questions. First, responses to the Likert-scale items were tallied for their frequencies. Then, answers to the open-ended questions were coded by the researcher.

## 4. Results and discussion

### 4.1 The looked-up words

#### 4.1.1 Descriptives of the looked-up words

Descriptive statistics of the participants' looked-up words were shown in Table 1. Each participant looked up between 16 and 51 words, with an average of 31 words. There were a total of 1188 look-up records. Among the 1188 look-up records, 960 (81%) were correct look-ups while 228 (19%) were errors. Thus, the correct rate was 81%. This high correct rate may confirm the later questionnaire results (item 1) that most of the participants (92%) could use *Yahoo!* online bilingual dictionary to get the information they want. Among the total 1188 look-up records, 86 different words were looked up. The exact looked-up words were shown in Appendix C.

#### 4.1.2 Types of errors of the looked-up words

Based on the previous work on the analysis of EFL learners' paper dictionary look-up errors (Al-Ajmi, 2002; Nesi & Haill, 2002), the present 228 online dictionary look-up errors were categorized into four different types. Some examples of the four error types were shown in Table 2.

**Type A errors** were those look-up records with the definitions chosen from the wrong grammatical class. For example, the target word was a verb, but the participants selected definitions from the sub-entry of noun. This type of errors was

similar to Nesi and Haill's (2002) category-one problem; namely, the subject chose the wrong dictionary entry or sub-entry. 57 errors (25%) belonged to this type.

**Type B errors** were those look-up records with the correct grammatical class but the wrong definitions. That is, the participants chose the wrong item among different definitions for a word. This type of errors was similar to Al-Ajmi's (2002) category-one errors, in that participants failed to find the correct sense in a polysemous entry or selected the wrong sub-sense. 91 errors (40%) fell into this type.

**Type C errors** were those look-up records with both correct and incorrect definitions. In other words, the participants selected multiple definitions, with both correct and incorrect ones. Al-Ajmi (2002) also attributed some errors he had found to his category-one errors, indicating that some participants chose more than one equivalent out of uncertainty. There were 46 errors (20%) of this type.

**Type D errors** were those look-up records without appropriate definitions provided in the dictionary. Since there were no appropriate definitions provided, the participants then selected the inappropriate ones, resulting in type D errors. Both Al-Ajmi (2002) and Nesi and Haill (2002) have indicated such errors found in their studies. A total of 34 errors (15%) belonged to this type.

The distribution of these four types of errors was shown in Figure 2, which clearly demonstrated that Type B errors (40%) were the most errors made by the participants. This suggests that the participants, even though they were in an English-gifted class, had difficulties in retrieving meanings from a long list or a polysemous entry. Thus, the skill of how to select appropriate meanings in a dictionary entry should be explicitly taught to students.

Type A errors (25%) were also common among the participants. It may suggest that the participants had problems in identifying the part of speech of a word, thus selecting the definitions from the wrong grammatical class. This problem seemed to have little connection with the participants' dictionary look-up skills, but was more directly related to their knowledge of the English language. It is because students will have difficulties in selecting definitions from a correct grammatical class if they do not know the grammatical role the word plays in the sentence. Thus, the best way to help students eliminate Type A errors is to improve their knowledge about a word's grammatical role or part of speech in a sentence.

It should be noted that although Type C errors accounted for 20% of the total errors, not every participant made such errors. Only 12 participants (32%) made this type of errors, and among them, one participant made 20 errors among the total 46 errors. This particular student may either have a serious problem in selecting the most appropriate meaning from a list of candidates, or did not take context into consideration when doing the task. He or she may also be uncertain or insecure about choosing one definition for a word.

In this study, there was only one looked-up word (i.e., *tout*) whose appropriate definition was not provided in the dictionary. But there were 34 participants (89%) looking up this word, so Type D errors could account for 15% of the total errors.

#### 4.2 Patterns of participants' look-up behavior

By examining both the correct look-ups and the errors the participants had made, we could obtain seven patterns of their *Yahoo!* online bilingual dictionary look-up behavior. First, *most of the participants read beyond the first definition of an entry to retrieve meanings*. This could be seen from the fact that some correct or incorrect definitions were in the third or even later item on the list, and the participants had selected them. This may suggest that they were cautious in choosing appropriate meanings, even though sometimes they still made errors.

