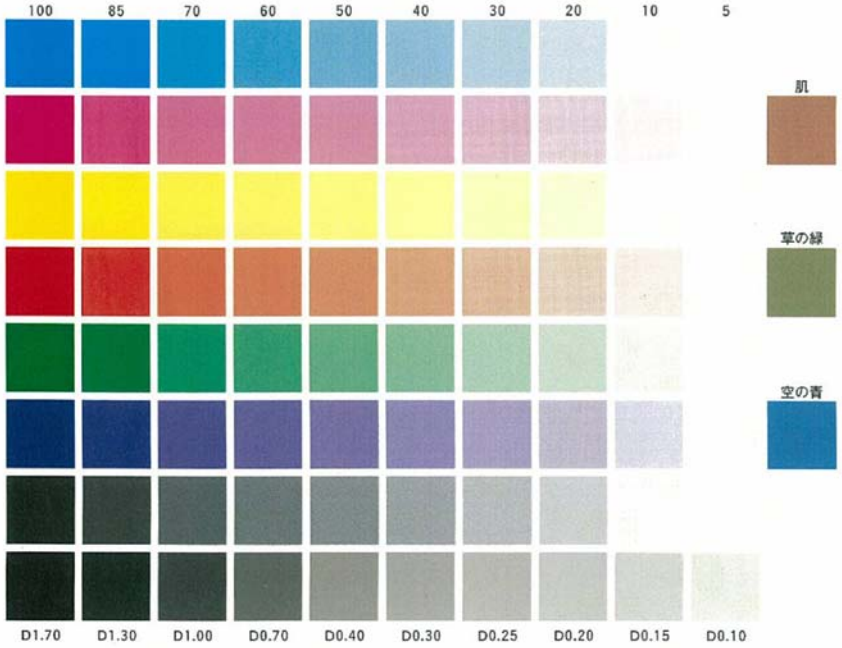

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For the Effective Use of Hand-held Electronic Dictionaries in the Japanese EFL Context: Focusing on Retention, Reading Comprehension, and Learners' Impressions

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by

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論文要旨

02D8004　小山敏子

我が国で最初の携帯型電子辞書（以下、電子辞書）が発売されてから、約20年が経過した。デジタル化技術の発達にともない、発売当初は見出し語レベルの検索しかできなかった電子辞書はここ数年で大きく様変わりした。複数のフルコンテンツの辞書が搭載され、検索機能面も格段に向上した現在では、この新しいタイプの辞書を利用する学習者が急増している。しかしながら、この電子辞書の出現が、EFL（English as a Foreign Language：外国語としての英語）学習にどのような変化を与えているかを調べた研究は極めて少ない。

本論文は、今後ますます利用者が増えると予想される電子辞書を対象とした実証研究である。紙に印刷されていた語彙情報が電子化され、小さな筐体に収められたことによってもたらされた変化を、大学生英語学習者の検索行動と検索語彙の再生、テキスト理解の面から調べた上で、EFL学習において電子辞書を効果的に活用するための方略を提言しようとしたものである。

第1章では、まず、本論文作成の動機を述べ、論文の構成について説明している。第2章では、各国の先行研究をもとに外国語学習における辞書の役割を概観し、同時に、テクノロジーの発達とともに、辞書の形態がどのような変化を遂げてきたかについて述べている。そして、我が国における電子辞書ユーザーの急増ぶりを報告し、その一方で、この辞書の使用がEFL学習にどのような変化をもたらすのかについての研究が、現在までにほとんどなされていないことを指摘している。

第3章は、電子辞書と印刷辞書を使用した際の比較実験である。

同一の被験者にこの２つの辞書それぞれを使用させ、英文読解に必要とする語彙情報の検索に要した時間を、デジタルビデオカメラで記録した映像を分析して調べ、同時にその実験から一週間後の検索語彙の定着度を、再認テスト・再生テストを用いて調査している。また、それぞれの辞書使用に対する学習者の印象の違いも報告している。その結果、１）電子辞書を使用した時より、印刷辞書を使用した時の方が検索語彙の定着がよく、２）被験者らは電子辞書の機能を高く評価しながらも、印刷辞書の検索に要するプロセスが検索語彙の定着度の向上に役立っていると考えていることがわかった。

第４章では、第３章から得られた知見をもとに、どのようにすれば電子辞書を使用した場合でも検索語彙の定着率を向上させることができるのかについての検証を、Mental Effort（心的負荷）仮説をもとに試みている。具体的には、学習者になんらかの学習課題（タスク）を与えることで検索語彙の定着度や辞書に対する印象にどのような変化が見られるのかを調べている。そして英語力の異なる被験者を対象とした２つの実験をおこなったが、その結果はほぼ同じであった。すなわち、１）電子辞書から語彙が使用されている英文の文脈にそった適切な用例を抜き出して書き移すというタスクの有無では、一週間後の検索語彙の定着率に差は見られず、２）このタスクを課すことで、使用した電子辞書に対する印象にも変化が見られなかった。

第５章では、一般に、電子辞書は被験者の検索行動を誘発しやすいのではないかといわれていることを、実証データを用いて明らかにしている。つまり、印刷辞書と比べて、電子辞書を使用して英文を読むと、学習者の検索頻度が確実に向上するのか、また、検索頻度の向上が英文テキストの理解にどのような影響を与えるのかについて、英語力の違う２つのグループで調べている。その結果、１）

電子辞書を使うと学習者の検索頻度は向上し、２）英文読解に要する時間を短縮することができたが、３）英文読解力については統計的にみて有意な差異は見られなかった。

第６章では、以上の実証実験から得られた知見をふまえ、電子辞書を使用した場合の利点（被験者が気軽に辞書を引こうとする）を、どのようにすれば学習効果に結びつけられるかを模索している。実験では、英語力が異なる２つの被験者グループの電子辞書検索行動の発話プロトコルデータを収集して分析し、特に上位学習者（Good Language Learner）の検索行動から、効果的な電子辞書使用の方略を探っている。分析結果から、１）上位学習者は、EFL 学習効果に結びつくような電子辞書使用の方略（例えば、対象語の検索前に文脈から意味を推測する）を使い、２）電子辞書特有の機能なども有効活用していることが判明した。また、３）下位学習者でも、印刷辞書とは違って、電子辞書の検索機能に助けられ、あきらめることなく対象語の検索をおこなっていることもわかった。

最終章においては、研究の限界点をふまえた上で、以上の４つの実証研究から得られた結果をまとめ、教育的示唆を提言している。

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I have been fortunate in writing this thesis to be able to draw on valuable advice from my teachers and several researchers around me.

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1. Introduction

1. 1 Motivation

Dictionaries are a vast treasure trove of information, and are generally considered to be an indispensable tool for foreign language learning (hereafter FL) (e.g., Hartmann, 2001; Jackson, 2002; Wingate, 2002). Most of FL learners, therefore, should have thumbed through the pages of a heavy and bulky dictionary to find detailed vocabulary information.

During the last few decades, however, information technology has brought about gradual changes in FL education. In fact, advances in technology have definitely provided a wide variety of learners' dictionaries. Digitized dictionaries such as those on CD-ROMs and on the Webs have become widespread in recent decades. Presently, the advent of a handheld electronic dictionary (hereafter ED) has been one of the epoch-making events in the English as a foreign language (hereafter EFL) context in Japan.

Once I talked with my students about English dictionaries at school. Suddenly, one of them said to me. "Let me show you a very convenient dictionary!" She took out a flat squire metal box from her bag. She continued, "But, my English teacher said to me, 'You should not use such a dictionary like a toy if you want to improve your English ability.'" That was the first time I saw an ED, and actually her words motivated me to begin my research.

Five years have passed since then. No one, including me, would be able to visualize how popular this type of dictionary has become among Japanese EFL learners. Compared with a thick printed dictionary (hereafter PD), an ED is obviously compact and easy-to-carry, although it contains many kinds of dictionaries. In addition, the ED seems to enable learners to shorten time for word retrieval. It appears that there exist the relative advantages of the ED over the PD for EFL learning. However, I soon found that this argument had never been

substantiated by research. Only a handful of studies have been done so far to investigate the effects of the ED use on EFL learning (See Chapter 2), while the number of ED users has rapidly expanding in Japan.

"How has the difference between ED and PD affected EFL learning?," and "How effective is ED as an aid to EFL learning?" These seemingly simple questions motivated me to pursue my research.

1. 2 Organization

This thesis is composed of seven chapters. Chapter 1 introduces the motive for the research and the organization of the thesis. Chapter 2 presents a review of the literature relevant to dictionary use in foreign/second language (hereafter L2) learning. It begins with theoretical issues concerning the role of dictionary in L2 learning, and focuses on empirical studies on investigating the effects of dictionary use. The latter part of the chapter deals with the research on electronic-based dictionaries, and discusses the issues of how the difference in an ED and a PD affects learners' look-up frequency, retention, and reading comprehension.

The next four chapters report on a series of empirical studies I have conducted. Chapter 3 clarifies the differences in learners' look-up behavior and retention of looked-up words between the ED and the PD. Learners' impression of each dictionary is also reported in this chapter. Chapter 4 investigates whether an assigned task facilitates learner's retention of looked-up words when using the ED, and also examines whether the task changes learners' impressions of the ED or not. Chapter 5 reveals the connection between look-up frequency and reading comprehension in EFL learning. Chapter 6 investigates the look-up behavior of good language learners by means of the think-aloud protocol, and finds some strategies for effective ED use.

Finally, Chapter 7 concludes the thesis by providing the summary and

pedagogical implications of the research. The limitations of the studies are also discussed.

2. Literature Review

2. 1 The role of dictionaries in L2 learning

It has been widely assumed that dictionaries play a key role in L2 learning. Nevertheless, despite its necessity, L2 learners are usually unaware of the purpose of dictionary use. Nation (2001) summarized the principal purposes for dictionary use based on Scholfield (1982, 1997), who claimed that the different requirements and strategies existed for dictionary use in comprehension and production (See Table 2-1).

Table 2-1. Purposes for Dictionary Use

Comprehension (decoding)
● Look up unknown words met while listening, reading or translating.
● Confirm the meanings of partly known words.
● Confirm guesses from context.
Production (encoding)
● Look up unknown words needed to speak, write or translate.
● Look up the spelling, pronunciation, meaning, and grammar, constraints on use, collocations inflections and derived forms of partly known words needed to speak, write or translate.
● Confirm the spelling, pronunciation, meaning, etc. of known words.
● Check that a word exists.
● Find a different word to use instead of a known one.
● Correct an error.
Learning
● Choose unknown words to learn.
● Enrich knowledge of partly known words, including etymology.

Adapted from Nation (2001: pp. 281-282)

Considering these various aspects of dictionary use, reference skills[1] are regarded as indispensable strategies when L2 learners happen to encounter unknown

words, and its importance has been emphasized in several studies (e.g., Cowie, 1999; Nation, 2001; Scholfield, 1982). Yet, in spite of their claims, the training of dictionary use has been neglected. What is behind this trend?

In the recent popular L2 acquisition theories, the vast majority of vocabulary is considered to be learned gradually through repeated exposures in various discourse contexts. This "Incidental Vocabulary Learning Hypothesis" is proposed on the basis of the first language (hereafter L1) acquisition concerning how children acquire their native language (Nagy & Herman, 1985). Although Nagy and Herman admitted that learning word meanings from *oral* context was obviously a major mode of vocabulary acquisition especially in the preschool years, they also recognized the possible contribution to vocabulary growth in reading under the teacher's control. On this view, therefore, extensive reading is considered to be an effective vocabulary learning strategy for L2 learners (Nagy & Herman, 1987).

There exists another popular L2 vocabulary acquisition theory called the "Input Hypothesis", in which learners acquire vocabulary and spelling most efficiently by receiving comprehensible input while reading and listening (Krashen, 1985, 1989). Originally, Krashen postulated this hypothesis for oral language acquisition, and later he claims that extensive reading also enables L2 learners to acquire a larger vocabulary. In fact, Krashen (1982) implied that vocabulary which was naturally acquired was more persistent than that was explicitly learned through memorization or dictionary use. Coady (1997), however, asserts that "research that positively supports Krashen's claims as regards L2 vocabulary acquisition is still very limited" (p. 226), as most of his studies involved native speakers rather than L2 learners.

On the basis of these hypotheses, contextual guessing without using dictionaries has been encouraged as a means of gaining a large amount of vocabulary while reading. An account supporting this notion is that contextual

guessing (or "inferring") from clues in a text helps learners retain a large vocabulary, since it seems to cause extra work for L2 learners. This account appears to accord with psychological literature on 'depth of processing', which was originally advocated by Craik and Lockhart (1972).

In addition to this notion, there exists an additional concern which many educators and researchers express: frequent interferences by looking up unknown words in a dictionary while reading may prevent learners from comprehending texts (Luppescu & Day, 1993). Put another way, reading comprehension of learners might suffer as a result of dictionary use.

Empirical evidence to back up the two assertions described above, however, has not been sufficiently produced so far (Summers, 1988). Actually, two conflicting aspects of contextual guessing exist (e.g., Bensoussan & Laufer, 1984; Sternberg, 1987; Day, Omura, & Hiramatsu, 1991; Hulstijn, 1992). While the advantage of contextual guessing in reading a text is reported by Sternberg (1987), Bensoussan and Laufer (1984) and Laufer and Sim (1985) investigated the difficulty of inferring correct meaning of unknown words from the context. Hulstijn (1992) performed five experiments of adult L2 learners who were assigned a reading comprehension task, and investigated the difference in retention of looked-up words between inferred and given word meanings. He concluded that "the retention of word meanings in a true incidental learning task is very low indeed" (pp. 121-122). The subsequent study has been conducted by the same author and his colleagues (Hulstijn, Hollander, & Greidanus, 1996), in which the effects of dictionary use in incidental vocabulary learning were examined. In the study, they aimed to explore how incidental vocabulary learning can be improved, based on the finding in Hulstijn (1992). From their finding, they advocate that repeated exposures with useful information on word meaning (through marginal glosses or dictionary use) will promote incidental vocabulary learning. Additionally,

they reported that "when readers *do* use the dictionary, the incidental vocabulary learning will be as good as, or even better than, when they are provided with marginal glosses" (p. 336). As the result shows, dictionary use might help induce vocabulary learning.

2. 2 The effect of dictionary use on L2 learning

In fact, there are a large number of studies to examine the effect of dictionary use in L2 learning (e.g., Fraser, 1999; Luppescu & Day, 1993; Hulstijn, 1993; Knight, 1994), in which most research have generally focused on reading comprehension and vocabulary acquisition, for it has been widely considered that a strong correlation exists between vocabulary knowledge and reading comprehension (Nagy & Herman, 1985).

Fraser (1999) found that more vocabulary was retained from inferring from context when the inference was followed up by consulting a dictionary. She reported that when the subjects in the study inferred and then consulted, they had a higher retention rate than if they inferred or consulted alone. Luppescu and Day (1993) attempted to confirm the effectiveness of bilingual dictionary use in L2 learning. In the study, a total of 293 Japanese university students were divided into two groups ("dictionary" and "no dictionary" groups), and each group read a short story containing 17 target words. Their retention of the target words was investigated by a multiple-choice test immediately after reading. As a result, the "dictionary" group obtained a higher score on the vocabulary test than the "no dictionary" group did. This means that learners did not forget the words in the time between reading the text and taking the test. Additionally, the results of their study also indicated that a dictionary might be helpful to disambiguate word meanings when learners could not infer them completely from the context. Another important finding was that the "dictionary" group incorrectly answered more of the target

words, which had a large number of alternative meanings in a dictionary, as compared with "no dictionary" group. Besides, the students who used dictionaries took nearly twice as long to read the passage as the students who did not. These findings indicate that the students in their study seemed not to have effective reference skills. Eventually, Luppescu and Day concluded that the use of a bilingual dictionary while reading could facilitate L2 learners' vocabulary learning, and seemed to help L2 learners who could not infer word meanings from the context with comprehending texts. At the same time, they admitted that there existed some disadvantages, such as lower reading speed and choosing incorrect definitions, which were caused by a lack of reference skills of dictionary users. They, thus, emphasized the necessity for teaching effective reference skills to L2 learners.

Hulstijn (1993) investigated L2 learners' look-up behavior when using an on-line dictionary. He conducted two experiments with 82 Dutch high school students enrolled in two different grade levels of English classes, and found a wide range of look-ups among L2 learners. On the one hand, the students who had high verbal abilities seemed to ignore the words irrelevant to the reading comprehension, and look up more frequently the words which were relevant to the assigned task; on the other hand, they tended to confirm their inferences with the dictionary on the computer, even though they could guess meanings from context. This tendency was also found in Knight (1994). She performed an experiment with 105 university students learning Spanish as a second language. To record the students' actual look-ups correctly, all the reading and testing materials including a dictionary were programmed on the computer. She found: 1) students who used a dictionary not only learned more words but also attained higher reading comprehension scores than those who guessed from context; 2) the students with low ability in Spanish were at a disadvantage when they were told to guess from context; and 3) the students with high proficiency in Spanish referred to the dictionary, even though

they have already guessed the correct meaning. Based on these findings, Knight put emphasis that comprehension did not suffer as a result of dictionary use, and suggested that teachers should assist different types of learners with teaching various skills for dictionary use.

To summarize the major point argued above, dictionary use can provide learners with the obvious advantages for effective L2 learning, and it is useful for learners with different proficiency levels.

2. 3 How effectively do learners use dictionaries

Now, let me direct my attention to the argument about actual look-up behavior of L2 learners. Several studies have been conducted to investigate how L2 learners use dictionaries (e.g., Bensoussan, Sim, & Weiss, 1984; Nesi & Meara, 1994; Tono, 2001). For instance, Bensoussan, Sim, and Weiss (1984) reported that no significant differences in reading comprehension test scores were found between Israeli students who used dictionaries and those who did not. Bensoussan et al. interpreted the findings to mean that the students could not use dictionaries effectively, while they expressed a preference for using bilingual dictionaries in the reading comprehension test.

Nesi and Meara (1994) investigated the patterns of errors in the productive use, and reported that many adult EFL learners systematically misinterpreted dictionary entries. Tono's work (2001) covered a wide range of studies on dictionary use in the context of FL learning. He reported on a series of empirical studies on dictionary users, and showed how research into dictionary use could contribute to the improvement of dictionary design and the clarification of issues in language learning. He claimed that leamers' look-up processes involved highly complicated cognitive skills, and also clarified relationship between language proficiency and dictionary skills on the basis of detailed analysis by means of

observations and a learner' profile questionnaire.

A study examining learners' retrieval strategies was made by Lantolf, Labarca, and Tuinder (1985). Lantolf et al. found two separate strategies for interacting with bilingual dictionaries in an experiment with 89 students enrolled in beginning, intermediate, and advanced undergraduate Spanish classes. They revealed that the students of beginning and intermediate levels appeared to favor a search strategy based on lexical form, while advanced students were able to employ a more successful semantic-based strategy.