Second, *some participants did follow-up consultation provided by the dictionary*. For example, the Chinese definition of the word *hummus* did not appear in the entry *hummus*, which was the word shown in the reading text, but the dictionary provided a link to *houmous*, and in this entry the definition of *hummus* was provided (see Figure 3). Eight participants (21%) had looked up this word, and all of them had followed the link and got the appropriate definition of *hummus*.

Third, *some participants did not remove the inflection of a word to recover the form, and looked up the word with its inflection in the dictionary*. This behavior could be seen from the error they made when searching for the definition of the word *transmits*. The word *transmits* was a verb in the reading text, but some participants got an inappropriate noun definition (*direct broadcast satellite*) for the verb *transmit*, which suggests that the participants had keyed in the verb with its inflection. If the participants had removed the inflection *-s*, and had keyed in the verb *transmit* for inquiry, they might not have made an error like this (see Figure 4). This behavior not only accounted for several Type A errors, but also showed that the participants were not familiar with the parts of speech of the words they looked up. Furthermore, this behavior demonstrated that there is a big difference between the *Yahoo!* online bilingual dictionary and paper dictionaries. In the online dictionary, students can retrieve the meaning of a word with inflections. By doing so, sometimes they can get the correct definitions, but sometimes they cannot. In paper dictionaries, students can only locate the word after they remove the inflection of that word. This difference might partially account for the

participants' responses to the questionnaire (item 6) that one of the strengths of the online dictionary is "its convenient to use" because they can just type in words with inflections and get the meanings immediately. But whether this function or characteristic of *Yahoo!* online bilingual dictionary (i.e., words can be consulted without their inflections removed) is beneficial to students deserves more scrutiny. It might be possible that if students cannot get the look-up results of a word with its inflection on, they will begin to notice the part of speech of the word which they are not aware of before, and re-consult the word with its bare form in the dictionary. If this is so, then the "convenient" function of the *Yahoo!* online dictionary may be a hindrance rather than an aid to students' learning. Yet, this pattern of students' look-up behavior revealed the need for instruction in the dictionary-consulting skills.

Fourth, *some participants did not make good use of the example sentences or phrases the dictionary provided.* Such behavior might result in Type A and Type B errors. As Figure 5 demonstrated, had the participants seen the example phrase of *clove*, they would have chosen the appropriate meaning instead of the inappropriate one because the example phrase was closely related to the reading topic, *garlic*. 22 participants (58%) had looked up this word, and only half of them had chosen the correct definition.

Fifth, *most of the participants looked up individual words instead of phrases.* That is, the participants did not recognize the multiword expressions and only looked up the meanings of the individual words in the reading text. Similar look-up behavior was also found in Al-Ajmi's (2002) study. There were three examples of such behavior in this study. The first was the phrase *oil refining*. Although there were 25 students (66%) looking up the word *refining*, only two students consulted the phrase *oil refining*, the meaning of which was provided in the dictionary. The second example was the phrase *per capita*. 25 participants (66%) retrieved the meaning of the word *capita*, but no participants looked up the phrase *per capita*, the meaning of which was also provided in the dictionary. The third example was the phrase *hydrogen sulfide*. 19 participants (50%) looked up the word *hydrogen*, and 37 participants (97%) looked up the word *sulfide*. But there were no clues of whether the participants had tried to look up the phrase *hydrogen sulfide* since the meaning of the phrase was not provided in the dictionary. Judging from the participants' reading sheets, it seemed that the participants did not recognize this phrase because all of them underlined the two words separately and none of them reported any failure of not finding the phrase in the online dictionary.

Sixth, *some participants felt uncertain or insecure about only one definition, and tried to provide multiple definitions, which turned out to include both correct and incorrect ones.* This behavior resulted in all the Type C errors. Similar errors also appeared in Al-Ajmi's (2002) study where the students chose more than one equivalent out of uncertainty.

Seventh, *some participants did not take the context into consideration when selecting an appropriate meaning for a word.* This behavior resulted in many Type A and Type B errors. This behavior was in conflict with their responses to the questionnaire (item 4), in which they reported that when a word has many definitions, they would choose the appropriate meaning based on the context. This mismatch between their belief and behavior might be partially due to their limited time (only about 30 minutes) to consult the online dictionary. It is possible that if they had been given more time to examine every definition of a word or to check the context of that word, they would have made fewer errors. Whether this speculation is true deserves further investigation.

#### 4.3 Results of the questionnaire

Results of the questionnaire revealed the participants' feedback on the *Yahoo!* online bilingual dictionary. The first three Likert-type items showed that most of the participants (92%) agreed that they could use *Yahoo!* dictionary to get the information they want, and a lot of them (76%) were satisfied with the dictionary. However, only about half of the participants (52%) reported that they would use the online dictionary often. This may be due to the fact that these students could not get access to the Internet whenever and wherever they wanted. In a classroom setting, an electronic or a paper dictionary may be more convenient to them. In addition, since the participants who were satisfied with the dictionary were fewer than those who could use it to get the needed information, it may suggest that "access to word information" may not be the only criterion they asked of the *Yahoo!* online dictionary. "Qualities of the information" may also be important to the participants as could be inferred from the weaknesses of the dictionary (item 7) they had pointed out.

When asked what they would do when a word had many definitions, many participants (71%) mentioned that they would check the context and then choose an appropriate definition from the long list. Some participants (24%) also indicated that they would go through every definition and select the most appropriate one. These responses suggest that they would not randomly choose a definition from a word entry, and that they would pay attention to the context of a word to select meaning for that word. But as their look-up error analyses showed, some participants did not pay attention to the context in which the looked-up word located, and thus they made several Type A and Type B errors.

When asked about the difficulties they had encountered in using *Yahoo!* online bilingual dictionary, some participants (32%) mentioned that the target words they were searching for could not be found in the dictionary, and some (29%) indicated that it was difficult to select an appropriate definition because there were many definitions of a word. In terms

of the strengths of *Yahoo!* online bilingual dictionary, some participants (34%) mentioned that it was convenient to use the dictionary, and some (29%) mentioned that it was fast to find the word meanings in the dictionary. These strengths were similar to those of electronic dictionaries pointed out by the EFL learners in the previous research (Koren, 1997; Liang, 2006; Tang, 1997). “Ease and speed” are always considered two major advantages of the technological dictionaries over the traditional paper ones. Concerning the weaknesses of *Yahoo!* online bilingual dictionary, some participants (29%) pointed out that the word bank of the dictionary was not big enough because they could not find the words they wanted in the dictionary. Another weakness mentioned by some participants (21%) was that the dictionary did not provide enough example sentences, and that some words even had no example sentences. This weakness demonstrates that these EFL learners may consider example sentences important in learning the meaning of a word; yet some of them did not seem to make good use of the example sentences as their error of the word *clove* showed in this study. It was interesting to find that some participants (21%) plainly stated that *Yahoo!* dictionary had no weaknesses. These participants might be those who were satisfied with the dictionary or those who did not find difficulties in using it.

## 5. Conclusion

This study mainly explored EFL students’ *Yahoo!* online bilingual dictionary use behavior in a reading task. The participants’ look-up errors were categorized into four types, and their look-up behavior was portrayed in seven patterns. Compared with the previous studies, it was found that no matter what types of dictionaries (i.e., paper or online dictionaries) EFL students used, there were some similarities in their look-up errors. This suggests that it is necessary to provide EFL students with some instruction in dictionary use skills regardless of what types of dictionaries they use.