Admittedly, an effective use of dictionary is regarded as one of the essential strategies for L2 learning, and its importance has been claimed by many studies (e.g., Barnett, 1989; Bishop, 1998, 2000, 2001; Carduner, 2003; Wingate, 2004). In general, most teachers just say, "If you can't work out what it means, just look it up in the dictionary" when their students' comprehension of texts are impeded by some vocabulary items (Scholfield, 1982, p.185). Few learners, therefore, are considered to be capable of fully exploiting the advantages of dictionary use, for "the task of finding the meaning of a word in a dictionary is a complex process" (Luppescu & Day, 1993, p. 274). In fact, Herbst and Stein (1987) asserted "successful use of a dictionary calls for a special 'competence' which for want of appropriate training, many students do not possess" (p.115). Scolfield (1982) also noted that looking up a word in a dictionary required specific strategies. He made a detailed description of look-up process, and claimed that successful look-ups of L2 learners could be increased, if the strategies for effective dictionary use were practiced. Nation (2001) briefly outlined Scolfield's strategies for dictionary use (see Table 2-2).

Taking these assertions into account, the effective reference skills should be developed for better L2 learning, and they ought to be learned in various kinds of situations.

Table 2-2. Basic Strategies for Using a Dictionary

Receptive use (listening and reading)
1. Get information from the context where the word occurred.
1) deciding on the part of speech of the word to be looked up
2) deciding if the word is an inflected or derived form that can be reduced to a base form
3) guessing the general meaning of the word
4) deciding if the word is worth looking up by considering its relevance to the task and general usefulness
2. Find the dictionary entry.
1) knowing the order of the letters of the alphabet
2) knowing the dictionary symbols for the different parts of speech
3) knowing alternative places to search (separate entries, sub-entries, word groups, derived forms, variant spellings and appendixes)
3. Choose the right sub-entry.
4. Relate the meaning to the context and decide if it fits.
Productive use (speaking and writing)
1. Find the wanted word form.
2. Check that there are no unwanted constraints on the use of the word.
3. Work out the grammar and collocations of the word.
4. Check the spelling or pronunciation of the word before using it.

Adapted from Nation (2001: pp. 285-288)

2. 4 Technological advances and dictionaries

Dictionaries have been commonly regarded as an enormous language resource printed on fine paper. With the development of information technology, however, most lexicographers have utilized computer corpus data to compile their dictionaries from the 1980s (Minamide, 1998), and soon thereafter a wide range of learners' dictionaries appeared. Digitized dictionaries such as those on CD-ROMs and on the Webs have become widespread during the last two decades (Cowie, 1998). McArthur (1998) indicates that the electronic medium opens up new

possibilities for dictionary use.

Therefore, several L2 studies in using texts and dictionaries on the computer have been carried out, since learners' searching behavior can be digitally recorded (e.g., Hill & Laufer, 2003; Hulstijn, 1993; Hulstijn, Hollander, & Greidanus, 1996; Iwasa, 1990; Laufer, 2000; Laufer & Levitzky-Aviad, 2003; Knight, 1994). For instance, to construct CAI courseware for EFL learning, Iwasa (1990) investigated learners' searching behavior under rigorous conditions. She built a computer-assisted reading system accompanied by an electronic-based dictionary, and reported that a positive correlation was observed between time for word retrieval and the accuracy of selecting L1 equivalent, while no significant relationship obtained between reading comprehensions and searching time.

During the last decade, *empirical* studies comparing these electronic-based dictionaries with a PD have also appeared (e.g., Aust, Kelley, & Roby, 1993; Bhatia, 1991; Inami, Nishikata, Nakayama, & Shimizu, 1997; Koga, 1995). Bhatia (1991) compared students' look-up behavior in a computer-based Kanji dictionary ("the Kanji Finder") with the PD. Since the dictionary induced learners' look-ups and gave them correct information they needed, Bhatia concluded that an electronic-based dictionary might enhance learners' motivation to study Japanese.

Aust, Kelley, and Roby (1993) argued that an online electronic dictionary (hyper-reference) could offer many advantages to learners, because it provided immediate access to the target information, compared with the PD which required learners to tackle an "arduous" task (Keller, 1987, p.17). In the study, consultation frequency, reading time, efficiency, and comprehension were investigated respectively under four conditions (an electronic text with a bilingual or a monolingual hyper-reference dictionaries / a printed text with a bilingual or a mono-lingual printed dictionaries). They found: 1) learners consulted hyper-references much more frequently than the PDs; 2) no significant difference in comprehension

was found between hyper-references and the PDs; and 3) learners showed a preference for bilingual dictionaries. Based on these findings and a result of the exit interviews, Aust et al. concluded that since hyper-references offered more efficient access than the PDs did, they could lower the "consultation trigger point", which means the point FL learners are willing to consult a dictionary to confirm the meanings of unknown words and phrases.

Koga (1995) investigated the effectiveness of using an electronic dictionary on the computer in understanding materials on CAI (Computer Assisted Instruction) or CAL (Computer Assisted Learning). He compared reading comprehension by using the electronic dictionary with that of a PD, and concluded that an electronic dictionary was more efficient when reading the text on the computer, because a computerized retrieval *system did not* cause interference to learners' reading process.

Research on comparing CD-ROM dictionaries with a PD was conducted by Inami et al. (1997). In the study, the percentage of correct answers and time for word retrieval were examined between a CD-ROM dictionary and the PD groups. The subjects' retention of looked-up words was investigated with a recall and a recognition tests as well. They also conducted a factor analysis based on a result of a 40-item questionnaire, and reported that a significant correlation ($r = .43$, $p<.01$) between the factor of "easy to memorize" and the percentage of correct answers was found. Based on the findings of the study, Inami et al. claimed that the CD-ROM dictionary in L2 vocabulary learning was effective.

All the studies described above came to the conclusion that electronic-based dictionaries on the computer were more effective than PDs in L2 learning, as they can reduce the time for word retrieval. It must be noted, however, that their subjects read an electronic text by using an electronic dictionary on the computer. Although the findings under such an artificial situation provide abundant evidence in support

of an effect on the use of electronic-based dictionaries, they might not be applicable to learning in a regular classroom or at home.

Now let us turn to another type of an electronic dictionary, which is rapidly replacing a PD among Japanese EFL learners.

2. 5 The advent of hand-held electronic dictionaries

When the first model of an ED appeared in Japan approximately twenty years ago, it was no more than a word-to-word translator. During the latter half of the 1990s, with an advent of a full-content ED[2], the number of L2 learners using the ED has been rapidly expanding in Japan. Nakamura (2003) reported that a market survey indicated a considerable demand for EDs in universities, colleges, and even in high schools. Also, Ichikawa, Shimizu, Takahashi, Kanazashi, and Ishii (2005), in a survey conducted in a university, revealed that 81 out of 113 students used the ED for their daily English study. As shown in Figure 2-1 below, the full-content-type of the ED market, in fact, has grown approximately fourfold in the last five years (Yagi, 2004).

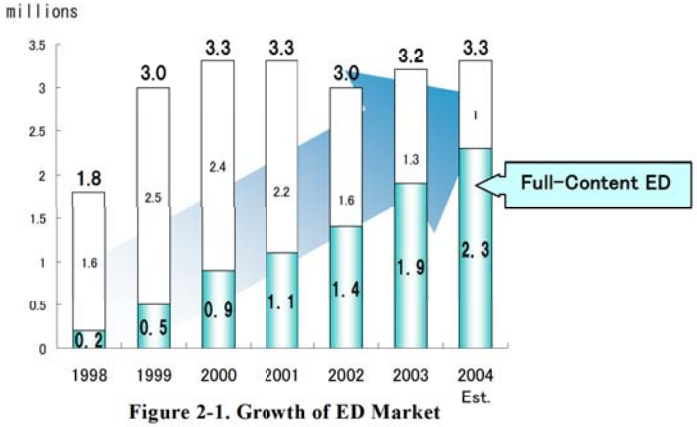

Figure 2-1. Growth of ED Market

(Yagi, 2004)

Although the best way to use the ED is a popular discussion topic for Japanese learners, only a handful of studies has been done to investigate the effects of the ED on EFL learning (e.g., Hattori, 2003; Koyama & Takeuchi, 2003; Osaki & Nakayama, 2004; Shizuka, 2003; Tsuchimochi, 2003).

Koyama and Takeuchi (2003) was one of the first attempts to compare the ED with the PD, focusing not only on reduction of search time or the number of words searched but also on learners' retention of words and their impressions of the dictionaries. In the study, they found that the relations existed between the dictionary's interface design and the learners' impression of each dictionary. They also reported that the number of look-ups when using the ED was not necessarily proportional to retention of the looked-up words, and claimed that the traditional interface design of the PD might lead to higher word retention. To confirm these findings from another perspective, they examined learners' verbal protocols relating to searching behavior, which were extracted by a think-aloud technique (Ericsson & Simon, 1993). They concluded that learners could only obtain limited information concerning the target word at once in using the ED, while they were able to derive other related information such as usage examples about the word at once from the PD due to the traditional interface design.

Osaki and Nakayama (2004) performed two experiments to compare the differences in comprehension of unknown words, reading comprehension of the texts, and retention of the looked-up words between an ED and a PD, with 167 and 152 Japanese EFL students respectively of the same university. The subjects of each experiment were divided into two proficiency groups on the basis of the results of the placement tests: upper and lower. Each group was instructed to read a text under three conditions (an ED, a PD, and no dictionary), and asked to answer comprehension and vocabulary tests after reading within the allotted time. Based on the combined data of the two experiments, their findings were: 1) the ED was not

superior in word retention to the PD; 2) the ED helped the learners find the suitable meanings for the texts better than the PD did; and 3) the ED promoted better reading comprehension, compared with the PD. To summarize these findings, they concluded that the use of the ED might help learners find appropriate meanings, and thus temporarily facilitate better text comprehension, when reading texts containing numerous unfamiliar words within a specified time limit. They also indicated that there was a possibility that use of the PD might guarantee better retention of looked-up words than that of the ED did.

On the other hand, Shizuka (2003) claimed the superiority of an ED over a PD, based on the results of a speed test which was performed with 77 university EFL students. In the study, he maintained that the ED was superior to the PD in accessing words and identifying their meanings more quickly. He also claimed that the ED could lower the "consultation trigger point" (Aust, Kelley, & Roby, 1993, p.70), thereby offering the learners more frequent and efficient access. Although he emphasized the importance of higher look-up frequency of the ED, he did not make any attempt to confirm whether it really led to better reading comprehension and better retention of looked-up words.

2. 6 Summary

The roles of dictionaries in L2 learning have been studies so far in this chapter, and it has been emphasized from the review of empirical studies that the effective reference skills should be needed for better L2 learning. Then, the overview of the transition from dictionaries printed on paper to those in an electronic medium during the last two decades has been summarized. Subsequently, with the advent of an ED, how the new technology diversified types of learners' dictionary has been shown.

As have been noted above, while the number of the ED users has rapidly

expanded in Japan, there is very little agreement concerning the effect of the ED on EFL learning. However, one aspect which can be seen in all the studies (e.g., Koyama & Takeuchi, 2003; Osaki & Nakayama, 2004; Shizuka, 2003) in common is that there exists a marked difference in interface design between the ED and PD. This means that learners are able to obtain a lot of information about headwords on the same page when using the PD. On the other hand, they are hardly aware of the large amount of information available on a particular item when using the ED, since dictionary data is stored in different layers. How does this difference in interface design affect searching behavior of EFL learners? Also, as indicated by several studies (e.g., Hattori, 2003; Osaki & Nakayama, 2004; Tsuchimochi, 2003), learners can quickly obtain information relevant to the target words due to the search functions of the ED, while they have to turn over the pages of a PD frequently. Does this difference have any effect on EFL learning? Besides, as Shizuka (2003) claimed, if learners tend to consult an ED more frequently than a PD, how does this tendency change reading comprehension of learners? Furthermore, if an ED can promote learners' look-up frequency, how can we lead this advantage to better EFL learning? These controversial questions still remain. Considering the rapid increase in the number of the ED users in the Japanese EFL context and the importance of a role of dictionaries in EFL learning, more empirical studies should be conducted to answer these questions.

Notes

1. According to Hartmann (2001), "reference skills" is defined as "the knowledge and abilities required by users in order to find the information searched for in a dictionary or other reference work".
2. The word "a full-content ED" indicates a hand-held electronic dictionary which contains all the information found in the corresponding printed counterpart minus illustrations.

3. The effect of dictionary type on the retention of looked-up words

3. 1 Background

As has been described in Chapter 2, Koyama and Takeuchi (2003) attempted to compare the PD and ED, focusing not only on reduction of search time and the number of words searched, but also on the learners' retention of words and their impressions of the dictionaries. One of their results indicated that no significant difference was found in the learners' retention of words between the two types of dictionaries. Other findings in their study were: 1) due to its interface design[1], learners tended to believe that the ED did not provide as much information, as did the PD, even though the information was identical; 2) there was a possibility that a feeling of familiarity with digital media might determine a learner's impressions of dictionaries. They also confirmed their findings by means of the think-aloud technique (Ericsson & Simon, 1993).

Since an ED is designed to be portable, its screen has to be small and thus EFL learners can obtain only "fragmentary" information about the target word "at a time" on the screen. Learners have to scroll down or sink deeper into a lower hierarchy to find more detailed information about the word. In contrast, a PD offers a lot of information such as meanings, usage examples, and even homonyms of the target word on the same page. Shizuka (2003)[2] admitted that this "hierarchical nature of data display" in the ED might be a reason for not finding significant differences in searching usage examples between the two dictionaries, although he maintained that this limitation of the device did not decrease its advantage to learners. Considering the pedagogical implications for learning EFL in using dictionaries, however, I believe that this marked difference in data display between printed and electronic versions should not be neglected. In addition, most of the studies concerning the ED described in the first chapter, whether they cast doubt on

the advantage of the ED or not, pointed out the crucial difference in the interface design between the ED and PD. Hence, I attempted to examine how the difference (i.e., horizontal or "on the same page" display vs. "hierarchical data display") in the two types of dictionaries has affected EFL learners' look-up behavior, specifically, time for word retrieval, retention of words searched, and learners' impressions of the dictionaries.

3. 2 Research Questions

To reveal the differences in learners' search behavior regarding the two types of dictionaries, the following three hypotheses are put forward in the present study:

Hypothesis 1: *The search time for usage examples in using an ED will be longer than that of a PD, although the search time for words in the ED condition will be shorter than that of the PD condition.*

According to Shizuka (2003), EFL learners could easily access words and identify their meanings in the ED condition, although locating usage examples in it was not simple. Tsuchimochi (2002) also seemed to support the above observations. In Koyama and Takeuchi (2003), however, no significant differences in respect to either the number of words EFL learners searched or the time they needed between the two types of dictionaries were found. To examine this difference empirically, *Hypothesis 1* was made.

Hypothesis 2: *The retention of searched words will be better in the PD condition.*

A large body of research in the realm of cognitive psychology suggests the relation between the utilization of retrieval cues and human memory (e.g., Anderson,

2000; Baddeley, 1990; Craik & Tulving, 1975; Loftus & Loftus, 1980). As the PD requires subjects to view information relating the target word on the same page, compared with the ED condition, there is a possibility that the subjects naturally, not intentionally, may obtain many "cues" for the target word in this process. Thus, we can consider that this promotes learners' retention of words searched.

Hypothesis 3: The subjects will highly evaluate the ED, compared with the PD.

Shizuka (2003) asserted that learners' familiarity with each dictionary type did not affect their preference for dictionaries. In contrast, Koyama and Takeuchi (2003) indicated that a feeling of familiarity with digital devices might be related to learners' impressions of dictionaries. Therefore, *Hypothesis 3* was proposed to explore the differences in their claims.

3. 3 Method

3. 3. 1 Subjects

The subjects in this experiment were 18 undergraduate students in a large university in Osaka. No subjects majored in English literature nor linguistics. They were asked to answer a questionnaire which attempted to investigate their daily dictionary use and contact with digital media. According to the result of a cloze test (See Appendix A) given to them in advance, the subjects were considered to be intermediate level of English proficiency (M = 23.39, SD = 3.62). They were paid for their participation.

3. 3. 2 Dictionaries

Two types of learners' dictionaries were introduced in the present study; *Taishukan's Genius English-Japanese Dictionary (3rd edition)*; and CASIO EX-word XD-R8100. The same number of words and usage examples were

included in both dictionaries. All the subjects were given an abridged version of the instruction manual for the ED, and were provided enough time to practice with the device before the experiment.

Figure 3-1. Electronic dictionary used in this Study

3. 3. 3 Materials

Texts A and B were used as reading materials (See Appendix B). They were selected from an English-reading textbook designed for college students. These texts contained several words and phrases that were unfamiliar to the subjects. The readability of both reading materials was considered to be approximately at the same level (See Table 3-1).

Table 3-1. Readability of Materials

	Flesch Reading Ease	Flesch-Kincaid Grade Level	Number of Words
Text A	70.4	6.8	463
Text B	72.3	6.4	464

3. 3. 4 Procedure

This experiment was conducted on an appointment system, and thus the

subjects could work at their own pace. The entire session, including instruction, warm-up to get used to the electronic dictionaries, and answering a questionnaire, lasted about 90 minutes.

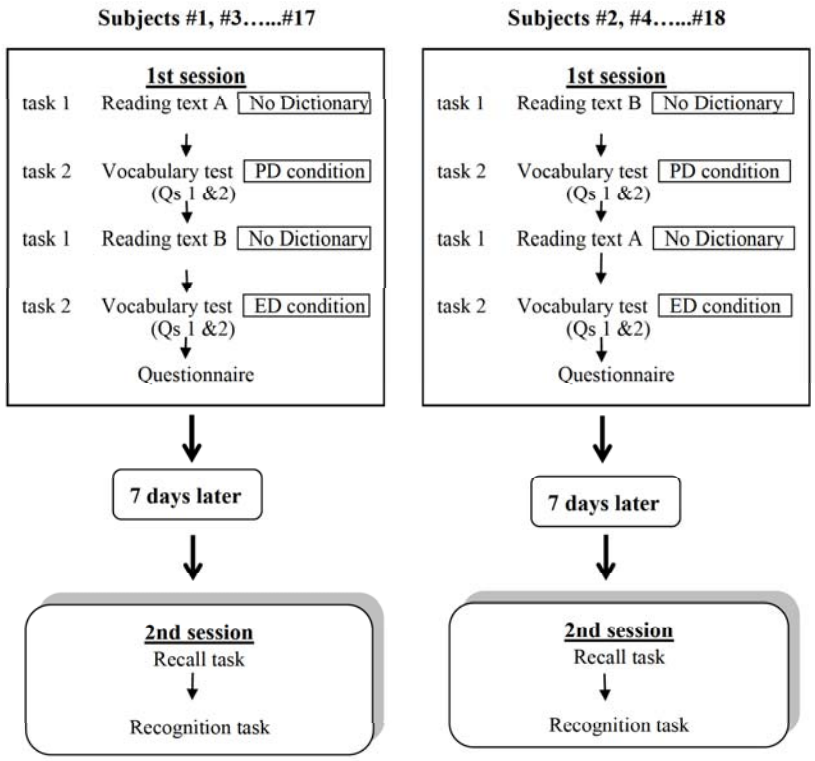

Figure 3-2. Procedure of the Experiment

The experiment was divided into two sessions. In the first session, the subjects performed two tasks, i.e., comprehending reading materials without a

dictionary and answering a vocabulary test with a dictionary. In the second session, which was held on the seventh day after the first session, two tasks were also assigned to the subjects, i.e., answering recall and recognition tasks (See Figure 3-2 for the procedure).