### 5.1 Pedagogical implications

Scholfield (1982) has already provided seven look-up procedures for paper dictionaries. Yet the following general dictionary consultation instruction may still be beneficial to EFL learners based on the results of this study. First, *teach students to remove the inflection of a word, if any, and look up the canonical or original form in the dictionary*. This skill is essential because some EFL students may not be aware of the fact that the word they are going to look up is inflected. This training may need to be combined with some grammar instruction concerning the grammatical role the target word plays in a sentence. Second, *train students to make good use of the other features of a word the dictionary provides in addition to the definitions of a word*. Some dictionaries may provide the example sentences, phrases, or collocations of a word. If students can make use of these extra features, they will be more likely to choose the appropriate definition of their looked-up word. Moreover, the phrases or collocations provided in the dictionary may reveal to students that the word they are looking up is part of a fixed expression, and that they had better consult the whole phrase or multi-word expression in the dictionary instead of looking them up individually. Third, *teach students to take context into consideration if the target word appears in context*. Usually, a word will have many definitions, and resorting to the contextual clues is the best way to select the appropriate meaning from a list of definitions provided in the dictionary. Training students to “situate the target word in context” can also help them lower their uncertainty of the appropriate meanings of a word and thus lessen their chances of choosing more than one definitions for a word which are not synonymous among themselves.

In addition to the above dictionary use instruction, it should be recognized that students’ dictionary look-up behavior will also be affected by the design of the dictionaries. For instance, students can retrieve the meaning of a word with inflections in *Yahoo!* online bilingual dictionary, but they have to remove the inflection of a word before looking it up in paper dictionaries. Therefore, in order to teach students how to make good use of dictionaries, teachers should, in advance, familiarize themselves with the designs or macro- and microstructures of different types of dictionaries so that they can detect and help students solve some potential problems in using the dictionaries.

### 5.2 Limitations of the present study and suggestions for further research

Although this study has contributed a little to our understanding of how EFL learners use *Yahoo!* online bilingual dictionary, it still has limitations. First, the participants in this study were students in an English-gifted class. Their behavior of online dictionary use may not be generalized to other groups of EFL learners. Thus, future studies can examine the behavior of dictionary use of students in a regular class or of students with different English proficiency levels. Second, the dictionary used in this study was *Yahoo!* online bilingual dictionary (the English-Chinese and Chinese-English version). Due to the different design of each online dictionary, the results of this study may not be generalized to learners’ behavior of using other online dictionaries. Further research can explore how EFL learners consult other online dictionaries, bilingual or even monolingual. Third, the reading task in this study did not include any post-reading comprehension questions because of two reasons. For one, the focus of this study was the examination of the process of students’ dictionary look-up behavior, not their comprehension of the reading text. For the other, the whole experimental design was to replicate the participants’ regular reading assignments in which they were not asked to answer any reading comprehension questions but were required to look up in dictionaries any unknown words they encountered in the reading materials. However, it might be possible that students would have a different pattern of

dictionary look-up behavior if they are required to do some post-reading comprehension questions. Whether this assumption is true or not deserves further investigation. Fourth, due to time constraint on the availability of the language laboratory where every participant could have access to the Internet, the time allotment for online dictionary consultation in this study was only about 30 minutes. It may not be long enough for the students to either examine every definition of an entry or to check which definition fitted the word's context. Future studies should take time allotment into consideration if replication of the design of this study is pursued.

### 5.3 Concluding remarks

In sum, EFL learners' dictionary use behavior is worth exploring. It is because their dictionary use behavior often reveals their understanding of the English language. By examining the students' look-up errors, teachers can know what their difficulties in learning English are, and can provide more appropriate instruction to them. Thus, more research is needed in investigating how learners use dictionaries. Given the growing popularity of online dictionaries among EFL learners, studies on learners' use of online dictionaries are highly recommended because they will have great pedagogical value on English teaching and learning in EFL contexts.

### Acknowledgments

The author would like to express her sincere gratitude to Prof. Hao-Jan Chen in NTNU for his guidance on the research area of online dictionary use, to the students who had participated in this study, and to the two anonymous reviewers for their precious comments on the manuscript of this article.