The first session contained a reading comprehension task and two questions. To measure their comprehension of the reading materials, the subjects were asked to summarize the text (A or B) at the first stage. Questions 1 and 2 (Qs 1 and 2) tested vocabulary. The subjects were instructed to consult the designated dictionaries to answer them. On Q 1, the subjects were given four target words from the texts, and they were asked to write the correct definitions in Japanese by using the dictionary. Q 2 consisted of four words as well, and the subjects were instructed to quote correct usage examples in English from the dictionary. These questions were prepared to examine how the subjects gained accurate information about the target words from each type of dictionary.

These eight words in Qs 1 and 2 were considered to be unfamiliar to the subjects based on my teaching experience, and thus they had to consult a dictionary. Furthermore, some of the words required subjects to push one button after another and scan different screens to obtain necessary information in using the ED, while in using the PD, not only synonyms but also further information were available on the same page (See Figure 3-3 for an example of the difference between the PD and the ED). This meant the subjects were forced to do additional tasks, especially in the ED condition.

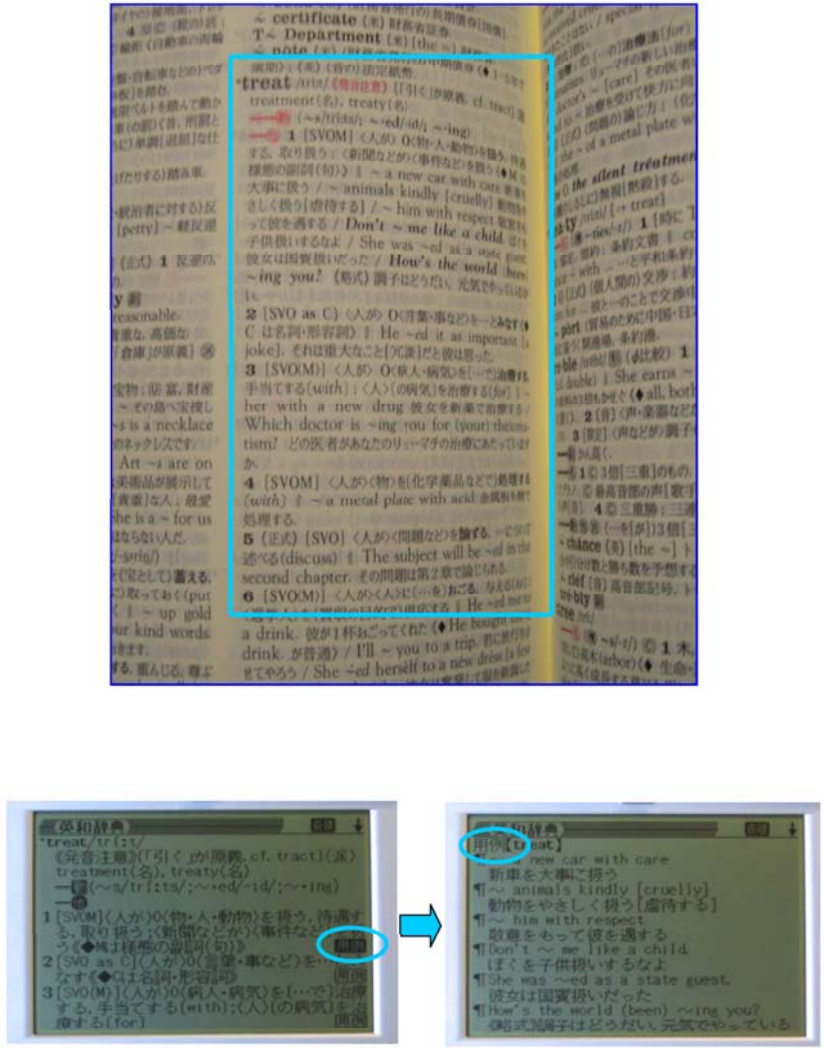

Figure 3-3. Difference between the PD and the ED

The subjects performed these tasks under two conditions, i.e., using the PD (the PD condition) and the ED (the ED condition). In other words, they did this session twice with a different text and a different type of dictionary. This meant that if Subject #1 was assigned Text A with the PD and Text B with the ED, Subject #2 performed Text A with the ED and Text B with the PD. Thus, the combination of dictionaries and reading materials were properly balanced. Their search behavior was video-recorded individually. After this session ended, they answered a questionnaire and wrote comments on the two different types of dictionaries they had used in the experiment.

In the second session, two different tasks were administered without advanced notice. One was a recall task and the other was a recognition task. These tasks were conducted to investigate retention of the words subjects had looked up in the first session. The subjects were asked to recall words they had consulted a week before. The recognition task was made up of the sentences used in Qs 1 and 2. The subjects were requested to circle the words they actually looked up in the first session.

3. 4 Results

3. 4. 1 Test Score and Search Time

Table 3-2 shows the result of the mean scores and the SDs for vocabulary tests (Qs 1 and 2) in the first session of the experiment. Five points were assigned to each word, so that partial credit could be given to an incomplete answer. The full mark was 20.

Table 3-3 indicates a comparison of the search time for Q 1 (Words) and Q 2 (Usage Examples) between the PD and ED conditions. Search time for each condition was defined as the time until subjects jotted down information regarding the target words after they began to consult the dictionary. The time for going back

to the dictionary after writing their initial answers was not included in both conditions. The researcher used the digital counter on a DVC camera to measure their search time.

Table 3-2. Results of Test Scores

	PD Condition			*ED Condition*		
	n	*M*	*SD*	*n*	*M*	*SD*
Question 1 (Words)	18	14.00	4.33	18	14.17	3.78
Question 2 (Usage Examples)	18	13.89	3.23	18	12.50	4.29

Table 3-3. Search Time Recorded

Subjects #	*PD Condition*		*ED Condition*	
	Q 1 (Words)	Q 2 (Usage Examples)	Q 1 (Words)	Q 2 (Usage Examples)
1	10'20"	5'49"	3'50"	4'51"
2	7'07"	3'14"	5'00"	4'25"
3	7'04"	5'20"	3'07"	5'21"
4	3'56"	4'02"	6'20"	5'57"
5	2'55"	3'16"	6'34"	3'47"
6	6'41"	5'22"	4'21"	7'45"
7	5'31"	4'23"	2'05"	3'38"
8	3'19"	4'19"	3'50"	6'08"
9	10'40"	7'56"	4'24"	8'40"
10	3'56"	4'00"	5'10"	3'46"
11	3'27"	10'04"	6'14"	8'21"
12	3'47"	5'38"	4'36"	2'43"
13	4'24"	3'50"	3'45"	4'03"
14	1'40"	2'34"	4'57"	3'26"
15	8'00"	6'26"	3'36"	5'54"
16	3'02"	6'30"	2'48"	5'09"
17	11'48"	8'00"	5'47"	5'07"
18	4'10"	3'14"	3'56"	3'02"
M	5'39"	5'13"	4'28"	5'07"

Since the number of the subjects was relatively small, normal distribution was not ensured. Therefore, the non-parametric Wilcoxon signed-ranks test (Siegel & Castellan, Jr., 1988) was run. The values of statistical analysis in Table 3-4 revealed no significant differences in search times of each question between the PD and ED conditions at the .05 level. Hence, the results of Shizuka's (2003) study, which indicated that the ED enabled users to find word definitions more quickly than the PD, were not confirmed in this experiment.

Table 3-4. Results of Statistical Analysis: Search Time

	Q 1 (Words)	Q 2 (Usage Examples)
z	1.241	.196

All values are N.S.

3. 4. 2 Retention

The results of two tasks in the second session were shown in Table 3-5. "Rate of Recall" and "Rate of Recognition" were calculated by dividing the number of words they consulted by the number of words recalled or recognized. This was because some subjects consulted the dictionary for more words than the researcher assigned to them in the vocabulary tests (Qs 1 and 2). Each score in Table 3-5 was thus shown in percentages.

The responses of the recall task, in which subjects wrote either spellings or their Japanese meanings of the words they had consulted a dictionary a week before, were given one point if their spellings were correct. Minor spelling mistakes (e.g., excuce for excuse; traiter for traitor) were disregarded in scoring. In grading the recognition task, one point was given if the subjects could circle the words they had actually looked up in a dictionary in the first session.

Comparing both rates in Table 3-5, the differences of each mean value

between the PD and ED conditions were larger in "Rate of Recognition." The difference was also statistically confirmed by the results of Wilcoxon signed-ranks test as shown in Table 3-6. This indicates that the words searched with the PD resulted in better retention than those with the ED.

Table 3-5. Descriptive Statistics: Retention of Words

Subjects #	*PD Condition*		*ED Condition*	
	Rate of Recall	Rate of Recognition	Rate of Recall	Rate of Recognition
1	6.3	37.5	0.0	25.0
2	0.0	54.3	0.0	55.6
3	0.0	62.5	10.0	40.0
4	12.5	75.0	0.0	33.3
5	12.5	37.5	12.5	12.5
6	11.1	33.3	0.0	12.5
7	0.0	37.5	0.0	12.5
8	0.0	75.0	0.0	75.0
9	8.3	50.0	0.0	46.2
10	0.0	12.5	0.0	25.0
11	13.3	46.7	8.3	50.0
12	20.0	80.0	13.3	73.3
13	12.5	87.5	25.0	50.0
14	0.0	25.0	25.0	50.0
15	12.5	37.5	0.0	30.0
16	0.0	22.2	0.0	22.2
17	0.0	66.7	0.0	18.2
18	0.0	50.0	0.0	50.0
M	6.1	50.0	5.2	37.8

(Unit: %)

Table 3-6. Results of Statistical Analysis: Retention of Words

	Rate of Recall	Rate of Recognition
z	.460	2.359*

* $p < .05$

3. 4. 3 Impressions and Comments on the dictionaries used

A 23-item questionnaire was administered to assess their impressions of the two types of dictionaries they had used in the experiment. In the questionnaire, the subjects rated their impressions on a scale of one to five, in which five means they expressed complete agreement with the description of that item.

Table 3-7 represents the comparison of the mean values of responses to each dictionary by the subjects. As described below, item (9) "*I felt I needed experience to use this dictionary well*," item (14) "*It was too trouble for me to get necessary information with this dictionary,*" item (15) "*I felt that using this dictionary required special skill*," and item (19) "*I feel as if I were lost when using this dictionary*" indicate negative evaluations to each type of dictionary. Therefore, low values of these items mean that subjects esteem them more highly.

Table 3-7 shows that the ED got a high evaluation in item (3) "*I could find the words of Qs 1 and 2 in this experiment with this dictionary quickly*" and item (22) "*This dictionary is easy to use at any time and any place*". On the other hand, the items which large differences between the PD and ED were observed were: item (18) "*I feel like my English proficiency will improve if I use this dictionary,*" item (21) "*This dictionary is appropriate for beginners in learning English at a primary or lower secondary school,*" and item (23) "*This dictionary is reliable.*" This means that the subjects considered the PD to be better than ED or to be suitable to learn introductory-level of English. These responses provided data contradictory to Shizuka's (2003) claim, in which learners' overwhelming preference for electronic dictionaries was found.

Table 3-7. Responses to the Questionnaire

	Questionnaire Items	*M*	
		PD	*ED*
1.	This dictionary provided much information at first sight.	3.7	3.2
2.	I saw other information besides the target word in this dictionary.	3.8	3.2
3.	I could find the words of Qs 1 and 2 in this experiment with this dictionary quickly.	2.7	4.1
4.	I felt that the words I looked up in this dictionary were easily retained.	3.4	2.4
5.	It was easy for me to scan information about the target word.	3.1	3.3
6.	I could get other related information about the target word with this dictionary.	3.6	3.4
7.	I could easily get necessary usage examples to understand the meaning of the target word in this dictionary.	3.3	3.3
8.	This dictionary was easy to use.	3.4	3.5
9.	I felt I needed experience to use this dictionary well.	3.1	3.7
10.	This dictionary was convenient for comparing the meanings of more than two words.	2.8	2.8
11.	I could use this dictionary for a long time.	2.7	3.6
12.	I could easily get suitable meaning after finding the target word in this dictionary.	3.4	3.4
13.	I enjoyed using this dictionary.	2.8	3.7
14.	It was too trouble for me to get necessary information with this dictionary.	3.1	2.2
15.	I feel that using this dictionary required special skill.	3.4	3.1
16.	This dictionary would be useful for my studies.	3.7	3.7
17.	I would like to use this dictionary again when participating in this experiment.	3.1	3.9
18.	I feel like my English proficiency will improve if I use this dictionary.	3.6	2.6
19.	I feel as if I were lost when using this dictionary.	1.9	2.4
20.	I would like to recommend this dictionary to my friends.	2.9	3.7
21.	This dictionary is appropriate for beginners in learning English at a primary or lower secondary school.	3.7	2.1
22.	This dictionary is easy to use at any time and any place.	2.5	4.4
23.	This dictionary is reliable.	4.0	3.0

(Translation mine)

After the subjects answered the questionnaire in the first session, they were asked a supplementary question concerning item (21), that is, "*Why do you or don't you think so?*" This question was asked to investigate why they highly evaluated PD on this item. Some excerpts from subjects' comments are shown in Table 8. Their comments reveal that the subjects considered the words consulted in the ED condition to be hard to retain.

Likewise, some of them thought an electronic one was not adequate for children's use. A comment from subject #16 seems to be in line with Shizuka's (2003) assertion on the importance of look-up frequency. With regard to foreign language acquisition, however, task-induced involvement might be more important than look-up frequency (e.g., Laufer & Hulstijin, 2001). Look-up frequency, thus, does not necessarily result in better learning.

Table 3-8. Subjects' Comments on Item (21)

Subjects #	Comments
1	I think that it is more important for school kids to read printed matter.
3	Students at a primary school should not use EDs, because I feel they will easily forget the words they looked up.
4	This ED is compact and easy-to-carry. I don't think we can see more information in the PD than an electronic one. The limited information of EDs' screen is easy to scan.
6	I feel the words I consulted in the PD are easily retained. On the contrary, I think I easily forget them when using an electronic one.
10	I can see other related information besides the target words in using the PD. But I only see limited information with an electronic one.
14	I have to look up the target words in the ED again and again, because the words searched in an electronic one pop up and disappear quickly.
17	I think that the PD is more appropriate for beginners.

(Translation mine)

3. 5 Discussion

Three points are to be discussed in this section. First, from the results in **3.4.1**, no difference was observed in the subjects' vocabulary test scores of Qs 1 and 2. It means that the subjects could obtain the correct definitions regarding the target words in either condition. Furthermore, no significant difference was observed at the .05 level in the Wilcoxon signed-ranks test in respect to the time to search for either words or usage examples between the PD and ED conditions, even if some of the words in Qs 1 and 2 were intentionally included in order to compare their searching behavior in both conditions as was explained in **3.3.4.** This result implies that the recent improvement of search-function of an ED contributed to a reduction of search time. *The first hypothesis,* therefore, was not supported.

Second, as shown in **3.4.2**, the Wilcoxon signed-ranks test yielded a significant difference in "Rate of Recognition." In other words, the words searched in the PD condition were well-retained in subjects' memory compared to those in the ED condition. Two reasons can be suggested. Firstly, as introduced in the previous section, cues to retention of words were considered to be more abundant in the searching-process of the PD condition. Secondly, EFL learners were obliged to do an arduous or elaborate work in the process of searching in the PD condition, while they could easily get a word definition only by inputting a spelling of the word in the ED condition. According to "the *depth of processing*" hypothesis, an elaborate process for acquiring new lexical information leads to higher retention (e.g., Laufer & Hulstijn, 2001). Consequently, the words searched in a longer process in PD condition could be retained better than those in the ED condition. Thus, *the second hypothesis* was supported.

Third, as indicated in **3.4.3**, the subjects highly evaluated the ED's advanced search-function and its handiness in items (3) and (22). Overall, the subjects regarded ED as convenient, while they considered PD to be reliable in items (18) and (23). From these findings, the following two interpretations can be made: 1) subjects were aware that some relations exist between the longer process necessary to obtain information in PD condition and the retention of words searched, although they regarded such a process as troublesome; and 2) subjects considered the characteristics of printed dictionaries, which they could obtain further information relating to the target words, to be advantageous for EFL learners at the beginning level. These interpretations were also backed up by the subjects' comments on item (21) (See Table 3-7). *The third hypothesis*, therefore, was not supported.

3. 6 Summary

The following findings were made in the present study. First, although the differences in the two types of dictionaries did not affect the selection of the correct definitions regarding the target words and reduction of search time, it influenced retention of words searched. Second, a longer process to obtain the necessary information in a dictionary might closely relate to the retention of words searched.

These findings stimulated further research to explore the possible connections between the depth of processing in look-ups and retention of looked-up words.

Notes

1. The word "interface design" is defined as "a point of contact between a human and a device" in the studies. In this respect, two types of dictionaries have a crucial difference in their design. Learners can see a large amount of information concerning the target word on the same dictionary page in the PD condition, while limited information appears on a small screen of a compact and easy-to-carry electronic dictionary. Learners, therefore, have to press keys to get further information in the ED condition.
2. One of the major differences between Shizuka's (2003) study and Koyama and Takeuchi (2003) is the situation in which data were collected. In Koyama and Takeuchi's study, EFL learners consulted a dictionary in a more realistic reading

situation, while they did so in a less realistic or more artificial one, in Shizuka's study.

4. The effect of assigned tasks on the retention of looked-up word

4. 1 Background

In Chapter 3, I focused on the crucial differences in the interface design between an ED and a PD, and investigated EFL learners' look-up behavior and their impressions of the dictionaries. The findings were: 1) the differences in the two types of dictionaries did not seem to affect the reduction in search time; but 2) they influenced the retention of words searched; and 3) the subjects considered that a longer process to obtain the necessary information in a dictionary might result in the better retention of looked-up words. Consequently, I concluded that "arduous" work[1] (Keller, 1987) through the use of the PD seemed to result in better retention. This interpretation is in accordance with the "*mental effort*" hypothesis (Hulstijn, 1992), which was originated from psychological literature on "*depth of processing*" (Craik & Lockhart, 1972).

The question we must consider here is how we can guarantee better retention when using an ED, with which we can quickly obtain relevant information without any "arduous" efforts. In other words, how can we induce learners' "*mental effort*" in the use of the ED? Considering a rapid growth in the number of the ED users in Japan (See **2.5**), this issue needs to be examined.

4. 2 Research Questions

To induce learners' "*mental effort*", I directed my attention to the "task-induced involvement load hypothesis" proposed by Laufer & Hulstijn (2001). They suggested that the retention of words depends on how EFL learners deal with newly encountered words, and thus, the assigned task in learning new vocabulary makes learners secure higher retention. This concept was applied to several studies concerning vocabulary learning by the use of dictionaries (e.g., Hill & Laufer, 2003;

Laufer & Levitzky-Aviad, 2003). These studies, therefore, led me to the hypothesis that if an assigned task can deepen mental processing when consulting the ED, the result should be improved retention.

Based on this hypothesis, I conducted two experiments to explore the possibility of the task-induced effect in the use of the ED. The following two research questions are proposed:

Research Question 1: *Can an assigned task facilitate learner's retention of searched words when using an ED?*

Research Question 2: *Does an assigned task affect the learner's impression of the ED?*

4. 3 Experiment 1

4. 3. 1 Purposes

The purposes of this experiment were: 1) to examine the task-induced effect on learners' retention of looked-up words in using an ED; and 2) to assess how the assigned task affects learners' impression of the ED.

4. 3. 2 Participants and Materials

The first experiment was conducted with 34 second-year students at a junior college located in Osaka. The same 45-item cloze test used in Chapter 3 was given to them in advance. The result reveals that they were considered to be false beginners (M = 13.44, SD = 4.02). Their daily dictionary use was determined by a questionnaire beforehand.

A reading text was selected from a written examination of the pre-2nd grade test of STEP (The Society for Testing English Proficiency, Inc.). This text consisted

of 225 words and contained several words unfamiliar to the subjects in this experiment. Its Flesch Reading Ease was 53.1 and Flesch-Kincaid Grade Level was 10.1, which is considered to be a reasonable level for the subjects, based on my teaching experience.

For the hand-held electronic dictionary, a CASIO EX-word XD-R9000 was chosen. This ED contains the same number of headwords, definitions, and examples as *Taishukan's Genius English-Japanese Dictionary* (3rd edition), which is one of the most popular English-Japanese dictionaries.

4. 3. 3 Procedure

On the basis of the results of the cloze test and the questionnaire, the subjects were divided into two groups: the "task" group vs. the "no task" group, both groups having the same average proficiency (Mann-Whitney U = 143.500, *ns*). Before the experiment, all the subjects were given sufficient time to get used to using this particular ED.

The procedure of the experiment is summarized in Figure 4-1. First, to make the subjects comprehend the text, they were asked to read and to summarize it in Japanese without a dictionary. Second, they were given an ED and a word definition test (See Appendix C). This test was composed of six lines taken from the text, and each line included one target word, which was considered to be unfamiliar to our subjects. They were instructed to look up these words in the ED and jot down the most appropriate L1 equivalent to the context. In this session, the "task" group was additionally asked to locate the examples relevant to the context and extract them from the ED. This task was intended to deepen the subjects' mental processing. Third, a 23-item questionnaire[2] was distributed to each group to investigate how their impressions of the ED varied according to the task.

One week later, to measure the subjects' retention of words that they had

looked up in the word definition test, two tests were administered without advanced notice. In the first test ("Recall test"), they were asked to spell out six words they had consulted a week before. As the second test, the same text they had read was used ("Recognition test"), and they were instructed to circle the words they had actually looked up in the ED seven days before (See Appendix D).

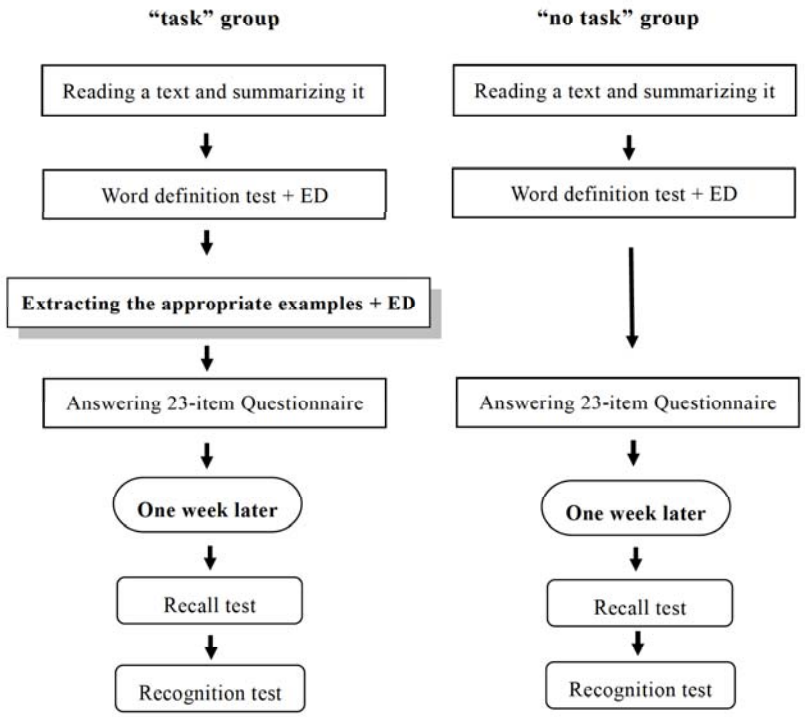

Figure 4-1. Procedure of the Experiment

4. 3. 4 Results

Table 4-1 displays the means and the SDs of the subjects' scores between the "no task" and the "task" groups. "Word Definitions" in the table indicates that the number of the correct answers in the word definition test. One point was given to each correct answer when the subjects could jot down the most appropriate L1 equivalent to the context, and thus the full mark was six. "Rate of Recall" and "Rate of Recognition" were calculated by dividing the number of the words the subjects could recall or recognize by six (i.e., the number of the designated words in the definition test). In this experiment, no one could recall the words they had consulted a week before.

Table 4-1. *Means and SDs of the Two Groups*

	Group	*n*	*M*	*SD*
Word Definitions	No Task	17	4.24	1.15
	Task	17	3.94	1.35
Rate of Recall (%)	No Task	17	0.00	0.00
	Task	17	0.00	0.00
Rate of Recognition (%)	No Task	17	.26	.20
	Task	17	.32	.29

Table 4-2. Results of Statistical Analysis

	Word Definitions	Rate of Recall	Rate of Recognition
U	124.0	144.5	133.5

All values are ns

The results of statistical analysis were shown in Table 4-2. Since the number of the subjects was small, a non-parametric Mann-Whitney *U*-test was conducted (Siegel & Castellan, Jr., 1988). As the table shows, there are no significant

differences between both groups in terms of "Word Definitions", "Rate of Recall", and "Rate of Recognition." This indicates that, contrary to expectation, the task of locating the examples relevant to the context and extracting them from the ED, which was assigned to the subjects when using the ED, did not have beneficial effect on subjects' retention of searched words, nor on their choosing of the appropriate meanings to the context.

In the 23-item questionnaire, the subjects rated their impressions of the ED on a scale of one to five. The reliability coefficient of this questionnaire was comparatively high (Cronbach's alpha = .86). Comparing the mean values of each item, almost no marked differences were observed between the "task" and the "no task" groups.

The number of the subjects or the number of the designated words was not sufficiently large to prove the hypotheses in the first experiment, and thus, Experiment 2 was conducted to replicate the findings above under more rigorous conditions.

4. 4 Experiment 2

4. 4. 1 Purpose

The purpose of Experiment 2 was to replicate Experiment 1 with a larger population under more rigorous conditions. For this purpose, the same task as in the previous study was assigned to subjects who had a different proficiency level from those of the first experiment. Additionally, the number of the designated words was increased for more reliable data collection.

4. 4. 2 Participants and Materials

The second experiment was conducted with 61 first-year students majoring in economics or commerce at a university located in Osaka. The cloze test used in the

first experiment was administered to the subjects in advance. Since the number of the subjects in Experiments 1 and 2 was different, an ANOVA was conducted on the three groups (Groups 1, 2, and 3) in order to compare their cloze test scores (See Table 4-3). As the ANOVA revealed the significant difference among the variances of the three groups ($F = 11.879$, $p < .0001$), the *post-hoc* Tukey's HSD was run. The result indicated that the significant differences were observed between Groups 1 and 2 ($t = -3.530$, $p < .05$), and Groups 1 and 3 ($t = -3.905$, $p < .05$) respectively.[3] Therefore, the English proficiency level of the subjects in this experiment was significantly higher than that of Experiment 1.

The result of the questionnaire, which asked their daily dictionary use, shows that approximately half of them used an ED in their daily study.

Table 4-3. Descriptive Statistics of the Cloze Test Scores

Subjects	*n*	*M*	*SD*
Group 1 (Subjects in Experiment 1)	34	13.44	4.024
Group 2 (Task Group in Experiment 2)	26	17.35	3.543
Group 3 (No Task Group in Experiment 2)	35	16.97	3.024

As a reading material, a short essay was selected from an English textbook designed for college students. This essay consisted of 463 words and contained several words and phrases unfamiliar to the subjects. Its Flesch Reading Ease was 70.4 and Flesch-Kincaid Grade Level was 6.8, both of which were regarded as a reasonable level for the subjects in the second experiment. The number of designated words in a word definition test was increased to ten (See Appendix E). The same ED as had been used in Experiment 1 was used in the second experiment.

4. 4. 3 Procedure

Subjects were divided into two groups ("no task" and "with task") in the same

manner that was used in Experiment 1. The subjects who use ED every day were equally included in each group. The same procedure was introduced as in the first study (See Figure 4-1).

4. 4. 4 Results

Table 4-4 represents a comparison of the mean values and SDs between the "no task" and the "task" groups. The same criterion as the first experiment was adopted for scoring.

Table 4-4. Means and SDs of the Two Groups

	Group	*n*	*M*	*SD*
Word Definitions	No Task	35	8.00	1.14
	Task	26	8.62	1.10
Rate of Recall (%)	No Task	35	.40	.65
	Task	26	.23	.59
Rate of Recognition (%)	No Task	35	4.11	1.94
	Task	26	4.27	2.33

Table 4-5. Results of Statistical Analysis

	t	*df*
Word Definitions	-2.120*	59
Rate of Recall	1.047	59
Rate of Recognition	-.284	59

*$p < .05$

The results of statistical analysis are shown in Table 4-5. The *t*-values revealed that a significant difference existed in "Word Definitions" between "no task" and "task" groups at $p < .05$. However, no significant differences were found in respect of either "Rate of Recall" or "Rate of Recognition". The results in this

experiment, like those in Experiment 1, indicate that the assigned task did not positively affect the subjects' retention of the searched words. Nevertheless, it helped the subjects choose appropriate L1 equivalents to the context from the ED.

In the 23-item questionnaire, in which the subjects rated their impressions of the ED on a scale of one to five, the reliability coefficient of this questionnaire was relatively high (Cronbach's alpha = .82). Comparing the mean values of each item, no significant difference between two groups was found.[4]

Favorable responses to the ED in both groups were observed as a whole, despite the fact that the "task" group had the additional work. Actually, the highest scores in each group were found on item (16) "*This dictionary would be useful for my studies*." ("task" group: $M = 3.81$; "no task" group: $M = 3.94$). In other words, the subjects in both groups showed a preference for the ED irrespective of their daily dictionary use. This finding was also supported by the result of the evaluation of item (14) "*It was too troublesome for me to find the required information with this dictionary*". Not only the "task" group but also the "no task" group evaluated this item comparatively low, as compared with other items ("task" group: $M = 2.42$; "no task" group: $M = 2.40$). To put it briefly, the subjects of both groups could draw necessary information from the ED without any trouble, whether they were assigned the task or not.

4. 5 Discussion and Summary

The results derived from the two experiments described above reveals the following. First, the results of the recall and recognition tests in two experiments revealed that the assigned task, contrary to expectation, did not help retention of the looked-up words. This might indicate that the task in the present study, which was locating the appropriate examples to the context and extracting them from the ED, did not assign a sufficiently heavy mental processing load to the subjects. One

possible explanation for the finding is that the task did not require the subjects to make a great deal of effort owing to a superior search function of the ED. This interpretation is also corroborated by the answers to item (14) of the 23-item questionnaire, in which neither group considered that looking up words in using the ED was troublesome or arduous work.

Second, from the analysis of the questionnaire in Experiments 1 and 2, the subjects' impressions of the ED did not seem to vary in accordance with the assigned task. In fact, all the answers in both experiments indicated their preferences for the ED, whether they performed the task or not.

Third, Experiment 2 revealed that the "task" group obtained significantly higher scores in the word definition test than the "no task" group did, while no difference was found between both groups in Experiment 1. These results indicate that the "task" group in the second experiment obtained information relevant to the context by looking up the examples of the target words, and thus they could choose the appropriate meanings from the dictionary. However, I could not find such an effect in the "task" group in Experiment 1, despite the fact that the same kind of task as in Experiment 2 was assigned. Since the only major difference between two experiments was the subjects' proficiency, the results suggested that learners with lower proficiency could not derive helpful information on the target words from the dictionaries.

To summarize the major findings described above, the superior search function of ED appears to overcome the task which is generally regarded as arduous or troublesome. However, I found that learners' proficiency is somewhat related to retrieval strategies, since the learners with low proficiency could not derive appropriate meanings to the context from the ED. According to Lantolf, Labarca, and Tuinder (1985), the different retrieval strategies exist in different proficiency levels. They revealed that the students of beginning and intermediate levels

appeared to favor a search strategy based on lexical forms, while advanced students were able to employ a more successful semantic-based strategy. Although their study was conducted in using printed dictionaries, a certain similarity can be found between their findings and mine. As was indicated by many researchers in this field (e.g., Carduner, 2003; Nation, 2001; Scholfield, 1997), acquiring the strategies for dictionary use is considered to be indispensable for better comprehension of the texts or retention of the looked-up words. Thus, the future direction of my study will be to find strategies for effective ED use in EFL learning.

Notes

1. Keller (1987) claimed that "frequent need to thumb through the dictionary is arguably the most arduous part of learning a foreign language."
2. The same questionnaire used in Chapter 3 was adopted.
3. No significant difference was found between Groups 2 and 3.
4. No item exceeded the pre-set alpha level of .002 in the multiple *t*-tests. This adjusted alpha level was calculated according to Bonferroni adjustment.

5. The effect of look-up frequency on reading comprehension

5. 1 Background

Before taking up strategies for the ED use, the relation between look-up frequency and reading comprehension was examined in this chapter, since look-up frequency is one of the controversial topics of dictionary use. As Keller stated, "frequent need to thumb through the dictionary is arguably the most arduous part of learning a foreign language" (Keller, 1987, p.17), turning over the pages of a printed dictionary has been considered to be a troublesome work. Aust, Kelley, and Roby (1993) also put great emphasis on the advantages of an online electronic dictionary (hyper-reference), which provided immediate access to the target information for FL learners. Shizuka (2003) was very emphatic on the importance of look-up frequency when using the ED, although he did not clarify the relationship between look-up frequency and better reading comprehension in Japanese EFL context.

Then, does the ED actually increase learners' look-ups more than PD does? Does higher look-up frequency induced by using ED actually help EFL reading? These are still moot questions. I thus attempted to clarify possible relations between look-up frequency and reading comprehension.

5. 2 Research questions

In this chapter, I aimed to investigate how the difference between an ED and a PD has affected EFL reading. My focus is especially on the relationship between look-up frequency and reading comprehension. For this purpose, the following two research questions were proposed:

Research Question 1: *How does look-up frequency of Japanese EFL learners differ between an ED and a PD conditions when reading materials written in English?*

Research Question 2: *Does higher look-up frequency affect the comprehension of reading materials?*

5. 3 Experiment 1

5. 3. 1 Subjects

The subjects of Experiment 1 were 34 Japanese female college students, who participated in the experiment on a voluntary basis. The 45-item cloze test used in Chapter 4 was given to them in advance. According to the result of the cloze test (M = 13.5, SD = 3.719) and the researcher's evaluation of their English proficiency, they were considered to be false beginners. Approximately half of them reported using an ED in their daily EFL study.

5. 3. 2 Dictionaries

The learners' dictionaries used for the experiment were identical to those used in the previous chapter. One was *Taishukan's Genius English-Japanese Dictionary* (3rd edition), and the other, CASIO EX-word XD-R9000. The same number of headwords, definitions, examples, and usages were contained in the PD and the ED.

5. 3. 3 Materials

Two reading materials (Texts A and B) were selected from an English-reading textbook[1] (See Appendix F). As seen in Table 5-1, their readability levels differed only slightly, and I considered, based on the researcher's teaching experience, that both materials were appropriate in terms of text difficulty and topic selection.

Table 5-1. Readabilities of Texts A and B

	Flesch Reading Ease	Flesch-Kincaid Grade Level	Number of Words
Text A	74.5	7.3	144
Text B	80.4	6.1	149

5. 3. 4 Procedure

Since the number of the subjects was small, a non-parametric Mann-Whitney *U*-test was conducted (Siegel & Castellan, Jr., 1988). Based on the results of the cloze test, the subjects were divided into two groups with the same proficiency (Mann-Whitney $U = 141.500$, *ns*). Each group was assigned a reading task under two conditions: ED and PD. In other words, all the subjects repeated this process twice with a different text and a different type of dictionary. As seen in Figure 5-1, the combination of the dictionary and the text was properly balanced. The subjects were allowed to make free use of the designated dictionaries to comprehend the texts. They were asked to circle the looked-up words in each text while reading.

The experiment was conducted one student at a time with an appointment system. First, the subjects were given sufficient time to get used to the ED before the experiment. Then, to investigate the words the subjects had already known in advance, a vocabulary list consisting of all the words minus function words in texts A and B was distributed. They were instructed to check the words they thought they knew without any advanced notice.

To measure their comprehension of the texts, the subjects were instructed to take a quiz (Quiz) after reading (See Appendix F). Each quiz consisted of two questions, which they could not answer correctly unless they fully comprehended the texts. Five points were allotted to each question so that partial credit could be given to their answers; a full mark, therefore, was ten.

Since the experiment was conducted individually, the researcher took the opportunity to interview some of the subjects after the completion of the experiment.