### References

- Al-Ajmi, H. (2002). Which microstructural features of bilingual dictionaries affect users' look-up performance? *International Journal of Lexicography*, 15(2), 119-131.
- Atkins, B. T. S., & Varantola, K. (1997). Monitoring dictionary use. *International Journal of Lexicography*, 10(1), 1-45.
- Bogaards, P. (1996). Dictionaries for learners of English. *International Journal of Lexicography*, 9(4), 277-320.
- Diab, T. A., & Hamdan, J. M. (1999). Interacting with words and dictionaries: The case of Jordanian EFL learners. *International Journal of Lexicography*, 12(4), 281-305.
- Fan, M. Y. (2000). The dictionary look-up behavior of Hong Kong students: A large-scale survey. *Education Journal*, 28(1), 123-138.
- Koren, S. (1997). Quality versus convenience: Comparison of modern dictionaries from the researcher's, teacher's and learner's points of view. *TESL-EJ*, 2(3), 1-16.
- Lan, L. (2005). The growing prosperity of on-line dictionaries. *English Today*, 21(3), 16-21.
- Lee, C. Y. (2008). A study on Internet dictionaries within the EFL context: Applications and criteria. *Journal of Applied English*, 1, 155-169.
- Liang, Y. F. (2006). A study on the use of English dictionaries by engineering students at a university of science and technology. Unpublished master's thesis, National Kaohsiung First University of Science and Technology, Taiwan.
- Nesi, H., & Hail, R. (2002). A study of dictionary use by international students at a British university. *International Journal of Lexicography*, 15(4), 277-305.
- Scholfield, P. (1982). Using the English dictionary for comprehension. *TESOL Quarterly*, 16(2), 185-194.
- Su, J. Y. (2003). The effects of electronic dictionaries on reading comprehension and incidental vocabulary acquisition of senior high EFL students in Taiwan. Unpublished master's thesis, National Kaohsiung Normal University, Taiwan.
- Tang, G. M. (1997). Pocket electronic dictionaries for second language learning: Help or hindrance? *TESL Canada Journal*, 15(1), 39-57.
- Wright, J. (1998). *Dictionaries: Resource books for teachers*. Oxford: Oxford University Press.

### Appendix A. Reading text

#### Unlocking the Benefits of Garlic

Garlic has long been touted as a health booster, but it's never been clear why the herb might be good for you. Now new research is beginning to unlock the secrets of the odoriferous bulb.

In a study published today in the Proceedings of the National Academy of Sciences, researchers show that eating garlic appears to boost our natural supply of hydrogen sulfide. Hydrogen sulfide is actually poisonous at high concentrations — it's the same noxious byproduct of oil refining that smells like rotten eggs. But the body makes its own supply of the stuff, which acts as an antioxidant and transmits cellular signals that relax blood vessels and increase blood flow.

In the latest study, performed at the University of Alabama at Birmingham, researchers extracted juice from

supermarket garlic and added small amounts to human red blood cells. The cells immediately began emitting hydrogen sulfide, the scientists found.

The power to boost hydrogen sulfide production may help explain why a garlic-rich diet appears to protect against various cancers, including breast, prostate and colon cancer, say the study authors. Higher hydrogen sulfide might also protect the heart, according to other experts. Although garlic has not consistently been shown to lower cholesterol levels, researchers at Albert Einstein College of Medicine earlier this year found that injecting hydrogen sulfide into mice almost completely prevented the damage to heart muscle caused by a heart attack.

“People have known garlic was important and has health benefits for centuries,” said Dr. David W. Kraus, associate professor of environmental science and biology at the University of Alabama. “Even the Greeks would feed garlic to their athletes before they competed in the Olympic games.”

Now, the downside. The concentration of garlic extract used in the latest study was equivalent to an adult eating about two medium-sized cloves per day. In such countries as Italy, Korea and China, where a garlic-rich diet seems to be protective against disease, per capita consumption is as high as eight to 12 cloves per day.

While that may sound like a lot of garlic, Dr. Kraus noted that increasing your consumption to five or more cloves a day isn't hard if you use it every time you cook. Dr. Kraus also makes a habit of snacking on garlicky dishes like hummus with vegetables.

Many home chefs mistakenly cook garlic immediately after crushing or chopping it, added Dr. Kraus. To maximize the health benefits, you should crush the garlic at room temperature and allow it to sit for about 15 minutes. That triggers an enzyme reaction that boosts the healthy compounds in garlic.

Garlic can cause indigestion, but for many, the bigger concern is that it can make your breath and sweat smell like...garlic. While individual reactions to garlic vary, eating fennel seeds like those served at Indian restaurants helps to neutralize the smell. Garlic-powder pills claim to solve the problem, but the data on these supplements has been mixed. It's still not clear if the beneficial compounds found in garlic remain potent once it's been processed into a pill.

(Source: <http://well.blogs.nytimes.com/2007/10/15/unlocking-the-benefits-of-garlic>)

## Appendix B. Results of the questionnaire

5: Strongly agree 4: Agree 3: Neutral 2: Disagree 1: Strongly disagree

	5	4	3	2	1
1. I can use <i>Yahoo!</i> online bilingual dictionary to get the information I want.	11 (29%)	24 (63%)	3 (8%)	0	0
2. I am satisfied with <i>Yahoo!</i> online bilingual dictionary.	2 (5%)	27 (71%)	7 (18%)	1 (3%)	1 (3%)
3. I will use <i>Yahoo!</i> online bilingual dictionary often.	7 (18%)	13 (34%)	13 (34%)	4 (11%)	1 (3%)
4. <i>In using Yahoo! online bilingual dictionary, when a word has many definitions, I will:</i> Check the context: 27 (71%) Go through every definition: 9 (24%)					
					See the example sentence: 1 (3%) Consult other dictionaries: 1 (3%)
5. <i>The difficulties I encounter when using Yahoo! online bilingual dictionary:</i> Target words not included: 12 (32%) Many definitions of a word: 11 (29%) No difficulties: 8 (21%) Unsure of the correctness of the definition: 1 (3%)					Pronunciation not clear: 1 (3%) Not comfortable with computer: 1 (3%) Slow keying in speed: 4 (11%)
6. <i>I think the strengths of Yahoo! online bilingual dictionary are:</i> Convenient to use: 13 (34%) Fast to find the words: 11 (29%) Providing example sentences: 6 (16%) Clear definitions: 5 (13%) Providing sounds of the words: 3 (8%)					Providing many definitions: 3 (8%) Words in big font: 2 (5%) Providing word roots: 1 (3%) Many functions: 1 (3%) No advantages: 1 (3%)
7. <i>I think the weaknesses of Yahoo! online bilingual dictionary are:</i> Target words not included: 11 (29%) Example sentences not enough: 8 (21%) No weaknesses: 8 (21%) Too concise: 3 (8%) Definitions not enough: 2 (5%) Few compound words: 2 (5%) Slow speed of dictionary processing: 1 (3%)					Few phrases: 1 (3%) Bad example sentences: 1 (3%) Too boring: 1 (3%) Too monotonous: 1 (3%) Too many information: 1 (3%) Hurting eyes: 1 (3%)

## Appendix C. Words looked-up by the participants

No.	F	No.	F	No.	F
1.	antioxidant 38	31.	injecting 18	61.	garlic 3
	odoriferous 37		boost 16		snacking 3
	sulfide 37		individual 16		stuff 3
	booster 36		potent 16		associate 2
	emitting 35		supplements 16		athletes 2
	noxious 35		unlock 15		centuries 2
	prostate 35		proceedings 13		crushing 2
	cholesterol 34		vessels 13		data 2
	colon 34		breast 11		oil refining 2
	touted 34		consistently 11		Olympic 2
11.	cellular 33	41.	flow 11	71.	powder 2
	enzyme 32		herb 11		seeds 2
	equivalent 31		hummus 8		vary 2
	bulb 30		Academy 7		added 1
	byproduct 30		Birmingham 7		chopping 1
	triggers 30		signals 7		concern 1
	extracted 28		supply 7		Einstein 1
	compounds 26		chefs 6		feed 1
	concentrations 26		reaction 6		increase 1
	capita 25		rotten 6		mice 1
21.	indigestion 25	51.	various 6	81.	per 1
	neutralize 25		Alabama 5		processed 1
	refining 25		amounts 5		protective 1
	consumption 24		cells 5		Sciences 1
	fennel 24		maximize 5		served 1
	transmits 24		pills 5		sit 1
	cloves 22		damage 4		<b>Total: 1188</b>
	downside 22		extract 4		
	poisonous 21		garlicky 4		
	hydrogen 19		mistakenly 4		

Note: 1. The words are presented in the original forms as appearing in the reading text.