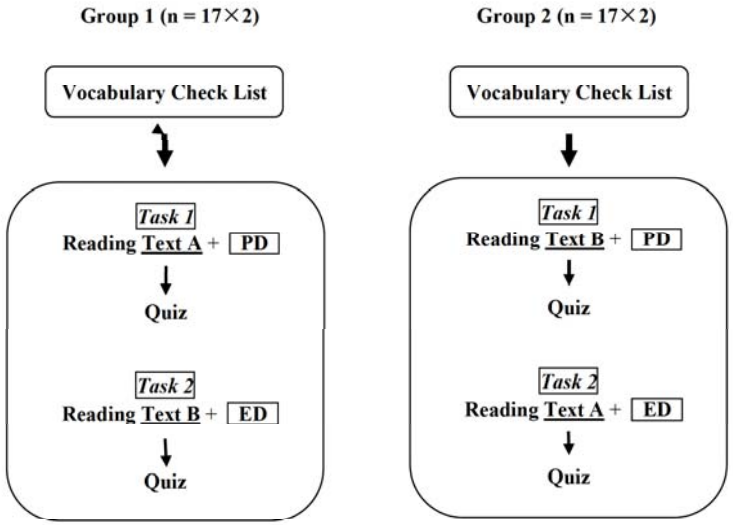

Figure 5-1. Procedure of Experiment 1

5. 3. 5 Results

Table 5-2 shows the comparisons of look-up behavior and reading comprehension between the ED and PD conditions. The combined data of Tasks 1 and 2 appear in the table. "Lapsed Time" in the table is the time they needed to read a text (Texts A or B) and to answer a quiz while consulting a dictionary in each (ED or PD) condition, which was measured with a stopwatch by the researcher. "Looked-up Words" indicates the total number of words the subjects looked up while reading texts in each condition. "Reported Words" means the number of the

looked-up words which they reported they knew in the vocabulary check beforehand, but were actually consulted during the task. To confirm the reliability coefficient, "Quiz Score" was re-checked by an EFL instructor. The Pearson correlation coefficient between two markers was .920 (ED condition) and .892 (PD condition) respectively (p<.001), which were satisfactory high.

Table 5-2. Comparisons of Look-up Behavior and Reading Comprehension

	n	ED Condition		PD Condition	
		M	*SD*	*M*	*SD*
Lapsed Time	34	11'54"	5'11"	13'37"	5'29"
Looked-up Words	34	11.12	4.916	7.41	3.839
Reported Words	34	3.03	2.736	1.18	1.527
Quiz Score	34	8.50	2.453	8.76	1.793

Table 5-3. Results of Statistical Analysis

	df	*t*
Lapsed Time	33	2.120*
Looked-up Words	33	-3.984***
Reported Words	33	-4.408***
Quiz Score	33	.515

* p <.05, ***p <.001

The t values in Table 5-3 revealed that significant differences existed in "Lapsed Time", "Looked-up Words", and "Reported Words" between the ED and PD conditions at p <.05 or p <.001, whereas no significant difference was found in "Quiz Score".[2] This indicates that the subjects in the ED condition needed less time to accomplish the task and looked up more words. Additionally, the results revealed that the subjects tended to re-check the words they had reported they knew more frequently in the ED condition. This finding was backed up by the comments from

some of the subjects who used PD in their daily study (See Table 5-4).

Table 5-4. Subjects' Comments on the Dictionaries

Subject #	Comments
5	The search-function of the ED was very convenient for me. So even if I knew the meanings of those words in advance, I was willing to confirm them once more with the ED, but not with the PD.
9	This ED is very useful! So I checked the meanings of the words I knew again and again.
14	I use the same PD in my daily study. But the ED I used in the experiment was easy to consult. So I looked up more words with the ED than I thought.

Translation mine.

The statistical analysis in Table 5-3, however, indicates the quiz score of the ED condition was not significantly better than that of the PD condition. This result means that the subjects obtained almost the same score in the reading comprehension tests (Quiz) under either condition, even though they looked up more words in the ED condition.

5. 3. 6 Discussion

The analysis above indicates that the subjects can reduce the time to comprehend a text by using the ED. Furthermore, they tend to look up more words using the ED, regardless of their prior knowledge of those words. These findings suggest that the ED could indeed lower the "consultation trigger point" (Aust et al, 1993), thereby inducing higher look-up frequency of the subjects.

Note that, in this experiment, no time constraint or limit on the number of target words to be looked up were set. The subjects spontaneously consulted dictionaries in order to understand the texts and answer the quizzes. Therefore, I can

claim that EFL learners' look-up frequency increases through using an ED when they try to comprehend reading materials written in English in real learning situations.

Another important point is that no significant difference was found in the quiz scores between the ED and the PD conditions in the *t*-test. This finding indicates that EFL learners might obtain the same degree of reading comprehension under either condition, even though they look up more words in the ED condition. Hence, it is possible that EFL learners' reading comprehension may be unaffected by the increased look-up frequency induced by the use of an ED.

Since Experiment 1 was the first attempt to investigate possible relations between learners' look-up frequency and reading comprehension, a second experiment was conducted with new subjects who had a different English proficiency level from those in the first experiment.

5. 4 Experiment 2

5. 4. 1 Subjects

Subjects in the second experiment were 31 undergraduate EFL students at a large university. The 45-item cloze test used in the other chapters was also given to the subjects (M= 23.7, SD = 3.618). The result indicates that the English proficiency level of the subjects in Experiment 2 was significantly higher than that of Experiment 1 (t = -11.162, df = 63, p<.0001). They were also asked about their daily dictionary use beforehand via a questionnaire.

On the basis of the scores of the cloze test, they were divided into two groups (ED and PD Groups) with approximately the same proficiency (U = 84.000, *ns*). Their daily dictionary use was properly balanced in both groups as well (See Table 5-5).

Table 5-5. Breakdown of Subjects

Group	*n*	Cloze Test		Daily Dictionary Use	
		M	*SD*	ED	PD
ED	15	24.47	3.461	13	2
PD	16	22.94	3.714	11	5

(U = 84.000, *ns*)

5. 4. 2 Dictionaries

The same ED and the PD which had been used in Experiment 1 were also utilized in the second experiment. Both dictionaries contain the same version of *Taishukan's Genius English-Japanese Dictionary* (3rd edition).

5. 4. 3 Material

Taking the subjects' English proficiency into account, a reading material (Text C), which was considerably difficult for Japanese EFL learners, was selected from the Pre-1st grade test of the STEP[3] test (See Appendix G). The readability of the text was shown in Table 5-6.

Table 5-6. Readability of Text C

	Flesch Reading Ease	Flesch-Kincaid Grade Level	Number of Words
Text C	47.2	11.1	377

5. 4. 4 Procedure

Subjects in the ED Group were given an abridged version of the users' manual and were provided enough time to get used to the ED before the experiment. The whole procedure is summarized in Figure 5-2.

To investigate the words the subjects had already known, a vocabulary list

was distributed, which was composed of all the words in text C excluding the words they should have already learned in junior high school. [4] The words on the list were arranged in alphabetical order, and no prior information about the purpose of the list was given to the subjects. They were asked to circle the words they thought they knew.

As seen in Figure 5-2, each group was assigned a reading comprehension task using the designated dictionary. The subjects in Experiment 2 could make free use the designated dictionary while performing the task. They were asked to circle the looked-up words while reading in the text. To measure their comprehension of the text, they were instructed to take a quiz (Quiz), which consisted of six questions with four multiple-choice options. One point was given to the correct answer, so that a perfect score was six.

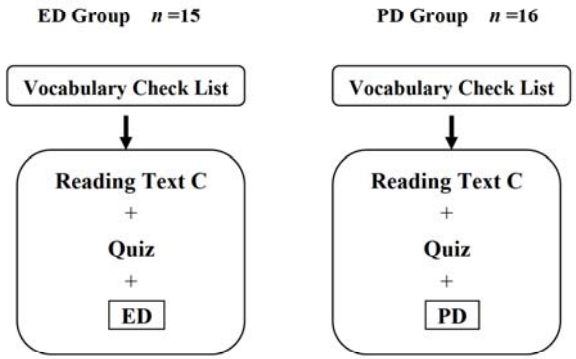

Figure 5-2. Procedure of Experiment 2

To confirm the reliability of the quiz, the scores of the cloze test and those of the quiz scores were correlated. The correlation coefficient shows that, these two sets of scores were significantly related (r = .498, $p \leqq$ .004), and the Spearman-

Brown prophecy formula shows a coefficient of .665 for the reliability of the quiz. Thus, I could maintain that the relatively reliable data were obtained, irrespective of a small number of the quiz items. In the experiment, the subjects were given sufficient time so that they could work at their own pace.

5. 4. 5 Results

The descriptive statistics are provided in Table 5-7. "Lapsed Time" in the table indicates the time the subjects needed to read the texts and to answer the quiz while consulting a dictionary in each (ED or PD) condition, which was self-measured and reported by the subjects. "Looked-up Words" indicates the total number of words the subjects looked up while reading texts. "Reported Words" means the number of the words which the subjects told they knew in the vocabulary check in advance, but were looked up during the task.

Table 5-7. Mean Values of Look-up Behavior and Reading Comprehension

Group	Lapsed Time	Looked-up Words	Reported Words	Quiz Score
ED	25'08"	25.00	6.07	3.40
PD	32'41"	12.25	1.00	3.38

As can be seen in Tables 5-7 and 5-8, there existed significant differences in "Lapsed Time," "Looked-up Words," and "Reported Words" between the ED and the PD groups at $p < .05$ or $p < .001$, which means that the ED group looked up more words to comprehend the texts than the PD group did in a briefer period. These differences were considerably larger than those in the first experiment. Additionally, the results also demonstrate that the ED group obviously re-checked more words which they thought they knew than the PD group did.

Table 5-8. Results of Statistical Analysis

	Lapsed Time	Looked-up Words (1)	Reported Words	Quiz Score
U	42.500***	49.000*	38.000***	111.500

*p <.05, ***p <.001

Nevertheless, the computed *U*-values in Table 5-8 indicate that no significant difference existed in the "Quiz Score". Despite the fact that the obvious difference was found in the subjects' English proficiency level between the two experiments, these findings precisely corresponded to the results of Experiment 1, and thus, I can claim that increased look-up frequency would not be of much benefit to our subjects in reading comprehension.

5. 4. 6 Discussion

As was seen from Table 5-7, the number of the looked-up words in the ED group was more than twice as that of the PD group. Furthermore, in the case of the re-checked words, the difference between the two groups was considerably wider than that of Experiment 1. These differences were substantial considering that the larger number of words in the reading material was used in Experiment 2.

In contrast to the number of the looked-up words, the time needed to perform the task of the subjects in the ED group was extremely shorter than those in the PD. These findings clearly indicate that the subjects who used ED could consult much larger number of words in a shorter time owing to the superior search function of ED, and they thus tried to confirm the word meanings they thought they knew. Put another way, the ED seems to encourage the learners' look-up behavior more than the PD.

A further important finding in the present study is that no significant difference in the quiz scores was found in Table 5-8. This finding indicates that

although the ED group looked up more words than the PD group, reading comprehension of the text did not differ. In other words, increased look-up frequency by using an ED does not necessarily guarantee better reading comprehension of learners.

The crucial point to note here is that the second experiment was conducted with the subjects who had a higher English proficiency level than those in the first experiment. The texts used and the manner of the two experiments were also different. Despite these differences, the results derived from both studies were virtually identical. Consequently, I can claim that higher look-up frequency does not necessarily lead to better EFL reading comprehension.

5. 5 Summary

Two experiments reported above provided us with the following conclusions. First, learners' look-up frequency seems to increase in comprehending reading materials when they use an ED at hand; second, the ED appears to reduce the time for FL reading; and third, higher look-up frequency induced by using the ED does not necessarily produce a corresponding beneficial effect on learners' degree of reading comprehension.

As was mentioned above, the results of Shizuka's study (2003), which insisted that an ED could lower the "consultation trigger point" (Aust, Kelley, & Roby, 1993, p.70), was supported by the findings in the present study. He also emphasized that the advantage of much larger look-up outweighed the drawbacks of less retained words in using the ED. I, however, believe that higher look-up frequency induced by using the ED should lead to better reading comprehension and better retention of looked-up words, and these two, i.e., better comprehension and retention, were not confirmed in Shizuka's study.

Notes

1. This book contains 30 stories, and each story consists of approximately 150 words at the 1,500-headword level (Hill, 1977).
2. The analyses of all the items also yield statistically significant values even when we applied a rigorous alpha-level based on the Bonferroni's adjustment, the procedure often used in comparing several items from the same data set (Pallant, 2005).
3. STEP stands for "The Society for Testing English Proficiency, Inc." This test has been extensively adopted to examine Japanese EFL learners' proficiency. The Pre-1st grade test is generally considered to be the pre-advanced level.
4. This is based on the word list composed of all the vocabulary which is adopted in the authorized text books of Japanese junior high (middle) schools. These words were supposed to be learned by the subjects by the time of the experiments, and I, thus, excluded them from the vocabulary lists used in Experiment 2.

6. How effectively do Good Language Learners use an ED

6. 1 Background

So far three empirical studies have been conducted, and the experimental data in these studies revealed that an ED promoted learners' look-up frequency more than a PD did. In addition, the ED could reduce the time for FL reading. In spite of these advantages, it appears that this higher look-up frequency does not necessarily guarantee better reading comprehension nor retention of looked-up words. Then, why did not these advantages lead to better comprehension nor retention?

In the field of second/foreign language acquisition research, a large number of empirical studies on the learning strategies of good language learners (GLLs) have been conducted. This is because their strategies might help us understand the learning process of second/foreign language (Takeuchi, 2003a, 2003b). Tono (2001) claimed that this approach was applicable to the study of dictionary users. As have been noted in **2.3**, he reported on a series of empirical studies on dictionary users, and showed how research into dictionary use could contribute to the improvement of dictionary design. One of his studies focused on some characteristics of good dictionary users. On the basis of the detailed analysis by means of observations and a learner' profile questionnaire, he clarified the relationship between language proficiency and dictionary skills. Wingate (2004) reported on an introspective study of intermediate learners of German using dictionaries for reading comprehension. She asserted, based on her findings, that the subjects lacked basic strategies which were crucial for successful dictionary consultation. Yamanishi (2005) also conducted a protocol analysis to examine individual differences in dictionary use by Japanese high school students. He found some tendencies in their look-up behavior among three different proficiency groups (advanced, intermediate, and basic writers), and divided them into seven categories. He suggested that the strategy found in his study could be used for guidance on how to use dictionaries in the

English composition class.

All studies described above analyzed a look-up process of FL learners, including GLLs, by adopting qualitative techniques which can reveal an invisible inner process of the human mind. This is because dictionary consultation is considered to involve quite a complicated cognitive process (e.g., Nation, 2001; Tono, 2001), and thus, concurrent verbal reports have been regarded particularly as an effective method to analyze cognitive processes of learners in specific tasks (Ericsson & Simon, 1993). Based on these theoretical and methodological perspectives, I attempted to examine EFL learners' look-up behavior with the ED through the think-aloud technique, and to find some strategies for efficient use of the ED particularly by analyzing GLLs' look-up behavior.

6. 2 The Study

6. 2. 1 Purposes

The purposes of the present study were: 1) to analyze the GLLs' look-up behavior, and compare it with that of false beginners (FBs); 2) to classify the GLLs' look-ups into categories; and 3) to find some strategies for effective an ED use for making the best use of the ED's advantages.

6. 2. 2 Subjects

Two groups of subjects who had a different educational background in EFL were selected for the study. One group (GLLs) consisted of five postgraduate students who had completed their master's degree in EFL education and research or in SLA studies, and have already had English teaching experience. In addition, all of them had secured high marks in TOEIC or TOEFL tests, and had overseas studying experience. The other group (FBs) was made up of five junior college students. Although they were studying English in the college, their English

proficiency level was rather low, and were considered to be false beginners (FBs) based on the researcher's teaching experience. To investigate their proficiency levels in advance, the same 45-item cloze test administered in the other chapters was also used. Table 6-1 shows the results of the test given to the subjects of each group. According to a non-parametric statistical analysis[1], the English proficiency level of the subjects in the GLL group was significantly higher than that in FB group (Mann-Whitney $U = .000$, $p < .009$). The result of an interview held one week before the experiment revealed that each subject in the present study had his/her own ED for daily use.

Table 6-1. Breakdown of Subjects

Group	*n*	Cloze Test Scores	
		M	*SD*
GLL	5	30.00	2.550
FB	5	17.80	3.271

(Full marks: 45)

6. 2. 3 Dictionary and Material Used

A CASIO XD-H9100 (a hand-held electronic dictionary) was used in the present study. This ED contains several dictionaries[2], and has some useful functions such as "Word history" and "Jump to multiple dictionaries" (See the details in Appendix H).

Taking proficiency levels of both groups into account, the text used in the study was carefully selected from an article designed for college students (See Appendix I). This text was 220 words long, and did not contain syntactically difficult sentences. Its Flesch Reading Ease was 61.3 and Flesch-Kincade Grade Level was 7.7, both of which are regarded as comparatively easy for students with high proficiency level. However, some unfamiliar words and phrases even to the

subjects of the GLL group were included in the text.

6. 2. 4 Procedure

Several studies indicated that, in the introspective method of thinking-aloud, researchers need to provide participants with precise methodological report procedures beforehand to obtain accurate verbal reports (e.g., Pressley & Afflerbach, 1995; Wingate, 2004). Pressley and Afflerbach (1995) assert that, "it is essential that every effort be made to portray exactly how participating readers were informed about what they were to do, even if that is only to provide an indication of the range of re-explanations that were used by the experimenter in reaction to participant difficulties"(p.121). Thus, in this study, careful attention was paid both to the instructions for the subjects and to practices before the actual think-aloud task. For example, the think-aloud task was demonstrated by the researcher before the experiment. The subjects were instructed to verbalize their thoughts while performing a task, not to describe or explain what they were doing. They were also told to perform the task in Japanese, since their L1 was Japanese, and the experiment should be conducted in natural, everyday situations. After the full explanation of the think-aloud task was made, they were asked to practice thinking-aloud during their daily English study at home until the experiment.

The procedure of the experiment is summarized in Figure 6-1. First, approximately one month before the experiment, all the subjects were provided with the designated ED with a user's manual, so that they could sufficiently get used to them. The experiment was conducted with one subject at a time on an appointment basis. Before going on the actual task, each subject was given a part of a short essay, and was assigned a warm-up task with the designated ED. At that time, they received feedback from the researcher. Then, each subject was given the text and performed the think-aloud task with the ED. Neither a time constraint nor limit on

the number of target words to be looked up was set during this session. Since the subjects were just told to verbalize their thoughts while reading the text, none of them were forced to consult the ED. Therefore, a decision of whether to use it or not was completely up to each subject.