2. F = Frequency

Table 1. Descriptive Statistics of the Participants' Looked-up Words

(N= 38)	Min	Max	Sum	Mean	S.D.
Total look-ups	16	51	1188	31.3	6.6
Correct	8	34	960	25.3	6.4
Incorrect	1	24	228	6.0	4.2

Table 2. Examples of the Four Error Types

Error type	Looked-up word	Correct definition	Incorrect definition (Participant's error)
A	trigger	v. 引起 (to cause)	n. 刺激物 (stimulant)
B	clove	n. 小鳞莖 (any of the small bulbs into which a larger bulb can be divided)	n. 丁香 (the flower of a tropical Asian plant)
C	cellular	adj. 細胞組成的 (consisting of cells)	adj. 細胞組成的 ; 多孔的 (consisting of cells; having many holes)
D	tout	v. 吹噓、吹捧 (to praise greatly)	v. 招徠顧客、兜售 (to try repeatedly to persuade people to buy one's goods, use one's services, etc.)



Figure 1. Screenshot of *Yahoo!* online bilingual dictionary

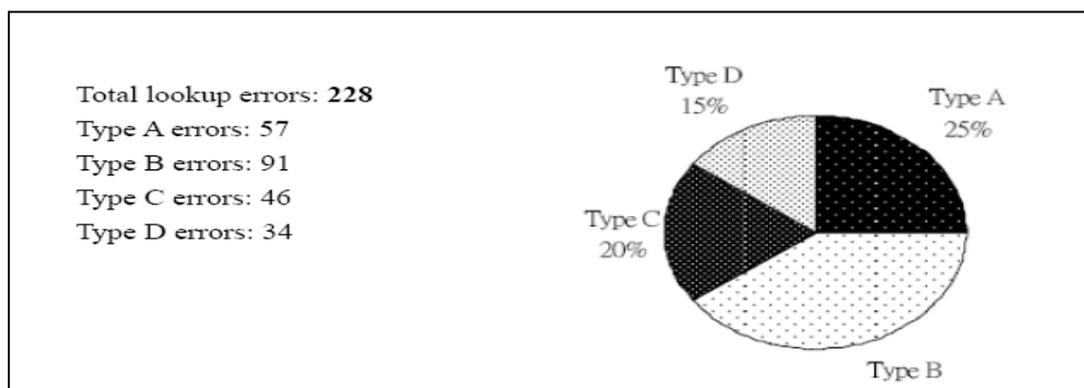


Figure 2. Distribution of four error types



Figure 3. Screenshots of *hummus* and *houmous*

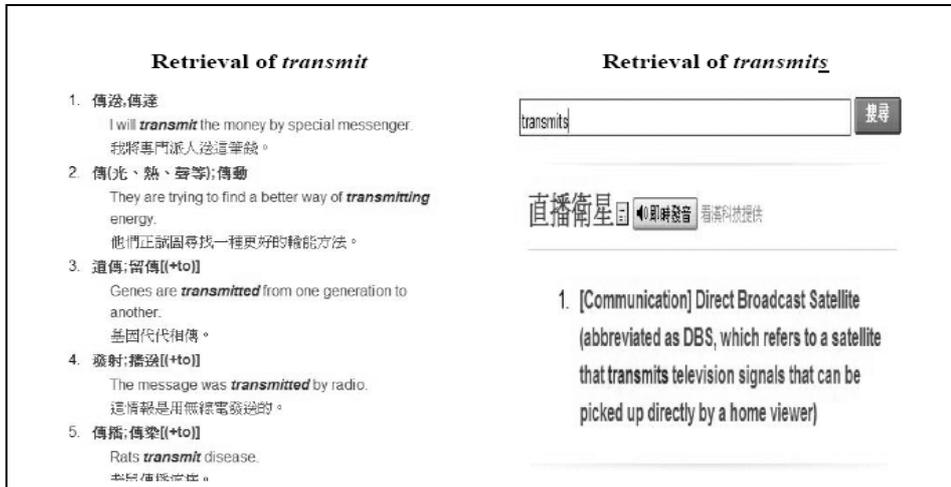


Figure 4. Screenshots of *transmit* and *transmits*



Figure 5. Screenshot of *clove*