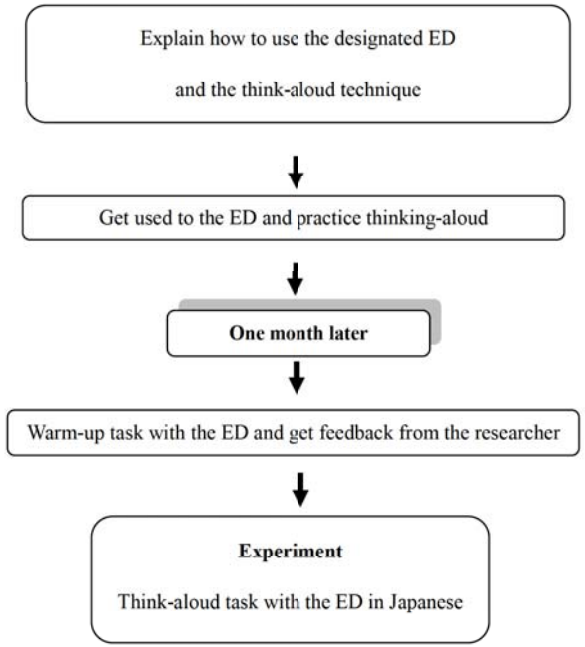

Figure 6-1. Procedure of the Experiment

All the verbal descriptions of each subject were recorded on a portable MD recorder with a cardioid microphone during the session. A DV camera with built-in microphone was also set up near the subjects as a visual back-up (See Figure 6-2).

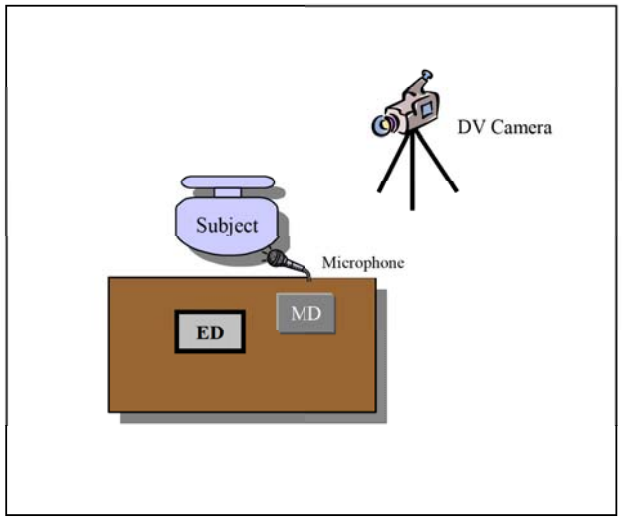

Figure 6-2. Schematic Depiction of the Experiment

The verbal descriptions of their cognitive processes while looking up the ED were carefully transcribed by the researcher. The visual back-up was also checked and used depending on the situation. First, all the transcriptions of the subjects were coded into each segment. This procedure of the segmentation was introduced based on the model of verbalization by Ericsson and Simon (1993). They added the following assumptions of their verbalization model to the analysis made by McNeill (1975): 1) units of articulation will correspond to integrated cognitive structures; and 2) pauses and hesitations will be good predictors of shifts in processing of cognitive structures. When a segment was fragmentary such as "Well" and "Oh...," such a segment was attached to another segment in order to remove ambiguity (See an example in Figure 6-3).

<GLL-A-12>	[Pause]
1. Both parents have 18-inch "scars" that run from their chest to their back...	[Reading aloud a sentence in the text.]
2. Oh...no...	[Thinking while reading]
3. "Scars"...this means that her parents have "scars" from their chest to their back...	
4. ...18-inch "scars" are left...	[Looking up "scar" in the dictionary *GENIUS*]
5. Well...	
6. "Scar"...let me confirm its meaning in *GENIUS* (the name of the dictionary)...	[Watching the screen of the ED]
7. "*KIZU*".. Yes, that's what I thought....	[Continue to read the next sentence]
8. Then...	

Encoding into Protocol-unit

<GLL-A-12>

12-1. Both parents have 18-inch "scars" that run from their chest to their back...Oh...no...

12-2. "Scars"...this means that her parents have "scars" from their chest to their back...

12-3. ...18-inch "scars" are left...

12-4. Well..."Scar"...let me confirm its meaning in *GENIUS*...

12-5. "*KIZU*"...OK, that's what I thought.

(Translation mine)

Figure 6-3. An Example of Encoding Process

After the completion of segmentation, some of the segments were jointly encoded into each protocol-unit on the basis of the subjects' behavior: look-up

behavior (Look-up) and the other. "Look-up" was defined here as a sequence of consulting behavior. It started when a subject noticed a word unknown or unfamiliar to him/her in one sentence, and ended when the subject comprehended the target sentence after consulting the ED. One protocol-unit of "Look-up", in other words, consists of several segments concerning look-up behavior of the subjects. "Others" indicates the segments which did not include the verbal descriptions related to the subjects' look-up behavior.

Figure 6-3 shows a process of encoding a protocol-unit which is a part of the verbal report of Subject A in the GLL group (GLL-A-12). This five-segment protocol-unit indicates that Subject A was looking up a word ("scar") in the ED while thinking of its meaning relevant to the context. In encoding, one fourth of the whole segments were randomly selected and checked by another researcher to confirm consistency. The inter-coder agreement was approximately 80%, which is considered to be sufficiently high.

The encoded protocol-units concerning look-up behavior in the GLL group were then classified into some groups according to the KJ method[3] (Kawakita, 1967, 1970, 1986) to find the strategies for effective dictionary consultation. Again, another researcher confirmed the consistency of classification. The inter-coder agreement was 86%.[4]

6. 2. 5 Results

6. 2. 5. 1 Analysis of Segments and Protocol-units

Tables 6-2 and 6-3 report the number of the segments and the protocol-units of the subjects in each group. For instance, the number of the protocol-units related to look-up behavior of Subject A in the GLL group was seven, which was composed of 59 segments, while Subject D in the FB group produced 30 protocol-units made up of 98 segments. "Segments / Protocol-units" in each table indicates the ratio of the

segments to the protocol-units.

Table 6-2. Number of Look-ups of Each Subject in GLL Group

Subject	Segments		Protocol-units		Segments/Protocol-units
	Look-ups	Others	Look-ups	Others	(Look-ups)
GLL-A	59	20	7	8	8.4
GLL-B	157	32	17	13	9.2
GLL-C	50	21	8	13	6.3
GLL-D	31	6	5	5	6.2
GLL-E	199	43	27	9	7.4
Average	99.2	24.4	12.8	9.6	7.5

Table 6-3. Number of Look-ups of Each Subject in FB Group

Subject	Segments		Protocol-units		Segments/Protocol-units
	Look-ups	Others	Look-ups	Others	(Look-ups)
FB-A	121	8	34	4	3.6
FB-B	172	19	50	17	3.4
FB-C	66	1	24	1	2.8
FB-D	98	5	30	2	3.3
FB-E	113	8	36	3	3.1
Average	114.0	6.2	34.8	5.4	3.2

Compared with the number of protocol-units related to look-up behavior in FB group, those in GLL group are considerably small (Mann-Whitney $U = 1.000$, $p < .016$). On the other hand, the number of segments per unit in the GLL group is approximately twice as large as those of the FB group. This means that the subjects in the GLL group spent more time to look up and comprehend the target words. This difference can be seen in Excerpts 1 and 2.

Excerpt 1 <FB-B-28>

28-1. "...using lobes..." I don't know this meaning, too. Let me see... l-o-b-e-s...Whoops! No headword is in *READERS* (the name of the dictionary)...

28-2. Oh, is 's' not necessary? Let me delete 's'...

28-3. Here comes. "*MIMITABU* (ear lobe)" or "*KUKIBUKURO* (air bag)"...but, there aren't any idioms and phrases.

28-4. Anyway, they use "lobe" of the donor....

(Translation mine)

Excerpt 2 <GLL-E-22>

22-1. OK. What do The Plums use? "...using lobes of the lung from living donors"

22-2. ...Let me see...oh, three lobes came out as entries in *GENIUS* (the name of the dictionary).

22-3. The first "lobe" means "*MIMITABU* (ear lobe)"...Oh, give me a break!

22-4. The second "lobe" is "*SHIKAKU HOGEN* (an uneducated spelling)... what's this? This is not a suitable meaning...

22-5. The third one is "*TAIKUTSUNAYATU* (bore)"...mmm, it's difficult...

22-6. But, wait a minute... I'm checking the meaning of "lobes of the lung". The lung doesn't have any ear lobes, right?

22-7. Then, here is Japanese "*HAIYOU*" in the first entry of "lobe", which means a dissection term.

22-8. Mmm...this is a technical term, isn't it? A part of the lung?

22-9. All right. They use "*HAIYOU*" of their lungs. I don't know "*HAIYOU*" itself well, but anyway, they use them.

(Translation mine)

In Excerpts 1 and 2, each subject in the GLL and the FB groups was looking up "lobe" in the dictionary. Some L1 equivalents to "lobe" appeared in the dictionary *GENIUS*, and "*HAIYOU*", which was the appropriate L1 equivalent to the context, seemed to be an unfamiliar word to most of Japanese learners. In spite

of this unfamiliarity, all the subjects in the GLL group, including Subject E in this example, made a successful consultation. Based on these findings, we can conjecture that GLLs might take time to derive information from the context in which the target words are used.

In the case of the FB group, the number of look-ups in the units was not identical with that of their actual look-ups. As shown in Excerpt 3 below, Subject C in the FB group looked up two words in one sentence in the dictionary without pausing. Her behavior is deemed to result from a lack of vocabulary. It should be noted here that this subject just rushed and consulted a dictionary when she encountered unknown words in the text, and did not deeply think of the word meaning relevant to the context. In short, she repeated to search an appropriate L1 equivalent that could replace each unknown or unfamiliar word in the reading text. This tendency was observed in almost all the protocol-units concerning look-ups of the FB group, and it has been also noted in other related studies (e.g., Neubach & Cohen, 1988; Tono, 2001; Wingate, 2004).

Excerpt 3 <FB-C-3>

3-1. Although... "*KEREDOMO*"...

3-2. "their effort"... dictionary... "*DORYOKU*"

3-3. "failed"... dictionary... "*SHIPPAISURU*"... Oh, "failed", then, "*SHIPPAISITA*"...

(Translation mine)

In comparison with the GLL group, the successful consultations by the subjects in the FB group were relatively low (See Tables 6-4 and 6-5). This result was in accordance with the findings in Chapter 4, which claims that learners' proficiency is somewhat related to the use of retrieval strategies. As shown in Table

6-5, however, the rate of FBs' successful look-ups reached more than 80%, despite the fact that the appropriate L1 equivalent did not necessarily appear at the beginning of the entry in the present study. Besides, their verbal data reveal that none of the subjects in the FB group gave up their look-ups halfway through. These results show that the subjects in the FB group, regardless of their low EFL proficiency, could usually successfully locate the L1 equivalents in the dictionary in the present study.

Table 6-4. Rate of Successful Look-ups in GLL Group

Subject	Look-ups	Successful Look-ups	Success Rates (%)
GLL-A	7	7	100
GLL-B	17	17	100
GLL-C	8	8	100
GLL-D	5	5	100
GLL-E	27	27	100

Table 6-5. Rate of Successful Look-ups in FB Group

Subject	Look-ups	Successful Look-ups	Success Rates (%)
FB-A	34	28	82
FB-B	50	42	84
FB-C	24	21	88
FB-D	30	25	83
FB-E	36	31	86

This finding seems to be inconsistent with that in Wingate (2004), which reported more than half of the whole consultations were failed, unless appropriate L1 equivalents were listed first in the entry. Also, according to Scholfield (1982), many dictionary users generally give up too soon if they cannot find L1 equivalents at the beginning of the entry. This is considered to be a noticeable tendency among

low proficiency learners, as frequent consultations to find appropriate L1 equivalents are a troublesome work for them. One possible explanation for the discrepancy between the present study and that of Wingate is the difference of the dictionary type: the dictionary used in the present study was an ED; and that in Wingate was a traditional PD. As has described in Chapter 5, the superior search function of an ED might enhance the subjects' look-up frequency even in the FB group, and, as the result, they could find the appropriate L1 equivalents without giving up. Therefore, it may be presumed that the use of an ED in reading comprehension might be somewhat advantageous even for learners whose English proficiency is relatively low.

6. 2. 5. 2 Analysis of Retrieval Strategies of GLLs

Table 6-6 summarizes major strategies used by the subjects in the GLL group while looking up the dictionary.[5] Figures in the table indicate the number of their protocol-units. When a unit contained more than two retrieval strategies, it was counted separately in the table.

An example of categorizing process of GLLs' retrieval strategies appears in Excerpt 4. Subject A in Excerpt 4 was guessing the meaning of "bronchitis" from the context while reading, and estimated that it was a name of the disease. Therefore, he used "*Guessing meanings from the context*" strategy at the moment after getting information from the context. He, then, looked up the word and found the dictionary entry. At that time, he repeated its pronunciation four times and confirmed the stressed syllable. This indicates the use of "*Paying attention to pronunciations*" strategy. In this way, most of the protocol-units in the GLL group contained more than two strategies as shown in Excerpt 4, and it means that GLLs in the present study concurrently used several strategies.

Table 6-6. Retrieval Strategies for ED use in the GLL Group

Strategies	Protocol-units
<Strategies in standard skills>	
Get information from the context where the word occurred.	64
Guessing meanings from the context / Confirming meanings	**31**
Find the dictionary entry.	64
Checking pronunciation / Paying attention to pronunciations	**9**
Choose the right sub-entry.	20
Relate the meaning to the context and decide if it fits.	64
Checking examples of usage	**15**
<Strategies in specific skills for ED>	
Using "Example search" or "Idiom search" to find further information	3
Using "Word history" or "Jump to multiple dictionaries"	4
Looking up in more than two dictionaries	3

Excerpt 4 <GLL-A-4>

4-1. ...and "Last New Year's Eve, Alyssa took to bed with symptoms that suggested bronchitis..."
4-2. Ah? Is this a name of the disease? ...yes, I'm sure.
<Guessing meanings from the context strategy>
4-3. This is a little difficult term, isn't it?
4-4. Well, Alyssa must have died from a disease...
4-5. All right, *GENIUS*! ...**bronchitis**... pronunciation... **bronchitis**....
4-6. It's complicated! ...**bronchitis**... The accent is on 'i'.
4-7. **bronchitis**... ***<Paying attention to pronunciations strategy>***
4-8. "*KIKANSHIENTO SHINDAN SARETE* (So, she was diagnosed with bronchitis)..."
4-9. "*DE...BYOINNI ITTA* (...and was sent to the hospital)"

(Translation mine)

As shown in Table 6-6, the "*Guessing meanings from the context*" strategy before actual look-ups was obviously used the most among the subjects in GLL group. Note the strategies in bold and italic letters in the table. These retrieval strategies which was categorized each protocol-units based on the KJ method (Kawakita, 1967, 1970, 1986) also corresponded to the GLL strategies reported in Takeuchi (2003a).

Excerpt 5 <GLL-C-15>

15-1. "Less than four weeks later,"
15-2. Well..."*YONSYUKANMO TATANAIUCHINI*"
15-3. "Cindy underwent the procedure"... As "underwent" is the past form of "undergo"...then, *SONO TETSUZUKIWO FUNDA?* (Did she go through the procedure?)
15-4. Then I'm going to check the meaning of this "underwent" by looking up "undergo" in the dictionary.
15-5. Well, "*KEIKENSURU* (experience)?"... "*KOUMURU* (undergo)?"
15-6. ..."*SONO procedure WO FUMU*?"
15-7. ..."*TAERU* (endure)?"
15-8. Maybe, she experienced the same thing...because another one was failed.

(Translation mine)

It is interesting that the conventional strategies in Scholfield (1982) such as "Find the dictionary entry" or "Choose the right sub-entry" were confirmed in the back-up DVCs, but could not be distinctively found in the protocol-units of GLLs (See the strategies not in bold letters of Table 6-6). All the GLLs seemed to use these conventional strategies for look-ups, and to decide the words to be looked up in their reading processes (See Excerpt 5). Their behavior is in contrast to that of FBs which can be seen in Excerpts 1 in **6.2.5.1.** FBs in the present study merely scanned the dictionary entry to replace the unknown word in the text, and never guessed the meanings of the target words from the context.[6]

As has been noted in **2.2**, this "*Guessing meanings from the context*" strategy before actual dictionary consultations is regarded as effective for better retention of words (e.g., Fraser, 1999), and furthermore, it promotes the incidental vocabulary learning (e.g., Hulstijn et al., 1996). Since all the subjects in the GLL group studied FL education or SLA, they should have known the theoretical background behind the strategy[7], and thus they could apply it to the ED use.

It is important to note that most of the subjects in the GLL group used "*Paying attention to pronunciations*" strategy when they found unknown or unfamiliar dictionary entries. The subjects in the GLL group had a high level of interest in pronunciation. Besides, they not only vocalized those words, but also repeated them until they themselves felt satisfied. This tendency, which was not observed in the FB group, is shown in Excerpts 6 and 7.

Excerpt 6 <GLL-E-11>

11-1. ...and "*ARISAHA* (Alyssa)..." "*KYONENENO OOMISOKA* (Last New Year's Eve)..."...took to bed... "*BYOSYONI TSUITANYA* (She was sick in bed)."
11-2. All right. Then, what was her condition?
11-3. OK! I'm going to look up this "bronchitis" with my favorite *GENIUS*.
11-4. b-r-o-n-c-h-i-t-i-s...Search!!
11-5. **bronchitis**.. what's this? ...**bronchitis**... If I don't read aloud its pronunciation correctly, I can't remember it...
11-6. **bronchitis**... **bronchitis**... "*KIKANSHIEN*"... **bronchitis**...
11-7. OK. She had bronchitis and stayed in bed. This is a technical term, isn't it?
11-8. "*KIKANSHIEN*"...Maybe Ms. Yamada knows this kind of medical words well, does she?
11-9. But, it doesn't matter... **bronchitis**...OK, next!

(Translation mine)

Excerpt 7 <GLL-B-9>

9-1. All right. Then, next... "Last New Year's Eve..." "*IBUNI*...."
9-2. "Alyssa took to bed with symptoms that suggested..."..?.. I don't know this word.
9-3. This "bron"... "bron"...well, I'd like to pay attention to its pronunciation...
9-4. Well, "bronchi" is the plural form of "bronchus"...OK.
9-5. **bronchitis**... **bronchitis**... **bronchitis**... **bronchitis**...
9-6. Mmm... "*KIKANSHIEN*" is its equivalent.

(Translation mine)

Since this behavior found in Excerpts 6 and 7 require time, it can be regarded as unnecessary if they try to make their look-ups more efficient. According to several research reports in the realm of cognitive psychology (e.g., Baddeley, 1990), however, phonological information, as well as repetition, is deemed to produce a beneficial effect upon retention of words in SL/FL learning. Also, this behavior can be recognized as successful learners' strategies (Takeuchi, 2003a). The GLLs holding masters' degree in FL education or SLA studies should have known the effect of vocalizing and rehearsing on vocabulary acquisition[8]. Therefore, they could apply this strategy to their look-up behavior.

It should be emphasized that GLLs in the present study frequently use "*Checking examples of usage*" strategy. This tendency can be seen obviously in the number of the protocol-units in Table 6-6. It is also interesting that they used this strategy not in the process of relating the meaning to the context and decided if it fitted, but in the process of searching for further information of the target words. In fact, some of the protocol-units in the FBs group contain "*Checking examples of usage*" strategy in the process of look-up behavior. However, unlike GLLs, FBs just used it to obtain necessary information of the target word (See the example in Excerpt 8).

Excerpt 8 <FB-B-5>

5-1. "the limits of..." "the limits of..." This seems to be an idiom. Let me see... 'limit' means KYOKUGEN, right?
5-2. ...How about an idiom? ...Oh...not here..., then, going back...
5-3. Let me check a phrase. ...mmm, nothing...
5-4. Well, this word has 's'... What should I do?
5-5. All right. Let me see an example...Oh, finally, I found it! ..."the limits of..." means *KYOKUDONO GENKAI NI TASSURU.*

(Translation mine)

As has been noted in **3.1**, since an ED has "hierarchical nature of data display", EFL learners have to scan a different screen of the ED to see an example of usage, and additionally take time to read the examples. In spite of these inconveniences, GLLs were very conscious of how target words could be used in different contexts, and frequently checked examples. Two distinctive examples are shown in Excerpts 9 and 10.

Excerpt 9 <GLL-B-12>

12-1. "Two days later, Alyssa was at her doctor's office with...?" ...Oh, I don't know this!
12-2. ...with what? ...with...pneu...monia...
12-3. I may know this word...I've heard of it somewhere...
12-4. Oh... "*HAIEN* (pneumonia)"!
12-5. This word must be in a glossary for TOEFL...
12-6. **pneumonia**... **pneumonia**... **pneumonia**...
12-7. 'p' is not pronounced.
12-8. Well...let me see an example of usage...
12-9. "He has acute..."...oh, I see.
12-10. Let me jot down its equivalent... "*HAIEN* (pneumonia)"

(Translation mine)

Excerpt 10 <GLL-E-16>

16-1. ...Well, "Within days" ...I'm going to confirm the use of this word, too.
16-2. Of course, I know a rough meaning, though...Let me check it in *GENIUS.*
16-3. 'within'... 'within'... well...information here is not satisfactory to me...then, let me use idiom search...
16-4. 'within & days...'...whoops, no hits.
16-5. All right! How about an example search? ...Oh, here comes!
16-6. 'within seven days' means "*NANUKA INAIDE*"
16-7. That's what I thought. 'within' means "*INAIDE*"...Then, in case of 'within two days' means "*FUTSUKA INAIDE*"
16-8. OK... "*NANNICHIKA INAIDE* (within days)"...

(Translation mine)

In Excerpt 9, Subject B did not know a L1 equivalent for "pneumonia", so she looked it up in the dictionary. Before finding the entry, she guessed its meaning somewhat retrospectively. She vocalized it several times, and noticed 'p' was silent. Lastly, she confirmed examples of "pneumonia" in the dictionary. Consequently, she used three types of strategies: "*Guessing meanings from the context*", "*Paying attention to pronunciations*", and "*Checking examples of usage*" in the process of consulting. On the other hand, Subject E in Excerpt 10 attempted to confirm how "within" used in other contexts, though he has already known its rough meaning. He therefore used only the "*Checking examples of usage*" strategy. He not only scanned several examples of "within" but also found some uses of the word in the different context. What needs to be emphasized about his behavior is that he made the most of some functions equipped with ED such as "Idiom search" and "Example search" in the look-up process (See Appendix H for the functions).

There also exists a similarity between the behavior of Subjects B and E. Subject B obviously checked examples not for comprehending the text, but for eliciting further information on the target word from the dictionary. Subject E

confirmed the "known" word in order to find its usage. In either case, both subjects could learn how to use the words in other contexts and repeatedly see it in different contexts as a result of their behavior. This repeated exposure to the target word with related information is considered to be one of the most important factors in the enrichment of vocabulary in FL learning (Hulstijn et. al., 1996; Laufer & Hulstijn, 2001). Nation (2001, p.219) also states that most vocabulary learning requires repeated attention to the vocabulary item based on Baddeley's theoretical account in cognitive psychology (1990). GLLs in the present study, therefore, seemed to maximize opportunities to learn vocabulary through their look-up behavior.

Another important point to be noted here is that some strategies in specific retrieval strategies for an ED were found in GLLs' protocol-units such as "*Using word history or Jump to multiple dictionaries*", "*Using example search or idiom search to find further information*", and "*Looking up in more than two dictionaries*". It is interesting that these strategies were also found in the FBs' verbal data. They utilized these specific strategies for the ED to confirm the word meanings which they looked up before. Their behavior might result from a lack of acquired vocabulary (See Excerpt 11).

Excerpt 11 <FB-E-33>

33-1. ...OK. Let me see the history...

33-2. 'suffer' means "*KURUSHINDA*", doesn't it?

(Translation mine)

As was mentioned, Excerpt 10 contains "*Using example search or idiom search to find further information*" strategy. Another example was shown in Excerpt 12. Subject A was interested in the usage of "from", so that he searched an expression of "turn from" in *GENIUS* by the use of "*Example search*". Since he

could not be satisfied with what he had found, he checked its definition in another dictionary, *LONGMAN,* by using "*Jump to multiple dictionaries*". Consequently, he used three kinds of specific strategies for the ED use, i.e., "*Using word history or Jump to multiple dictionaries*", "*Using example search or idiom search to find further information*", and "*Looking up in more than two dictionaries*".

Excerpt 12 <GLL-A-8>

8-1. ...Well, although she was in the doctor's office... "Within days, her skin turned blue..."

8-2. "*SANSO NO KETSUJYO NIYORI AOZAMETA*" I can understand 'turn blue', but I'm just wondering whether 'from' indicates *GENIN* (a cause) or not...

8-3. All right. Let me check an idiom 'turn A from B'. Example search in *GENIUS*...

8-4. Mmm...'turn from...' '...turn from O'... No, this information is not what I want.

8-5. Then, how about *LONGMAN*? '...from' '...from'

8-6. We'd better look up the use of preposition in an English-English dictionary...

8-7. The first explanation is 'where sb/sth starts...starting at a particular place...' Well, it's a sort of prototype...

8-8. What about the next...? ... ...All right...go down...

8-9. Oh, 'origin'...that's what I thought!

8-10. "'turn blue' *NI NATTA* 'origin' *GA* 'lack of oxygen' (the cause of turning blue was lack of oxygen)"

(Translation mine)

According to Takeuchi (2003b), successful language learners have a voracious appetite for knowledge of the language and maximize opportunities to use the language in general. It would be reasonable to think that GLLs in the present study had also their strong motives for further information of the language. At the

same time, it is an indisputable fact that these various functions pertaining to the ED made their look-up behavior possible. Based on these findings, we can claim that superior functions of an ED provided GLLs with scaffolding[9] for learning.

6. 3 Discussion and Summary

The qualitative data derived from the study described above reveal the following. First, the results of the analysis of segments and protocol-units indicated that GLLs took time to derive information from the context in which the target words were used. This means GLLs never rush, and always carefully think of the word meaning relevant to the context. Their behavior contrasts clearly with those of the FBs, who repeatedly search for L1 equivalents that could simply replace the unknown words in the reading text. This finding also corresponded with GLLs' strategies found in Takeuchi (2003a).

Another important finding is that, unlike the previous studies using a printed dictionary (e.g., Scolfield, 1982; Wingate, 2004), the rate of FBs' successful consultation was relatively high in the present study. This indicates that the difference of the dictionary type might affect the result. According to **5.4.6**, an ED seems to encourage the learners' look-up behavior more than a PD does. Based on this finding, ED's search function might enhance FBs' look-ups and lead them to successful consultations. We thus can conjecture that the use of an ED may be advantageous to low English proficiency learners in reading comprehension.

Third, the analysis of retrieval strategies indicates that GLLs were also successful ED users. They never looked up words thoughtlessly. Before starting actual look-ups, they obtained full information from the context where the word occurred and were "*guessing meanings from the context*". In the look-up process, they were "*paying attention to pronunciation*" of the target words, and were also "*checking examples of usage*" to obtain further information of the target words.

These strategies GLLs used in the present study are supported by both empirical and theoretical accounts for effective FL learning (Takeuchi, 2003a).

What needs to be emphasized is that GLLs skillfully took advantage of the superior search functions of the ED, which helped overcome the arduous task in **5.4.6**, and induce their "*mental effort*" (Hulstijn, 1992). To put it briefly, they maximized opportunities to learn vocabulary even when consulting ED. Lastly, the findings in the present study indicate that the ED's functions provided not only GLLs but also FB with scaffolding for EFL learning.

Notes

1. The Mann-Whitney *U*-test is applicable to a small number of subjects, i.e. five subjects and more.
2. The ED used in this chapter contains four large English/Japanese dictionaries including *The Kenkyusha Dictionary of English Collocations* (*COLLOCATIONS*), *Reader's English/Japanese Dictionary* (*READERS*), *Readers Plus*, *Unabridged Genius English/Japanese Dictionary* (*GENIUS*), as well as English/English dictionaries, *Longman Advanced American Dictionary* (*LONGMAN*).
3. The KJ method is widely used to classify human behavior in specific task into some categories.
4. The entire protocol-units were examined to confirm the consistency.
5. "Reading Aloud" was not included in the strategies in the present study, since it is not directly related to reference skills. However, all the subjects in GLL group read aloud every sentence in the text, while none of the subjects in FB group read it.
6. None of the subjects in the FB group used "*Guessing meanings from the context*" strategy.
7. "*Guessing meanings from the context*" strategy is widely recognized as an effective method to acquire new vocabulary in SL/FL environments (e.g., Clarke & Nation, 1980; Schmitt, 1997), while it is regarded as inapplicable to learners with low proficiency level (Knight, 1994). More studies, therefore, should be conducted on how to apply this strategy appropriately to learners with different proficiency levels.

8. Several models of an ED have already been equipped with a speaking function of phonetic symbols, and have provided learners who do not know how to read dictionary entries with correct pronunciation.
9. van Lier (1996) indicates that "scaffolding" is support or a help to learners who attempt to tackle a more difficult task.

7. Conclusion

7. 1 Summary of Findings

Before concluding this dissertation, a limitation of the studies should be pointed out. The number of the subjects in some studies was relatively small. Although careful consideration was given to the selection of the statistical tests and the assurance of the reliabilities of the tests, this might somewhat affect the results of the studies.

With this limitation in mind, I first present a comprehensive summary of the findings of my research. The review of the literature relevant to dictionary use in L2 learning (Chapter 2) reports: 1) use of dictionaries can provide learners with the obvious advantages for effective L2 learning; 2) the recent development of digital technology have provided us with new types of electronic-based dictionaries, and particularity; 3) the number of the ED users in Japanese EFL context has been rapidly expanding, although studies on the effect of the use of the ED on learning are still lacking.

One of the main purposes of my research, therefore, was to explore how the differences between an ED and a PD have affected learning in Japanese EFL context. For this purpose, the differences in two types of dictionaries were examined in Chapter 3, in terms of learners' look-up behavior, retention of looked-up words, and learners' impressions of each dictionary. The major findings were: 1) the looked-up words in the PD condition tended to be better retained than those in the ED condition; 2) the subjects considered that a longer process to obtain the necessary information in a dictionary might result in the better retention of looked-up words, while they highly evaluated the advanced search function of the ED, which can shorten the look-up process. I thus maintained that the difference in word retention between the two types of dictionaries might be attributed to a longer searching-process which is inherent to its interface design of the PD. Theoretical

support for this interpretation can be found in the "*depth of processing*" hypothesis (Craik & Lockhart, 1972; Craik & Tulving, 1975), which was later modified into the "*mental effort*" hypothesis by Hulstijn (1992).

On the basis of the findings described above, I directed my attention to the "*task-induced involvement load hypothesis*" (Laufer & Hulstijn, 2001) in order to guarantee better retention when using an ED in Chapter 4. To induce EFL learners' "*mental effort*", the task was set, in which the learners had to locate the appropriate examples to the context and extract them from the ED. Whether the assigned task affected the learner's impression of the ED or not was also examined. The findings based on two experimental data were: 1) the task assigned to the subjects did not facilitate their retention of the looked-up words, and 2) the subjects' impressions of the ED did not vary according to the assigned task. Based on these findings, I made a tentative conclusion that the superior search function of the ED appears to overcome a load of the task which is generally regarded as an arduous or troublesome, thereby did not promote the retention of the look-up behavior.

Chapter 5 dealt with the connection between look-up frequency and reading comprehension in EFL learning. I investigated how differences in the two types of dictionaries resulted in variations in the learners' look-up behavior and reading comprehension. The findings derived from two studies with the EFL learners of different proficiency levels were: 1) learners' look-up frequency seems to increase in comprehending reading materials when they use an ED at hand; 2) an ED appears to reduce the time for FL reading; and 3) higher look-up frequency induced by the ED does not necessarily produce a corresponding beneficial effect on learners' reading comprehension.

The findings of a series of empirical studies show that: 1) the use of an ED in EFL learning, compared with that of a PD, facilitates learners' look-ups, regardless of difference in their English proficiency levels; and 2) the higher look-up

frequency induced by using the ED, however, guarantees neither better retention of looked-up words nor better reading comprehension of the text. Results from this dissertation, therefore, highlight the importance of how EFL learners use an ED for their learning.

Consequently, another important purpose of my research was to find some strategies for effective ED use in EFL learning. Based on the theoretical and methodological perspectives (e.g., Ericsson & Simon, 1993; Tono, 2001; Wingate, 2004), I, therefore, investigated the look-up behavior of GLLs by means of the think-aloud technique in Chapter 6. The analysis of the subjects' look-up behavior suggested the possibility that the ED's functions provided not only GLLs but also FB with scaffolding for EFL learning. Also, the findings from the qualitative analysis of GLLs' dictionary consultation revealed that GLLs were good ED users. They took advantage of the superior search function of the ED, and leaded to better reading comprehension and vocabulary learning. The retrieval strategies they used are: "*Guessing meanings from the context*", "*Paying attention to pronunciation*" of the target words, and "*Checking examples of usage*" to obtain further information of the target words, all of them are considered to be effective FL learning strategies (Takeuchi, 2003a).

7. 2 Pedagogical Implications

The quantitative and qualitative data obtained in this dissertation demonstrate some pedagogical implications. First, one of the remarkable features of an ED use is that it can induce look-up behavior in EFL learners. Additionally, the use of the ED can indeed reduce the time for EFL reading. This can be attributed to the superior search function of the ED. Teachers or instructors, therefore, should have a true appreciation for the usefulness of the ED. Also, they need to encourage their students to make the maximum use of the various functions available on the ED,

since these functions are useful for EFL learning and help learners of different proficiency levels.

Second, regardless of these advantages of ED use, it does not guarantee better retention of the looked-up words, since the ED can reduce the load of the search process due to its superior search function, thereby shortcutting the longer process required for better retention. Furthermore, compared with the use of a PD, an ED use does not necessarily lead to better comprehension of the texts. Thus, teachers or instructors should offer their students adequate guidance on how to use an ED effectively, i.e., "*Guessing meanings from the context*" before actual consultation, "*paying attention to pronunciation*" of unknown words and vocalizing them, and "*Using example search or idiom search to find further information*" or "*Looking up in more than two dictionaries*" to induce their "*mental effort*" (Hulstijn, 1992).

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Appendices

Appendix A *Cloze Test*

In schools all over the world boys and girls are learning foreign languages. Everyone knows his own language, but [1]other languages are also useful, especially when [2b]we visit foreign countries. If we go [3]to France, we should be able to [4]speak French, and in Germany people will [5]hope that we can understand German.

How [6]many languages are there in the world? [7]There are about fifteen hundred, but many [8]of them are not spoken by very [9]many people. English is one of the [10]most important languages because so many people [11]use it, not only in England and [12]the United States of America, but in [13]other parts of the world. Over two [14]hundred million speak it as their own [15]language, and about two hundred million use [16]it as a second language. It is [17]hard to say how many people are [18]learning it. Many millions of boys and [19]girls are trying to do so.

English [20]children study French, which is also a [21]very important language. English people can often [22]find someone in almost all parts of [23]the world who is able to talk [24]to them in either English or French.

[25]What is the best way to learn [26]a language? We know that we all [27]learned our own language well when we [28]were children. Think of what a small [29]child does. It listens to what people [30]say, and it tries to say what [31]it hears. When a child wants something, [32]it has to ask for it. It [33]talks in the language and thinks in [34]it all the time. If people always [35]have to use a foreign language, they [36]will learn it quickly.

It is important [37]to know, also, that we learn our [38]own language by hearing people speak it; [39]we do not learn it by seeing [40]what they write. In school, although you [41]learn to read and write as well [42]as to hear and speak, it is [43]best to learn all new words and [44]sentences through the ear. You can read [45]them and write

them later.

Appendix B *Texts A and B used in Chapter 3*

A. 次の英文は、Amy Wu によって書かれた "Unwelcome in Chinatown" です。これを読んで以下の問に答えなさい。[Translation: A. This short essay, "Unwelcome in Chinatown" is written by Amy Wu. Read it and answer the following questions.]

When I go to Chinatown for breakfast with my parents or my relatives from Hong Kong, we are ushered① to the best table, offered a variety of special dishes and treated⑤ to warm smiles and solicitous service by the dim sum② ladies.

You might think that because I am Chinese--with the standard straight hair, yellow skin and slanted eyes--I would have an inside track in Chinatown. But there are hundreds of men and women like me in New York who actually get short shrift③ there because we're ABC's, American-born Chinese, and we don't speak Cantonese.

Whether it's an outdoor market, a stationery store, a bakery or a restaurant, the routine is always the same. ABC's are initially greeted with a smile and a friendly word in Cantonese. Then, when it's discovered that we don't understand, the word, smile and any pretense⑥ of friendliness disappear.

It can be embarrassing. One time, a dim sum lady asked me something after she had chatted with my father. "She doesn't speak Cantonese," my father said. The woman turned scarlet. "What, you never taught her?! " she asked indignantly.

Actually, when I was little, my parents enrolled me in a Saturday morning private school to learn Chinese language and culture. I dropped out when I was 7, after a year or two. I had better things to do on a weekend--mainly to play with my American friends. I wanted nothing more than to be like them, and that's what I became. Now in Chinatown, I pay⑦ the price.

Tourists get better treatment than ABC's. Ladies in cheepows bow to them. Waiters fill teapots without being asked. Managers make polite chit-chat, asking how they like Chinatown. Tourists have an excuse⑧ for not knowing Cantonese.

Well, nobody asked, but I love Chinatown--the smells of fried noodles, the hurly-burly, the feeling of being in another world that is like a little piece of my heritage. I don't think I deserve the treatment I receive there.

A Chinatown friend says I should be more understanding. "They live in tiny rooms, in poverty," she said. "They have very little to be proud about except this language no one else understands. You're either in or out. "

To them, I'm just another Americanized young person, a failure, a traitor④. Sure I understand, but most of the time I'm just plain angry. It's not that I want to be accepted, just respected.

Whenever my downtown ABC friends and I want Chinese food without the

insults, we go to a take-out place near our New York University dorm. The lo mein is dry and the vegetables are watery, but the cook gives us extra fortune cookies and orange slices and jokes with us in English. He makes us feel at home. Of course, he is an ABC, too.

L. C. Smith & N.N. Mare (2000), *Topics for Today Book 2*, 松柏社

B. 次の文は、Harvard Medical School に勤務する 81 才の医師 Moore 氏が、著書 *A Miracle and a Privilege* の中で、危篤状態にある患者にどの時点で安らかな死を迎えさせるかの苦悩について述べたものです。これを読んで、以下の問に答えなさい。[Translation: B. This short essay, "A Miracle and a Privilege" is written by 81- year-old Dr. Moore who is working for Harvard Medical School. It is on his experience of anguish about the time to discontinue a terminal care of his patient who is in a critical condition. Read it and answer the following questions.]

The best way to bring the problem into focus is to describe two patients whom I cared for. The first, formerly a nurse, had sustained a fractured pelvis in an automobile accident. A few days later her lungs seemed to fill up; her urine stopped; her heart developed⑤ dangerous rhythm disturbances. So there she was: in coma①, on dialysis, on a breathing machine, her heartbeat maintained with an electrical device. One day after rounds, my secretary said the husband and son of the patient wanted to see me. They told me their wife and mother was obviously going to die; she was a nurse and had told her family that she never wanted this kind of terrible death, being maintained by machines. I told them that while I respected their view, there was nothing intrinsically lethal about her situation. The kidney failure she had was just the king for which the artificial kidney was most effective. While possibly a bit reassured, they were disappointed. Here was the head surgeon seemingly determined to keep everybody alive, no matter what.

When patients start to get very sick, they often seem to fall apart all at once. The reverse is also true. Within a few days, the patient's pacemaker could be removed and she awoke from her coma. About six months later I was again in my office. The door opened and in walked a gloriously fit⑥ woman. After some cheery words of appreciation⑦, the father and son asked to speak to me alone. As soon as the door closed, both men became quite tearful. All that came out was, "We want you to know how wrong we were."

The second patient was an 85-year-old lady whose hair caught fire while she was smoking. She arrived with a deep burn; I knew it would surely be fatal⑧. As a remarkable coincidence there was a seminar going on at the time in medical ethics, given by the wife of an official② of our university. She asked me if I had any sort of

ethical problem I could bring up for discussion. I described the case and asked the students their opinion. After the discussion, I made a remark③ that was, in retrospect, a serious mistake. I said, "I'll take the word back to the nurses about her and we will talk about it some more before we decide." The instructor and the students were shocked: "You mean this is a real patient?" The teacher of ethics was not accustomed to being challenged by reality. In any event, I went back and met with the nurses. A day or two later, when she was making no progress and was suffering terribly, we began to back④ off treatment. When she complained of pain, we gave her plenty of morphine. A great plenty. Soon she died quietly and not in pain.

L. C. Smith & N.N. Mare (2000), *Topics for Today Book 2*, 松柏社

Appendix C *Word Definition Test used in Experiment 1 of Chapter 4*

問２　本文中で使われている次の単語（下線部①～⑥）の意味として、もっとも適切と考えられる意味を電子辞書で確認し、その意味を日本語で 書きなさい。また、本文中と同じ意味で使われている用例を電子辞書からひとつ選び、その用例を一つ英語のまま 抜き出しなさい。[Translation: Question 2. For the following words used in the text (underlined words 1-6), find the most appropriate meaning using your electronic dictionary and write the meaning in Japanese. Next, find an example sentence with the same meaning and write it in English.]

①range

They ranged① over most of Asia, from the shores of the Caspian Sea east into Siberia, and all the way south to Indonesia.

意味[meaning]

用例[example]

②species

But of the original eight species② of tiger, only five remain alive today.

意味

用例

③fuel

The forests where the tigers live and hunt have been cut down to make farmland and to obtain wood for fuel③.

意味

用例

④preserve

Since humans are responsible for the tragic situation of these noble animals, it is up to us to preserve④ and protect the few wild tigers that are left.

意味

用例

⑤urgent

Two urgent⑤ tasks face us now.

意味

用例

⑥fund

Private organizations must work together with national governments to increase public interest and raise funds⑥ for protection.

意味

用例

"Save the Tiger" from the written examination of the pre-2nd grade test of STEP, 1998

Appendix D *Recognition Test used in Experiment 1 of Chapter 4*

以下の書かれた英文の中から、あなたが 1 週間前に電子辞書で、「実際に引いた単語」を〇で囲んでください。[Translation: In the text below, find the words you actually looked up one week before, and circle them.]

It is believed that there were over 100,000 tigers in the world at the beginning of the 20th century. They ranged over most of Asia, from the shores of the Caspian Sea east into Siberia, and all the way south to Indonesia. But of the original eight species of tiger, only five remain alive today. It is now thought that the number of tigers in the wild ranges from a low of 5,000 to a maximum of 7,000.

The major threat to the tiger has come from human beings. The forests where the tigers live and hunt have been cut down to make farmland and to obtain wood for fuel. Illegal hunters collect tiger bones, organs, and other body parts for traditional medicines, even though there is no scientific proof of any benefits.

Since humans are responsible for the tragic situation of these noble animals, it is up to us to preserve and protect the few wild tigers that are left. Two urgent tasks face us now. One is creating special areas for the tigers to live. The other is making sure those areas are defended from illegal hunters. Private organizations must work together with national governments to increase public interest and raise funds for protection. If a determined effort is made now, there may still be hope for the long-term survival of the tiger.

Appendix E *Word Definition Test used in Experiment 2 of Chapter 4*

本文中で使われている次の語句（下線部①～⑩）の意味として、最も適切と考えられるものを与えられた辞書で確認し、本文にそった意味を日本語で 書きなさい。また、本文中と同じ意味で使われている例文（例句）を与えられた辞書からひとつ選び、その例文（例句）を一つ英語のまま 抜き出しなさい。[Translation: Look up the underlined words in the text, numbered 1-10, using the dictionary provided to you and then write the most suitable meaning for the usage of the word in the text on this sheet. Next, find an example sentence that uses the word in the same way and write the English sentence in the space provided.]

When I go to Chinatown for breakfast with my parents or my relatives from Hong Kong, we are ushered① to the best table, offered a variety of special dishes and treated to warm smiles and solicitous service by the dim sum ladies.

You might think that because I am Chinese－with the standard straight hair, yellow skin and slanted eyes－I would have an inside track in Chinatown. But there are hundreds of men and women like me in New York who actually② get short shrift there because we're ABC's, American-born Chinese, and we don't speak Cantonese.

Whether it's an outdoor market, a stationery store, a bakery or a restaurant, the routine is always the same. ABC's are initially greeted with a smile and a friendly word in Cantonese. Then, when it's discovered that we don't understand, the word, smile and any pretense③ of friendliness disappear.

It can be embarrassing④. One time, a dim sum lady asked me something after she had chatted with my father. "She doesn't speak Cantonese," my father said. The woman turned scarlet. "What, you never taught her?!" she asked indignantly.

Actually, when I was little, my parents enrolled me in a Saturday morning private school to learn Chinese language and culture. I dropped out when I was 7, after a year or two. I had better things to do on a weekend－mainly to play with my American friends. I wanted nothing more than to be like them, and that's what I became. Now in Chinatown, I pay the price⑤.

Tourists get better treatment than ABC's. Ladies in cheepows bow to them. Waiters fill teapots without being asked. Managers make polite chit-chat, asking how they like Chinatown. Tourists have an excuse⑥ for not knowing Cantonese.

Well, nobody asked, but I love Chinatown－the smells of fried noodles, the hurly-burly, the feeling of being in another world that is like a little piece of my heritage. I don't think I deserve⑦ the treatment I receive there.

A Chinatown friend says I should be more understanding. "They live in tiny rooms, in poverty⑧" she said. "They have very little to be proud about except this language no one else understands. You're either in or out."

To them, I'm just another Americanized young person, a failure, a traitor⑨. Sure I understand, but most of the time I'm just plain angry. It's not that I want to be accepted, just respected.

Whenever my downtown ABC friends and I want Chinese food without the insults⑩, we go to a take-out place near our New York University dorm. The lo mein is dry and the vegetables are watery, but the cook gives us extra fortune cookies and orange slices and jokes with us in English. He makes us feel at home. Of course, he is an ABC, too.

L. C. Smith & N.N. Mare (2000), Topics for Today Book 2, 松柏社

Appendix F　*Texts A and B used in Experiment 1 of Chapter 5*

次の英文を読み、以下の問１と問２に日本語で答えなさい。わからない単語や熟語は、渡された辞書を自由に使ってよいが、辞書を引いた単語や熟語は必ず○で囲むこと。 [Translation: Read the text below, answer Questions 1 and 2 in Japanese. You can use the dictionary provided to you while reading. Do not fail to circle the looked-up words in the text.]

Text A

Joe was going into this usual bar before lunch when he saw a poorly dressed man fishing in a small pool of rain-water about five centimeters deep outside it.

Joe stopped and watched the man for a few minutes. He saw that most of the people who passed by him believed he must be rather mad.

Joe pitied the man, so after a few minutes he went up to him and said kindly, 'Hullo, would you like to come into the bar and have a drink with me?'

The fisherman was delighted to accept his offer, and the two men went into the bar together. Joe bought the fisherman a few drinks, and finally said to him, 'You've been fishing outside here, haven't you?' How many did you manage to catch this morning, if I may ask?'

'You're the eighth,' the fisherman answered merrily.

Hill, H.A. (1977). *Intermediate Stories for Reproduction 2*, Oxford University Press

問１　Joe は、どうしてその釣り人を飲み屋に誘ったのか？ [Translation: Question 1. Why did Joe invite the man into the bar for a drink?]

問２　その釣り人は、ほんとうは何を釣ろうとしていたのか？[Translation: Question 2. What was the fisherman actually going to catch?]

Text B

A clerk who worked very hard and was usually very punctual arrived at his office very late one morning. He had bruises on his face, a scratch on one of his lips, sticking-plaster on his left wrist and thumb, and a bandage on his right shoulder. He had also hurt his knees, ankles and some of his toes.

The manager of the office was not a patient man, and he had been waiting for the clerk, because he had some work to give him. When he saw him come in at last, he said angrily, 'You're an hour late, Tomkins!'

'I know, sir,' answered the clerk politely. 'I'm very sorry. My flat is on the eighth floor, and just before I left home this morning, while I was closing one of the windows, I slipped and fell out.'

'Well,' the manager answered coldly, 'did that take you an hour?'

Hill, H.A. (1977). *Intermediate Stories for Reproduction 2*, Oxford University Press

問１　事務員はある朝、どんな状態（様子）で事務所に現れたか？ [Translation: Question 1. How was the clerk in the morning when he appeared in his office?]

問２　その事務員はどうしてそのような状態になったか？[Translation: Question 2. Why did the clerk become such a serious condition?]

Appendix G ***Text C used in Experiment 2 of Chapter 5***

Text C

次の英文を読んで、問（１）～問（６）のそれぞれ４つの選択肢の中から最も適切なものを選び、その番号を○で囲みなさい。解答する際、指定された辞書を自由に使ってよいが、辞書で確認した単語は必ず○で囲むこと。[Translation: Read the text below. Choose the best answer among the four multiple-choice options and circle it. You can use the designated dictionary while reading the text or answering the questions. Do not fail to circle the words you actually look up in the dictionary.]

The average American a hundred years ago was able to sleep 20 percent longer than the average American today. Experts at universities and hospitals say that as a nation Americans are laboring under a large and increasingly burdensome "sleep deficit," defined as the difference between how much sleep they need and how much they get.

Why, by degrees, are they omitting sleep? Many commentators would blame it on what we might call the AWOL factor – that is, the American Way of Life. Americans are by nature a busy and ambitious people whom social forces – declining average wages, higher rates of divorce, instant telecommunications, jet travel across time zones – have made busier and busier to no clear end.

It is hard not to credit the importance of the AWOL factor, but the driving force behind the sleep deficit is global in nature: the triumph of light. The widespread, seemingly harmless use of electricity in powering the common light bulb has reduced the amount of sleep people get. Electricity has made it possible for the first time in history for large numbers of human beings to conquer darkness.

In the United States at midnight, more than five million people are at work at full-time jobs. Supermarkets, gas stations, copy shops – many of them never close. The supply-side theory may not have worked in economics, but it has certainly worked with regard to light: the more we get, the more we find ways to put it to use. The result of all this is that we have distanced ourselves from the basic rhythms of night and day in which we evolved as human beings.

Having said this, what exactly can we do about the situation? The only suggestion for improvement that I have to offer comes from reflecting on life in Ireland in the 1960s. One of the elements that made Irish life so amicable was that the Electric Supply Board somehow or other managed to produce frequent but unpredictable blackouts. The progress of time would suddenly be frozen for an uncertain duration. Lights would go off. Clocks would stop. Television screens would go black. The entire community would take a brief timeout. Perhaps what

Americans need is some sort of periodic timeout, a mandatory rest from their busy routine.

A revised version from the written examination of the pre-1st grade test of STEP, 1996

Question 1. According to the article, the "sleep deficit"

1. actually started over a hundred years ago.
2. affects few Americans very severely.
3. is a term used for a chronic lack of sleep.
4. refers to the difference between two types of sleep.

Question 2. The writer believes that the AWOL factor is

1. the prime reason for the "sleep deficit."
2. of secondary importance for the "sleep deficit."
3. of no importance in considering the "sleep deficit."
4. really global in nature.

Question 3. In general, the reason why many shops never close at midnight is

1. they obey the government policy.
2. they contribute to reduction of crimes.
3. they notice the relationship between supply and demand.
4. they work according to the AWOL factor.

Question 4. The writer believes that the supply-side theory has worked with light because

1. the demand decreases when supply is increased.
2. the demand increases when more light is provided.
3. the supply always remains greater than the demand.
4. the supply and demand work independently of each other.

Question 5. The writer states that the main result of light on human life is that

1. it has created social forces such as higher rates of divorce.
2. it has enabled us to organize our life better.
3. it has separated us from natural cycles and rhythms.
4. it has helped us evolve as human beings.

Question 6. The main argument of the writer is that

1. a short period without electricity would be beneficial to our modern pace of life.
2. the Electric Supply Board in Ireland had a plan to reduce the tension caused by light in daily life.
3. frequent and unpredictable blackouts can make life less amicable.
4. going to bed earlier will help Americans deal with their busy routine.

Appendix H *Useful Functions of the ED used in the studies*

Each ED model used in these studies provides the following functions to help learners' look-up behavior:

1) *Real-time search*

A headword search function is activated immediately after input of each character. This function can reduce the time spent searching;

2) *Word history*

The list of previously searched words in the ED is displayed, when learners press the ヒストリー key;

3) *Jump to multiple dictionaries*

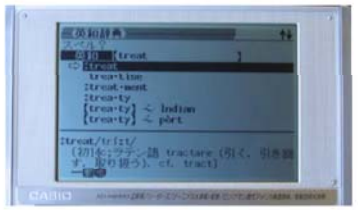
With a search result screen displayed, one can press the ジャンプ key, and select a word appearing on the screen. Pressing the 訳・決定 key after choosing one of the dictionaries on the screen, will display further information concerning the target word in the other dictionary;

4) *Example or Idiom search*

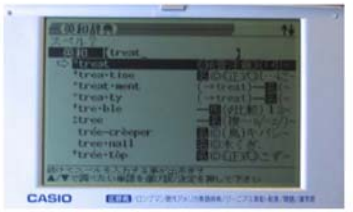
Example sentences or idioms can be searched directly by the use of 例文検索 key;

5) *Preview*

The screen is divided into two parts: upper and lower (See the difference between the pictures below).



CASIO XD-H9100



CASIO XD-R8100/XD-R9000

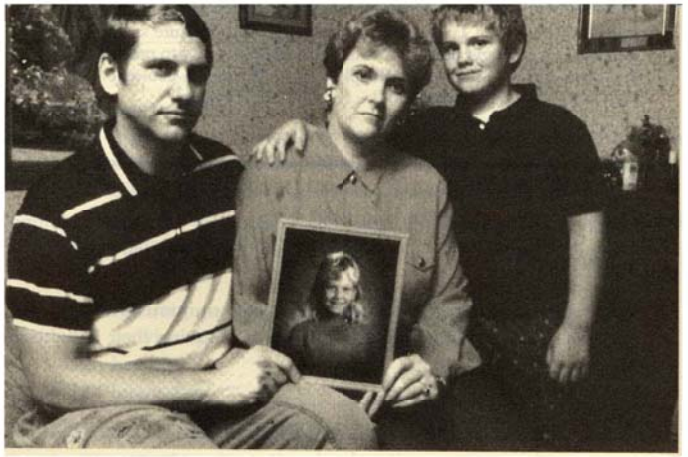
The differences among the functions of each ED are shown in the table below.

Functions	Chapter 3 XD-R8100	Chapters 4&5 XD-R9000	Chapter 6 XD-H9100
Real-time search	○	○	○
Word history	○	○	○
Jump to multiple dictionaries	○	○	○
Example or Idiom search	×	×	○
Preview	×	×	○

"○" means function available; "×"means function unavailable.

Appendix I *Text used in Chapter 6*

これから、お渡しする英文を指定した辞書を自由に使って読み、内容を理解するようにしてください。ただし、英文読み始めから終わりまでの間、自分が頭の中に浮かんだことのすべてを声に出してください。特に辞書を引いているとき（キー入力をしているときや目的の単語がなかなか見つけられないときなども含めて）頭の中であれこれ考えていることを、すべて発話してください。
[Translation: Read the text below with the designated dictionary. Do not fail to verbalize your thoughts while reading the text. Especially verbalize all kinds of thoughts when searching words with the dictionary.]



Two Parents Offer Their Daughter the Breath of Life — to No Avail

Time

Did Cindy and Roger Plum of Coon Rapids, Minnesota, overstep the limits of parental sacrifice to try to save their 9-year-old daughter Alyssa? Although their efforts failed, both parents say they would do it again—and again.

Last New Year's Eve, Alyssa took to bed with symptoms that suggested bronchitis. Three months later, she was rushed to a hospital emergency room with a high fever. Doctors suspected a virus, but sent her home. Two days later, Alyssa was at her doctor's office with pneumonia. Within days, her skin turned blue from lack of oxygen. By mid-April she was on a list for lung transplant.

The Plums, who had read about transplant surgeries using lobes of the lung from living donors, decided to volunteer. Alyssa successfully received a piece of Roger's lung. Then her other lung failed. Less than four weeks later, Cindy

underwent the procedure. This time Alyssa died of heart failure. Both parents have 18-inch scars that run from their chest to their back. Cindy's sleep is still interrupted by pain. Roger suffers from muscle weakness. Even though the couple have a son, Travis, six, who risked losing a parent, they never had doubts about their actions. "If I didn't give Alyssa a chance at life," says Cindy, "I didn't know if I could live with myself."

L. C. Smith & N.N. Mare (2000), *Topics for Today Book 2*, 松柏社